From: Aliso WD GSA <info@alisowdgsa.org>
Sent: Friday, September 20, 2019 4:48 PM
Subject: Fw: Aliso WD GSA Notice of GSP Public Hearing and Review

Good afternoon,

You are receiving this email as an interested party to the Aliso Water District. Attached is the notice of our public hearing for our Groundwater Sustainability Plan adoption. The hearing will be held on or after December 19, 2019. Shortly you will find the GSP on our website for your review and comment.

Aliso Water District
Groundwater Sustainability Agency

13991 Avenue 7

Madera, CA 93637

(559) 659-1483

www.alisowdgsa.org

Aliso Water District
Groundwater Sustainability Agency
www.alisowdgsa.org
13991 Avenue 7
Madera, CA 93637
(559) 659-1483

NOTICE OF PUBLIC HEARING FOR PROPOSED GROUNDWATER SUSTAINABILITY PLAN ADOPTION (WATER CODE § 10728.4)

September 20, 2019

This letter is to provide notice of the Aliso Water District ("AWD") Groundwater Sustainability Agency's ("GSA") proposed adoption of a Groundwater Sustainability Plan ("GSP") pursuant to Water Code section 10728.4. Under the Sustainable Groundwater Management Act of 2014 (Water Code §§ 10720 et seq.) ("SGMA"), at least 90-days prior to holding a public hearing to adopt a GSP, a Groundwater Sustainability Agency ("GSA") must provide notice to a city or county within the area of the proposed GSP. (Water Code § 10728.4.)

The document will be available for public review and comment through December 19, 2019 at the AWD Office, or it may be downloaded from the District's website.

A public hearing will be held at 1:30 PM on December 19, 2019, or as soon thereafter as may be heard, at the offices of the O'Neill Agri-Management, 13991 Avenue 7, Madera, CA 93637. Considerations to adopt this document may occur as part of public hearing. Once adopted, the AWD GSA GSP will govern sustainable groundwater management actions within AWD GSA's jurisdictional boundaries located in the Delta-Mendota Subbasin (Groundwater Basin: 5-022.07).

If you have any comments you would like AWD GSA to review and consider, please provide them in writing (via letter or e-mail) to:

info@alisowdgsa.org
or
Aliso Water District
Groundwater Sustainability Agency
13991 Avenue 7
Madera, CA 93637

From: Aliso WD GSA
Sent: Friday, December 13, 2019 9:27 AM
Subject: Aliso WD Public Hearing Notice

Good morning,

Attached to this email you will find the Public Hearing Notice for the Aliso Water District GSA, Groundwater Sustainability Plan. If you would like to submit questions or comments regarding the Plan, please direct them to this Aliso WD GSA email, at info@alisowdgsa.org.

Thank you for your time,

Aliso Water District
Groundwater Sustainability Agency
13991 Avenue 7
Madera, CA 93637
(559) 779-2616

Aliso Water District
Groundwater Sustainability Agency

www.alisowdgsa.org
13991 Avenue 7
Madera, CA 93637
(559) 659-1483

PUBLIC NOTICE

Aliso Water District Groundwater Sustainability Agency

Notice of Public Hearing on Aliso Water District GSA Groundwater Sustainability Plan

Notice is hereby given that, pursuant to the Sustainable Groundwater Management Act (SGMA) of 2014, a public hearing on the draft Aliso Water District Groundwater Sustainability Agency's Groundwater Sustainability Plan (GSP) will be held by the Aliso Water District GSA at 1:30 p.m. on Thursday, December 19, 2019 at the offices of O'Neill Agri-Management, located at 13991 Avenue 7 in Madera, California.

The Aliso Water District GSA's draft GSP is available on-line at www.alisowdgsa.org, and hard copies are available at the district office, located at 13991 Avenue 7 in Madera. The Aliso Water District GSA will consider all written comments received before and up through the public hearing from beneficial users of groundwater or local stakeholders. Written comments may be submitted by mailing to 13991 Avenue 7, Madera, CA 93637; by emailing info@alisowdgsa.org; or by providing oral and/or written comments at the public hearing.

Considerations to adopt the GSP may occur immediately following the public hearing. Once adopted, the Aliso Water District GSA's GSP will govern sustainable management actions with the GSA's jurisdictional boundaries located in the Delta-Mendota Subbasin.

Aliso Water District
Groundwater Sustainability Agency
www.alisowdgsa.org
13991 Avenue 7
Madera, CA 93637
(559) 659-1483

NOTICE OF PUBLIC HEARING FOR PROPOSED GROUNDWATER SUSTAINABILITY PLAN ADOPTION (WATER CODE § 10728.4)

September 20, 2019

This letter is to provide notice of the Aliso Water District ("AWD") Groundwater Sustainability Agency's ("GSA") proposed adoption of a Groundwater Sustainability Plan ("GSP") pursuant to Water Code section 10728.4. Under the Sustainable Groundwater Management Act of 2014 (Water Code §§ 10720 et seq.) ("SGMA"), at least 90-days prior to holding a public hearing to adopt a GSP, a Groundwater Sustainability Agency ("GSA") must provide notice to a city or county within the area of the proposed GSP. (Water Code § 10728.4.)

The document will be available for public review and comment through December 19, 2019 at the AWD Office, or it may be downloaded from the District's website.

A public hearing will be held at 1:30 PM on December 19, 2019, or as soon thereafter as may be heard, at the offices of the O'Neill Agri-Management, 13991 Avenue 7, Madera, CA 93637. Considerations to adopt this document may occur as part of public hearing. Once adopted, the AWD GSA GSP will govern sustainable groundwater management actions within AWD GSA's jurisdictional boundaries located in the Delta-Mendota Subbasin (Groundwater Basin: 5-022.07).

If you have any comments you would like AWD GSA to review and consider, please provide them in writing (via letter or e-mail) to:

info@alisowdgsa.org
or
Aliso Water District
Groundwater Sustainability Agency
13991 Avenue 7
Madera, CA 93637

Agenda

Aliso Water District Groundwater Sustainability Agency

Aliso Board of Directors

Thursday December 19, 2019

1:30 p.m.

13991 Avenue 7 Madera, California 93637

1. Public Hearing on the Aliso Water District GSA's draft GSP.
2. Special Board meeting to consider adoption of AWD's GSP.
   A. Call meeting to order.
   B. Resolution 19-04 to adopt District's draft GSP
3. Public comment
4. Other business to come before board
5. Adjourn 1:40

Aliso Water District

Special Board Meeting Minutes

Thursday December 19, 2019

1:30 P.M.

13991 Avenue 7 Madera, California 93637

Present: Katie Durham, Joe Hopkins, Mike Nunes, Michael Logoluso, Ross Franson, Jeremy Seibert, Daniel Duncan and Roy Catania

Absent: Bernard Puget

1. Call to order
2. Public Hearing opened on the Aliso Water District GSA's draft GSP
    a. There was no public comment.
    b. Public hearing closed
3. Called to order the special meeting of the Aliso Water District
4. Resolution 19-04
    a. Approve the GSP
    b. Allow the staff to make editorial and non-substantial change to the final version that will be provided to DWR
    c. Authorizes its board president , its consultants, and the Plan Manager to take such other actions as may be reasonably necessary to submit the GSP to DWR online by January 31, 2020, and implement the purpose of this Resolution.

    M/S: Michael Logoluso, Jeremy Seibert

    Director Ross Franson Aye

    Director Roy Catania Aye

    The President announced that the Board voted to approve the motion

5. Public Comment.
    a. No public comment
6. Other business to come before the Board

a. LAFCO sent out a project review request pertaining to certain acreage to be annexed into the Gravelly Ford Water District. The Board was given copies of the request to review.

7. Adjournment 1:40 P.M.

Aliso Water District GSA
Public Review Comment Summary
to September 2019 Public Draft

The Public Draft version of the Aliso Water District Groundwater Sustainability Agency's (AWD GSA) Groundwater Sustainability Plan (GSP) was released for public review and consideration on September 20, 2019. The public review period closed on December 19, 2019. The following table summarizes the comments received on the Public Draft GSP.

Comments received to date on the Public Draft version of the GSP have not been addressed in the Final GSP submitted for adoption by the AWD GSA. The GSA is beginning consideration and discussion of the comments received to date. Furthermore, the GSA is anticipating receiving additional comments during the 60-day public comment period to be held after the GSP is submitted to the California Department of Water Resources (DWR) and is posted to their SGMA Portal; these comments will be combined with those received during the 60-day comment period for subsequent consideration.

The AWD GSA thanks those entities who reviewed and commented on the Public Draft GSP. The GSA looks forward to working with those who conveyed interest in participating in the development, completion, and implementation of the GSP.

No.	Section.	By	Date Received	Review Comments Summary
1.	Chapter 4	U.S. Bureau of Reclamation	12/19/2019 12:43pm	The draft GSP acknowledges the current subsidence rates within the district and outlines plans for groundwater monitoring. The GSP lacks any specific action plan and mitigation measures should threshold exceedances or undesirable results occur. The GSP Should include mitigation measures that require prompt corrective actions to avoid unanticipated undesirable effects.
2.	2.5.1	California Dept. of Fish and Wildlife	12/19/2019 3:05pm	The GSP acknowledges environmental beneficial uses and users of groundwater but does not describe or consider their reliance on groundwater. Recommendation: The department recommends elaborating on potential environmental beneficial uses and users of groundwater by including a detailed description on how these users, such as GDEs, may rely on groundwater and may be impacted by the Sustainable Management Criteria. Recommendation: TNC Lookbook (2019).

Aliso Water District GSA
Public Review Comment Summary
to September 2019 Public Draft

3.	Chapter 3-1 Chapter 4 Chapter 5	California Dept. of Fish and Wildlife	12/19/2019 3:05pm	The narrative describing the Plan Area's interconnected surface water conditions is lacking detail and does not identify interconnected surface waters. The Common Chapter identifies Reach 2 as experiencing groundwater interconnectivity, contradicting the Plan Area.
4.			12/19/2019 3:05pm	The GSP does not include a figure identifying the extent of the legal agreement preventing surface water depletions.
5.			12/19/2019 3:05pm	There may be GDEs proximate to the SJR that may be affected by pumping outside of the legal limit [of Herminghaus Agreement].
6.			12/19/2019 3:05pm	Independent of well restriction's abilities to prevent interconnected surface water depletions, the GSP regulations require identification of ISW.
7.			12/19/2019 3:05pm	The GSP does not define the temporal or spatial resolution of the SJRRP monitoring network nor does it clearly define how SJRRP data collection will inform GSA decision-making and adaptive management.
8.	2.4.12, Figure 2-8 and Appendix B Common Chapter (4.2.7, 4.2)	California Dept. of Fish and Wildlife	12/19/2019 3:05pm	Methods applied to the Natural Communities Commonly Associated with Groundwater Dataset to identify potential GDEs need further evaluation. Exclusion of potential GDEs based on a singular groundwater elevation is invalid because it does not consider representative climate conditions across season and water type years.
9.				The "No net wetland loss" policy established by the Fish and Game Commission to protect the states remaining nature wetlands, and there are more federal and state laws protecting wetlands.

Aliso Water District GSA
Public Review Comment Summary
to September 2019 Public Draft

10.	Chapter 4	California Dept. of Fish and Wildlife	12/19/2019 3:05pm	The minimum thresholds do not reflect a "Critically Overdrafted" Basin Status. The MT of 100 feet above the Corcoran Clay layer allows for significant groundwater elevation declines. Managing to this MTs risks sustained, on-going groundwater table decline, mirroring the historical trends that led to the Critically Overdrafted Status.
11.	2.2.1	California Dept. of Fish and Wildlife	12/19/2019 3:05pm	Extensometer data from the USGS Yearout Station, south of the Plan Area, indicates vertical displacement in the unconfined aquifer system of approximately 0.30/ft from 1999-2017. However, the GSP recognizes subsidence occurring from only lower aquifer pumping.
12.	3.3.2.4	California Dept. of Fish and Wildlife	12/19/2019 3:05pm	The GSP indicates that between the period of record, average annual groundwater pumping was approximately 90,000 AF; however, there were large gaps in production data for irrigation wells. With additional data from irrigation wells, the extraction volumes would likely be significantly larger than what was provided in the water budget.
13.	Chapter 4	California Dept. of Fish and Wildlife	12/19/2019 3:05pm	The GSP has established MTs for subsidence that allow 0.2 ft/year of compaction, which is consistent with the Subbasin's goals; however, the MTs for water levels may be too lenient, and result in experiencing the subsidence MT.
14.	Chapter 5	California Dept. of Fish and Wildlife	12/19/2019 3:05pm	The number and distribution of groundwater monitoring wells in the Plan Area and along the surface waters in the GSA are insufficient for analysis of shallow groundwater trends and groundwater-surface water interconnectivity.
15.	Chapter 5	California Dept. of Fish and Wildlife	12/19/2019 3:05pm	Existing groundwater monitoring wells are insufficient to characterize shallow groundwater and surface water-groundwater interactions within the regions of the Plan Area most likely to

				support GDEs and ISW, such as downstream reaches of SJR in Zone 3. Shallow groundwater data are critical to understanding groundwater management impacts of fish and wildlife beneficial uses and users of groundwater.
16.	Overall Comment	California Dept. of Fish and Wildlife	12/19/2019 3:05pm	SGMA exempts the preparation and adoption of GSPs from CEQA; however, SGMA specifically states that implementation of project actions taken pursuant to SGMA are not exempt from CEQA.
17.	Overall Comment	California Dept. of Fish and Wildlife	12/19/2019 3:05pm	The Department of Fish and Wildlife is a responsible agency under CEQA and expects that it may need to exercise regulatory authority as provided by the Fish and Game Code for implementation of projects related to the GSP that are also subject to CEQA. These projects may be subject to the Departments Lake and Streambed Alteration regulatory authority. To the extent that implementation of any project may result in “take” of any species protected under CEQA, related authorization as projected by the Fish and Game Code will be required.
18.	Overall Comment	California Dept. of Fish and Wildlife	12/19/2019 3:05pm	Water Rights: The implementation of SGMA does not alter or determine surface or groundwater rights. The capture of unallocated stream flows to artificially recharge groundwater aquifers are subject to appropriation and approval by the State Water Resources Control Board.

United States Department of the Interior

BUREAU OF RECLAMATION
Interior Region 10
2800 Cottage Way
Sacramento, California 95825-1898

IN REPLY REFER TO:
MP-400
WTR-4.03

Aliso Water District
1301 Avenue 7
Madera, California 93637

VIA ELECTRONIC MAIL

Subject: Comments on Aliso Water District Groundwater Sustainability Agency's Groundwater Sustainability Plan

Dear Aliso Water District Groundwater Sustainability Agency:

The United States Bureau of Reclamation (Reclamation) provides these comments on the draft groundwater sustainability plan (GSP) published by the Aliso Water District Groundwater Sustainability Agency (GSA).

We commend and appreciate your efforts, time, and energy devoted to the very difficult task of developing a GSP to comply with the Sustainable Groundwater Management Act of 2014.

The mission of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. The Aliso Water District is in close proximity to some of the most critical features of the Central Valley Project that allow us to meet our mission. This includes the implementation of the San Joaquin River Restoration Program.

The draft GSP acknowledges the current subsidence rates within district and outlines plans for groundwater monitoring. However, the GSP lacks any specific action plan and mitigation measures should threshold exceedances or undesirable results occur. The GSP should include mitigation measures that require prompt corrective actions to avoid unanticipated and undesirable effects.

Reclamation appreciates your consideration of these comments. If you should have any questions on this matter, please contact me at (916) 978-5201 or by email at rwoodley @usbr.gov.

Richard J. Woodley
Regional Resources Manager

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Central Region
1234 East Shaw Avenue
Fresno, California 93710
(559) 243-4005
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

December 17, 2019

Via Mail and Electronic Mail

Roy Catania
Aliso Water District GSA
13991 Avenue 7
Madera, California 93637
info@alisowdgsa.org

Subject: Comments on the Aliso Water District Groundwater Sustainability Plan

Dear Mr. Catania:

The California Department of Fish and Wildlife (Department) Central Region is providing comments on the Aliso Water District Draft Groundwater Sustainability Plan (GSP) prepared by Aliso Water District Groundwater Sustainability Agency (GSA) pursuant to the Sustainable Groundwater Management Act (SGMA). As trustee agency for the State's fish and wildlife resources, the Department has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of such species (Fish & Game Code §§ 711.7 and 1802).

Development and implementation of Groundwater Sustainability Plans (GSP) under SGMA represents a new era of California groundwater management. The Department has an interest in the sustainable management of groundwater, as many sensitive ecosystems and species depend on groundwater and interconnected surface waters. SGMA and its implementing regulations afford ecosystems and species specific statutory and regulatory consideration, including the following as pertinent to GSPs:

- Groundwater Sustainability Plans shall identify and consider impacts to groundwater dependent ecosystems (GDEs) pursuant to 23 California Code of Regulations (CCR) § 354.16(g) and Water Code § 10727.4(l);

- Groundwater Sustainability Agencies shall consider all beneficial uses and users of groundwater, including environmental users of groundwater pursuant to Water Code § 10723.2(e); and Groundwater Sustainability Plans shall identify and consider potential effects on all beneficial uses and users of groundwater pursuant to 23 CCR §§ 354.10(a), 354.26(b)(3), 354.28(b)(4), 354.34(b)(2), and 354.34(f)(3);

- Groundwater Sustainability Plans shall establish sustainable management criteria that avoid undesirable results within 20 years of the applicable statutory

deadline, including depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water pursuant to 23 CCR § 354.22 *et seq*. and Water Code §§ 10721(x)(6) and 10727.2(b) and describe monitoring networks that can identify adverse impacts to beneficial uses of interconnected surface waters pursuant to 23 CCR § 354.34(c)(6)(D); and

- Groundwater Sustainability Plans shall account for groundwater extraction for all Water Use Sectors including managed wetlands, managed recharge, and native vegetation pursuant to 23 CCR §§ 351(al) and 354.18(b)(3).

Furthermore, the Public Trust Doctrine imposes a related but distinct obligation to consider how groundwater management affects public trust resources, including navigable surface waters and fisheries. Groundwater hydrologically connected to navigable surface waters and surface waters tributary to navigable surface waters are also subject to the Public Trust Doctrine to the extent that groundwater extractions or diversions affect or may affect public trust uses (*Environmental Law Foundation v. State Water Resources Control Board* (2018), 26 Cal. App. 5th 844). Accordingly, groundwater plans should consider potential impacts to and appropriate protections for navigable interconnected surface waters and their tributaries, and interconnected surface waters that support fisheries, including the level of groundwater contribution to those waters.

In the context of SGMA statutes and regulations and Public Trust Doctrine considerations, the Department values SGMA groundwater planning that carefully considers and protects groundwater dependent ecosystems and fish and wildlife beneficial uses and users of groundwater and interconnected surface waters.

COMMENT OVERVIEW

The Department supports ecosystem preservation in compliance with SGMA and its implementing regulations based on Department expertise and best available information and science.

The Department recommends the GSP provide additional information and analysis that considers all environmental beneficial uses and users of groundwater and better characterizes surface water-groundwater connectivity. In addition, the Department is providing comments and recommendations below.

COMMENTS AND RECOMMENDATIONS

The Department comments are as follows:

1. **Comment #1 Environmental Beneficial Uses.** Chapter 2 Plan Area. Subsection 2.5.1 Description of Beneficial Users (page 2-28). The GSP acknowledges environmental beneficial uses and users of groundwater but does not describe or consider their reliance on groundwater.

    a. *Issue*: Pursuant to 23 CCR § 354.10(a), GSPs are to include in the Notice and Communication Section a "description of the beneficial uses and users of groundwater in the basin." The GSP describes 'Environmental Users of Groundwater' as consultation with state and federal agencies and environmental organizations (page 2-28), rather than as the plants, animals, and groundwater dependent ecosystems that rely on groundwater. Additionally, environmental users were not included on the list of 'Surface Water Users' (page 1-22), even though the San Joaquin River in the GSA Plan Area supports riparian vegetation and potential GDEs (Klausmeyer et al. 2018) which constitute beneficial users of surface water. These vegetated riparian areas are among the environmental beneficial uses and users of surface water and groundwater in the subbasin, in addition to the animal species supported by the in-stream and riparian habitats.

    b. *Recommendation:* The Department recommends elaborating on potential environmental beneficial uses and users of groundwater by including a detailed description on how these users, such as GDEs and the species therein, may rely on groundwater and may be impacted by Sustainable Management Criteria pursuant to 23 CCR §§ 354.10(a), 354.26(b)(3), 354.28(b)(4), 354.34(b)(2), and 354.34(f)(3). The Critical Species LookBook (TNC 2019) is a resource to help identify threatened and endangered species in any basin subject to SGMA and to help understand species relationships to groundwater. The LookBook also offers narrative on species and habitat groundwater dependence that can be a model for describing environmental beneficial uses and users of groundwater in the GSP.

2. **Comment #2 Interconnected Surface Water.** Chapter 3 Basin Setting (starting page 3-1). Chapter 4 Sustainable Management Criteria (starting page 4-1). Chapter 5 Monitoring Network (starting page 5-1). The narrative describing the Plan Area's interconnected surface water (ISW) conditions is diffuse, lacks detail, and does not identify interconnected surface waters.

    a. *Issue:* The analysis of surface water interconnectivity offers an incomplete understanding of surface water-groundwater interconnectivity in the Plan Area. Pursuant to 23 CCR § 354.16(f), a GSP shall identify "interconnected surface water systems within the basin and an estimate of

the quantity and timing of depletions of those systems" within the GSP's 'Groundwater Conditions' section. This GSP provides a dispersed discussion on surface water interconnectivity along the San Joaquin River throughout the GSP, but it does not specifically identify ISW. The dispersed discussion on surface water interconnectivity includes the following narratives.

i. Significant and unreasonable impacts and threshold affects are not defined for ISW, because Aliso Water District (AWD) has deed restrictions on well constructions and does "not have the ability to impact ISW" (page 4-10).

ii. The GSA cannot deplete ISW due to legal constraints that "restrict well design and construction to limit the strata in which production of groundwater occurs. Groundwater extraction in wells near the [San Joaquin River (SJR)] must occur below the semi-confining clay layer commonly referred to as the A-Clay to prevent unintended pumping of hydrological connected surface water" (page 4-12). "This [legal] agreement restricts groundwater pumping from the lands known as the Hemminghaus lands in the upper aquifer adjacent to the SJR. This agreement prevents construction and use of wells perforated less than 75 feet bgs" (page 5-9).

iii. "Groundwater in [Reach 2 of the San Joaquin River] has historically been disconnected from surface water due to past water management practices [...] Restoration efforts have resulted in hydraulic connection between the SJR and the Sacramento-San Joaquin River Delta during non-critical water years. However, due to previous management practices establishing the diversion of surface water away from the upper reaches of the SJR except during instance of flood, the surface water will likely continue to be disconnected from the groundwater system [...] Groundwater levels near the river average 50-feet deep in the shallow aquifer according to the [San Joaquin River Restoration Program (SJRRP)]" (pages 5-8 to 5-9).

iv. "Areas of saturated zones between the SJR and the shallowest underlying aquifer may exist semi-seasonally but not on a continuous basis as this stretch of the SJR does regularly go dry [...] Based on [CCR Title 23 § 351.(o)] definition of interconnected surface water, the stretch of the San Joaquin River along AWD is not continuously interconnected" (page 5-9).

v. "AWD has determined that the monitoring network put in place for the SJRRRP will be adequate for determining if the SJR hydraulically connects to groundwater in the future" (page 5-14).

vi. In the Data Gaps Section, AWD notes, "How shallow water levels can be correlated with depletion of surface water is still being considered" (page 5-29).

These discussions raise a few issues. Importantly, the Delta-Mendota Common Chapter *Table CC-8 Estimated Quantity of Gains/Depletions for Interconnected Team Reaches, SJR* identifies reaches of surface water - groundwater interconnectivity along Reach 2 of SJR, contradicting the GSP's conclusions that there are no ISW in the Plan Area. Additionally, the GSP touts an existing legal agreement to prevent surface water depletions, but it does not provide a figure explaining the geographic scope of the agreement, nor a subsurface cross section or hydrologic analysis to show how the 75-foot minimum depth for well screens protects against surface water depletions. If well restrictions only apply to a portion of the subbasin, there may be GDEs proximate to the SJR, such as the concentration of potential GDEs in the farthest downstream reaches of Reach 2 (page 2-27, Figure 2-8), that risk impacts from groundwater pumping outside the scope of the legal agreement. Regardless of how effective these well restrictions are to prevent ISW depletions, the GSP regulations require identification of ISW whether or not groundwater extraction is likely to impact surface water depletions. Finally, the GSP describes a reliance on SJRRP shallow groundwater monitoring to ensure an adequate understanding of groundwater-surface water relationships, but the GSP does not define the temporal and spatial resolution of the SJRRP monitoring network nor does it clearly define how SJRRP data collection will inform GSA decision-making and adaptive management.

b. *Recommendations:* To reconcile the incomplete analysis of ISW and depletions attributable to groundwater pumping, the Department recommends the GSA consider the following actions:

i. Describe how AWD is coordinating with the SJRRP to "[monitor] groundwater surface water interaction and river flow losses in adjacent reaches of the river to ensure that surface water is unimpaired by groundwater users in AWD" (page 5-9).

ii. Specify and describe ISW in the 'Groundwater Conditions' subsection within *Chapter 3. Basin Setting.* Reference the Delta-Mendota Common Chapter and Technical Memoranda (Appendix B)

Table CC-8 Estimated Quantity of Gains/Depletions for Interconnected Team Reaches, SJR to identify reaches of interconnectivity and data gaps.

iii. Determine a clear path to identifying the estimated quantity, timing, and location of streamflow depletions in the subbasin, per 23 CCR 354.28 (c)(6)(A), that have not yet been identified.

iv. Periodically reevaluate sustainable management criteria based on an improved understanding of ISW and with consideration for impacts to environmental beneficial uses and users of groundwater (see Comments #1, 3, 4).

3. **Comment #3 Groundwater Dependent Ecosystems.** Chapter 2 Plan Area. Section 2.4 Additional GSP Components, Subsection 2.4.12 Groundwater Dependent Ecosystems (page 2-26 and Figure 2-8) and Appendix B Common Chapter, Chapter 4 Subbasin Setting, Section 4.2 Delta-Mendota Subbasin Groundwater Conditions, Subsection 4.2.7 Interconnected Surface Water System (pages CC-114 to CC-118 and Figures CC-62 and CC-63). The GDE identification section, pursuant to 23 CCR § 354.16 (g), is based on limited information to identify ecosystems that may depend on groundwater.

   a. *Issue*: Methods applied to the Natural Communities Commonly Associated with Groundwater (NCCAG) dataset to identify potential GDEs need further evaluation.

      i. Depth to Groundwater: Evaluating only areas with a depth to groundwater greater than 30 feet in Spring 2013 (as stated on page 2-26) relies on a single-point-in-time baseline hydrology. Exclusion of potential GDEs based on this singular groundwater elevation measurement is invalid, because it does not consider representative climate conditions across seasons and water type years.

      ii. No Land Use Protections for GDEs: The Department does not concur that there are no laws or regulations that protect GDEs (see Delta-Mendota Common Chapter, page CC-118). The Department has a "No net wetland loss" policy established by the Fish and Game Commission to protect our states remaining natural wetlands. Furthermore, there are other state and federal laws to protect natural wetlands.

   b. *Recommendations:* The Department recommends the GSP consider the following for information gathering related to GDEs:

i. Depth to Groundwater: Develop a hydrologically robust baseline which includes areas with a depth to groundwater greater than 30 feet that relies on multiple, climatically representative years of groundwater elevation and that accounts for the inter-seasonal and inter-annual variability of GDE water demand.

ii. Include additional references for evaluation: The Department recognizes that NCCAG (Klausmeyer et al. 2018) provided by California Department of Water Resources (CDWR) is a good starting reference for GDEs; however, the Department recommends the GSP include additional resources for evaluating GDE locations. The Department recommends consulting other references, including, but not limited to, the following tools and other resources: the California Department of Fish and Wildlife (CDFW) Vegetation Classification and Mapping Program (VegCAMP) (CDFW 2019A); the CDFW California Natural Diversity Database (CNDDB) (2019B); the California Native Plant Society (CNPS) Manual of California Vegetation (CNPS 2019A); the CNPS California Protected Areas Database (CNPS 2019B); the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (2018); the USFWS online mapping tool for listed species critical habitat (2019); the U.S. Forest Service CALVEG ecological grouping classification and assessment system (2019); and other publications by Klausmeyer et al. (2019), Rohde et al. (2018), The Nature Conservancy (TNC) (2014, 2019), and Witham et al. (2014).

4. **Comment #4 Sustainable Management Criteria.** Chapter 4 Sustainable Management Criteria (starting on page 4-1). Minimum Thresholds (MTs) do not reflect a 'Critically Overdrafted' Basin status.

   a. *Issue*: The Delta-Mendota Subbasin is designated as 'Critically Overdrafted,' meaning "continuation of present water management practices [in the basin] would probably result in significant adverse overdraft-related environmental, social, or economic impacts" (CDWR "Critically Overdrafted") (CDWR 2019). the GSP establishes MTs 100 feet above the Corcoran Clay layer. These MTs allow for significant groundwater elevation declines, in some cases up to ~150 feet (page 4-14, Table 4-2; page 5-22, Table 5-2). Managing to these MTs risks sustained, on-going groundwater table decline, mirroring the historical trends that led to the subbasin's Critically Overdrafted status. Conceptually, there is a disconnect between the subbasin's 'Critically Overdrafted' designation and sustainable management criteria the allow for continued groundwater level decline.

b. *Recommendation*: The Department recommends revising MTs to reflect a 'Critically Overdrafted' subbasin designation by seeking to actively improve upon historical groundwater conditions rather than allow for continued aquifer depletion trends over the next two decades.

5. **Comment #5 Land Subsidence.** Chapter 2 Plan Area, Section 2.2.1 Monitoring and Management Programs, Land Subsidence Monitoring (starting page 2-10). The GSP acknowledges on page 2-10 that the main forms of subsidence in the Plan Area are deep subsidence and shallow subsidence; however, on page 2-11, the GSP goes on to state that, "the extent of subsidence in the GSA area has been minimal if not absent, and as such, the land subsidence records here are not extensive." The Delta-Mendota Common Chapter states "Land subsidence is a prevalent issue in the Delta-Mendota Subbasin as it has impacted prominent infrastructure of statewide importance, namely the Delta-Mendota Canal (DMC) and the California Aqueduct, as well as local canals, causing serious operational, maintenance, and construction-design issues" (page cc-100). Additionally, the Common Chapter indicates that reduction in groundwater storage (i.e. reduction from groundwater pumping) in fine-grained materials in the lower confined aquifer has resulted in damage to well infrastructure. The subsidence data presented in the GSP is taken from a short time period (2012 -2018) that does not necessarily represent a complete data set for subsidence within the basin, nor does it acknowledge any impacts from past and present groundwater extraction practices that likely contribute to land subsidence issues collectively within the Delta-Mendota Subbasin.

   a. *Issues:* As previously stated The Delta-Mendota Subbasin is designated as 'Critically Overdrafted,' meaning "continuation of present water management practices [in the basin] would probably result in significant adverse overdraft-related environmental, social, or economic impacts" (CDWR "Critically Overdrafted") (CDWR 2019). Available data (Estimated Vertical Displacement Data SJV DWR) indicate that from 1949 to 2005 vertical displacement has been recorded up to 10 feet within the GSP Plan Area. Extensometer compaction data from the USGS Yearout Station just south of the Plan Area indicates that between the years of 1999 and 2017 approximately 0.30 feet of compaction was observed within the shallow unconfined aquifer system. Additional historic extensometer data was reviewed for the Yearout Extensometer station as provided by the USGS online database (*https://www.usgs.gov/centers/ca-water-ls/science/extensometers-and-compaction?qt-science_center_objects=0#qt-science_center_objects*). Records indicate that between the years of 1966 and 1983, approximately 0.30 feet of compaction in the upper aquifer was recorded. The GSP states that while the majority of wells in the Plan Area are shallow wells pumping below the

semi-confining A-Clay layer, the remaining wells are composites wells that extract water from both the semi-confined and confined aquifers (page 4-15). On page 3-18 under Subsection 3.3.2.4 Groundwater System Outflows, the GSP states "groundwater is pumped from both the upper and lower aquifer in the AWD. It is not yet known how much water is pumped from each aquifer; total pumping can however be estimated using cropping data, population, and known industrial and commercial activities." Based on the information provided in the historical water budget, the GSP indicates that between the period of record (2003-2012) average annual groundwater pumping was approximately 90,000 AF; however, there were large gaps in production data for irrigation wells. With additional data from the irrigation wells, the extraction volumes would likely be significantly larger than what is provided within the water budget. This extraction information is needed to properly assess and develop realistic SMC criteria for land subsidence within the GSA.

The GSP has established MTs for subsidence that allow 0.2 feet/year (four feet by 2040) of compaction. These SMC align with overall basin objectives; however, the proposed lenient MTs for groundwater levels (see Comment #4) combined with a lack of data for groundwater extraction volumes creates a strong potential for increased subsidence rates within the plan area.

b. *Recommendations:* In addition to recommendations to revise groundwater elevation MTs to reflect a 'Critically Overdrafted' subbasin by seeking to improve conditions (see Comment #4), the Department recommends prompt accounting for groundwater pumping extractions and an analysis of extraction volume and timing in conjunction with subsidence rates to inform subsidence SMC and on-going adaptive management.

6. **Comment #6 Monitoring Network.** Chapter 5 Monitoring Network (starting page 5-1). The number and distribution of groundwater monitoring wells in the Plan Area and along the surface waters in the GSA are insufficient for analysis of shallow groundwater trends and groundwater-surface water interconnectivity.

   a. *Issues:* Existing groundwater monitoring wells are insufficient to characterize shallow groundwater and surface water-groundwater interactions within the regions of the Plan Area most likely to support GDEs and ISW, such as the downstream reaches of the SJR in Zone 3 (Figure 2-8; Figure 5-3). Shallow groundwater data are critical to understanding groundwater management impacts on fish and wildlife beneficial uses and users of groundwater, including GDEs and potential

interconnected surface water habitats, that are impacted disproportionately by shallow groundwater trends.

b. *Recommendations:* The Department recommends installing additional shallow groundwater monitoring wells near potential GDEs in the basin and along interconnected surface waters, potentially pairing multiple-completion wells with streamflow gages for improved understanding of surface water-groundwater interconnectivity. Where there exists third party monitoring data for these data gaps (e.g., SJRRP), the Department recommends gathering and synthesizing this information to be included in GSP revisions and annual groundwater reporting.

OTHER COMMENTS: Implementation of Future Project Actions Related to SGMA

SGMA exempts the preparation and adoption of GSPs from the California Environmental Quality Act (CEQA) (WC § 10728.6); however, SGMA specifically states that implementation of project actions taken pursuant to SGMA are not exempt from CEQA (WC § 10728.6). The Department is California's Trustee Agency for fish and wildlife resources and holds those resources in trust by statute for all the people of the State (Fish & G. Code, §§ 711.7, subd. (a) & 1802; Pub. Resources Code, § 21070; CEQA Guidelines § 15386, subd. (a)). The Department, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species (*Id.*, § 1802). Similarly, for purposes of CEQA, the Department is charged by law to provide, as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect fish and wildlife resources.

The Department is also a Responsible Agency under CEQA (Pub. Resources Code, § 21069; CEQA Guidelines, § 15381), and the Department expects that it may need to exercise regulatory authority as provided by the Fish and Game Code for implementation of projects related to the GSP that are also subject to CEQA. These projects may be subject to the Department's lake and streambed alteration regulatory authority (i.e., Fish & G. Code, § 1600 et seq.). Notification pursuant to Fish and Game Code § 1602 is warranted if a project will (a) substantially divert or obstruct the natural flow of any river, stream, or lake; (b) substantially change or use any material from the bed, bank, or channel of any river, stream, or lake (including the removal of riparian vegetation); and/or (c) deposit debris, waste or other materials that could pass into any river, stream, or lake. Likewise, to the extent that implementation of any project may result in "take" as defined by State law of any species protected under the California Endangered Species Act (CESA) (Fish & G. Code, § 2050 et seq.), related authorization as provided by the Fish and Game Code will be required. The Department is required to

comply with CEQA in its issuance of a Lake or Streambed Alteration Agreement or an Incidental Take Permit.

Water Rights: The implementation of SGMA does not alter or determine surface or groundwater rights (WC § 10720.5). It is the intent of SGMA to respect overlying and other proprietary rights to groundwater, consistent with section 1200 of the Water Code (Section 1(b)(4) of AB 1739). The capture of unallocated stream flows to artificially recharge groundwater aquifers are subject to appropriation and approval by the State Water Resources Control Board (SWRCB) pursuant to Water Code § 1200 et seq. The Department, as Trustee Agency, is consulted by SWRCB during the water rights process to provide terms and conditions designed to protect fish and wildlife prior to appropriation of the State's water resources. Certain fish and wildlife are reliant upon aquatic and riparian ecosystems, which in turn are reliant upon adequate flows of water. The Department therefore has a material interest in assuring that adequate water flows within streams for the protection, maintenance and proper stewardship of those resources. The Department provides, as available, biological expertise to review and comment on environmental documents and impacts arising from project activities.

CONCLUSION

In conclusion, the Aliso Water District Draft GSP needs to address all SGMA statutes and regulations, and the Department recommends the GSP seriously consider fish and wildlife beneficial uses and interconnected surface waters. The Department recommends that the GSA consider the above comments before the GSP is submitted to CDWR. The Department appreciates the opportunity to provide comments on the GSP. If you have any further questions, please contact Dr. Andrew Gordus, Staff Toxicologist, at Andy.Gordus@wildlife.ca.gov or (559) 243-4014 extension 239.

Sincerely,

Julie A. Vance
Regional Manager, Central Region

Enclosures (Literature Cited)

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July 12, 2022

Via E-mail

Board of Directors
Aliso Water District Groundwater Sustainability Agency
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info@alisowdgsa.org

Re: Provisional Comments on Proposed Approval of Revised GSP by Aliso Water District GSA

Dear Board of Directors of the Aliso Water District Groundwater Sustainability Agency:

On behalf of California Sportfishing Protection Alliance (CSPA) we provide the following comments opposing approval by the Aliso Water District Groundwater Sustainability Agency ("Aliso GSA") of the revised Aliso Water District Groundwater Sustainability Plan within the Delta-Mendota Subbasin ("Revised GSP").

The GSA Has Failed to Provide Adequate Opportunities for Public Participation

On or around July 8, 2022, a notice of hearing for adoption of a resolution approving an amended GSP was posted for public view. The meeting is scheduled for July 12, 2022 at 1:30 p.m.[1] The Revised GSP document available to the public is approximately 1,211 pages long. Thus, the public has effectively two business days to review more than a thousand pages of highly technical material and provide comments. This is not an effective opportunity for comment.

As a result, the hearing on July 12 does not provide the public an opportunity to exhaust any "administrative remedies" that may exist. At the outset, SGMA has no statutory exhaustion requirement, and CSPA's submission of this comment letter should not be construed as an acknowledgement by CSPA that an administrative remedy exists under SGMA. As the courts have held, "[I]f the Legislature has not provided an administrative remedy, or the administrative remedy is not effective, the exhaustion

[1] The notice of meeting is available at http://www.alisowdgsa.org/assets/2022-0712-awdgsa-special-board-mtg-notice.pdf (accessed July 11, 2022). The meeting agenda is available at http://www.alisowdgsa.org/assets/2022-0712-awdgsa-special-board-mtg-agenda.pdf (accessed July 11, 2022.)

requirement is not applicable." (*Cal. Correctional Peace Officers Assn. v. State Personnel Bd.* (1995) 10 Cal.4th 1133, 1151.) In instances where "no forum or administrative remedy is afforded for the issues raised, recourse to the local administrative agency is not required before initiation of court action." (*Park 'N Fly of San Francisco, Inc. v. City of South San Francisco* (1987) 188 Cal.App.3d 1201, 1209.) "[W]hen an administrative remedy *is provided by statute*, relief must be sought from the administrative body and this remedy exhausted before the courts will act." (*Abelleira v. Dist. Court of Appeal* (1941) 17 Cal.2d 280, 292, emphasis added.) Moreover, the statutory remedy must be an "effective" one for the exhaustion requirement to apply: an administrative remedy is required to be exhausted "in those instances where the administrative body is required to actually accept, evaluate and resolve disputes or complaints." (*City of Coachella v. Riverside County Airport Land Use Com.* (1989) 210 Cal.App.3d 1277, 1287.)

Even if exhaustion were required, however, the hearing on July 12 would not be an "effective" administrative remedy that would be required to be exhausted. The short timeline does not provide an adequate period for the public to evaluate the lengthy and technical changes to the GSP. And SGMA contains no requirement that a GSA "accept, evaluate, and resolve" any issues raised in public comments. (*Id*.)

Moreover, the Revised GSP is just one component GSP of the Delta-Mendota Coordinated GSP. Its methodologies and assumptions must be consistent with the common chapter of the Coordinated GSP and with the other five component GSPs. (Wat. Code §§ 10727, subd. (b)(3), 10726.6, subd. (a); Cal. Code Regs., tit 23, § 357.4(a).)

Changes to the Delta-Mendota GSP were directed at a meeting of the Special Joint Meeting of the Northern Delta-Mendota Region Management Committee Central Delta-Mendota Region Management Committee Central Delta-Mendota GSA, and Delta-Mendota Subbasin Coordination Committee on June 20, 2022. Counsel for CSPA appeared and gave oral comments both on the inadequacy of the public process and made substantive comments, to the extent possible, on the failure of the proposed revisions to the GSP to comply with SGMA and applicable law. Throughout the spring of 2022, most of the substantive changes to the coordinated and component GSPs were made in closed session and relevant documents were never made available to the public. Indeed, the material discussed at the June 20 meeting included four technical memos, public versions of which appear to never have been released and which are not attached or made available in the agenda for the July 12 meeting. In other words, the record before the agency and made available to the public is incomplete. This is a violation of Government Code section 54957.5, subdivision (b).

As a result, and given the July 20 deadline to submit the revisions to DWR, there is no time for Aliso GSA to respond meaningfully to comments and make appropriate revisions. As such, for the purpose of exhausting any administrative remedies that may exist, CSPA can "positively state that the [agency] has declared what its ruling will be

on" this "particular case" and thus any administrative remedy, assuming one is required, is also "futile" in addition to ineffective. (*Coachella Valley Mosquito & Vector Control Dist. v. California Public Employment Relations Bd.* (2005) 35 Cal.4th 1072, 1080-81.)

As a result of the failures of Aliso GSA and the other GSAs in the Delta-Mendota Subbasin to provide an adequate process for the public to review and comment on these revisions to the coordinated and component GSP, these comments are provisional. CSPA reserves all rights to make further and future comments and to pursue all available legal remedies in court and before other administrative agencies once it has had an adequate opportunity to analyze, inter alia, the entire coordinated GSP for the Delta Mendota Sub-basin, including all six component GSPs; the Revised GSP; all supporting materials for these GSPs, the relationships between the component GSPs and the relationships between the component GSPs and the coordinated GSP.

Substantive Comments on the Revised GSP

The Revised GSP Does Not Alter CSPA's Previous Assessment That It Violates SGMA, the Public Trust Doctrine, and the Waste and Unreasonable Use Doctrine.

In previous comments and filings, CSPA presented legal authority that the coordinated Delta-Mendota GSP and its component GSPs, including the GSP for the Aliso Water District GSA, failed to consider and comply with the waste and unreasonable use doctrine and the public trust doctrine. (Cal Const., art. X, § 2; *National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419, 426; *Environmental Law Foundation v. State Water Resources Control Bd.* (2018) 26 Cal.App.5th 844; see also *United States v. State Water Resources Control Bd.* (1986) 182 Cal.App.3d 82, 105.) The Revised GSP provides no additional analysis under these doctrines, nor does it demonstrate any compliance with the requirements imposed by them.

CSPA also presented comments showing that the coordinated and component GSPs failed to adequately measure, map, characterize, and analyze interconnected surface waters ("ISWs") and groundwater dependent ecosystems ("GDEs") as required by SGMA. Nor do the coordinated and component GSPs rely on the best available information in violation of California Code of Regulations, title 23, section 354.18(e). These comments are attached to this letter. Nothing in the Revised GSP demonstrates any change in CSPA's conclusions regarding the adequacy of the identification of GDEs or ISWs—they violated SGMA in 2020 and violate SGMA today.

The Sustainable Management Criteria Violate SGMA and Are Not Supported by the Best Available Science or by Adequate Evidence

The Revised GSP makes superficial changes to the definitions of sustainable

management criteria, undesirable results, minimum thresholds, and measurable objectives. These changes do not resolve the issues identified by CSPA in earlier correspondence and the Revised GSP continues to fail to comply with SGMA. As stated above, the following comments are provisional in light of the thoroughly inadequate comment period. CSPA reserves further comments for a future date after full evaluation of the Revised GSP.

The Revised GSP, via the revised Common Chapter, changes the sustainability goal for ISW to:

> Maintain interconnected surface waters comparable to existing conditions (historic low conditions as of Water Year 2016) in order to prevent a trend of increasing interconnected surface water losses from the San Joaquin River. Work with neighboring Subbasins to address increased interconnected surface water losses caused by pumping outside of the Subbasin.

(Revised GSP at 485 [clean Common Chapter], 753 [redlined Common Chapter].)[2] It is unclear what the basis for the selection of the 2016 water year as "existing conditions" is. It is unclear why the sustainability goal is limited to the San Joaquin River, when the GSP fails to characterize other potential ISWs and GDEs in the subbasin.

The GSP continues to list ISW as a "Sustainability Indicator[] Not Considered," demonstrating its failure to comply with SGMA by analyzing and mitigating impacts to ecosystems and the listed species that rely on them. (Revised GSP at 122.)

The Revised GSP revises its discussion of the measurable objective ("MO") for ISW to read as follows:

> Interconnected Surface Water is an identified data gap in the Subbasin. As an interim measurable objective, use the Chronic Lowering of Groundwater Level Measurable Objective as a proxy for interconnected surface waters.

(Revised GSP at 144.) The minimum threshold (MT) also relies on groundwater levels as a proxy for interconnected surface waters:

> Interconnected Surface Water is an identified data gap in the Delta-Mendota Subbasin. As an interim minimum threshold, use the

[2] Page references are to the redlined version of the Revised GSP available on the Aliso GSA website as of July 11, 2022.

> Chronic Lowering of Groundwater Level Minimum Threshold as a proxy for impacts to interconnected surface waters.

(Revised GSP at 128.) The failure to establish an MO is a facial violation of SGMA and its regulations. SGMA requires a measurable objective to be set for each sustainability criterion "to achieve the sustainability goal in the basin within 20 years of the implementation of the plan." (Wat. Code § 10727.2, subd. (b)(1).) An MO must contain "specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin." (Cal. Code Regs., tit. 23, § 351, def. (s).) A GSP may only use groundwater elevation as a "proxy" for other sustainability indicators when the Agency can "demonstrate" that such value is a "reasonable proxy" as "supported by adequate evidence." (Cal. Code Regs., tit. 23, § 354.30(d).) The GSP does not supply such evidence.

And the MT must be "supported" by:

> (A) The location, quantity, and timing of depletions of interconnected surface water.
>
> (B) A description of the groundwater and surface water model used to quantify surface water depletion. If a numerical groundwater and surface water model is not used to quantify surface water depletion, the Plan shall identify and describe an equally effective method, tool, or analytical model to accomplish the requirements of this Paragraph.

(Cal. Code Regs., tit. 23, § 354.28(c)(6).) The use of groundwater levels as a proxy does not tell the GSP or the public anything about the "location, quantity, and timing" of depletions of interconnected surface water. And as the GSA has chosen not to use a "numerical groundwater and surface water model," it has not demonstrated that the use of the groundwater level proxy is "equally effective" to accomplish the "requirements" of SGMA.

The definition of the groundwater level proxy has its own problems. The Revised GSP states that, with respect to chronic lowering of groundwater levels, "Significant and unreasonable is quantitatively defined as exceeding the minimum threshold at more than 50 percent of representative monitoring sites by principal aquifer in a GSP area." (Revised GSP at 117.) There is no evidence tying this 50% figure to flow depletion figures in identified ISWs. Nor is there justification for why 50% was chosen: it is conceivable, in fact likely, that significant effects could occur should half of the wells in a given area drop below 2015 levels—levels that were catastrophically low due to the

historic 2012-2016 drought.[3] By choosing a 50% figure, and by tying it to a four-year rolling average, the Revised GSP in fact guarantees that the basin will experience effects more severe than in the 2016 scenario because it permits up to 50% of wells to drop below that level, into uncharted and potentially disastrous territory.

The description of undesirable results is likewise inadequate. SGMA requires a definition of undesirable results that includes "[t]he criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator," and this criteria "shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin." (Cal. Code Regs., tit. 23, § 354.26(b)(2).) The Revised GSP revises the definition of undesirable results for interconnected surface water to read as:

> Depletions of interconnected surface water as a direct result of groundwater pumping that cause significant and unreasonable impacts on natural resources of downstream beneficial uses and users.

(Revised GSP at 115.) The undesirable results description in the Revised GSP fails because, among other things, it does not provide a "quantitative description of the combination of minimum threshold exceedances." Nor does it provide a definition of "significant and unreasonable" with respect to actual effects on the ground, including the ecological consequences of depleted surface water flows to species, ecosystems, and the beneficial users who rely on them. Nor does the statement that additional monitoring wells will be drilled provide assurance that these effects on the environment will be monitored and incorporated into the SMC definitions in the future.

For all of the SMCs, the GSP has unlawfully punted the development of the required study and work to prepare a plan that would be protective of interconnected surface waters. Despite five years to the prepare the Plan, lengthy comment letters proposing additional facts and methodologies, and two additional years following submission, and six months following DWR's determination that the GSP was inadequate, the GSP has still not been amended to comply with SGMA.

The Revised GSP identifies "interconnected surface water" as a "data gap." (Revised GSP at 128, 144, App. B [Common Chapter] at 485, table CC-23.) This misuses the term "data gap" as used in the SGMA regulations. (Cal. Code Regs., tit. 23, §§ 350.4(d), 351(*l*), 354.38.) SGMA contains no authority for a GSA to simply fail to

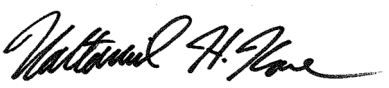
[3] Of course, the circular and inadequate definition of "significant and unreasonable" in the GSP prevents evaluation of what such effects are and determination of whether they are occurring at any given time.

describe undesirable results nor to set minimum thresholds or measurable objectives that meet the regulatory requirements. In any event, comments provided to the GSPs earlier in the process provide much of the data and methodology that the GSP claims is a "gap." Notably, CSPA's comments provided a methodology to map depletions of interconnected surface waters. And the Nature Conservancy provided a methodology for evaluating GDEs. Yet the GSPs ignored these offers, choosing instead to simply do nothing. This violates SGMA.

Conclusion

For the reasons stated in this letter, the Revised GSP violates SGMA. In addition, other component GSPs and the common chapter contain deficiencies that preclude approval because the coordinated GSP must manage the basin as a whole. We urge that the relevant agencies vote against approving this revision.

Sincerely,



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May 14, 2020

Mr. Tom Lippe, Law Office of Thomas N. Lippe, APC
201 Mission Street, 12th Floor
San Francisco, CA 94105

Subject: Review of Final Groundwater Sustainability Plan
For the North and Central Delta-Mendota Regions

Dear Mr. Lippe:

I have been retained by your practice to review the Final Groundwater Sustainability Plan (GSP) for the North and Central Delta-Mendota Groundwater Subbasin. I submitted comments on the Public Draft GSP to the San Luis & Delta-Mendota Water Authority on October 11, 2019. The Final GSP indicates that these and other public comments were not addressed as part of final plan development. To the best of my knowledge, the Final GSP does not resolve the concerns and deficiencies presented in my comments. Therefore, I'm resubmitting these comments as Attachment A as they still apply to the Final GSP.

Based on my review of the Final GSP and comment letters submitted by the National Marine Fisheries Service (NMFS)[1] and California Department of Fish and Wildlife (CDFW)[2], I'm providing the following additional comments and opinion pertaining to additional deficiencies with the Final GSP.

1. Section 354.16 of the GSP Regulations stipulates that each plan describe current and historic groundwater conditions in the basin based on the best available information. With regard to Section 5.3.7 of the GSP (Interconnected Surface Water Systems), I would like you to be aware of a study completed by Kamman Hydrology & Engineering, Inc.[3], which delineates subterranean streams and Potential Stream Depletion Areas (PSDA) along the San Joaquin River within Stanislaus County. PSDA's are areas where groundwater pumping could potentially cause stream depletion. This report and selected maps are attached for reference and integration into Section 5.3.7 of the GSP.

[1] Strange, E., 2020, NOAA's National Marin Fisheries Service comments on the Public Final Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions. Letter to California Department of Water Resources, NMFS, West Coast Region, April 6, 5p.
[2] Vance, J., 2020, Comments on the Northern and Central Delta Mendota Final Groundwater Sustainability Plan. Letter to California Department of Water Resources and San Luis & Delta-Mendota Water Authority, California Department of Fish and Wildlife, Central Region, March 11, 13p.
[3] Kamman Hydrology & Engineering, Inc., 2018, Delineating subterranean streams and Potential Stream Depletion Areas, Lower Stanislaus and Tuolumne River Watershed. Draft Technical Memorandum prepared for: Law Offices of Thomas N. Lippe, APC, July 23, 9p. and 15 sheets.

2. The GDEs presented on Figures 5-118 and 5-119 of the GSP have been screened to remove NCCAG areas where groundwater is in excess of 30-feet below ground surface. However, it is my opinion that when adhering to The Nature Conservancy (TNC) GDE identification guidelines (2019)[4] for developing depth-to-groundwater contours, it will be found that many of these data gap areas eliminated will have groundwater depths much less than 30 feet. This conclusion is based on the depth-to-water mapping along the Stanislaus and San Joaquin Rivers completed by WRIMES in 2007[5], which indicates values much less than 30-feet in contrast to the greater than 30 feet used to generate the GDE maps in the Final GSP (see Figure 1 below).

3. I've reviewed all five of the spreadsheet water budgets presented in the GSP and have identified a number of deficiencies, uncertainties and inconsistencies within water budgets and proposed GSP projects and management actions. In total, these problems and general lack of transparency in describing water budget assumptions call into question the accuracy and validity of the water budget calculations. The water budget problems and associated concerns include the following.

    a. The water budgets do not factor in stream flow gains and losses associated with interconnected surface water and groundwater. Although the water budgets are the primary tools being used to quantify sustainable yield, they don't provides a way to evaluate the effects of water operations and management actions on ISW or GDEs. Without a quantification of stream flow gains and losses, there is no way to determine if groundwater pumping is causing undesirable stream flow depletions. Quantifying stream flow depletions is required in order to develop ISW sustainability indicators as required under SGMA. As you recall, using the water budgets for the neighboring Eastern San Joaquin groundwater subbasin GSP, I was able to identify undesirable depletions from the Stanislaus River associated with their projected conditions scenario. These undesirable impacts on the beneficial uses of the river would have otherwise been missed without the quantification and presentation of estimates for stream flow gains and losses.

    b. The water budgets do not incorporate evapotranspiration losses from riparian and wetland areas (i.e., GDE). Page 10 of Appendix D (Water Budget Model Documentation) to the GSP states, "*Evapotranspiration volumes were limited in non-crop and non-irrigated areas to avoid having evapotranspiration volumes exceed precipitation volumes. This was enforced to ensure that evapotranspiration volumes alone didn't exceed inflows into any control volume where irrigation was not occurring.*" The omission of evapotranspiration calls into question the accuracy and ability of the water budgets to identify undesirable impacts to GDEs, let alone the quantification of sustainable yield. The water budget is an accounting of all sources of water. Disregarding a known and quantifiable output will skew the computation of storage higher and underestimate the amount of overdraft.

[4] https://groundwaterresourcehub.org/public/uploads/pdfs/TNC_NCdataset_BestPracticesGuide_2019.pdf.
[5] WRIME, 2007, Recharge characterization for Stanislaus and Tuolumne Rivers Groundwater Basin Association. Memorandum prepared for MID and DWR, May 2, 31p.

c. A primary purpose of the water budgets is to quantify changes in groundwater storage. The standard water budget equation is:

Inflows – outflows = change in storage

However, the change in storage estimates computed and utilized in the water budgets were derived from a different method as described on page 6 of Appendix D to the GSP, which states:

In the groundwater system, long-term water storage exists within the aquifers and the difference in inflows and outflows should be equal to the change in groundwater in storage. Annual changes in groundwater storage were calculated independent of the inflow and outflow accounting using hydrographs from wells around the Plan area. This independently-calculated change in groundwater storage is presented as a part of the Groundwater Budget. The difference between this independently-calculated change in storage (based on hydrographs) and the estimated (accounted) value is a result of inaccuracies in both the calculated change in groundwater storage and inaccuracies in inflow and outflow estimations.

This statement in itself calls into question the accuracy and validity of the water budgets. Based on review of the historic period water budget tables, the 10-year average difference in annual total groundwater storage volumes between "accounted" and "based on hydrographs" methods is 36% and annual differences range from 1% to 844%. The difference in annual total groundwater storage volumes between "accounted" and "based on hydrographs" for the current period water budget is 31%. These differences are not trivial when applied to overdraft estimates - the large imbalance in water budget estimates of groundwater storage call into question their overall accuracy and water budget derived estimates of overdraft volumes and safe yield.

d. A series of three projected water budgets were used to develop a baseline condition and evaluate the effects of climate change and implementation of projects and management actions intended to reduce groundwater demands. These water budgets include: 1) Baseline projected water budget (BPWB); 2) baseline projected water budget with climate change (BPWB+CC); and 3) baseline projected water budget with climate change and projects and management actions (BPWB+CC+P&MA). Page 22 of Appendix D states that the change in storage volumes used in the historic and current water budgets were averaged by water year type and used throughout the projected water budget periods. However, review of annual change in storage values for the water budgets vary by water year type. The rationale for these changes and how these values are quantified and how/why these values change between water budgets is not explained. The cumulative sum of the change in storage values are the key variable used to quantify the amount of overdraft and sustainable yield. Any

deviation from the values as defined in the GSP call into question the transparency of the assumptions and values used in the water budget. The water budgets need to be clear and understandable to be defensible.

e. The BPWC+CC+P&MA incorporates the projects and management actions listed on Table 5-5 of Appendix D (pages 26 - 27). This table includes a total of 13 projects: two (2) projects increase surface water deliveries; one (1) project proposes a decrease in groundwater pumping associated with the Orestimba Creek Recharge and Recovery Project; and 10 projects propose deep percolation to recharge groundwater. The additional groundwater pumping incorporated into this water budget is due to the projects and management actions described in Table 5-5. Water budget results indicate that these projects will results in 35,000 AF/yr of reduced groundwater pumping and a 12,000 AF/yr increase in groundwater recharge. These figures equate to a 25% reduction in groundwater pumping from the basin and 14% increase in groundwater recharge, when compared to the baseline. Together, these demand reductions total 37,000 AF/yr and are attributed with significantly reducing groundwater overdraft and bringing the basin closer to safe yield. . In my opinion, the volume of pumping involved and reported benefits of a 25% reduction in groundwater pumping from the entire subbasin are not feasible from this single location. The Orestimba Creek Recharge and Recovery Project is described in detail on page 117 of the Final GSP for the San Joaquin River Exchange Contractors Group in the Delta-Mendota Subbasin. The 80 acre recharge facility will divert and retain excess flood flows from Orestimba Creek. It is expected to recharge up to 15,000 AF/yr. During a critical year, up to 7,500 AF of stored groundwater can be extracted. The Plan does not explain how this facility could possibly result in the reduced pumping rates presented in the water budget, and frankly, given the numbers presented here, there is no way it could.

4. I agree with NMFS and CDFW's recommendations that the Final GSP develop conservative streamflow depletion thresholds and sustainable management criteria protective of surface water beneficial uses. As recommended by NMFS and CDFW, and required under SGMA {Section 354.28(c)(6)}, the GSP must identify a way to quantify how historic, current and future changes in groundwater levels have/will affect the timing and rate of surface water depletions and impacts on stream flow levels/rates, water quality and the associated aquatic habitats sustained by stream hydrology. This requires understanding the interrelated set of hydrologic and ecological processes that occur on spatial and temporal scales much finer than the coarse scales represented by the proposed monitoring network and typical of groundwater basin model grids. In order to quantify just the hydrologic processes at a single point, one would ideally need to: construct, screen and continuously monitor a well within suitable distance and depths of the stream channel; measure and record well pumping rates; measure water levels and flow rates in the stream channel adjacent to well; characterize the hydraulic properties of the intervening aquifer sediments and stream bed material; and analyze the data over a suitable period that captures seasonal changes in groundwater and surface water levels and flow rates. Through analytical or modeling methods, the

concomitant changes in stream flow depletions, stream water levels, pumping rates and stream flow rates could be correlated and quantified. These empirically-based correlations could then be incorporated into an integrated surface water-groundwater model for areas displaying similar geologic and hydrologic conditions. The monitoring data would also be used to calibrate the surface water-groundwater interaction solutions performed by a numerical model.

However, this only covers the physical processes. Additional monitoring and analyses of the benefits and impacts of varying stream flow and water levels on ecological conditions would need to be developed in order to determine how changes in stream flow depletions impact aquatic habitats, including salmonids. This analysis would need to consider all life stages of target species, which means understanding seasonal habitat requirements. Bridging the cause and effect relationships between physical and biological processes in an ISW system can't be done by monitoring water levels alone. Nor monitoring only water levels and stream levels – the full spectrum of interrelated physical and biological processes need to be correlated.

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter.

Sincerely,

Greg Kamman, PG, CHG
Principal Hydrologist

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May 15, 2020

Mr. Tom Lippe, Law Office of Thomas N. Lippe, APC
201 Mission Street, 12th Floor
San Francisco, CA 94105

Subject: Review of Final Groundwater Sustainability Plans
Delta-Mendota Groundwater Subbasin

Dear Mr. Lippe:

I have been retained by your practice to review the six (6) Final Groundwater Sustainability Plan (GSP) within the Delta-Mendota Groundwater Subbasin. These include the following GSPs:

- North and Central Delta-Mendota Regions (NCDM);
- San Joaquin River Exchange Contractors (SJREC);
- Aliso Water District (Aliso);
- Farmers Water District (Farmers);
- County of Fresno (Fresno); and
- Grassland Groundwater Sustainability Agency (Grassland).

Based on my review and comment letters submitted by the National Marine Fisheries Service (NMFS)[1] and California Department of Fish and Wildlife (CDFW)[2], I'm providing the following common comments and opinions to each of the Final GSPs listed above.

1. The presentation and discussion of Interconnected Surface Water (ISW) in most GSPs are difficult to understand without the aid of a map. With the exception of the Aliso GSP, ISWs are not mapped. SGMA code 354.14(d)(4) and 354.16(f) require that ISWs are mapped as they are areas of potential recharge and discharge. The GSPs should be required to include this mapping.

2. Section 354.16 of the GSP Regulations stipulates that each plan describe current and historic groundwater conditions in the basin based on the best available information. With regard to the characterization and delineation of Interconnected Surface Water

[1] Strange, E., 2020, NOAA's National Marin Fisheries Service comments on the Public Final Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions. Letter to California Department of Water Resources, NMFS, West Coast Region, April 6, 5p.
[2] Vance, J., 2020, Comments on the Northern and Central Delta Mendota Final Groundwater Sustainability Plan. Letter to California Department of Water Resources and San Luis & Delta-Mendota Water Authority, California Department of Fish and Wildlife, Central Region, March 11, 13p.

(ISW), I would like you to be aware of a study completed by Kamman Hydrology & Engineering, Inc.[3], which delineates subterranean streams and Potential Stream Depletion Areas (PSDA) along the San Joaquin River within Stanislaus County. PSDA's are areas where groundwater pumping could potentially cause stream depletion. This report and maps (attached to my May 14, 2020 comment letter on the Northern and Central Delta-Mendota Regions GSP) provide a method for identifying and delineating ISW and can be integrated into GSPs where applicable.

3. A number of the Groundwater Dependent Ecosystems (GDE) presented in GSPs have been screened to remove NCCAG areas where groundwater is in excess of 30-feet below ground surface. However, it is my opinion that when adhering to The Nature Conservancy (TNC) GDE identification guidelines (2019)[4] for developing depth-to-groundwater contours, it will be found that many of these data gap areas eliminated will have groundwater depths much less than 30 feet. This conclusion is based on the depth-to-water mapping along the Stanislaus and San Joaquin Rivers completed by WRIMES in 2007[5], which indicates values much less than 30-feet in contrast to the greater than 30 feet used to generate the GDE maps in the Final GSP (see Figure 1 below).

4. I've reviewed all the spreadsheet water budgets presented in the GSPs and have identified a number of deficiencies, uncertainties and inconsistencies within water budgets. In part or total, these problems and general lack of transparency in presenting data and describing water budget assumptions call into question the accuracy and validity of the water budget calculations. The water budget problems and associated concerns are presented below. Table 1 is a water budget review matrix, which I refer to in this discussion.

    a. The GSP water budgets do not factor in stream flow gains (see Row 1 of Table 1). Many water budgets do not estimate or account for losses associated with stream seepage (see Row 2, Table 1). Although the water budgets are the primary tools being used to quantify sustainable yield, the GSPs don't provides a way to evaluate the effects of water operations and management actions on ISW or GDEs. Without a quantification of stream flow gains and losses, there is no way to determine if groundwater pumping is causing undesirable stream flow depletions. For example, without accounting for stream gains from groundwater inflow, there is no way to determine or quantify if nearby pumping is extracting water that would otherwise discharge to a stream. Quantifying stream flow depletions is required in order to develop ISW sustainability indicators as required under SGMA. As you recall, using the independent stream gains and seepage water budget estimates for the Eastern San Joaquin groundwater subbasin GSP, I

[3] Kamman Hydrology & Engineering, Inc., 2018, Delineating subterranean streams and Potential Stream Depletion Areas, Lower Stanislaus and Tuolumne River Watershed. Draft Technical Memorandum prepared for: Law Offices of Thomas N. Lippe, APC, July 23, 9p. and 15 sheets.
[4] https://groundwaterresourcehub.org/public/uploads/pdfs/TNC_NCdataset_BestPracticesGuide_2019.pdf.
[5] WRIME, 2007, Recharge characterization for Stanislaus and Tuolumne Rivers Groundwater Basin Association. Memorandum prepared for MID and DWR, May 2, 31p.

was able to identify undesirable depletions from the Stanislaus River associated with their projected conditions scenario. These undesirable impacts on the beneficial uses of the river would have otherwise been missed without the quantification and presentation of estimates for stream flow gains and losses.

b. Technical memorandum #1 (Common Datasets and Assumptions used in the Delta-Mendota Subbasin GSPs) in the Common Chapter Appendix indicates GSPs will apply DWR's Climate Change Factors (CCF) for precipitation, evapotranspiration and stream flow. Although the application of precipitation and evapotranspiration CCFs is stated in all GSPs, some do not indicate that the stream flow CCFs were applied (see Rows 3 through 5, Table 1). If not applied, climate change stream flow volumes in the projected conditions water budgets are incorrect and could adversely impact calculation of sustainable yields.

c. A primary purpose of the water budgets is to quantify changes in groundwater storage. The standard water budget equation is:

Inflows – outflows = change in storage

This is the Inflow/Outflow (I/O) Method referred to in Row 8 of Table 1. Water budgets developed for the SJREC, Farmers and Fresno GSPs use the I/O Method. The Inflow/Outflow Method is based on the water budget difference between inflow to the area (supply sources) and outflow from the area (uses). However, the change in storage estimates computed and utilized in the NCDM, Aliso, and Grassland GSP water budgets, as well as the Delta-Mendota Subbasin water budget found in the Common Chapter (indicated by "SY" in Row 8, Table 1) were derived by the Specific Yield (SY) Method. The SY Method is used to calculate change in storage based on average annual measured water level decline and the specific yield[6] for the associated aquifer. Multiplying the SY by the change in water level and aquifer area provides an estimate of the change in aquifer storage. The SY Method is an empirically-based method to calculate past change in storage, while the I/O method predicts the change using a process-based accounting method.

In my opinion, the SY Method is not well suited to predict future changes in storage in a spreadsheet model. In order to complete the projected water budgets, GSPs using the SY Method derived representative change in storage volumes for designated year-types by averaging the values of same year-types from the historic water budget. These values were then applied to same year-types in the projected water budget. In essence, the SY method defeats the purpose of a water budget intended to calculate change in storage, because it has already calculated the change in storage and "hard-wired" that value into the water budget. I don't agree with using the SY Method in the water budgets, especially as a predictive

[6] Specific yield is the ratio of the volume of water that drains from a saturated aquifer under gravity to the total volume of the aquifer.

tool. I suspect that the professionals opting to use the I/O Method for the SJREC, Farmers and Fresno GSP water budgets agree.

d. Several GSPs chose to complete water budgets using volumes averaged over the entire multi-year period of analysis (see Row 7, Table 1). Not having a chronological summary of annual inputs and outputs prevented me from identifying or tracking how different operations changed sequentially or by water year-type. As a professional hydrologist, I appreciate and strive to provide as much transparency to an analysis as possible. I believe that is also the intent of SGMA as Section 354.18(a) of the code stipulates that basin water budgets provide an accounting and assessment of total annual inflow and outflow volumes. GSP water budgets that don't provide an annual accounting (i.e., SJREC, Aliso and Grassland) are insufficient and the GSP should be considered unacceptable.

e. Other GSP issues that warrant your attention, which may render the GSPs incomplete, include:

- The NCDM GSP does not provide an estimate of sustainable yield;
- The Fresno GSP reports no overdraft from the upper aquifer, however Table 3-6 of the GSP (Historical period water budget) indicates an annual overdraft of 1,400 AF/yr; and
- The Farmers and Fresno GSPs state they are operating within sustainable conditions and no projects or management actions are required. Although the Fresno GSP quantifies no overdraft conditions, the Farmers GSP estimates and average annual overdraft of 600 AF in the upper aquifer and does not provide an estimate for the lower aquifer.

f. After reviewing all the GSP spreadsheet water budgets, including the Basin Wide water budget, it is my scientific opinion that a more coordinated and sophisticated modeling water budget tool covering the entire subbasin is necessary to generate a scientifically valid water budget and would eliminate inconsistencies between individual water budgets and address many of the concerns I've raised. An integrated surface water-ground water numerical model would better address stream-aquifer interactions, especially since they are highly varied within the subbasin. Such a tool would also better quantify the interactions between GSP areas, some of which are very small and attribute potential depletions from pumping from neighboring jurisdictions.

5. I agree with NMFS and CDFW's recommendations, where provided, that Final GSPs develop conservative streamflow depletion thresholds and sustainable management criteria protective of surface water beneficial uses. As recommended by NMFS and CDFW, and required under SGMA {Section 354.28(c)(6)}, the GSP must identify a way to quantify how historic, current and future changes in groundwater levels have/will affect the timing and rate of surface water depletions and impacts on stream flow levels/rates, water quality and the associated aquatic habitats sustained by stream hydrology. This requires understanding the

interrelated set of hydrologic and ecological processes that occur on spatial and temporal scales much finer than the coarse scales represented by the proposed monitoring network and typical of groundwater basin model grids. In order to quantify just the hydrologic processes at a single point, one would ideally need to: construct, screen and continuously monitor a well within suitable distance and depths of the stream channel; measure and record well pumping rates; measure water levels and flow rates in the stream channel adjacent to well; characterize the hydraulic properties of the intervening aquifer sediments and stream bed material; and analyze the data over a suitable period that captures seasonal changes in groundwater and surface water levels and flow rates. Through analytical or modeling methods, the concomitant changes in stream flow depletions, stream water levels, pumping rates and stream flow rates could be correlated and quantified. These empirically-based correlations could then be incorporated into an integrated surface water-groundwater model for areas displaying similar geologic and hydrologic conditions. The monitoring data would also be used to calibrate the surface water-groundwater interaction solutions performed by a numerical model.

However, this only covers the physical processes. Additional monitoring and analyses of the benefits and impacts of varying stream flow and water levels on ecological conditions would need to be developed in order to determine how changes in stream flow depletions impact aquatic habitats, including salmonids. This analysis would need to consider all life stages of target species, which means understanding seasonal habitat requirements. Bridging the cause and effect relationships between physical and biological processes in an ISW system can't be done by monitoring water levels alone. Nor monitoring only water levels and stream levels – the full spectrum of interrelated physical and biological processes need to be correlated.

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter.

Sincerely,

Greg Kamman, PG, CHG
Principal Hydrologist

TABLES & FIGURES

TABLE 1: GSP water budget review matrix for GSPs in Delta-Mendota Groundwater Subbasin

Water Budget (WB) Element	NCDM	SJREC	Aliso	Farmers	Fresno	Grassland	Basin wide[6]
1. Does WB[1] account for stream gains from groundwater?	no	no	no	no	no	no	no
2. Does WB account for stream seepage/recharge?	no	yes	yes	yes, but lumped[3]	yes, but lumped	no	no
3. Does WB apply CCF[2] to precipitation?	yes	yes	yes	yes	yes	yes	yes
4. Does WB apply CCF to evapotranspiration?	yes	yes	yes	yes	yes	yes	yes
5. Does WB apply CCF to stream flow?	not stated	yes	not stated	yes	not stated	not stated	yes
6. Are projects and management actions into projected WB?	yes	yes	yes	not required	not required	yes	yes
7. Does WB present total annual volume?	yes	no	no	yes	yes	no	yes
8. Method used to calculate aquifer change-in-storage volume?	SY[4]	I/O[4]	SY	I/O	I/O	SY	SY
9. WB estimate of sustainable yield - upper aquifer (AF/yr)	NA[5]	189,000	83,600	6700 - 9200	NA	NA	325,000 - 480,000
10. WB estimate of sustainable yield - lower aquifer (AF/yr)	NA	73,000		733	NA	NA	250,000
11. WB estimate of historic overdraft - upper aquifer (AF/yr)	42,000	13,000	2,200	600	0	0	118,182
12. WB estimate of historic overdraft - lower aquifer (AF/yr)	8,000	10,000		NA	0	0	61,636

Notes:

1. WB= water budget
2. CCF = Climate Change Factor
3. Stream seepage volume integrated into total surface water recharge estimate - not reported as independent estimate.
4. I/O = input/output method; SY = specific yield method.
5. NA = not available/reported
6. Basin wide water budget presented in Common Chapter appendix

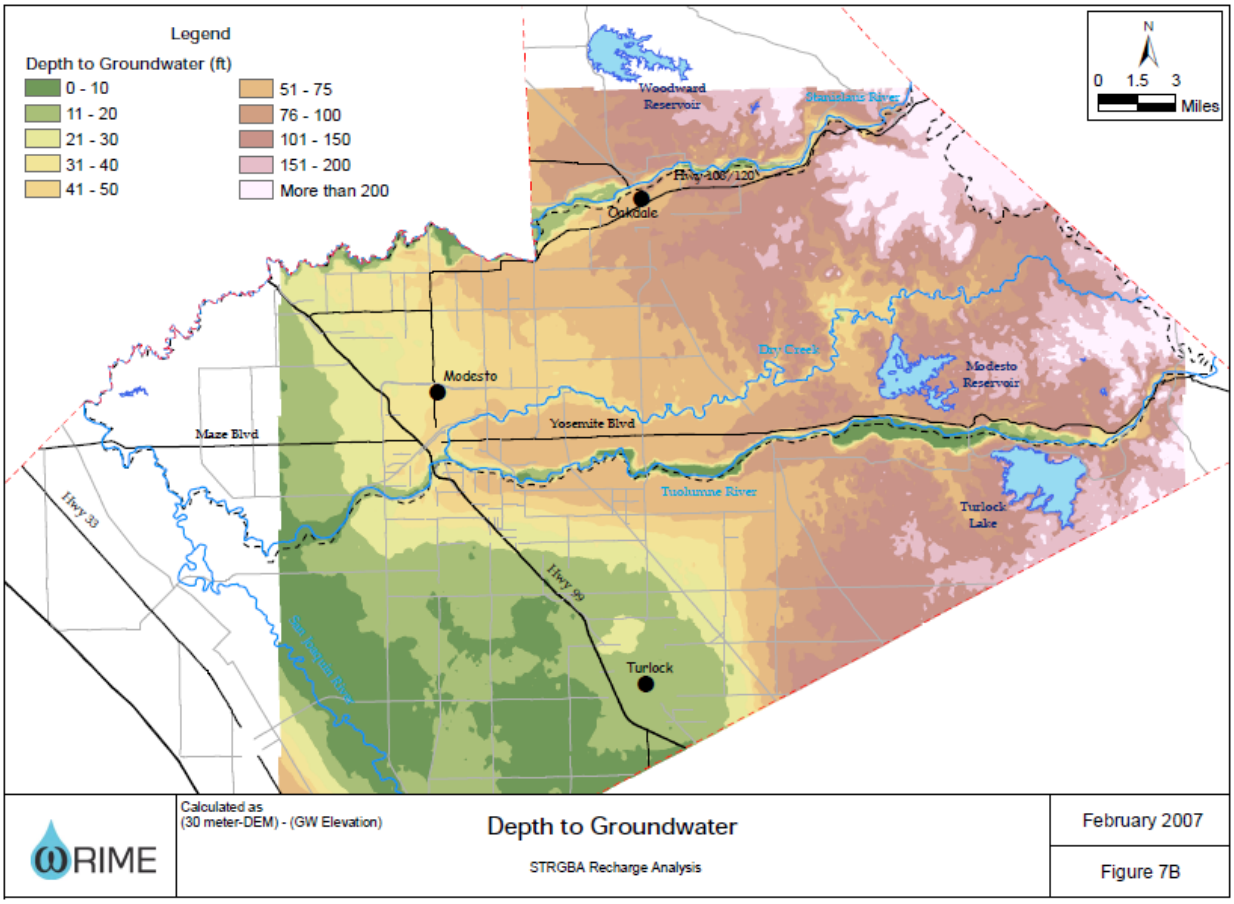

FIGURE 1: Depth-to-water estimates along Stanislaus River (boxed area) from Figure 7B of WRIME study. Note depth to water is less than 30 feet along majority of Stanislaus River corridor within boxed area.

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May 15, 2020

Craig Altare
Supervising Engineering Geologist
California Department of Water Resources
901 P Street, Room 213
Sacramento, California 94236

Re: California Sportfishing Protection Alliance's Comments on the Groundwater Sustainability Plans for the Delta Mendota Subbasin (5-022.07):
- Groundwater Sustainability Plan For the Northern and Central Delta-Mendota Regions.
- Groundwater Sustainability Plan for the San Joaquin River Exchange Contractors GSP Group in the Delta-Mendota Subbasin.
- Groundwater Sustainability Plan for Fresno County Management Area A and Management Area B in the Delta-Mendota Subbasin.
- Farmers Water District Groundwater Sustainability Agency Groundwater Sustainability Plan.
- The Aliso Water District Groundwater Sustainability Agency Groundwater Sustainability Plan.
- Grassland Groundwater Sustainability Plan.

Dear Mr. Altare:

This office represents the California Sportfishing Protection Alliance (CSPA) regarding the Groundwater Sustainability Plans (GSPs) for the Delta Mendota Subbasin (Subbasin 5-022.07), including the six GSPs identified above (Plan or Plans).

I. INTRODUCTION

CSPA's concerns substantially overlap the concerns expressed by the National Marine Fisheries Service (NMFS) and the California Department of Fish & Wildlife (CDFW) in their comments on these Plans. CSPA adopts the comments presented in each of these letters as its own, with the following emphasis: in all instances where NMFS or CDFW identifies a shortcoming in the Plan or recommends a change in the Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan. CSPA also provides additional legal, biological, geological, and hydrological context for these comments where additional information is available and pertinent.

CSPA also adopts the comments made by Greg Kamman, its consulting geologist and hydrologist, in his letters dated May 14, 2020, and May 15, 2020, attached hereto as Exhibits 11 and 12, respectively.

These six Plans operate pursuant to a coordination agreement. (See Water Code § 10727(b).) They are also interdependent with respect to their calculation of water budgets and sustained yield goals (see "Common Chapter" included in each GSP as either Appendix A or B) and their shared reliance on implementing common projects and management actions in attempting to achieve sustainable yield of groundwater. Consequently, a comment on one GSP in this subbasin is a comment on all six GSPs in the subbasin. Therefore, CSPA requests that DWR consider its comments on each Delta Mendota subbasin GSP to be a comment on all six Delta Mendota Subbasin GSPs.

This letter discusses the Northern and Central Delta-Mendota GSP in section IV; the San Joaquin River Exchange Contractors GSP in section V; the Fresno County Management Area A and B GSP in section VI; the Farmers Water District GSP section VII; the Aliso Water District GSP in section VIII; and the Grassland GSP in section IX.

While these plans share many common analytic tools and approaches, they also differ in many crucial respects. As explained by Greg Kamman, these differences obfuscate, rather than illuminate, the extent to which the Plans considered as a whole will achieve sustainable yield for the entire Delta-Mendota Region subbasin. (Exs 11, 12.) For political and "local control" reasons, the GSAs in the Delta-Mendota Region chose to balkanize their preparation of GSPs for the subbasin into the six areas with six plans now before DWR for review. The result is scientifically indefensible. The result is also legally invalid, because the six plans, whether considered individually or collectively, fail to demonstrate **achievement of sustainable** groundwater management or the Plans' sustainability goals. (Water Code §§ 10720.1; 10721(v); 10733(a).)

CSPA is concerned with the deleterious effects of groundwater pumping on stream flow, which severely damages populations and habitat of many species of fish and wildlife dependent on aquatic and riparian ecosytems. These Plans fails to use the best available information to identify the geographic locations where, and times of year when, groundwater pumping depletes or is likely to deplete stream flow. Also, to the extent there are legitimate "data gaps," the Plans fail to include a plan or protocol to fill these gaps. While the Sustainable Groundwater Management Act (SGMA) contemplates the possibility of "data gaps," it does not authorize the wholesale "kick the can down the road" approach taken by these Plans.

The same is true regarding areas where the groundwater table has already dropped below the elevation of hydrologic connection to stream channels due to pumping groundwater. In these

areas, the continuing loss of stream flow to groundwater remains an undesirable result. The Plans gives no thought to changing these conditions to recover hydrologic connection between such channels and their historical sources of groundwater derived base flow.

As discussed below, the streams and rivers in this subbasin are home to several species of endangered or special concern salmonids on the verge of extinction. The failure of the Plans to describe how they will avoid further harm to these species and contribute to their recovery from the brink of extinction represents a failure to comply with SGMA's requirement to avoid undesirable results by establishing minimum thresholds, measurable objectives, and interim milestones supported by the best available information and best available science.

With respect to identifying the undesirable result of stream flow depletion as a result of pumping inter-connected groundwater, the Plans treat the topic as an afterthought, when it must be recognized as a critical factor in determining the extinction or recovery of Central Valley steelhead and Central Valley spring-run Chinook salmon, two anadromous salmonid species listed as "threatened" under the federal Endangered Species Act ("ESA").[1]

CSPA objects to DWR's approval of these Plans because they do not meet the requirements of the Sustainable Groundwater Management Act, DWR's GSP Emergency Regulations at Title 23, Cal. Code Regs. section 350 et seq. (GSP Rules), the reasonable use doctrine, or the public trust doctrine. The Plans do not satisfy GSP Rule 355.4(b)(1), the reasonable use doctrine, or the public trust doctrine because the Plans' descriptions of sustainability goals, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable or supported by the best available information and best available science.

The Plans fail to demonstrate **achievement of sustainable** groundwater management or the Plan's sustainability goal within 20 years. (See Water Code § 10720.1 ["it is the intent of the Legislature to ... (a) To provide for the sustainable management of groundwater basins"]; § 10721(v) ["Sustainable groundwater management" means "the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results"]; § 10733(a) ["DWR must determine if GSP "is likely to achieve the sustainability goal for the basin"].)

[1]In 2005 and 2006, respectively, the National Marine Fisheries Service (NMFS) designated the the California Central Valley spring-run Chinook salmon ESU and the California Central Valley steelhead DPS as "threatened species" under the federal ESA after finding both species to be "at risk of becoming endangered in the foreseeable future throughout all or a significant portion of their range." (Ex 4, p. 50412; Ex. 2 p. 857.)

II. FACTUAL BACKGROUND

Four distinct runs of Chinook Salmon spawn in the Sacramento-San Joaquin River system, named for the season when the majority of the run enters freshwater as adults. Fall-run Chinook Salmon migrate upstream as adults from July through December and spawn from early October through late December. The timing of runs varies from stream to stream. Late-fall-run Chinook Salmon migrate into the rivers from mid-October through December and spawn from January through mid-April. The majority of young salmon of these runs migrate to the ocean during the first few months following emergence, although some may remain in freshwater and migrate as yearlings.

Spring-run Chinook Salmon enter the Sacramento River from late March through September. Adults hold in cool water habitats through the summer, then spawn in the fall from mid-August through early October. Spring run juveniles migrate soon after emergence as young-of-the-year, or remain in freshwater and migrate as yearlings.[2]

Fall-run Chinook Salmon are currently the most abundant of the Central Valley races, contributing to large commercial and recreational fisheries in the ocean and popular sport fisheries in the freshwater streams. Fall-run Chinook Salmon are raised at five major Central Valley hatcheries which release more than 32 million smolts each year. Due to concerns over population size and hatchery influence, Central Valley fall and late-fall-run Chinook Salmon are a Species of Concern under the federal Endangered Species Act.[3]

NMFS' proposed decision to list Central Valley steelhead as "threatened" under the federal ESA states:

> This coastal steelhead ESU occupies the Sacramento and San Joaquin Rivers and their tributaries. In the San Joaquin Basin, however, the best available information suggests that the current range of steelhead has been limited to the Stanislaus, Tuolumne, and Merced Rivers (tributaries), and the mainstem San Joaquin River to its confluence with the Merced River by human alteration of formerly available habitat. The Sacramento and San Joaquin Rivers offer the only migration route to the drainages of the Sierra Nevada and southern Cascade mountain ranges for anadromous fish. The distance from the Pacific Ocean to spawning streams can exceed 300 km, providing unique potential for reproductive isolation among

[2]https://wildlife.ca.gov/Conservation/Fishes/Chinook-Salmon

[3]https://wildlife.ca.gov/Conservation/Fishes/Chinook-Salmon

> steelhead. The Central Valley is much drier than the coastal regions to the west, receiving on average only 10– 50 cm of rainfall annually. The valley is characterized by alluvial soils, and native vegetation was dominated by oak forests and prairie grasses prior to agricultural development. Steelhead within this ESU have the longest freshwater migration of any population of winter steelhead.

(Ex 1, p. 41547.)

> In the San Joaquin River Basin, there is little available historic or recent information on steelhead distribution or abundance. According to McEwan and Jackson (1996), there are reports of a small remnant steelhead run in the Stanislaus River. Also, steelhead were observed in the Tuolumne River in 1983, and large rainbow trout (possibly steelhead) have been observed at Merced River Hatchery recently. NMFS concludes that the Central Valley steelhead ESU is presently in danger of extinction. Steelhead have already been extirpated from most of their historical range in this ESU. Habitat concerns in this ESU focus on the widespread degradation, destruction, and blockage of freshwater

(Ex 1, p. 41554.)

> Steelhead on the west coast of the United States have experienced declines in abundance in the past several decades as a result of natural and human factors. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydropower purposes (especially in the Columbia River and Sacramento-San Joaquin Basins) have greatly reduced or eliminated historically accessible habitat. Studies indicate that in most western states, about 80 to 90 percent of the historic riparian habitat has been eliminated. Further, it has been estimated that during the last 200 years, the lower 48 states have lost approximately 53 percent of all wetlands and the majority of the rest are severely degraded. Washington and Oregon's wetlands are estimated to have diminished by one-third, while California has experienced a 91-percent loss of its wetland habitat. Loss of habitat complexity has also contributed to the decline of steelhead. For example, in national forests in Washington, there has been a 58-percent reduction in large, deep pools due to sedimentation and loss of pool-forming structures such as boulders and large wood. Similarly, in Oregon, the abundance of large, deep pools on private coastal lands has decreased by as much as 80 percent. Sedimentation from land use activities is recognized as a primary cause of habitat degradation in the range of west coast steelhead.

(Ex. 1, p. 41557.)

NMFS' final decision to list Central Valley steelhead as "threatened" under the federal ESA states:

> Modification of natural flow regimes have resulted in increased water temperatures, changes in fish community structures, depleted flow necessary for migration, spawning, rearing, flushing of sediments from spawning gravels, reduced gravel recruitment and the transport of large woody debris. In addition to these indirect effects from dams and other water control structures, they have also resulted in increased direct mortality of adult and juvenile steelhead.

(Ex 2, p. 856.)

NMFS's proposed decision to list Central Valley spring-run Chinook salmon as "threatened" under the federal ESA states:

> Chinook salmon (O. tshawytscha) are easily distinguished from other Oncorhynchus species by their large size. Adults weighing over 120 pounds have been caught in North American waters. ... Chinook salmon are anadromous and semelparous. This means that as adults, they migrate from a marine environment into the fresh water streams and rivers of their birth (anadromous) where they spawn and die (semelparous). Adult female chinook will prepare a spawning bed, called a redd, in a stream area with suitable gravel composition, water depth and velocity. ... Stream flow, gravel quality, and silt load all significantly influence the survival of developing chinook salmon eggs.

(Ex 3, p. 11483.)

> Native spring chinook salmon have been extirpated from all tributaries in the San Joaquin River Basin, which represents a large portion of the historic range and abundance of the ESU as a whole. The only streams considered to have wild spring-run chinook salmon are Mill and Deer Creeks, and possibly Butte Creek (tributaries to the Sacramento River), and these are relatively small populations with sharply declining trends. Demographic and genetic risks due to small population sizes are thus considered to be high.
>
> Habitat problems are the most important source of ongoing risk to this ESU. Spring-run fish cannot access most of their historical spawning and rearing habitat in the Sacramento and San Joaquin River Basins (which is now above impassable dams), and current spawning is restricted to the mainstem and a few

> river tributaries in the Sacramento River. The remaining spawning habitat accessible to fish is severely degraded. Collectively, these habitat problems greatly reduce the resiliency of this ESU to respond to additional stresses in the future. The general degradation of conditions in the Sacramento River Basin (including elevated water temperatures, agricultural and municipal diversions and returns, restricted and regulated flows, entrainment of migrating fish into unscreened or poorly screened diversions, and the poor quality and quantity of remaining habitat) has severely impacted important juvenile rearing habitat and migration corridors

(Ex 3, pp. 11491-11492.)

NMFS's final decision to designate critical habitat for Central Valley steelhead and Central Valley spring-run Chinook salmon, under the federal ESA states, regarding these species' life cycle and habitat needs:

> Juveniles and subadults typically spend from 1 to 5 years foraging over thousands of miles in the North Pacific Ocean before returning to spawn. Some species, such as coho and Chinook salmon, have precocious life history types (primarily male fish known as "jacks") that mature and spawn after only several months in the ocean. Spawning migrations known as "runs" occur throughout the year, varying by species and location. Most adult fish return or "home" with great fidelity to spawn in their natal stream, although some do stray to non-natal streams. Salmon species die after spawning, except anadromous O. mykiss (steelhead), which may return to the ocean and make one or more repeat spawning migrations. This complex life cycle gives rise to complex habitat needs, particularly during the freshwater phase (see review by Spence et al., 1996). Spawning gravels must be of a certain size and free of sediment to allow successful incubation of the eggs. Eggs also require cool, clean, and well oxygenated waters for proper development. Juveniles need abundant food sources, including insects, crustaceans, and other small fish. They need places to hide from predators (mostly birds and bigger fish), such as under logs, root wads and boulders in the stream, and beneath overhanging vegetation. They also need places to seek refuge from periodic high flows (side channels and off channel areas) and from warm summer water temperatures (cold water springs and deep pools). Returning adults generally do not feed in fresh water but instead rely on limited energy stores to migrate, mature, and spawn. Like juveniles, they also require cool water and places to rest and hide from predators. During all life stages salmon require cool water that is free of contaminants. They also require rearing and migration corridors with adequate passage conditions (water quality and quantity available at specific

times) to allow access to the various habitats required to complete their life cycle.

(Ex 6, p. 52519 (italics added.)

NMFS's final decision to designate critical habitat for Central Valley steelhead and Central Valley spring-run Chinook salmon also discusses the required scale for analyzing impacts on these species:

> We are now also able to identify "specific areas" (ESA section 3(5)(a)) and "particular areas" (ESA section 4(b)(2)) at a finer scale than in 2000. As used the State of California's CALWATER watershed classification system, which is similar to the USGS watershed classification system that was used for salmonid critical habitat designations in the Northwest. This information is now generally available via the internet, and we have expanded our GIS resources to use these data. We used the CALWATER Hydrologic Subarea (HSA) unit (which is generally similar in size to USGS HUC5s) to organize critical habitat information systematically and at a scale that, while somewhat broad geographically, is applicable to the spatial distribution of salmon. Organizing information at this scale is especially relevant to salmonids, since their innate homing ability allows them to return to the watersheds where they were born. Such site fidelity results in spatial aggregations of salmonid populations that generally correspond to the area encompassed by HSA watersheds or aggregations of these watersheds.
>
> The CALWATER system maps watershed units as polygons, bounding a drainage area from ridge-top to ridgetop, encompassing streams, riparian areas and uplands. Within the boundaries of any HSA watershed, there are stream reaches not occupied by the species. Land areas within the CALWATER HSA boundaries are also generally not "occupied" by the species (though certain areas such as flood plains or side channels may be occupied at some times of some years). We used the watershed boundaries as a basis for aggregating occupied stream reaches, for purposes of delineating "specific"' areas at a scale that often corresponds well to salmonid population structure and ecological processes. This designation refers to the occupied stream reaches within the watershed boundary as the "habitat area'" to distinguish it from the entire area encompassed by the watershed boundary. Each habitat area was reviewed by the CHARTs to verify occupation, PCEs, and special management considerations (see "Critical Habitat Analytical Review Teams" section below).
>
> The watershed-scale aggregation of stream reaches also allowed us to analyze the impacts of designating a "particular area,"' as required by ESA section 4(b)(2). As

> a result of watershed processes, many activities occurring in riparian or upland areas and in nonfish-bearing streams may affect the physical or biological features essential to conservation in the occupied stream reaches. The watershed boundary thus describes an area in which Federal activities have the potential to affect critical habitat (Spence et al., 1996). Using watershed boundaries for the economic analysis ensured that all potential economic impacts were considered. Section 3(5) defines critical habitat in terms of "specific areas," and section 4(b)(2) requires the agency to consider certain factors before designating "'particular areas." In the case of Pacific salmonids, the biology of the species, the characteristics of its habitat, the nature of the impacts and the limited information currently available at finer geographic scales made it appropriate to consider "specific areas"' and "particular areas" as the same unit.

(Ex 6, p. 52520.)

III. LEGAL FRAMEWORK

A. SGMA and GSP Regulations.

Both SGMA and the GSP regulations require that GSPs consider, identify, and map the interactivity between surface waters and groundwater extractions where and when groundwater pumping may cause depletion of groundwater that is deleterious to beneficial use of waters before GSAs adopt and before DWR approves a GSP.

The purpose of a GSP is to facilitate the achievement of a basin's sustainability goal,[4] which is the "implementation of measures targeted to ensure that the applicable basin is operated within its sustainable yield."[5] A basin's "sustainable yield" is "the maximum quantity of water… that can be withdrawn annually from a groundwater supply without causing an undesirable result."[6] Six undesirable results are identified, including "depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water."[7] Thus, a GSP must facilitate achieving no depletions of interconnected surface waters that have significant and unreasonable adverse impacts on the beneficial uses of the surface water

[4] See Water Code, § 10727, subd. (a).

[5] *Ibid.*, subd. (u).

[6] *Ibid.*, subd. (v).

[7] *Ibid*., subd. (x)(6).

in a basin.

Each GSP must include a water budget—"an accounting of the total groundwater and surface water entering and leaving a basin including the changes in the amount of water stored."[8] Further, SGMA requires consideration of the interests of all beneficial uses and users of groundwater, which include "surface water users, if there is a hydrologic connection between surface and groundwater bodies."[9] GSPs must also identify "groundwater dependent ecosystems",[10] which are "ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occur near the ground surface."[11] Finally, GSPs must identify minimum thresholds for depletions of interconnected surface water, which are "the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results."[12] Thus, both SGMA and the regulations require DWR to consider the interactivity between groundwater pumping and interconnected surface water.

B. Reasonable and beneficial use doctrine.

The "reasonable and beneficial use" doctrine, to which SGMA expressly must comply,[13] is codified in the California Constitution. It requires that "the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare." (Cal Const, Art. X § 2; see also *United States v. State Water Resources Control Bd.* (1986) 182 Cal.App.3d 82, 105 ["…superimposed on those basic principles defining water rights is the overriding constitutional limitation that the water be used as reasonably required for the beneficial use to be served."].) The reasonable and beneficial use doctrine applies here given the negative impacts of the Draft GSP on groundwater supply, which are likely to unreasonably interfere with the use of groundwater for in-stream and riparian

[8] Water Code, § 10727, subd. (y)

[9] *Id.*, § 10723.2, subd.(f).

[10] *Id*., subd. (g).

[11] *Ibid*., § 351, subd. (m).

[12] *Ibid*., § 354.28, subd. (6).

[13] Water Code § 10720.1(a)

habitat uses. As the GSP authorizes waste and unreasonable use, it conflicts with the reasonable and beneficial use doctrine and the California Constitution.

C. Public Trust Doctrine.

The "public trust" doctrine applies to the waters of the State, and establishes that "the state, as trustee, has a duty to preserve this trust property from harmful diversions by water rights holders" and that thus "no one has a vested right to use water in a manner harmful to the state's waters."[14] The "public trust" doctrine has recently been applied to groundwater where there is a hydrological connection between the groundwater and a navigable surface water body. (*Environmental Law Foundation v. State Water Resources Control Bd.* (2018) 26 Cal.App.5th 844 (*Environmental Law Foundation* or *ELF*). In *Environmental Law Foundation*, the court held that the public trust doctrine applies to "the extraction of groundwater that adversely impacts a navigable waterway" and that the government has an affirmative duty to take the public trust into account in the planning and allocation of water resources.[15] The court also specifically held that SGMA does not supplant the requirements of the common law public trust doctrine.[16] In contrast to these requirements, the GSP does not consider impacts on public trust resources, or attempt to avoid insofar as feasible harm to the public's interest in those resources.

The Public Trust Doctrine imposes an "affirmative duty on the state to act on behalf of the people to protect their interest in navigable water."[17] The doctrine is expansive and flexible—public trust uses include not only navigation, commerce, and fishing, but also hunting, bathing and swimming.[18] Further, "an increasingly important public use is the preservation of trust lands 'in their natural state, so that they may serve as ecological units for scientific study, as open space, and as environments which provide food and habitat for birds and marine life, and

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

[15] *Id*. at 856-62.

[16] *Id*. at 862-870.

[17] *ELF, supra*, 26 Cal.App.5th 844, 857.

[18] *ELF, supra*, 26 Cal.App.5th at p. 857

which favorably affect the scenery and climate of the area.'"[19]

ELF held that the State Board's public trust obligation was independent of, and not limited by, its authority to oversee permitting.[20] Relying on *National Audubon Society v. Superior Court*, ELF held that state agencies have "an affirmative duty to take the public trust into account in the planning and allocation of water resources and to protect public trust uses whenever feasible."[21] Further, ELF held that "SGMA does not . . . replace or fulfill public trust duties, or scuttle decades of decisions upholding, defending, and expanding the public trust doctrine."[22] Therefore, SGMA does not supplant a state agency's affirmative and independent obligation to consider the public trust in decisions regarding the planning and allocation of water resources and to protect public trust uses whenever feasible.

Both GSAs and DWR must comply with the holding of *Environmental Law Foundation v. State Water Resources Control Board* in deciding to adopt or approve GSPs. Pursuant to *Environmental Law Foundation*, GSAs and DWR must: (1) identify any public trust resources within each basin; (2) identify any public trust uses within each basin; (3) identify and analyze the potential adverse impact of groundwater extractions on public trust resources and uses; and (4) determine the feasibility of protecting public trust uses and protect such uses "whenever feasible."

The affirmative and independent obligation to consider the public trust imposes on applies to GSAs and DWR a legal duty to not only consider the potential adverse impacts of groundwater extractions on navigable waterways but also "to protect public trust uses whenever feasible."[23] ELF explicitly held that this affirmative duty is not supplanted by SGMA.[24] GSAs and DWR are thus legally obligated to consider the public trust in adopting or approving GSPs. The criteria for each basin should include: (1) identifying any public trust resources within the

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[19] *ELF, supra*, 26 Cal.App.5th 844, 857 [quoting *San Francisco Baykeeper, Inc. v. State Lands Com.* (2015) 242 Cal.App.4th 202, 234.]

[20] *ELF, supra*, 26 Cal.App.5th at p. 862.

[21] *ELF, supra*, 26 Cal.App.5th at p. 865 [quoting *National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419, 446-47 [hereinafter *National Audubon*].)

[22] *ELF, supra*, 26 Cal.App.5th at p. 865.

[23] *ELF, supra*, 26 Cal.App.5th at p. 865

[24] *ELF, supra*, 26 Cal.App.5th at p. 856-67.

basin; (2) identifying any public trust uses within the basin; (3) identifying and analyzing potential adverse impacts of groundwater extractions on public trust resources and uses; and (4) determining the feasibility of protecting public trust uses and protecting such uses "whenever feasible."

The first step is to identify any public trust resources—state-owned navigable waterways—within the groundwater basin.[25] The public trust doctrine mandates that "the title which a State holds to land under navigable waters is . . . held in trust for the people of the State."[26] In ELF, the Scott River was a navigable waterway and so constituted a public trust resource.[27] Thus, to satisfy its public trust duty, GSAs and DWR must identify all state-owned navigable waterways in each basin—this step should be formally incorporated as the first public trust criteria in the GSP regulations. GSAs and DWR must ensure that the GSP identifies all state-owned navigable waterways in each basin when making its decision regarding a submitted GSP or Alternative.

The second step is to identify any public trust uses within the groundwater basin for each public trust resources identified above. DWR must identify all public trust uses, including but not limited to: navigation, commerce, fishing, hunting, bathing, and swimming as well as preserving natural spaces to "serve as ecological units for scientific study, as open space, and as environments which provide food and habitat for birds and marine life, and which favorably affect the scenery and climate of the area."[28] As explained in ELF, "the range of public trust uses is broad" as well as "flexible, accommodating changing public needs."[29] To satisfy its public trust obligation, GSAs and DWR must identify all public trust uses in each basin.

The third step is to identify potential adverse impacts of groundwater extractions on the identified public trust resources and uses. As held in ELF, "the public trust doctrine applies if

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[25] See *Illinois Central Railroad Co. v. State of Illinois* (1892) 146 U.S. 387, 436 ["the [public trust] doctrine is founded upon the necessity of preserving to the public the use of navigable waters"]; ELF, supra, 26 Cal.App.5th at p. 857-58.

[26] *ELF, supra*, 26 Cal.App.5th at p. 856-57 [quoting *Long Sault Development Co. v. Call* (1916) 242 U.S. 272, 278-79.]

[27] *ELF, supra*, 26 Cal.App.5th at p. 853.

[28] *ELF, supra*, 26 Cal.App.5th at p. 857

[29] ELF, supra, 26 Cal.App.5th at p. 857 [quoting *San Francisco Baykeeper, Inc. v. State Lands Com., supra*, 242 Cal.App.4th at p. 233.]

extraction of groundwater adversely impacts a navigable waterway to which the public trust doctrine does apply."[30] GSAs and DWR must analyze all potential harm from groundwater pumping to the identified public trust resources and uses within each basin. This encompasses analyzing all instances where groundwater extractions "allegedly harm[] a navigable waterway" and "thereby violate[] the public trust."[31]

The fourth step is to analyze the feasibility of protecting the identified public trust uses from the identified potential harms due to groundwater extractions. As held in *ELF* and *National Audubon*, "the state has an affirmative duty to . . . protect public trust uses whenever feasible."[32] Thus, GSAs and DWR must analyze the feasibility of protecting public trust uses before making its decision regarding a GSP or Alternative.

However, not only must agencies analyze feasibility, they must also protect public trust uses within each basin "whenever feasible." If it is feasible to protect public trust uses in decisions regarding GSPs, then DWR and GSAs must do so—even if the depletions of interconnected surface water are not determined to have "significant and unreasonable adverse impacts" on its beneficial uses.[33]

While SGMA sets a deadline of 2020 or 2022 for adopting GSPS for high- and medium-priority basins,[34] it delays until 2025 any SGMA-based interim plan by the State Water Resources Control Board intended to remedy a condition where the groundwater extractions result in significant depletions of interconnected surface waters in probationary basins.[35] However, under *ELF* and the public trust doctrine, DWR and GSAs have the authority, and the obligation, to take action now.

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[30]ELF, supra, 26 Cal.App.5th at p. 859 ["the determinative fact is the impact of the activity on the public trust resource."]

[31] *ELF, supra,* 26 Cal.App.5th at p. 859-60.

[32] *ELF, supra,* 26 Cal.App.5th at p. 862 [quoting *National Audubon, supra,* 33 Cal.3d 419, 446-47.]

[33] See Wat. Code, § 10727, subd. (x)(6).

[34] See Wat. Code, § 10720.7, subd. (a).

[35] *Ibid.*, § 10735.8, subd. (h).

D. CDFW's Fish & Wildlife Groundwater Planning Considerations.

In 2019, the California Department of Fish & Wildlife (CDFW) published "Fish & Wildlife Groundwater Planning Considerations" specifically to provide guidance to GSA's in their efforts to draft GSPs that adequately address both "Groundwater Dependents Ecosytems" (GDEs) and "Interconnected Surface Waters" (ISW). (Ex 7.) This guide book provides important criteria for judging the Plan's failure to adequately address both issues.

With respect to Interconnected Surface Waters, CDFW's Groundwater Planning Considerations pose three simple questions that GSPs should answer:

> 1. How will groundwater plans document the timing, quantity, and location of ISW [Interconnected Surface Waters] depletions attributable to groundwater extraction and determine whether these depletions will impact fish and wildlife?
> 2. How will GSAs determine if fish and wildlife are being adversely impacted by groundwater management impacts on ISW?
> 3. If adverse impacts to ISW-dependent fish and wildlife are observed, how will GSAs facilitate appropriate and timely monitoring and management response actions?

(Ex 7, p. 5.) These Plans answer none of these questions.

CDFW's Groundwater Planning Considerations provide a detailed description of the factors that must be included in GSPs to evaluate impacts on fish and wildlife stream flow depletion from groundwater pumping, including factors relating to species life cycle (e.g., temporal water needs ["aquatic and terrestrial species require different quantities and qualities of water at different times and for different durations"]; spatial water needs ["similar to temporal water needs, species are sensitive to the location and coverage of ISW and GDE wetland habitat available to them"]; hydrologic variability ["water availability is naturally variable, and many species rely on a degree of hydrologic variability"]; water availability ["CDFW expects groundwater budget projections to include fish and wildlife water needs"]; water quality ["Groundwater quality and ISW quality play a significant role in habitat adequacy. Groundwater pumping can impact many components of water quality..."]) and factors relating to habitat value (e.g., connectivity ["Habitat connectivity is a key ecological attribute of thriving ecosystems"]; heterogeneity ["Habitat heterogeneity, such as vegetation age and diversity, is a key ecological attribute of many functional ecosystems ..."]; groundwater elevation ["Groundwater-dependent habitats, including ISW, are particularly susceptible to changes in the depth of the

groundwater"].)[36] (Ex 7, pp. 9-11.)

These Plans do not include any analysis of these factors, nor do any of them propose a plan or protocol to do so in the future..

IV. NORTHERN AND CENTRAL DELTA-MENDOTA REGIONS GSP

CSPA adopts the comments presented by the NMFS in its April 6, 2020, comment letter on this Plan and the other five Delta Mendota Region GSPs (NMFS 4/6/20);[37] and by the CDFW in its March 11, 2020, comment letter on this Plan (CDFW 3/11/20). In all instances where NMFS or CDFW identifies a shortcoming or recommends a change in a Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan.

A. Interconnected Surface Water.

Given the critical importance of avoiding harmful stream flow depletion in the subbasin's rivers and stream, one would expect it to be a major topic of investigation, reporting, and planning in development of the Plan over the last five years. Instead, the topic is disposed of a few short paragraphs, as follows:

> 5.3.7.4 Current Conditions
> Historically, most of the San Joaquin River, which forms the great majority of the Delta-Mendota Subbasin's eastern border, was a gaining reach. Snowmelt runoff

[36] "Lowered water tables that drop beneath root zones can cutoff phreatophyte vegetation from water resources, stressing or ultimately converting vegetated terrestrial habitat. Induced infiltration attributable to groundwater pumping can reverse hydraulic gradients and may cause streams to stop flowing, compromising instream dissolved oxygen and temperature characteristics, and eventually causing streams to go dry. The frequency and duration of exposure to lowered groundwater tables and low-flow or no-flow conditions caused by groundwater pumping, as well as habitat and species resilience, will dictate vulnerability to changes in groundwater elevation. For example, some species rely on perennial instream flow, and any interruption to flow can risk species survival. Impacts caused by changes in groundwater elevation should be considered in the evaluation of groundwater management effects on GDEs and ISW." (Ex 7, p. 11.)

[37] NMFS' letter states: "This letter transmits NMFS' comments specifically regarding the final NCDMR GSP, although these comments generally apply also to the five other final GSPs submitted for the Delta Mendota Subbasin." (NMFS 4/6/20, p. 1.)

> during the spring and early summer resulted in these conditions through a good portion of the year. However, significant decreases in groundwater elevations due to pumping, storage, and upstream diversions on the river have reversed this condition so most reaches are now losing reaches. Some localized gaining reaches still remain on the lower river, such as between the Stanislaus and Merced Rivers, corresponding to the reaches of the San Joaquin River boarding the Northern and Central Delta-Mendota Regions.
>
> 5.3.7.5 Estimates of Timing and Quantity of Gains/Depletions Using available data, the quantity of gains and/or depletions from the groundwater at each reach of the San Joaquin River identified along the Northern and Central Delta-Mendota Regions was estimated. Table 5-9 summarizes these estimates. Estimates of the timing of gains and/or depletions were unavailable in related literature, and insufficient data were available to estimate the timing of losses and gains in the Northern and Central Delta-Mendota Regions. Such information will be gathered through future monitoring efforts related to this GSP.

(Plan, p. 5-175.)

In fact, there are readily available methodologies for identifying stream reaches at risk of groundwater depletion from groundwater pumping. Mr. Kamman's comments describe one such method previously used by the State Water Resources Control Board for mapping areas where groundwater pumping is likely to cause depletion of surface flows, known as Potential Stream Depletion Areas ("PSDA"). (Ex 11.) Mr. Kamman applied this method to the mainstem Stanislaus River watershed between Goodwin Dam and its confluence with the San Joaquin River; and the mainstem Tuolumne River watershed between La Grange Dam/Reservoir and the San Joaquin River (the "PSDA Study Area"). The results include maps using USGS 7.5-minute topographic quadrangle sheets (quad sheets) showing the mainstem river channels. (Final GSP, Appendix 1-I, Public Comments, pdf pp. 598-612.)

These maps cover areas both inside and outside the Plan boundary. They are presented here as an example of a data gathering method that can and should be employed for this plan. GSAs cannot avoid location specific characterizations of the risk of undesirable results because someone else has not already developed the information. The GSAs have spent five years developing a broad range of data pertinent to their basins. They must do the same for interconnected surface waters.

The Plan fails to describe any protocol to obtain usable information to identify areas and times with a high risk of groundwater pumping induced stream flow depletion. The Plan also provides no assurance that the GSAs will gather heretofore unavailable information that would correlate groundwater and surface flow elevations to the life cycle and habitat of listed salmonids

at sufficiently fine-grained geographic and temporal scales to evaluate the risk of undesirable results.

Given the virtual absence of useable information in the Plan for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion, the PSDA methodology and resulting maps represent the best information available for this purpose. Yet the Plan fails to adopt the methodology or the resulting maps; and fails to explain why they do not represent the best information available.

B. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

This Plan's basin-wide sustainable yield estimate for the Upper Aquifer ranges from 325,000 AF/yr ± 10 percent (no management actions) to 480,000 AF/yr +/- 10 percent (with management actions) (Plan p. 5-237). The basin-wide sustainable yield estimate for the Lower Aquifer is 250,000 AF/yr (Plan p. 5-238). The overdraft reduction estimate is 50,000 AF/yr (total), with 42,000 AF/yr for Upper Aquifer and 8,000 AF/yr for the Lower Aquifer (Plan p. 5-225). These estimates, however, are invalid because they fail to reflect consideration of undesirable results, especially on fish and wildlife species dependent on interconnected surface water.

There are numerous problems with the Plan's water budget, sustainable yield estimate, and overdraft reduction estimate calculations (described in detail by Mr. Kamman in his letters attached as Exhibits 11 and 12) that preclude it from demonstrating achievement of sustainable groundwater management or the Plan's sustainability goal.

C. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal because it relies on projects of unknown feasibility to reduce groundwater pumping.

The Plan relies on the implementation of numerous "projects and management actions" to achieve the Plan's sustainability goal, but concedes that these projects and management actions "require further analysis and permitting to determine feasibility and cost effectiveness." (ES-1, ES-9.)[38] The Plan's failure to demonstrate the feasibility of these projects and management

[38]"The six Delta-Mendota Subbasin GSP Groups will work together in a coordinated fashion to implement projects and management actions within their respective GSP Plan areas in order to achieve sustainability Subbasin-wide. The Northern & Central Delta-Mendota Region GSP has identified projects that can either replace (offset) or supplement (recharge) groundwater to aid in reaching sustainability by 2040. *** The projects and management actions contained in this GSP,

actions means the Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

V. SAN JOAQUIN RIVER EXCHANGE CONTRACTORS GSP.

CSPA adopts the comments presented in NMFS 4/6/20 and by the CDFW in its April 15, 2020, comment letter on this Plan (CDFW 4/15/20). In all instances where CDFW or NMFS identifies a shortcoming or recommends a change in a Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan.

A. Interconnected Surface Water.

The Plan recognizes that current conditions, when compared to historic conditions represent a significant adverse change in surface water depletions from groundwater pumping and other factors:

> Historically, most of the San Joaquin River, which forms the great majority of the Delta-Mendota Subbasin's eastern border, was a gaining reach. Snowmelt runoff during the spring and early summer resulted in these conditions through a good portion of the year. However, significant decreases in groundwater elevations due to a myriad of factors, including pumping, tile drains, the channelizing of flood flows, and upstream diversions on the river, have reversed this condition so most reaches are now losing reaches. Some localized gaining reaches still remain on the lower river, such as between the Stanislaus and Merced Rivers; however, many reaches along these rivers (and along localized streams) may transition from gaining to losing depending on hydrology.

(Appendix B, Common Chapter, CC-115-116.)

In its comment letter, CDFW emphasizes the need to identify conditions in which groundwater pumping may causes stream flow depletion. (CDFW 4/15/20.) Yet, the Plan fails to establish the metrics required by SGMA, including metrics for undesirable results, minimum thresholds, measurable objectives, and interim milestones. For example, the Plan states:

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along with the projects and management actions implemented by the other five GSP Groups in the Subbasin, are anticipated to bring the Subbasin into sustainability by 2040. These projects and management actions require further analysis and permitting to determine feasibility and cost effectiveness and the project/management action list will be reviewed and revised, as appropriate, during GSP implementation. Projects and management actions are summarized in the table below."

> The SJREC have not proposed to develop measurable objectives and interim milestones to address interconnected surface water and groundwater.

(Plan, p. v [pdf p. 7].) This sounds like a declaration of independence from the will of the legislature as expressed in SGMA rather than an attempt to comply with SGMA.

The Plan then states:

> Rather than developing a plan to mitigate a problem after the problem has presented itself, the SJREC GSP group has proposed to work with the counties to develop well construction standards to fully mitigate the potential for wells installed near the San Joaquin River to have an impact to the surface water flows.

(Plan, p. v [pdf p. 7].) The implication that there are no existing problems that must be evaluated and mitigated is directly contrary to the Common Chapter's admission that current conditions, when compared to historic conditions represent a significant adverse change in surface water depletions from groundwater pumping and other factors. This conclusion is also directly contrary to DWR's finding, based on the best information available in 2019, that the evidence supports concluding that the Delta Mendota subbasin is experiencing adverse effects on stream flow and habitat from groundwater pumping. Indeed, DWR assigned the maximum number of points for these effects for purposes of prioritizing this basin as "critically overdrafted." (Ex 9, pp. 29-31; Ex 10.)

The Plan entirely fails to evaluate how continuing use of groundwater may continue these "undesirable results" conditions or potentially exacerbate them. Instead, the Plan refers to vague commitments to avoid impacts and to unsupported assertions that certain area are not at risk of surface water depletion as a result of groundwater depletions. (See e.g., Plan p. 106 [pdf p. 130].)

The Plan then states:

> The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results.

(Plan p. 106 [pdf p. 130].) This is merely a restatement of what SGMA requires, not an actual minimum threshold based on evaluating environmental conditions.

As discussed above, there are readily available methodologies for identifying stream reaches at risk of groundwater depletion from groundwater pumping, including PSDA method

described by Mr. Kamman. (Ex 11.) These maps cover areas both inside and outside the Plan boundary. They are presented here as an example of a data gathering method that can and should be employed for this plan. GSAs cannot avoid location specific characterizations of the risk of undesirable results because someone else has not already developed the information. The GSAs have spent five years developing a broad range of data pertinent to their basins. They must do the same for interconnected surface waters.

The Plan fails to describe any protocol to obtain usable information to identify areas and times with a high risk of groundwater pumping induced stream flow depletion. The Plan also provides no assurance that the GSAs will gather heretofore unavailable information that would correlate groundwater and surface flow elevations to the life cycle and habitat of listed salmonids at sufficiently fine-grained geographic and temporal scales to evaluate the risk of undesirable results.

Given the virtual absence of useable information in the Plan for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion, the PSDA methodology and resulting maps represent the best information available for this purpose. Yet the Plan fails to adopt the methodology or the resulting maps; and fails to explain why they do not represent the best information available.

B. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

The SJREC Plan's sustainable yield estimate is 189,000 AF/year for upper aquifer and 73,000 AF/year for lower aquifer (Plan pp. 96-97.). Its overdraft reduction estimate based on historic water period is -13,000 AF/yr for Upper Aquifer and -10,000 AF/yr for Lower Aquifer (Plan pp. iv). Overdraft estimate from Projected water budget has Upper Aquifer recovering (+12,000 AF/yr) but Lower Aquifer still in deficit (-5,000 AF/yr) (Plan p. 85-87). These estimates, however, are invalid because they fail to reflect consideration of undesirable results, especially on fish and wildlife species dependent on interconnected surface water.

There are numerous problems with the Plan's water budget, sustainable yield estimate, and overdraft reduction estimate calculations (described in detail by Mr. Kamman in his letter attached as Exhibit 12) that preclude it from demonstrating achievement of sustainable groundwater management or the Plan's sustainability goal.

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C. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal because it relies on projects of unknown feasibility to reduce groundwater pumping.

The Plan relies on the implementation of numerous "projects and management actions" to achieve the Plan's sustainability goal. (See e.g., Plan pp. 131, 138, 145, 150, 156, 158, 165, 175, 178, 181, 184, 190.) But the Plan confusingly says "these projects are not intended to mitigate Undesirable Results in this plan." (Plan p. 131.) Achieving the sustainability goal is avoiding undesirable results.

The Plan states that several of these projects "have been analyzed for feasibility" but have not cleared environmental review and have not received permits. (Plan, pp. 113-118.) Plus, the Northern and Central Delta Mendota GSP states that:

> The projects and management actions contained in this GSP, along with the projects and management actions implemented by the other five GSP Groups in the Subbasin, are anticipated to bring the Subbasin into sustainability by 2040. These projects and management actions require further analysis and permitting to determine feasibility and cost effectiveness and the project/management action list will be reviewed and revised, as appropriate, during GSP implementation. Projects and management actions are summarized in the table below.

(Northern and Central Delta Mendota GSP, p. ES-9.) The referenced table includes the projects and management actions listed in the SJREC GSP at pp. 113-118. (Northern and Central Delta Mendota GSP, p. ES-10.) Thus, the Northern and Central Delta Mendota GSP throws more doubt on whether these projects and management actions will be successfully implemented. Absent such assurance, the Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

VI. FRESNO COUNTY MANAGEMENT AREA A AND B GSP

CSPA adopts the comments presented in NMFS 4/6/20 or by the CDFW in its April 28, 2020, comment letter on this Plan (CDFW 4/28/20). In all instances where CDFW or NMFS identifies a shortcoming or recommends a change in a Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan.

A. Interconnected Surface Water Systems.

The Plan fails to establish the metrics required by SGMA, including metrics for undesirable results, minimum thresholds, measurable objectives, and interim milestones. The Plan's implication that there are no existing problems that must be evaluated and mitigated is

contrary to the Common Chapter's admission that current conditions, when compared to historic conditions represent a significant adverse change in surface water depletions from groundwater pumping and other factors. This conclusion is also contrary to DWR's finding, based on the best information available in 2019, that the evidence supports concluding that the Delta Mendota subbasin is experiencing adverse effects on stream flow and habitat from groundwater pumping. Indeed, DWR assigned the maximum number of points for these effects for purposes of prioritizing this basin as "critically overdrafted." (Ex 9, pp. 29-31; Ex 10.)

The Plan fails to evaluate how continuing use of groundwater may continue these "undesirable results" conditions or potentially exacerbate them. Instead, the Plan refers to vague commitments to avoid impacts and to unsupported assertions that certain area are not at risk of surface water depletion as a result of groundwater depletions.

As discussed above, there are readily available methodologies for identifying stream reaches at risk of groundwater depletion from groundwater pumping, including PSDA method described by Mr. Kamman. (Ex 11.) While these maps cover areas outside of the Fresno GSP's boundary, they represent an example of data gathering that can and should be employed for this plan. GSAs cannot avoid location specific characterizations of the risk of undesirable results because someone else has not already developed the information. The GSAs have spent five years developing a broad range of data pertinent to their basins. They must do the same for interconnected surface waters.

The Plan fails to describe any protocol to obtain usable information to identify areas and times with a high risk of groundwater pumping induced stream flow depletion. The Plan also provides no assurance that the GSAs will gather heretofore unavailable information that would correlate groundwater and surface flow elevations to the life cycle and habitat of listed salmonids at sufficiently fine-grained geographic and temporal scales to evaluate the risk of undesirable results.

Given the virtual absence of useable information in the Plan for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion, the PSDA methodology and resulting maps represent the best information available for this purpose. Yet the Plan fails to adopt the methodology or the resulting maps; and fails to explain why they do not represent the best information available.

B. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

The Fresno Plan does not present an individual sustainable yield estimate; it only presents the basin-wide estimates that are also presented in the Northern and Central Delta Mendota GSP.

(Plan, p. 50).[39] These estimates, however, are invalid because they fail to reflect consideration of undesirable results, especially on fish and wildlife species dependent on interconnected surface water.

The Fresno Plan claims no overdraft is occurring and there is no overdraft reduction estimate (Plan, p. 50). However, Table 3-6 on Plan p. 50 contradicts this assertion, showing an average annual overdraft in the historic water budget data of 1,400 AF/yr. (Ex 12.)

There are numerous problems with the Plan's water budget, sustainable yield estimate, and overdraft reduction estimate calculations (described in detail by Mr. Kamman in his letter attached as Exhibit 12) that preclude it from demonstrating achievement of sustainable groundwater management or the Plan's sustainability goal.

Also, the Plan does not explain the discrepancy between, on one hand, its location in a basin prioritized as in critical overdraft by DWR and its use of a basin-wide water budget, and on the other hand, its claim that considering this Plan in isolation, no overdraft is occurring.[40]

VII. FARMERS WATER DISTRICT GSP

CSPA adopts the comments presented in NMFS 4/6/20 or by the CDFW in its March 11, 2020, comment letter on this Plan (CDFW 3/11/20). In all instances where NMFS or CDFW identifies a shortcoming or recommends a change in a Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan.

A. Interconnected Surface Water Systems.

The Plan fails to establish the metrics required by SGMA, including metrics for undesirable results, minimum thresholds, measurable objectives, and interim milestones. The Plan's implication that there are no existing problems that must be evaluated and mitigated is contrary to the Common Chapter's admission that current conditions, when compared to historic

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[39]The basin-wide sustainable yield estimate for the Upper Aquifer ranges from 325,000 AF/yr ± 10 percent (no management actions) to 480,000 AF/yr +/- 10 percent (with management actions). The basin-wide sustainable yield estimate for the Lower Aquifer is 250,000 AF/yr. The overdraft reduction estimate is 50,000 AF/yr (total), with 42,000 AF/yr for Upper Aquifer and 8,000 AF/yr for the Lower Aquifer.

[40] "Further investigation of existing data gap areas and development of future projects and management actions will ensure that sustainable conditions are maintained through the planning and implementation horizon (2040 through 2070)." (Plan, ES-5.)

conditions represent a significant adverse change in surface water depletions from groundwater pumping and other factors. This conclusion is also contrary to DWR's finding, based on the best information available in 2019, that the evidence supports concluding that the Delta Mendota subbasin is experiencing adverse effects on stream flow and habitat from groundwater pumping. Indeed, DWR assigned the maximum number of points for these effects for purposes of prioritizing this basin as "critically overdrafted." (Ex 9, pp. 29-31; Ex 10.)

The Plan fails to evaluate how continuing use of groundwater may continue these "undesirable results" conditions or potentially exacerbate them. Instead, the Plan refers to vague commitments to avoid impacts and to unsupported assertions that certain area are not at risk of surface water depletion as a result of groundwater depletions.

As discussed above, there are readily available methodologies for identifying stream reaches at risk of groundwater depletion from groundwater pumping, including PSDA method described by Mr. Kamman. (Ex 11.) While these maps cover areas outside of the Farmers GSP boundary, they represent an example of data gathering that can and should be employed for this plan. GSAs cannot avoid location specific characterizations of the risk of undesirable results because someone else has not already developed the information. The GSAs have spent five years developing a broad range of data pertinent to their basins. They must do the same for interconnected surface waters.

The Plan fails to describe any protocol to obtain usable information to identify areas and times with a high risk of groundwater pumping induced stream flow depletion. The Plan also provides no assurance that the GSAs will gather heretofore unavailable information that would correlate groundwater and surface flow elevations to the life cycle and habitat of listed salmonids at sufficiently fine-grained geographic and temporal scales to evaluate the risk of undesirable results.

Given the virtual absence of useable information in the Plan for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion, the PSDA methodology and resulting maps represent the best information available for this purpose. Yet the Plan fails to adopt the methodology or the resulting maps; and fails to explain why they do not represent the best information available.

B. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

The Farmers' GSP presents sustainable yield estimates for Historic and Projected conditions: 6700 AF/yr for historic (Plan p. 46) and 9200 AF/yr for Projected upper aquifer and 733 AF/yr for lower aquifer (Plan p. 46). The overdraft reduction estimate is 600 AF/yr for upper aquifer and undetermined for lower aquifer (Plan p. 45).

There are numerous problems with the Plan's water budget, sustainable yield estimate, and overdraft reduction estimate calculations (described in detail by Mr. Kamman in his letter attached as Exhibit 12) that preclude it from demonstrating achievement of sustainable groundwater management or the Plan's sustainability goal.

VIII. ALISO WATER DISTRICT GSP

CSPA adopts the comments presented in NMFS 4/6/20 or by the CDFW in its April 28, 2020, comment letter on this Plan (CDFW 4/28/20). In all instances where NMFS or CDFW identifies a shortcoming or recommends a change in a Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan.

A. Interconnected Surface Water Systems.

The Plan fails to establish the metrics required by SGMA, including metrics for undesirable results, minimum thresholds, measurable objectives, and interim milestones. The Plan's implication that there are no existing problems that must be evaluated and mitigated is contrary to the Common Chapter's admission that current conditions, when compared to historic conditions represent a significant adverse change in surface water depletions from groundwater pumping and other factors. This conclusion is also directly contrary to DWR's finding, based on the best information available in 2019, that the evidence supports concluding that the Delta Mendota subbasin is experiencing adverse effects on stream flow and habitat from groundwater pumping. Indeed, DWR assigned the maximum number of points for these effects for purposes of prioritizing this basin as "critically overdrafted." (Ex 9, pp. 29-31; Ex 10.)

The Plan fails to evaluate how continuing use of groundwater may continue these "undesirable results" conditions or potentially exacerbate them. Instead, the Plan refers to vague commitments to avoid impacts and to unsupported assertions that certain areas are not at risk of surface water depletion as a result of groundwater depletions.

As discussed above, there are readily available methodologies for identifying stream reaches at risk of groundwater depletion from groundwater pumping, including PSDA method described by Mr. Kamman. (Ex 11.) While these maps cover areas outside of the Aliso GSP's boundary, they represent an example of data gathering that can and should be employed for this plan. GSAs cannot avoid location specific characterizations of the risk of undesirable results because someone else has not already developed the information. The GSAs have spent five years developing a broad range of data pertinent to their basins. They must do the same for interconnected surface waters.

The Plan fails to describe any protocol to obtain usable information to identify areas and times with a high risk of groundwater pumping induced stream flow depletion. The Plan also

provides no assurance that the GSAs will gather heretofore unavailable information that would correlate groundwater and surface flow elevations to the life cycle and habitat of listed salmonids at sufficiently fine-grained geographic and temporal scales to evaluate the risk of undesirable results.

Given the virtual absence of useable information in the Plan for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion, the PSDA methodology and resulting maps represent the best information available for this purpose. Yet the Plan fails to adopt the methodology or the resulting maps; and fails to explain why they do not represent the best information available.

B. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

The Aliso Plan's sustainable yield estimate for combined upper & lower aquifer is 83,600 AF/yr (Plan p. 3-20) and its overdraft reduction estimate is 2,200 AF/yr per Table 3-7 (Plan p. 3-24).

There are numerous problems with the Plan's water budget, sustainable yield estimate, and overdraft reduction estimate calculations (described in detail by Mr. Kamman in his letter attached as Exhibit 12) that preclude it from demonstrating achievement of sustainable groundwater management or the Plan's sustainability goal.

C. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal because it relies on projects of unknown feasibility to reduce groundwater pumping.

The Plan relies on the implementation of projects and management actions to achieve the Plan's sustainability goal. As noted above, the Northern and Central Delta Mendota GSP concedes that "The projects and management actions contained in this GSP, along with the projects and management actions implemented by the other five GSP Groups in the Subbasin ... require further analysis and permitting to determine feasibility and cost effectiveness." (Northern and Central Delta Mendota GSP, p. ES-9.) Absent more assurance that the projects and management actions, the Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

IX. GRASSLANDS GSP

CSPA adopts the comments presented by the NMFS in its April 6, 2020, comment letter on all six Delta Mendota Region Plans (NMFS 4/6/20). In all instances where NMFS or CDFW identifies a shortcoming or recommends a change in a Plan, CSPA contends that each such

aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan.

A. Interconnected Surface Water Systems.

The Plan "assumes ... there is a net inflow from the Grassland Plan Area to the SJR [San Joaquin River], designating it as interconnected and a gaining stream in this section." (Plan, p. 4-9 [pdf 164].) The Plan states:

> The only locations in the area evaluated where groundwater is known to be in direct hydraulic communication with a stream is along a nine-mile-long reach of the San Joaquin River on the north edge of the San Luis NWR (Figure 3-4). A series of shallow monitoring wells have been installed by Reclamation as part of the SJRRP. Water level maps indicate that groundwater in the upper aquifer discharges to the river along this reach. The GGSA has installed a network of shallow (10 to 20 feet deep) observation wells in the District. Monitoring of these wells will provide more definitive information on the relationship between shallow groundwater and streamflow at these same locations.

(Plan, p. 3-39 [pdf 127].)

The Plan quantifies its groundwater pumping as follows:

> Approximately 30,000 - 50,000 AFY of groundwater is pumped and used within the Plan Area. This pumping includes the pumping of state, federal, and private refuge lands as well as the limited agricultural lands in the Plan Area. Historically, GWD's refuge water supply pumping can be up to 28,262 AF in below normal or critical years. Pumping is reduced significantly during wet years when other sources of surface water are available for use in the Plan Area.

(Plan, p. 2-26 [pdf 063].) The Plan also concludes that

> Groundwater pumping in the Grassland Plan Area does not influence surface water depletion. Reduction of interconnected surface water bodies and associated groundwater dependent ecosystems (GDEs) that would require reduction in groundwater pumping (no management activities have depleted interconnected surface water in the Grassland Plan Area within the historical period).

(Plan, p. 4-5 [pdf 160].)

The Plan defines "significant and unreasonable undesirable results of interconnected surface water" as "reduction of interconnected surface waterbodies and associated GDEs that

would require reduction in groundwater pumping." (Plan, p. 4-8]pdf 163].)

This definition is circular because it defines the condition to be remedied (i.e., significant and unreasonable undesirable results) by reference to the need to employ the remedy. This circularity omits any reference or metric tied to the environmental resources (e.g., threatened salmonids) that are undesirably impacted by surface water depletions caused by groundwater pumping.

In another location, the Plan states:

> Quantitative Definition of Significant and Unreasonable Undesirable Results: If a twenty percent or greater decrease from the recent historical (2000 to 2019) upper aquifer groundwater level lows are experienced or exceeded at more than fifty percent of the representative monitoring network wells for three consecutive years, then it can be assumed that significant and unreasonable undesirable results have occurred.

(Plan, p. 4-10]pdf 165].) Again, the metric is untethered to at-risk environmental resources.

Similarly, the proposed "interim goals and measurable objectives" outlined in Plan section 4.5.1 do not meet regulatory requirements because they are not tied to the lifecycle and habitat needs of affected species such as threatened salmonids. The Plan bases its "interim goals and measurable objectives" on this description of recent and existing conditions:

> Unlike most GSPs within critically overdrafted basins, the Grassland Plan Area is not projected to significantly deviate from the sustained groundwater levels it has historically experienced. Therefore, the interim goals and measurable objectives are reflective of a sustained system.

(Plan p. 4-25 [pdf p. 180].) Even assuming, arguendo, that the Grassland Plan area continues to experience these conditions in the future, the fact remains that interconnected surface water dependent species are going extinct in this regional ecosytem. The Plan concedes that "Any disruptions to that contribution are best assessed on a regional basis rather than on a site-specific scale." (Plan, p. 4-18 [pdf 173].) But, without conducting any analysis tied to species impacts at either level, the Plan focuses on what it expects to happen within its own boundaries.

This violates SGMA's requirements to coordinate analyses when GSPs are "coordinated" as the six Delta Mendata GSPs are, and SGHMA's requirement to consider impacts in adjacent or hydrologically connected basins.

It would appear that the Grassland GSAs refrained from complying with SGMA with

respect to interconnected surface waters because they believe the risk of harm to ISW associated environmental resources is low. The Plan's implication that there are no existing problems that must be evaluated and mitigated is contrary to the Common Chapter's admission that current conditions, when compared to historic conditions represent a significant adverse change in surface water depletions from groundwater pumping and other factors. This conclusion is directly contrary to DWR's finding, based on the best information available in 2019, that the evidence supports concluding that the Delta Mendota subbasin is experiencing adverse effects on stream flow and habitat from groundwater pumping. Indeed, DWR assigned the maximum number of points for these effects for purposes of prioritizing this basin as "critically overdrafted." (Ex 9, pp. 29-31; Ex 10.)

The Plan fails to evaluate how continuing use of groundwater may continue these "undesirable results" conditions or potentially exacerbate them.

The Plan indicates that "the Grassland GSP Technical Working Group and Plan Area participants have decided to use water elevation SMCs as a proxy for interconnected surface water (see Section 5.3.2)." (Plan, p. 4-9 [pdf p. 164].) As stated by NMFS

> SGMA requires that if a proxy metric is used, then significant correlation must be established between the two metrics (CCR § 354.36(b). No correlation or linkage between a "significant increase in the depletion of surface water" and significant, unreasonable adverse impacts on beneficial uses of surface water, is presented in the final GSP. Thus, this threshold is inconsistent with SGMA regulations and guidance, which require consideration of not only the rate or volume of streamflow depletion, but more importantly the impact the depletion may have on beneficial uses of surface water (e.g., meeting habitat requirements for ESA-listed salmonids). As stated earlier, the appropriate method to determine whether pumping is having "significant and unreasonable adverse impacts" on beneficial uses of surface water is to understand the level of impact (i.e., volume of streamflow depletion) and how habitat quality and functionality change because of that impact.

(NMFS 4/6/20, pp. 3-4; see also, CDFW's Groundwater Planning Considerations, Ex 7, pp. 5-11.)

The Plan states that:

> Historically, the SJR is interconnected to the stretch adjacent to the Grassland Plan Area for most of the year during most water years. The Grassland Plan Area's contribution to the interconnection can be quantitatively measured by the upper aquifer groundwater levels across the Plan Area, as the groundwater flow

> trends towards the SJR and contributes a net inflow to the river. Any disruptions to that contribution are best assessed on a regional basis rather than on a site-specific scale.

(Plan, p. 4-18 [pdf 173].) But the Plan does conduct this analysis at either the regional or site-specific level and does not include a plan or protocol to do so.

As discussed above, there are readily available methodologies for identifying stream reaches at risk of groundwater depletion from groundwater pumping, including PSDA method described by Mr. Kamman. (Ex 11.) While these maps cover areas outside of the Grassland GSP's boundary, they represent an example of data gathering that can and should be employed for this plan. GSAs cannot avoid location specific characterizations of the risk of undesirable results because someone else has not already developed the information. The GSAs have spent five years developing a broad range of data pertinent to their basins. They must do the same for interconnected surface waters.

The Plan fails to describe any protocol to obtain usable information to identify areas and times with a high risk of groundwater pumping induced stream flow depletion. The Plan also provides no assurance that the GSAs will gather heretofore unavailable information that would correlate groundwater and surface flow elevations to the life cycle and habitat of listed salmonids at sufficiently fine-grained geographic and temporal scales to evaluate the risk of undesirable results.

Given the virtual absence of useable information in the Plan for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion, the PSDA methodology and resulting maps represent the best information available for this purpose. Yet the Plan fails to adopt the methodology or the resulting maps; and fails to explain why they do not represent the best information available.

B. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

The Grasslands Plan reports no sustainable yield estimate, "as the plan area experiences a positive change in groundwater storage on average." (Plan p. 45). The reported positive annual change in groundwater storage is 3200 AF/yr (Plan p. 149). However, the Plan does report the basinwide sustainable yield estimation for the upper lower aquifers, stating:

> The basinwide analysis resulted in an Upper Aquifer Sustainable Yield estimate ranging from 325,000 AF to 480,000 AF, demonstrating the Subbasin's estimated Upper Aquifer sustainable yield without implementing any projects and management actions (low end of range) and the Subbasin's estimated Upper

> Aquifer sustainable yield considering the implementation of projects and management actions (high end of range).
> The basinwide estimates for the Lower Aquifer sustainable yield are approximately 250,000 AFY over the approximately 750,000-acre Subbasin.

(Plan, p. 3-57 [pdf p. 145] citing section 4.3.4 of the Common Chapter.)

There are numerous problems with the Plan's water budget, sustainable yield estimate, and overdraft reduction estimate calculations (described in detail by Mr. Kamman in his letter attached as Exhibit 12) that preclude it from demonstrating achievement of sustainable groundwater management or the Plan's sustainability goal.

X. CONCLUSION

As noted in connection with the Grassland GSP, individual GSPs in this subbasin must coordinate to assess interconnected groundwater conditions that effect listed species impacts across the entire subbasin. Each Plan cannot myopically focus on its own boundaries.

The groundwater levels sustainable management criteria set by a GSA must be the point that, "if exceeded, may cause undesirable results."[41] Therefore, the Plans' groundwater levels sustainable management criteria must have the purpose of avoiding "significant and unreasonable" impacts on beneficial users caused by declining groundwater levels.[42] The GSAs' determination of what is "significant and unreasonable" must consider the impacts on all types of beneficial users, including fish and wildlife, CSPA and its members, and all who use and are concerned about watershed health in the rivers and streams of California.

The regulations also establish that a failure to consider all beneficial uses and users of groundwater undermines the likelihood that a basin will reach its sustainability goal.[43] For groundwater levels specifically, GSAs must place minimum thresholds for each monitoring site at the level "that may lead to undesirable results."[44] Under the SGMA regulations, the GSP should provide a description of "the information and criteria relied upon to establish minimum thresholds," an explanation of how the proposed minimum thresholds will "avoid undesirable results," and "how minimum thresholds may affect the interests of beneficial uses and users of groundwater."[45]

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[41] 23 CCR § 354.28(a).
[42] 23 CCR § 354.26.
[43] 23 CCR § 355.4(b).
[44] 23 CCR § 354.28.
[45] 23 CCR § 354.28.

Because these Plans do not consider effects on the interests of all the beneficial uses and users of groundwater, it fails to "include[] the information required by [SGMA] and [its accompanying regulations]" and is thus inadequate.[46] Here, the Plans fail to comply with 23 CCR § 355.4(b) ["(1) Whether the assumptions, criteria, findings, and objectives, including the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are reasonable and supported by the best available information and best available science"]; ["(2) Whether the Plan identifies reasonable measures and schedules to eliminate data gaps]; ["(3)Whether sustainable management criteria and projects and management actions are commensurate with the level of understanding of the basin setting, based on the level of uncertainty, as reflected in the Plan"]; and (4) ["Whether the interests of the beneficial uses and users of groundwater in the basin, and the land uses and property interests potentially affected by the use of groundwater in the basin, have been considered"].)

Thus, the Plans are inadequate because they do not "include[] the information required by [SGMA] and [its accompanying regulations]." (23 CCR § 355.4(a)(2).)

Thank you for your attention to this matter.

Very Truly Yours,

Tom Lippe

Thomas N. Lippe

List of Exhibits

1. Proposed Endangered Status for Five ESUs of Steelhead and Proposed Threatened Status for Five ESUs of Steelhead in Washington, Oregon, Idaho, and California. Federal Register/Vol. 61, No. 155/Friday, August 9, 1996/pp. 41541-41561.

2. Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Federal Register/Vol. 71/No. 3/January 5, 2006/pp. 834-862.

3. Proposed Endangered Status for Two Chinook Salmon ESUs and Proposed Threatened Status for Five Chinook Salmon ESUs. Federal Register/Vol. 63, No. 45/March 9, 1998/pp. 11482-11520.

4. Threatened Status for Two Chinook Salmon Evolutionarily Significant Units (ESUs) in

[46] 23 CCR § 355.4(a)(2).

California. Federal Register / Vol. 64, No. 179 / Thursday, September 16, 1999/pp. 50394-50415.

5. Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon (Oncorhynchus tshawytscha) and Steelhead (O. mykiss) in California. Federal Register/Vol. 69, No. 237/Friday, December 10, 2004/Proposed Rules/pp. 71880-72017.

6. Final Critical Habitat Rule for Central Valley steelhead (Oncorhynchus mykiss) and Central Valley spring-run Chinook salmon (O. tshawytscha). Federal Register/Vol. 70, No. 170/September 2, 2005/pp. 52488-52627.

7. Fish & Wildlife Groundwater Planning Considerations. California Department of Fish & Wildlife, 2019.

8. Sustainable Groundwater Management Act - 2019 Basin Prioritization, Process and Results; Department of Water Resources, May 2020.

9. Excerpt from DWR Basin Priority Database for the Delta Mendota Subbasin.

10. Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development (Guidance Document), Department of Water Resources; July 2018.

11. Letter dated May 14, 2020, from Greg Kamman, consulting geologist and hydrologist.

12. Letter dated May 15, 2020, from Greg Kamman, consulting geologist and hydrologist.

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Kamman Hydrology & Engineering, Inc.
539 Bret Harte Road, San Rafael, CA 94901
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E-mail: greg@KHE-Inc.com

October 11, 2019

San Luis & Delta-Mendota Water Authority
842 6th Street
Los Banos, CA 93635
Via email: andrew.garcia@sldmwa.org

Subject: Review of Public Draft Groundwater Sustainability Plan
For the Northern and Central Delta-Mendota Regions

Dear Sir/Madame:

I am a hydrologist with over thirty years of technical and consulting experience in the fields of geology, hydrology, and hydrogeology. I have been providing professional hydrology and geomorphology services throughout California since 1989 and routinely manage and lead projects in the areas of surface- and groundwater hydrology, water supply, water quality assessments, water resources management, and geomorphology. A copy of my resume is attached.

On behalf of the California Sportfishing Protection Alliance, I have been retained by the Law Offices of Thomas N. Lippe, APC to review and evaluate the Public Draft Groundwater Sustainability Plan (GSP) for the Northern and Central Delta-Mendota Regions, especially as it pertains to groundwater interaction with the San Joaquin River. Based on my review, it is my opinion that the GSP is deficient in many areas. The rationale for this opinion is based on the findings presented below.

1. **Page 5-89, Section 5.3, Sentence starting with, "This section..."**
   The current conditions in the GSP is represented by Water Year (WY) 2013 conditions. WY 2013 is out-dated when compared to the year (2020) that this plan represents. Section 354.16 of the GSP Regulations (Groundwater Conditions) states, "Each Plan shall provide a description of current and historical groundwater condition in the basin, including data from January 1, 2015, to current conditions, based on the best available information…" The WY2013 period used in the GSP to represent "current conditions" predates the "current condition" period stipulated in GSP regulations.

2. **Page 5-94, Section 5.3.2.4, Sentence starting with, "Due to insufficient..."**
   Due to insufficient data, groundwater elevation contour maps for the Lower Aquifer for the spring and fall of 2013 could not be prepared. This is another issue with choosing WY 2013 to represent current conditions. A different and preferably more current year should be considered. The GSP fails to fully describe current groundwater conditions.

3. **Page 5-170, Section 5.3.7.2, Sentence starting with, "The San Joaquin..."** Section 354.16 of the GSP Regulations stipulates that each plan describe current and historic groundwater conditions in the basin based on the best available information. With regard to Interconnected Surface Water Systems, I would like you to be aware of a study completed by Kamman Hydrology & Engineering, Inc.[1], which delineates subterranean streams and Potential Stream Depletion Areas (PSDA) along the San Joaquin River. PSDA's are areas where groundwater pumping could potentially cause stream depletion. A link to this report and associated maps is provided in the footnote below for reference and integration into the GSP.

4. **Page 5-170, Section 5.3.7.2, Sentence starting with, "The San Joaquin..."** The GSP only addresses interconnected surface water systems along the San Joaquin River north of Newman, California, where the river is characterized as a gaining stream. This constitutes only 1/3rd of the river length within the Delta-Mendota Subbasin boundary. South (upstream) of Newman, the Nature Conservancy (2016) characterizes groundwater and stream interaction along the San Joaquin River as a mix of gaining and losing reaches, but dominated by gaining reaches. The GSP fails to fully characterize the interconnected surface water conditions along the San Joaquin River within the Subbasin boundary. Understanding and properly managing and protecting these interconnected surface- and groundwater systems is important as there are significant GDE's and associated resources like fish, riparian vegetation and wetlands along the entire length of River in the Subbasin.

5. **Page 5-172, Section 5.3.7.6, Sentence starting with, "The NCCAG dataset..."** The GSP Regulations define "groundwater dependent ecosystem" (GDE) as ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. Section 354.16 of the Regulations stipulate that Plans identify (current and historic) GDEs within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information. As stated on page 5-172, the Natural Communities Commonly Associated with Groundwater (NCCAG) database, developed by DWR, CDFW and The Nature Conservancy (TNC), is used to identify GDEs within the Delta-Mendota Subbasin. The GSP then describes a methodology to further screen available information and establishes the following standards to identify GDEs:

[1] Kamman Hydrology & Engineering, Inc., 2018, Delineating subterranean streams and Potential Stream Depletion Areas, Lower Stanislaus and Tuolumne River Watershed. Draft Technical Memorandum prepared for: Law Offices of Thomas N. Lippe, APC, July 23, 9p. and 15 sheets. https://www.dropbox.com/s/2ser942wkeb5d3v/PSDA-mapping-Tech-Memorandum_v1%2Bquads.pdf?dl=0

(1) Areas with depths to groundwater levels greater than 30 feet were eliminated unless the vegetation identified in those areas were consistent with species with deep root systems (e.g. live oaks);
(2) Seasonally-managed areas and wetlands were eliminated due to their dependence on applied surface water; and
(3) A 100-foot buffer was applied around the San Joaquin River within the Northern Delta-Mendota Region to include all communities in the NCCAG dataset as potential GDEs, except where professional juedement and local knowledge determined GDEs were not present.

A problem with this GDE screening methodology is the failure to acknowledge that GDEs may depend on shallow groundwater regardless of the presence of applied surface water sources. For example, wetlands within or adjacent to irrigated agriculture may not rely on that irrigation for survival; if they did, we would expect to find wetlands growing in all irrigated lands. In addition, the presence and sustainability of perennial surface water in Central Valley Rivers is controlled by many factors (e.g., groundwater inflow, reservoir operations, irrigation drainage, etc.). Information presented in the GSP indicate significant contributions of groundwater flow to "gaining" reaches of the San Joaquin River. The riparian and wetland vegetation bordering these gaining reaches are surely sustained to some degree by this groundwater inflow to the river and the shallow groundwater conditions that likely accompany gaining reaches. The interconnected condition is also likely influenced significantly by seasonal and long-term wet and dry cycles. However, the GSP does not quantify the relative spatial or temporal contributions of groundwater supply to riparian habitats. Instead, the GPS simply dismisses these habitats as GDE's under the assumption that perennial flow is sustained through the summer by agricultural deliveries or tailwater. Therefore, it is my opinion that the process of elimination of GDEs as presented in the GSP is seriously flawed and does not correctly recognize or delineate GDEs in the basin.

6. **Page 5-173, Section 5.3.7.6, Sentence starting with, "As a result..."**
The GSP states, "*Management and protection of GDEs may require more focus on land use or irrigation activities more than groundwater management*." This is a bizarre statement because the GSP eliminates areas mapped as GDEs if they are, "*seasonally-managed areas and wetlands due to dependence on applied surface water*." Per the GDE screening methodology described above, the "management and protection" practices being suggested for GDEs would eliminate these areas from consideration as a GDE.

7. **Page 5-185, Section 5.4.3, Sentence starting with, "The current water budget..."**
The GSP states, "*The current water budget year is defined as WY2013. While "current water budget conditions" are defined in the GSP Emergency Regulations §354.18(c)(1) as the year with "the most recent population, land use,*

and hydrologic conditions," WY2015, WY2016 and WY2017 were not thought to be representative of the Delta-Mendota Subbasin under "normal" or "average" conditions. Response to the most recent drought began in WY2014 with some initial fallowing of lands. By WY2015 and WY2016, which are both classified as dry years, more lands were fallowed throughout the Subbasin in response to multiple dry year conditions. Agricultural production was higher in WY2017, compared to WY2015 and WY2016, but the delivery allocations from the Central Valley Project (CVP) came late in the season, so a considerable amount of land was still fallowed. By WY2018, agricultural land production increased and was similar to conditions in WY2013, however complete datasets were not yet available for use in the water budgets. Therefore, the Coordination Committee agreed that WY2013 represents the most recent water year with a complete data set representing typical demands and supplies."

WY 2013 is a critically dry year-type falling within the 2012-2016 recent drought period, which heavily influences the meteorology, hydrology and water operations reflected in the associated "current conditions" water budget. There are more current years reflecting normal or average conditions. For example, Figures 5-84 and 5-85 (page 5-120) indicate that 2017 and 2018 were wet and average year types respectively. During WY2017, there was little change in aquifer storage in both the upper and lower aquifers, suggesting water operations balanced with available supplies. WY2017 also better representative of "current conditions" as it post-dates January 1, 2015 and reflects an average water operational period. WY2018 would also be a suitable when complete datasets become available.

8. **Page 5-186, Section 5.4.3, Sentence starting with, "Streamflow Climate Change..."**
California Department of Water Resources (DWR) has developed a document (July 2018) entitled, Guidance for Climate change *Data Use During Groundwater Sustainability Plan Development* (Guidance Document). This document explains the DWR-provided climate change data, including how the data were developed, the methods and assumptions used for data development, and how they can be used in the development of a projected water budget. DWR has prepared climatological, hydrological and water operations datasets. This Guidance Document also describes tools and processes relevant to perform climate change data analysis (i.e., incorporating climate change analysis into projected water budgets, with and without numerical surface water/groundwater models). The data and methods described in the Guidance Document are optional and other local analysis and methods may be used.

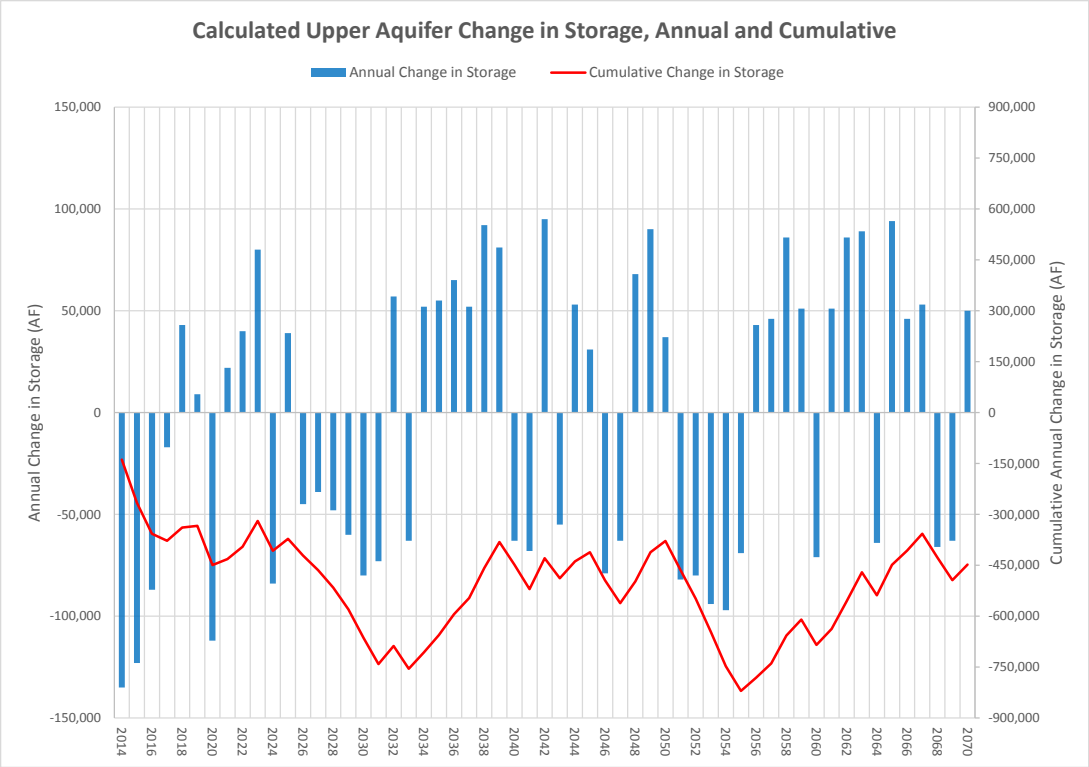
The projected (climate change) water budgets presented in the GSP utilize much of the climatological datasets. However, stream flow climate change factors from DWR were not applied – the proposed GSP considers them out-of-date and considers the result of using them as producing skewed (unreasonable) results for future surface water deliveries. Instead, the GSP states that GSA member

agencies provided estimates for anticipated future surface water deliveries that were used in the water budget calculations. However, there is no discussion on the methods and assumptions used for data development, and how climate change was integrated into data values. Therefore, there is no way to evaluate the validity or applicability of these water budget variables with the information provided in the GSP. These information deficiencies should be remedied before approving the GSP.

9. **Page 5-189, Section 5.4.4, Sentence starting with, "The selected alternative..."** The GSP uses a spreadsheet modeling approach for water budget development in lieu of numerical groundwater modeling. The spreadsheet modeling approach does not account for surface water-groundwater interaction and is therefore not an "equally effective method" (see *§354.18(e))* to numerical modeling with respect to identification on interconnected surface water systems and estimating the quantity and timing of depletions of those systems.

10. **Page 5-234, Section 5.4.10, Sentence starting with, "With the addition..."** Based on the results of the Projected Annual Groundwater Budget with Climate Change and Projects & Management Actions, the subbasin should still be considered in a state of overdraft. Although water results indicate a trend of recovery and surplus storage in the Upper Aquifer, the Upper Aquifer displays a long-term trend in storage decline. To better visualize results for this water budget, the annual and cumulative change in storage volumes for the Upper Aquifer, Lower Aquifer and Total (combined Upper and Lower Aquifers) were plotted. These plots are presented below.

    The plot of cumulative change in storage for the Upper Aquifer indicates multi-year periods of large fluctuations in storage, but a long-term trend in declining storage. The GSP states that over the WY2014 to WY2070 period, the average annual change in Upper Aquifer storage is -4,000 AF and the average annual change in Lower Aquifer is +3,000 AF. This statement in itself indicates the Upper Aquifer is in overdraft and long-term decline under this water budget scenario. Based on the graphs below, I estimate that the long-term annual change (deficit) in Upper Aquifer storage is twice as high (-8000 AFY) as that reported in the GSP (-448,000 AF divided by 56 years). I also estimate an annual change in storage in the Lower Aquifer is +6214 AFY (+348,000 AF divided by 56 year) and the total annual change in storage of the Upper and Lower combined is -1785 AFY (-100,000 AF divided by 56 years). Although the proposed Projects and Management Actions presented in the GSP will address overdraft sustainable management of the Lower Aquifer, the GSP has not demonstrated sustainable management for the Upper Aquifer, which provides a much larger percentage of total groundwater supply in the subbasin than the lower aquifer.


Calculated Upper Aquifer Change in Storage, Annual and Cumulative
Annual Change in Storage
Cumulative Change in Storage
Annual Change in Storage (AF)
Cumulative Annual Change in Storage (AF)
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100,000
50,000
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-50,000
-100,000
-150,000
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750,000
600,000
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-150,000
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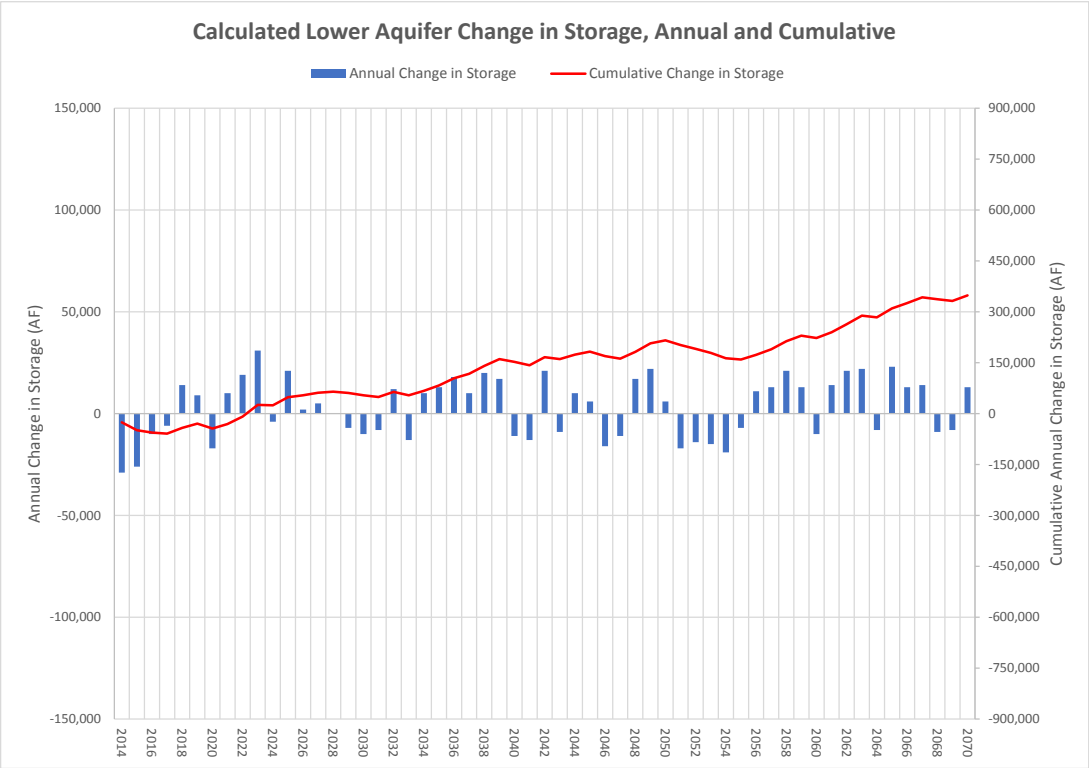
Calculated Lower Aquifer Change in Storage, Annual and Cumulative
Annual Change in Storage
Cumulative Change in Storage
Annual Change in Storage (AF)
Cumulative Annual Change in Storage (AF)
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-50,000
-100,000
-150,000
900,000
750,000
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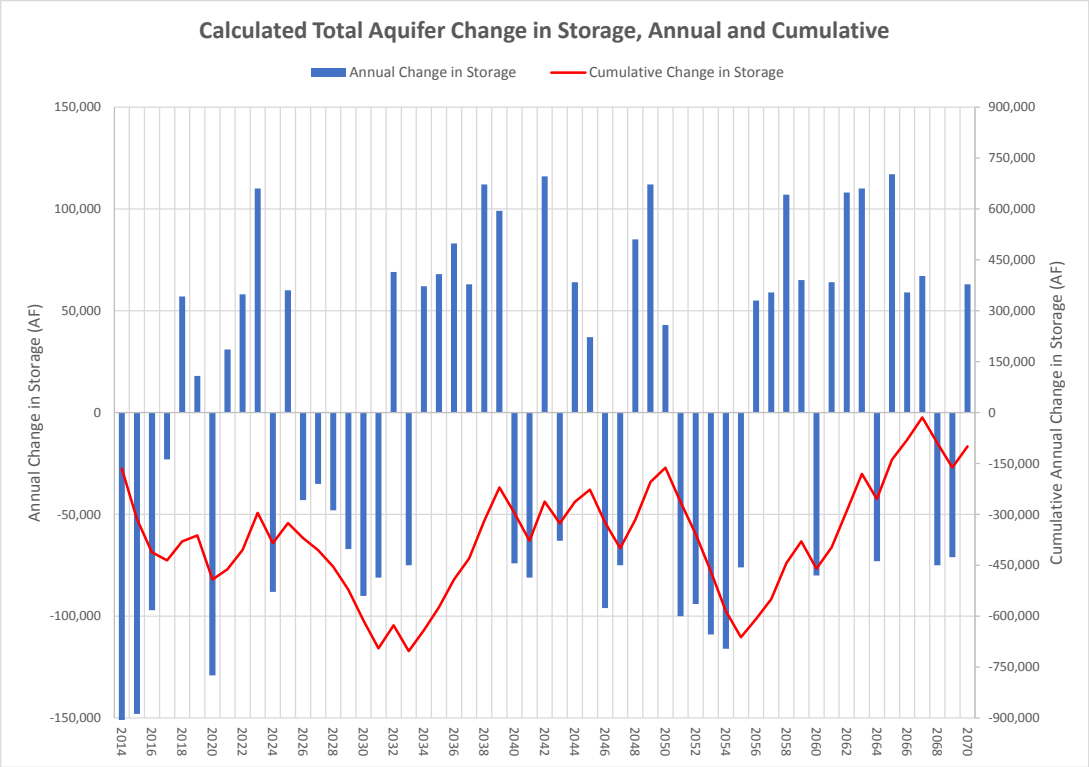


11. **Page 5-235, Section 5.4.11, Sentence starting with, "This analysis resulted..."**
The GSP presents a description and formula for estimating sustainable yield. However, the Upper or Lower Aquifer estimates are not reproducible using this formula and the water budget result tables presented earlier in the GSP. Therefore, the draft GSP should be revised to provide more detailed explanation of these calculations, including a sample calculation so the reader can understand and verify how they are quantified, and then recirculated from public comment.

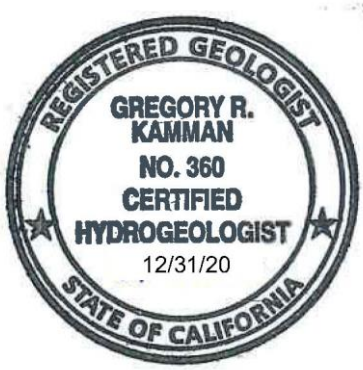
12. **Page 6-12, Section 6.3.2, Sentence starting with, "Reduction of Groundwater"**
This section indicates that the GSP uses groundwater levels minimum thresholds as a proxy for the reduction of groundwater storage sustainability indicator. The plots of annual and cumulative annual change in groundwater storage presented above are very helpful in identifying and understanding long-term trends in aquifer storage. I recommend that in lieu of (or in addition to) using groundwater levels as a proxy, water budgets and the resulting annual and cumulative aquifer storage graphics (like those above) should be used as a more meaningful groundwater storage sustainability indicator. The data to maintain current annual water budgets would be required. The existing GSP and future reporting graphs can be used to define and track undesirable results, minimum thresholds, measureable objectives, and interim milestones for the reduction in groundwater

storage. For example, one measureable objective may be positive or neutral trends in long-term cumulative storage. An example minimum threshold may be maintaining a neutral or positive long-term average change in annual storage for both the Upper and Lower Aquifers.

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter.

Sincerely,

Greg Kamman, PG, CHG
Principal Hydrologist



Attachment - Kamman Resume

Greg Kamman, PG, CHG

Principal Hydrologist

EDUCATION	1989	M.S. Geology - Sedimentology and Hydrogeology Miami University, Oxford, OH
	1985	A.B. Geology Miami University, Oxford, OH
REGISTRATION	No. 360 No. 5737	Certified Hydrogeologist (CHG.), CA Professional Geologist (PG), CA
PROFESSIONAL HISTORY	1997 - Present	Principal Hydrologist/Vice President Kamman Hydrology & Engineering, Inc. San Rafael, CA
	1994 - 1997	Senior Hydrologist/Vice President Balance Hydrologics, Inc., Berkeley, CA
	1991 - 1994	Project Geologist/Hydrogeologist Geomatrix Consultants, Inc., San Francisco, CA
	1989 - 1991	Senior Staff Geologist/Hydrogeologist Environ International Corporation, Princeton, NJ
	1986 - 1989	Instructor and Research/Teaching Assistant Miami University, Oxford, OH

SKILLS AND EXPERIENCE

As a Principal Hydrologist with 30 years of technical and consulting experience in the fields of geology, hydrology, and hydrogeology, Mr. Kamman routinely manages projects in the areas of surface- and ground-water hydrology, stream and wetland habitat restoration, water supply, water quality assessments, water resources management, and geomorphology. Areas of expertise include: stream and wetland habitat restoration; characterizing and modeling basin-scale hydrologic and geologic processes; assessing hydraulic and geomorphic responses to land-use changes in watersheds and causes of stream channel instability; evaluating surface- and ground-water resources and their interaction; and designing and implementing field investigations characterizing surface and subsurface conditions; and stream and wetland habitat restoration feasibility assessments and design. In addition, Mr. Kamman commonly works on projects that revolve around sensitive fishery, wetland, wildlife and/or riparian habitat enhancement. Mr. Kamman performs many of these projects in response to local, state (CEQA) and federal statutes (NEPA, ESA), and other regulatory frameworks. Thus, Mr. Kamman is accustomed to working within a multi-disciplined team and maintains close collaborative relationships with biologists, engineers, planners, architects, lawyers, and resource and regulatory agency staff. Mr. Kamman is a prime or contributing author to over 80 technical publications and reports in the discipline of hydrology – the majority pertaining to ecological restoration. Mr. Kamman routinely teaches courses on stream and wetland restoration through U.C. Berkeley Extension and San Francisco State University's Romberg Tiburon Center.

PROFESSIONAL SOCIETIES & AFFILIATIONS	Groundwater Resources Association of California Society for Ecological Restoration International California Native Plant Society

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October 11, 2019

Mr. Andrew Garcia
San Luis & Delta-Mendota Water Authority
842 6th Street
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Telephone: (209)832-6229
By email to: andrew.garcia@sldmwa.org

Re: California Sportfishing Protection Alliance Comments on the Northern and Central Delta-Mendota Regions - Public Draft Groundwater Sustainability Plan.

Dear Mr. Garcia:

This office represents the California Sportfishing Protection Alliance (CSPA) regarding your review and adoption of the Northern and Central Delta-Mendota Regions - Public Draft Groundwater Sustainability Plan (Plan).

CSPA objects to your adoption of the Plan because it does not meet the requirements of the Sustainable Groundwater Management Act or the GSP Emergency Regulations at Title 23, Cal. Code Regs. section 350 et seq. (GSP Rules), as more fully explained in comments submitted by Hydrogeologist Greg Kamman under separate cover on this date.

The Plan does not satisfy GSP Rule 355.4(b)(1) because the Plan's description of the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable or supported by the best available information and best available science.

The Plan does not satisfy GSP Rule 355.4(b)(3) because the sustainable management criteria and projects and management actions identified in the plan are not commensurate with the level of understanding of the basin setting, based on the level of uncertainty, as reflected in the Plan.

The Plan does not satisfy GSP Rule 355.4(b)(5) because the Plan does not contain or present substantial evidence to conclude that the projects and management actions identified to achieve sustainable yield are effective or feasible or not likely to prevent undesirable results or to ensure that the basin is operated within its sustainable yield.

These deficiencies are described in more detail in Mr. Kamman's October 11, 2019, comments.

For example, Section 354.16 of the GSP Regulations (Groundwater Conditions) states, "Each Plan shall provide a description of current and historical groundwater condition in the basin, including data from January 1, 2015, to current conditions, based on the best available information…."

The Plan improperly uses Water Year 2013 data to represent "current conditions." Per the GSP regulations, the Plan must present data at least as recent as January 1, 2015, and must present data "from January 1, 2015 to" the present where available. The Plan provides no explanation as to why data from 2016, 2017 or 2018 is not presented as required by the regulations. As Mr. Kamman observes, 2013 was a drought year; while 2017 and 2018 were not drought years. Consequently, there was more demand for groundwater in 2013 than in 2017 and 2018.

Also, in addition, the draft Plan's identification of Groundwater Dependent Ecosystems is derived from data from DWR and TNC, but the draft plan then "excludes seasonally-managed areas and wetlands" dependent "on applied surface water." (Plan, p. 5-172.) This exclusion is inconsistent with the Plan's inclusion of the areas mapped by DWR and TNC as long as the area's depth to groundwater is less than 30 feet. If 30-feet depth to groundwater is a reliable criterion for GDE areas that are not seasonally-managed areas or wetlands dependent on applied surface water, it should be a reliable criterion for GDE areas that are seasonally-managed areas/wetlands dependent on applied surface water.

Put another way, the fact that GDE vegetation or wetland features may be partially "dependent" on applied surface water does not mean the GDE is not also partially dependant on groundwater or would not be entirely dependent on groundwater if surface were no longer applied. Indeed, the Plan recognizes that "Management and protection of GDEs may require more focus on land use or irrigation activities more so than groundwater management." (Plan, p. 5-173.) The contemplated use of changing irrigation activities to maintain GDEs reflects the facts that GDEs may be dependent on both groundwater and surface water, and an area's partial dependence on surface water should not exclude it from classification as a GDE.

In addition, section 6.3.2.1.2 states: "Long-term reductions in storage are not anticipated for either principal aquifer so long as groundwater levels are managed above minimum thresholds." (Plan p. 6-13.) This conclusion is directly contradicted by the change in aquifer storage figures for the Upper Aquifer presented by Mr. Kamman, which show long-term downward trend in storage for the Upper Aquifer, even with implementation of proposed Projects and Management Actions.

CSPA urges the Authority to not adopt the Plan in its current form; to revise the draft Plan to remedy these informational deficiencies; and to recirculate the revised Plan for public comment.

Thank you for your attention to this matter.

Very Truly Yours,

Tom Lippe

Thomas N. Lippe

AD002a North Central Delta Mendota.wpd

The Nature Conservancy
Protecting nature. Preserving life.

CALIFORNIA WATER | **GROUNDWATER**

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nature.org
GroundwaterResourceHub.org

October 11, 2019

Andrew Garcia
San Luis & Delta-Mendota Water Authority
842 6th St
Los Banos, CA 93635

Submitted online via: http://deltamendota.org/gsp-summary/

Re: Public Draft Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions

Dear Mr. Garcia,

The Nature Conservancy (TNC) appreciates the opportunity to comment on the Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions being prepared under the Sustainable Groundwater Management Act (SGMA).

TNC as a Stakeholder Representative for the Environment

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

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

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

Given our mission, we are particularly concerned about the inclusion of nature, as required, in GSPs. The Nature Conservancy (TNC) has developed a suite of tools based on best available science to help Groundwater Sustainability Agencies (GSAs), consultants, and stakeholders efficiently incorporate nature into GSPs. These tools and resources are available online at

GroundwaterResourceHub.org. TNC's tools and resources are intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

Addressing Nature's Water Needs in GSPs

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

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

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

1. Environmental Representation

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

2. Basin GDE and ISW Maps

SGMA requires that GDEs and interconnected surface waters (ISWs) be identified in the GSP. We recommend using the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) provided 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 California Department of Fish and Wildlife (CDFW) and TNC. We also recommend using GDE Pulse, which is also available on the internet at https://gde.codefornature.org/#/home. We also recommend using the California Natural

[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/

Diversity Database (CNDDB) data set provided by CDFW to look up species occurrences within your area.

3. Potential Effects on Environmental Beneficial Users

SGMA requires that potential effects on GDEs and environmental surface water users be described when defining undesirable results. In addition to identifying GDEs in the basin, TNC recommends identifying beneficial users of surface water, which include environmental users. This is a critical step, as it is impossible to define "significant and unreasonable adverse impacts" without knowing *what* is being impacted. We acknowledge and appreciate your inclusion of TNC's freshwater species list for the Northern and Central Delta-Mendota Region in your GSP. 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 CDFW, United States Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Services (NMFS) to obtain their input on the groundwater and surface water needs of the organisms on the GSA's freshwater species list. We also refer you to the Critical Species Lookbook[3] prepared by TNC and partner organizations for additional background information on the water needs and groundwater reliance of critical species. Since effects to plants and animals are difficult and sometimes impossible to reverse, we recommend erring on the side of caution to preserve sufficient groundwater conditions to sustain GDEs and ISWs.

4. Biological and Hydrological Monitoring

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

TNC has reviewed the Northern and Central Delta-Mendota Regions Draft GSP and acknowledges and appreciates the use of some our relevant resources in addressing GDE-related topics. However, we consider it to be **inadequate** under SGMA since key environmental beneficial uses and users are not adequately identified and considered. In particular, ISWs and GDEs are not adequately identified and evaluated for ecological importance or adequately considered in the basin's sustainable management criteria. **Please present a more thorough analysis of the identification and evaluation of ISWs and GDEs in subsequent drafts of the GSP**. **Once GDEs are identified, they must be considered when defining undesirable results and evaluated for further monitoring needs**.

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

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

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

Best Regards,

Sandi Matsumoto
Associate Director, California Water Program
The Nature Conservancy

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
Northern and Central Delta-Mendota Regions Groundwater Sustainability Plan,
Public Review Draft

A complete draft of the Northern and Central Delta-Mendota Regions was provided for public review on September 9, 2019. TNC has previously provided comments on GSP Draft Section 5.2 (Hydrogeologic Conceptual Model) in a letter dated April 3, 2019. This attachment summarizes our comments on the complete public draft GSP and includes any initial review comments from our April 3, 2019 letter that have not yet been addressed. Comments are provided in the order of the checklist items included as Attachment A.

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

[Section 4.1 Description of Beneficial Uses and Users in Plan Area (p. 4-1-4-3)]

- The California Water Code §1305(f) defines that beneficial uses of waters of the State include "preservation and enhancement of fish, wildlife, and other aquatic resources and preserves" (p. 4-1). Table 4-1 lists beneficial uses and user stakeholder groups (p. 4-2 to 4-3) and includes federal and state lands and facilities; environmental agencies and groups; rivers, creeks, and recreational and wildlife refuges; and recreational areas in addition to the direct users of groundwater and surface water. The GSP noted further refinement of the Table 4-1 list will be made by 2025. **Please describe whether other beneficial uses and users of groundwater in the Subbasin are present: Protected Lands, including conservation areas and other protected lands; and Public Trust Uses including wildlife, aquatic habitat, fisheries, and recreation.**
- The types and locations of environmental uses, species and habitats supported, and the designated beneficial environmental uses of surface waters that may be affected by groundwater extraction in the Subbasin should be specified. **Please identify environmental users, and refer to the following:**
    - Natural Communities Commonly Associated with Groundwater dataset (NC Dataset) - https://gis.water.ca.gov/app/NCDatasetViewer/
    - The list of freshwater species located in the Delta-Mendota Subbasin in Table 5-10 of the GSP. Please take particular note of the species with protected status.

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

[Section 2.2.1 General Plans in Plan Area (p. 2-42 to 2-66)]

- Figure 2-26 (p. 2-43) shows the area covered by city, community, and county general plans. There are five county plans, one city plan, and three community plans that cover a portion of the Northern and Central Delta-Mendota Regions. The plans should be modified to include a discussion of General Plan goals and policies related to the protection and management of GDEs and aquatic resources that could

be affected by groundwater withdrawals. **Please include a discussion of how implementation of the GSP may affect and be coordinated with General Plan policies and procedures regarding the protection of wetlands, aquatic resources and other GDEs and ISWs.**

- In general the plans seek to protect riparian habitat. This section should identify Habitat Conservation Plans (HCPs) or Natural Community Conservation Plans (NCCPs) within the Subbasin and if they are associated with critical, GDE or ISW habitats. **Please identify all relevant HCPs and NCCPs within the Subbasin and address how GSP implementation will coordinate with the goals of these HCPs or NCCPs.**
- Please refer to the Critical Species 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 2.1.2.2 Major Water-Related Infrastructure (p. 2-10 to 2-12)]

- The GSP provides a description of the major water infrastructure projects including the Central Valley Project, the State Water Project, and the Tracy Fish Collection Project, however there is no discussion of any in-stream flow requirements. **Please describe any current or planned in-stream flow requirements of the San Joaquin and Merced Rivers or any of the westside creeks.**

[Section 2.3.2 County Well Construction/Destruction Standards and Permitting (p. 2-77)]

- Table 2-7 (p. 2-78) summarizes well permitting requirements and county ordinances for the counties of Fresno, San Benito, Merced, Stanislaus, and San Joaquin. The counties have ordinances that limit groundwater export and several counties have ordinances that minimize unsustainable groundwater extraction. **Please include a discussion of the following in this section:**
    - Future well permitting must 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 v. SWRCB and Siskiyou County, No. C083239). The need for well permitting programs to comply with this requirement should be stated in the text.

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

[Section 5.2.5.2 Definable Bottom of Basin (p. 5-12)]

- Defining the bottom of Subbasin based on geochemical properties is a suitable approach for defining the base of freshwater, however, as noted on page 9 of DWR's

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

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.** This will prevent the possibility of extractors with wells deeper than the basin boundary (defined by the base of freshwater) from claiming exemption of SGMA due to their well residing outside the vertical extent of the basin boundary.

[Section 5.2.6.1 Principal Aquifers (p. 5-12 to 5-14)]

- The very shallow unconfined groundwater falls under DWR's definition of a principal aquifer, which is defined as "aquifer or aquifer system that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems" [*23 CCR §351(aa)*]. **Thus, disregarding this shallow groundwater as a principal aquifer due to its "shallow nature and high salinity" is inadequate.** This is especially true in the places where projects to develop the shallow groundwater may be considered for use on more salt-tolerant crops. SGMA requires GSAs to sustainably manage groundwater resources in all aquifers, especially if groundwater use and management can result to impacts on beneficial uses and users. Please refer to Best Practice #1 in Attachment C for further explanation and accompanying graphics.

[Section 5.2.6.2 Aquifer Properties p. 5-14 to 5-31]

- Regional basin-wide geologic cross sections are provided in Figures 5-7 through 5-16 (p. 5-15 to 5-27). These cross-sections do not include a graphical representation of the manner in which the very shallow groundwater or perched water may interact with ISWs or GDEs that would allow the reader to understand this topic. **Please include example near-surface cross section details that depict the conceptual understanding of shallow groundwater and stream interactions at different locations, including the perched aquifer and the Upper Aquifer**.
- The two-aquifer system is separated primarily by the Corcoran Clay, which has a variable depth as shown on Figure 5-17 (p. 5-28). The Corcoran Clay is absent in the far western parts of the Subbasin. There is also a Very Shallow unconfined groundwater zone, and perched water is sometimes present due to fine-grained clay layers. **Please provide a map showing where the Very Shallow groundwater zone and the perched aquifers are located.**

[Section 5.3.2.4 Groundwater Trends (p. 5-92 to 5-118)]

- Data gap areas for the Upper Aquifer, Lower Aquifer, or both are shown in Figure 5-64 (p. 5-96). Much of the data gaps area is located within the Northern and Central Delta-Mendota Regions. There are very few wells screened in the Upper Aquifer shown in the groundwater contour map in Spring 2013 and Fall 2013, as shown on Figures 5-80 and 5-81, within the Northern and Central Delta-Mendota Regions. **Please explain how these data gaps will be filled, or refer to a section later in the GSP.**

- Well hydrographs are shown for wells screened in the Very Shallow Groundwater in Figure 5-67 (p. 5-99). **Please indicate which of these wells are located within the Northern and Central Delta-Mendota Regions.**
- The GSP states (p. 5-94) that vertical gradients are restricted by the Corcoran Clay. In the western part of the Subbasin, interfingering clay layers minimize downward gradients, except where the clay has been compromised by the construction of composite wells. **Please provide data or analysis to explain and substantiate the vertical gradients noted in the text.**

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

[Section 5.3.7 Interconnected Surface Water Systems (p. 5-170 to 5-172)]

- 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. ISWs can be either gaining or losing. The text states (p. 5-170) "Streams stemming from the west side of the Delta-Mendota Subbasin are ephemeral in nature, and only two of these creeks reach the San Joaquin River (Del Puerto Creek and Orestimba Creek). These creeks lose their flows to the underlying vadose zone (net-losing streams) and therefore do not represent areas of potential GDEs." No evidence is provided in the Plan that states that these streams are not connected to the Upper Aquifer along some portion of the drainage for some time period. **Please provide data or analysis to back up the statement that these westside streams do not represent areas of potential GDEs. 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 to improve ISW mapping in future GSPs**.
- **Please provide more detail on how the quantity of gains and/or depletions from the groundwater at each reach of the San Joaquin River was determined.** For example, were the values taken from the cited literature sources or determined from further analysis or modeling? Please provide or refer to a map that shows the designated reaches listed in Table 5-9.

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

[Section 5.3.7.6 Groundwater Dependent Ecosystems (p. 5-172)]

- The text states (p. 5-172): "To further screen available information regarding GDEs, the following standards were set for identifying GDEs in the Northern and Central Delta-Mendota Regions: (1) areas with depths to groundwater levels greater than 30 feet were eliminated unless the vegetation identified in those areas were consistent with species with deep root systems (e.g. live oaks); (2) seasonally-managed areas

and wetlands were eliminated due to their dependence on applied surface water; and (3) a 100-foot buffer was applied around the San Joaquin River within the Northern Delta-Mendota Region to include all communities in the NCCAG dataset as potential GDEs, except where professional judgement and local knowledge determined GDEs were not present." The three standards are discussed in turn below.

- The following comments apply to *Standard (1): Areas with depth to groundwater greater than 30 feet in Spring 2015, unless the vegetation identified in those areas were consistent with species with deep root systems (e.g. live oaks).*
    - 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 point in time (e.g., Spring 2015) 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. **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 C of this letter for best practices for using local groundwater data to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer. If insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons in the GSP until data gaps are reconciled in the monitoring network. Additionally, Spring 2015 is after the SGMA benchmark date of January 1, 2015. Please include groundwater condition data prior to the SGMA benchmark date in the analysis.**
    - **Please confirm that wells screened in the Upper Aquifer (or very shallow groundwater where present) are being used to verify whether NCCAGs are actual GDEs, given the significant data gap areas noted on Figure 5-64 (page 5-96).** Using "depth to groundwater" measurements from confined aquifers is mapping piezometric head of the confined aquifer and not detecting groundwater conditions in the principal aquifers of the unconfined aquifer that are supporting the ecosystem. If there

is insufficient groundwater level data in the Upper Aquifer, then the NCCAGs in these areas should be included as GDEs in the GSP until data gaps are reconciled in the monitoring network.

- **Please provide depth to groundwater contour maps and note the following best practices for doing so.**
  - i) Are the wells used for interpolating depth to groundwater sufficiently close (<5km) to NC Dataset polygons to reflect local conditions relevant to ecosystems?
  - ii) Are the wells used for interpolating depth to groundwater screened within the surficial unconfined aquifer and capable of measuring the true water table (see comment b above)?
  - iii) 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.
- **Please use care when considering rooting depths of vegetation. Please list the species in each GDE, and whether the GDE was eliminated or retained based on the 30-foot standard, and provide evidence for the decision.** 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 prefer to have their roots submerged in groundwater for extended periods of time, and hence can access groundwater at deeper depths.

- The following comment applies to *Standard (2): Habitat areas with supplemental water*. The application of supplemental water to managed wetlands does not preclude the possibility that NC polygons could be accessing groundwater in addition to the supplied water. In the scientific literature, it is generally acknowledged that GDEs can rely on groundwater for some or all of their requirements. GDEs can rely on multiple water sources simultaneously and at different temporal/spatial scales (e.g., precipitation, river water, reservoir water, soil moisture in the vadose zone, groundwater, applied water, treated wastewater effluent, urban stormwater, irrigated return flow). SGMA defines GDEs as "ecological communities and species that depend on groundwater emerging from aquifers or on groundwater occurring

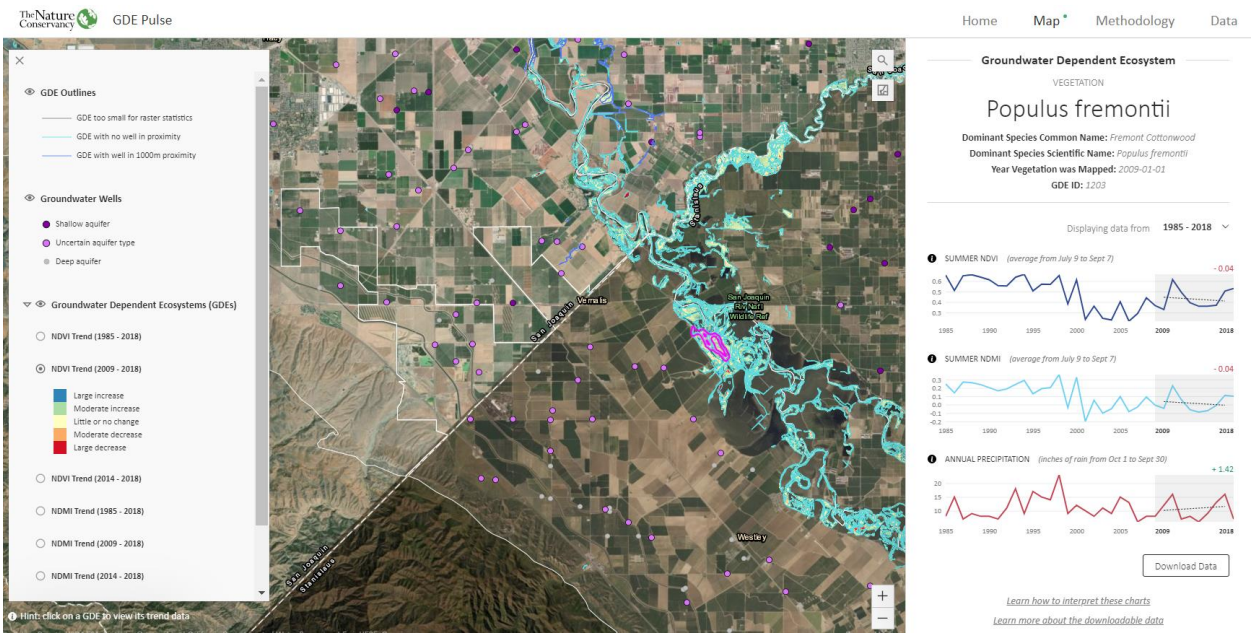
near the ground surface". **Hence, we recommend that depth to groundwater contour maps are used to identify whether a connection to groundwater exists for the managed wetlands in the Northern and Central Delta-Mendota Regions. Please refer to Attachment C of this letter for best practices for using local groundwater data to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer.**

- The following comment applies to *Standard (3): 100-foot buffer area applied around the San Joaquin River.* **We disagree with the use of an arbitrary 100-foot cutoff. In addition to "professional judgement and local knowledge" please explain how this criterion is supported by groundwater level and plant physiological data to exclude potential GDEs near the river.**
- On p. 5-173 the GSP states, "Possible GDEs have also been identified along streams originating from the Coast Range; however, these areas are topographically disconnected from the Subbasin's principal aquifers and are located in areas of de minimus or zero groundwater use and are therefore are unmanageable through the Sustainable Groundwater Management Act (SGMA)." **Please provide further information on the analysis of GDEs on westside streams, including citing field studies or modeling studies that show the disconnected nature of these streams. Indicate on which streams GDE polygons were excluded and on which streams GDE polygons were retained. Identify any data gaps and ensure that GDE polygons are retained until data gaps are reconciled.**
- The NC Dataset comprises 4,852 acres of potential GDEs for the Northern and Central Delta Mendota Regions. On Figures 5-118 and 5-119, it is difficult to distinguish the colors underneath the hatching, and thus see which removal categories apply to the Northern and Central Delta-Mendota Regions. **Please consider changing the hatching pattern or supplying a map for just the Northern and Central Delta-Mendota Regions. Please be more specific when denoting "mapping error". The basin's GDE shapefile, which is submitted via the SGMA Portal, should also include two new fields in its attribute table denoting: 1) which polygons were kept/removed/added, and 2) the change reason (e.g., why polygons were removed). In addition, in the text please cite the acreage of GDEs retained and removed.**

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

[Section 5.3.7.6 Groundwater Dependent Ecosystems (p. 5-172)]

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



- **Please provide an ecological inventory (see Appendix III, Worksheet 2 of the GDE Guidance) for all potential GDEs that includes the vegetation types or habitat types and rank the GDEs as having a high, moderate or low value; and what characterizes the rank.**
- **Please identify whether any endangered or threatened freshwater species of animals and plants, or areas with critical habitat were found in or near any of the GDEs since some organisms rely on uplands and wetlands during different stages of their lifecycle**. Please refer to the list of species included as Table 5-10 of the GSP, the Critical Species Lookbook, and CDFW's CNDDB database.

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

[Section 5.4 Water Budgets (p. 5-181 to 5-235)]

- Evapotranspiration is included as an outflow category in the land surface budget, however it is not split between type of evapotranspiration. **Please separate this term by land-use type (for example, agricultural; municipal and domestic; and native and riparian).**
- Groundwater outflow to ET does not appear to be identified as a groundwater budget component. **Since GDEs (including wetlands, riparian vegetation, phreatophytes and other communities) are recognized as beneficial users of groundwater in the Northern and Central Delta-Mendota Regions, it is appropriate to include them in these calculations.**

<u>Checklist Item 23-26 Sustainability Goal (23 CCR §354.24)</u>

[Section 6.2 Sustainability Goal (p. 6-2)]

- **Since GDEs are present within the Subbasin (please see comments under checklist items 16-20) they should be recognized as beneficial users of groundwater and should be included in the Sustainability Goal. In addition, a statement about any intention to address pre-SGMA impacts to GDEs and ISWs should be included here and within the interim milestones and measurable objectives.**
- **We request that the connectivity of GDEs and ISWs to each aquifer (including the very shallow groundwater, where present) be made clear. If connectivity to the very shallow surficial aquifer exists, please establish its current and/or future management to determine if it is a principal aquifer. If it is a principal aquifer, it should be included in the sustainability goal and sustainability criteria. If it isn't a principal aquifer, please include text that states the future protection of GDEs would be incorporated into the 5-year update as future management plans are developed.**
- The GSP states that there are time periods of ISW connectivity along the San Joaquin River on the northern end of the basin. **Please include protection of ISWs as a part of the Sustainability Goal.**
- GDEs are dependent, in part, on suitable water quality; however, this GSP only considers water quality for irrigation and domestic use. **Since GDEs may also be affected by water quality they should be included in the Sustainability Goal.**

<u>Checklist Item 26 – Measurable Objectives (23 CCR §354.30)</u>

[Section 6.3.1.3 Measurable Objectives for Groundwater Levels (p. 6-10)]

- This Measurable Objective does not consider GDEs. **Please include GDEs (see comments under Checklist Items 16-20) in this section and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.**

[Section 6.5.3 Measurable Objectives for Water Quality (p. 4-29)]

- This Measurable Objective does not consider water quality needs of GDEs. **Please modify this section to specifically address degraded water quality from total dissolved solids (TDS), arsenic (As), boron (B), and other potential constituents of concern to wildlife and vegetation communities of GDEs**.

[Section 6.3.6.3 Measurable Objectives and Interim Milestones (for Interconnected Groundwater Surface Water Systems) (p. 6-35)]

- The GSP states that depletions will be considered from monitoring data collected in 2020 to 2025 and proposes a qualitative statement of no increased depletions. Based on statements made in Chapter 5, Sections 5.3.7 (pp. 5-170 to 5-173), this GSP only considers gaining and losing reaches of the San Joaquin River as being potentially interconnected (See Table 5-9 on p. 5-172). There are several ephemeral

streams that may reach the San Joaquin in a given year that are dismissed because they are not regularly connected and, or flow is ephemeral. Streams that are not continuously connected spatially and, or temporally, or are ephemeral in nature, are still potential ISWs and should not be excluded from this GSP. Ephemeral water courses in the basin include Orestimba Creek, Del Puerto Creek, Mercy Creek, Hospital Creek, Inghram Creek Salado Creek, and Cow Creek. For example, on page 4-7 in the *Stanislaus County Hydrologic Model: Development and Forecast Modeling* (Stanislaus County, California) it states "data from nearby calibration wells suggests that in fact Orestimba Creek is groundwater connected and gaining in its middle and lower reaches". **Because the question of ISWs is a data gap, it needs to be acknowledged and a plan to reconcile the data gap specified. Even though the streams may not be continuously connected, they may still be ISWs, and should be included in the Measurable Objectives.**

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

[Sections 6.3.1.2 Minimum Thresholds for Groundwater Levels (p. 6-5)]

- The GSP states that environmental use was considered when establishing the groundwater level minimum threshold; however, the criteria used was not included in the narrative. In addition, Table 6-1 (p. 6-9) does not identify which DMS ID corresponds to GDEs and, or ISWs. **Please update this section to provide detail on criteria used to evaluate minimum thresholds for GDEs and ISWs, and to establish proposed thresholds, or a process for establishing thresholds in regards of protecting GDEs and ISWs.**

[Section 6.3.3.2 Minimum Thresholds for Water Quality (p. 6-16)]

- Although agricultural water quality concerns were articulated, similar concerns were not identified for GDEs. **Please include a discussion about GDEs and water quality, and how the minimum thresholds and interim milestones will help achieve the sustainability goal as it pertains to the environment.**

[Sections 6.3.6.2 Minimum Thresholds for Interconnected Groundwater Surface Water Systems (p. 6-35)]

- The GSP states that depletions will be analyzed to determine the location, timing, and quantity of depletions from monitoring data collected between 2020 to 2025, and proposes a qualitative statement of no increased depletions. **Please modify this section of the GSP to provide a statement that quantifies gains and, or losses similar to those shown in Table 5-9 (p. 5-172) as they relate to the 2015 conditions.**

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

[Section 6.3.1.1 Undesirable Results (for chronic lowering of groundwater levels) (p. 6-3)]

- 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 and ISWs" to the list of potential undesirable results presented in Section 6.3.1.1.**

[Section 6.3.1.1.2 Identification of Undesirable Results (for chronic lowering of groundwater levels) (p. 6-4)]

- This section states that "..conditions are deemed significant and unreasonable, when groundwater elevations drop below the site-specific minimum threshold of 25% of representative monitoring wells in a principal aquifer…..in a given year". **Please describe how a drop below the site-specific minimum threshold of 25% of representative monitoring wells in a principal aquifer relates to undesirable results.** A specific threshold should be provided for monitoring wells that measure groundwater levels near GDEs.

- The GDE Pulse web application developed by TNC provides easy access to 35 years of satellite remote sensing data to view trends of vegetation metrics, groundwater depth (where available), and precipitation data. This satellite imagery can be used to observe trends for NC dataset polygons within and near the GSA. Over the past 10 years (2009-2018), some NC dataset vegetation polygons have experienced adverse impacts to vegetation growth and moisture along the San Joaquin River. An example screen shot from the GDE Pulse tool is presented under Checklist Items 11-15 above.

    - **For each identifiable GDE unit with supporting hydrological datasets please include the following:**
        - Plot and provide hydrological datasets for each GDE.
        - Define the baseline period in the hydrologic data.
        - Classify GDE units as having high, moderate, or low susceptibility to changes in groundwater.
        - Explore cause-and-effect relationships between groundwater changes and GDEs.

    - **For each identifiable GDE unit without supporting hydrological datasets please describe data gaps and/or insufficiencies.**

    - **Compile and synthesize biological data for each GDE unit by including:**
        - Plots of biological datasets for each GDE unit, and when possible provide baseline conditions for assessment of trends and variability.
        - Describe data gaps/insufficiencies.

    - **Description of potential effects on GDEs, land uses, and property interests, including:**
        - Cause-and-effect relationships between GDE and groundwater conditions.

- Impacts to GDEs that are considered to be "significant and unreasonable".
- Report known hydrological thresholds or triggers (e.g., instream flow criteria, groundwater depths, water quality parameters) for significant impacts to relevant species or ecological communities.
- Land uses include and consider recreational uses (e.g., fishing/hunting, hiking, boating).
- Property interests include and consider privately and publicly protected conservation lands and opens spaces, including wildlife refuges, parks, and natural preserves.

[Section 6.3.3.1.2 Identification of Undesirable Results (for degraded water quality) (p. 6-15)]

- This Section discusses MCLs and WQOs but does not include metrics for GDEs. **Please modify this section to specifically address degraded water quality from TDS, As, B and other constituents that could pose a threat to wildlife and / or vegetative communities associated with GDEs and ISWs. Although As and CrVI are mentioned in this section, please add a statement addressing that overpumping and dewatering of aquitards has been identified as a potential source of elevated As concentrations above drinking water standards in San Joaquin Valley aquifers.** 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.

[Sections 6.3.6 Depletions of Interconnected Surface Water (p. 6-34)]

- The GSP states that depletions will be considered from monitoring data collected between 2020 to 2025. At a minimum the GSP should maintain the current level of ISWs until additional information is collected and measurable objectives and minimum thresholds can be more precisely defined. For example, Table 5-9 (p. 5-172) estimates the quantity of gains and depletions for reaches of the San Joaquin River only. This type of information should be used to support the statement of undesirable results and should be expanded to other streams that are potential ISWs. **Please modify this section of the GSP to include a statement that there will be no increase in depletions for confirmed and potential ISWs, at least until data gaps are filled.**

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

[Section 7.2.5.1 Groundwater Level Monitoring Network (p. 7-35)]

- The GSP proposes to use groundwater level monitoring for tracking chronic groundwater level and as a proxy for groundwater storage and depletion of interconnected surface waters. A set of representative wells has been selected in six

subregions, shown in Figure 7-2 (p. 7-33). The representative wells to be used for monitoring groundwater levels in the semi-confined Upper Aquifer and the confined Lower Aquifer are shown in Figure 7-3 (p. 7-39) and Figure 7-4 (p. 7-40). Areas with spatial data gaps have been identified and are shown on both maps. The potential locations for wells for monitoring both aquifers are shown in Figures 7-5 and 7-6 (p. 7-47 and 7-48). Tables 7-6 and 7-7 (p. 7-37 and 7-38) indicate that some wells are missing key information, e.g. status, well depth or screened interval. Although a list of criteria including "adequate construction information" were listed on page 7-41, it appears that not all criteria were met in all the wells. A plan to fill these data gaps is included in Section 7.2.5.6.6 (Plan to Fill Data Gaps) that includes obtaining video logs of some wells and drilling new wells. **Please emphasize in the text the importance of using dedicated monitoring wells with complete construction information in order to accurately monitor single aquifers.**

- The GSP states on p. 7-45: "Not all wells included in these networks are dedicated monitoring wells, as recommended by DWR's Monitoring Networks and Identifications of Data Gaps BMP (2016a)." The GSP noted that an effort would be made to replace pumping wells with dedicated monitoring wells. **Please discuss the importance of using dedicated monitoring wells instead of pumping wells at all locations.**
- The GSP states on p. 7-45: "For the purpose of monitoring depletions of interconnected surface water, where groundwater levels are used as a proxy, four additional wells with tentative locations have been identified that would also be included in the groundwater level monitoring network. These wells are located within three miles of the San Joaquin River within the Northwestern Delta-Mendota GSA and Patterson Irrigation District GSA." **Consideration should be given to using wells closer to the river, or installing new wells. Please discuss how the data will be used to verify ISWs and quantify depletions of stream flow due to groundwater extraction.**

[Section 7.2.5.6 Depletions of Interconnected Surface Water Monitoring Network (p. 7-67)]

- At present there are only two wells located within 3 miles of the San Joaquin River in the ISW area. Locations of four clustered wells have been identified and other stream gauging sites proposed as shown in Figure 7-11 (p. 7-73). **Please expand on the discussion of how the new well and stream data will be used to improve ISW mapping and inform an adequate analysis. Please discuss how the data will be used to verify possible GDEs and reaches that include ISWs.**
- As stated above in the comments for Checklist Items 8-10, **please reconcile data gaps (shallow monitoring wells, stream gauges, and nested/clustered wells) along westside ephemeral streams in this section of the GSP to improve ISW mapping in future GSPs**.

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

[Section 7.1 Projects and Management Actions (p. 7-1)]

- The Subbasin includes many potential GDEs and ISWs (see our comments under Checklist Items 8-10 and 16-20 above) that are beneficial uses and users of groundwater and may include sensitive resources and protected lands. Environmental resource protection needs should be considered in establishing project priorities. In addition and consistent with existing grant and funding guidelines for SGMA-related work, priority should be given to multi-benefit projects that can address water quantity and quality as well as providing environmental benefits or benefits to disadvantaged communities.
    - Although Table 7-2 (p. 7-5) provides information on how each project supports ISWs there are no criteria provided on how GDEs and ISWs were considered in project selection. **Please include criteria considered for project selection as it relates to GDEs and ISWs.**
    - In Section 7.1.1.1.1 (p. 7-9), the narrative supporting the Los Banos Creek Recharge and Recovery Project states that project beneficiaries are groundwater users but there is no discussion about how environmental users (i.e., GDEs and ISWs) will specifically benefit. **Please update the environmental benefits and multiple benefits as criteria for assessing project priorities and articulate how project monitoring will support GDEs and ISWs.**
    - Table 7-2 (pp. 7-5 to 7-8) identifies many important projects; however, the descriptions of objectives for each sustainability indicator for these projects only identify benefits to water level and storage. Since 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 these 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 or enhanced by those listed, please include and describe additional management actions and projects targeted for protecting known and potential 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. In addition, incorporating HCPs, NCCPs, and managed wetlands into recharge projects may effectively tie into the project's permitting strategy described in Section 7.1.5. For projects that construct recharge ponds, **please update Table 7-4 (p. 7-21) to identify if there are multi-benefit opportunities that can incorporate habitat components into project designs and how the recharge ponds will be managed to benefit environmental uses and users.**

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

[Section 7.1.1.2 Tier 1 Management Actions (p. 7-12)]

- This section discusses the Management Actions for GSP implementation and SGMA compliance; however, these actions are focused on meeting groundwater level and storage measures and do not include support for GDEs or ISWs. **Please modify the Management Actions to include education and outreach for GDEs, ISWs and the sensitive habitats they support. Please update Section 7.1.1.2 Tier 1 Management Actions (p. 7-12) and Section 7.1.1.4 Tier 2 Management Actions (p. 7-15) to include GDEs and ISWs.**

Attachment C

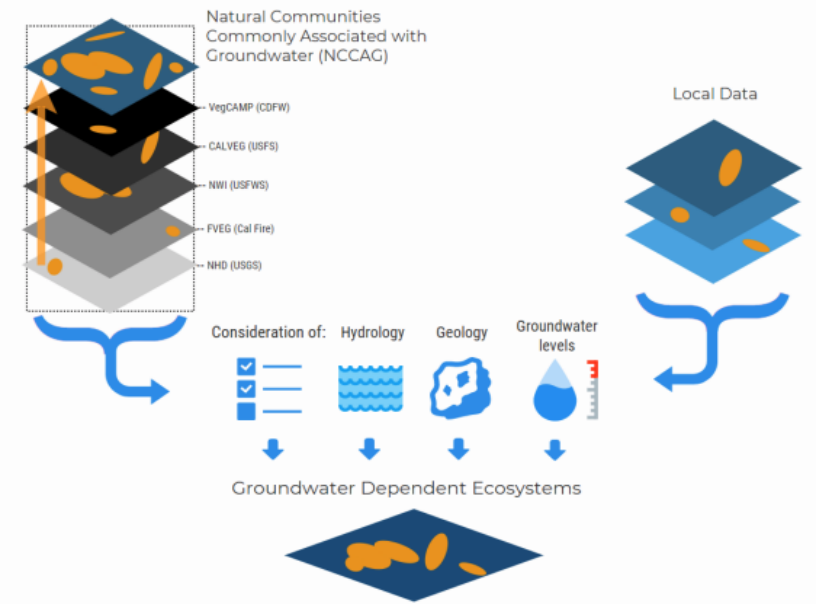
The Nature Conservancy

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[5] 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)[6]. This document highlights six best practices for using local groundwater data to confirm whether mapped features in the NC dataset are supported by groundwater.



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

[6] 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[7]. 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[8] on the Groundwater Resource Hub[9], 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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[7] *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*

[8] "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/

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

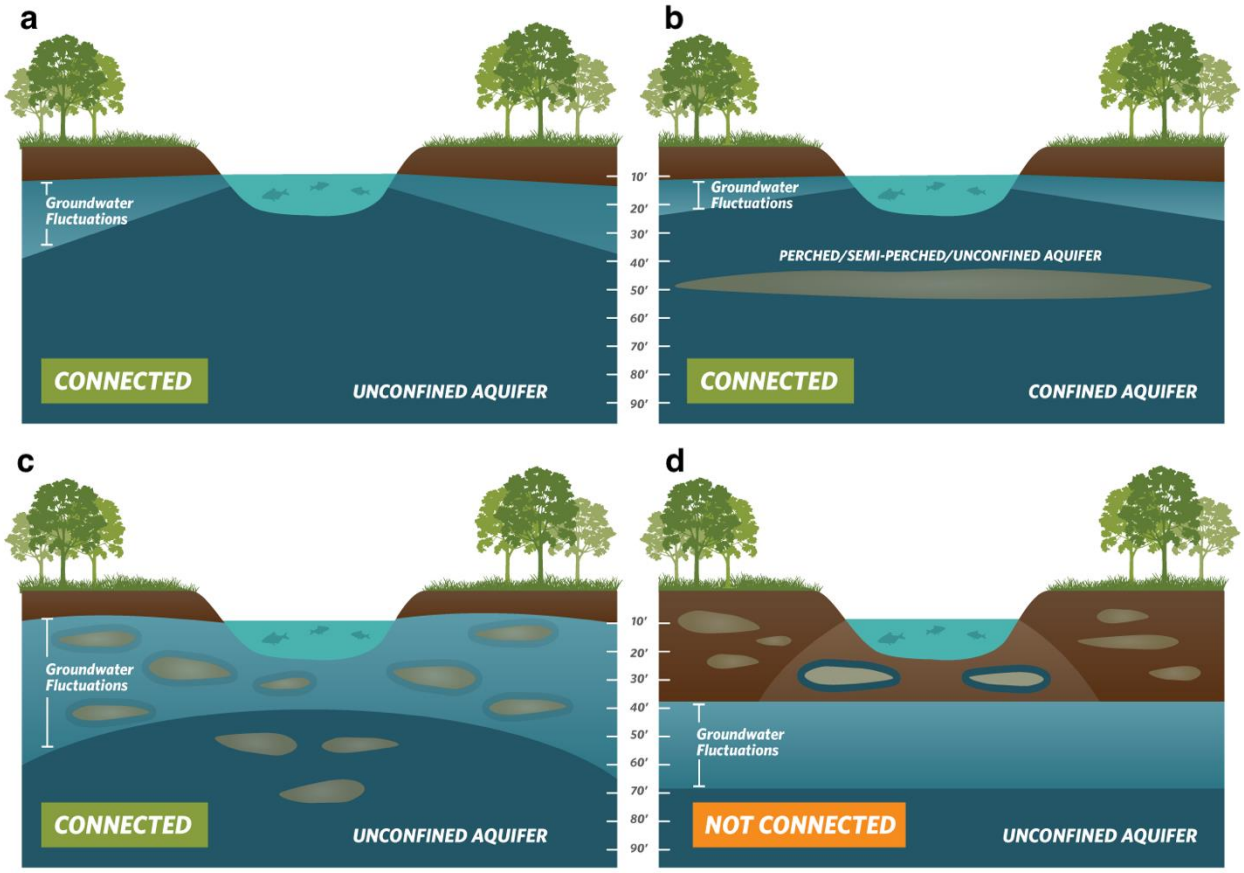


Figure 2. Confirming whether an ecosystem is connected to groundwater. Top: (a) Under the ecosystem is an unconfined aquifer with depth-to-groundwater fluctuating seasonally and interannually within 30 feet from land surface. **(b)** Depth-to-groundwater in the shallow aquifer is connected to overlying 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[10] 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[11] 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[12] 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[13]. 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).

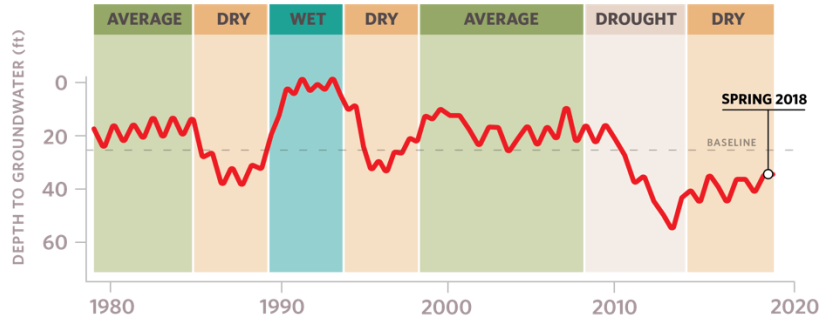


Figure 3. Example seasonality and interannual variability in depth-to-groundwater over time. Selecting one point in time, such as Spring 2018, to characterize groundwater conditions in GDEs fails to capture what groundwater conditions are necessary to maintain the ecosystem status into the future so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

[10] 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

[11] *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)]*

[12] 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]).

[13] *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[14], 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).

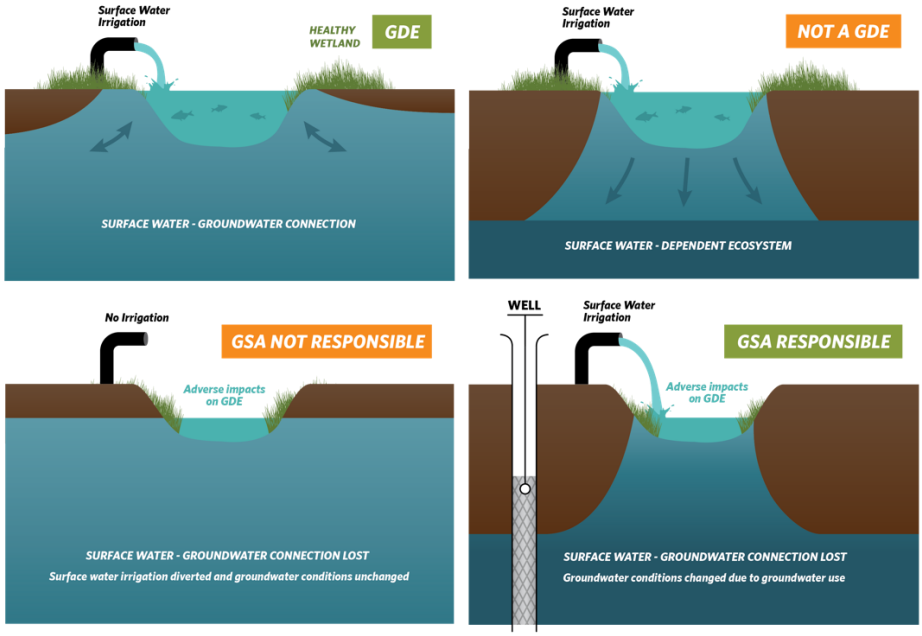


Figure 4. Ecosystems often depend on multiple sources of water. Top: (Left) Surface water and groundwater are interconnected, meaning that the GDE is supported by both groundwater and surface water. **(Right)** Ecosystems that are only reliant on non-groundwater sources are not groundwater-dependent.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

[14] *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.

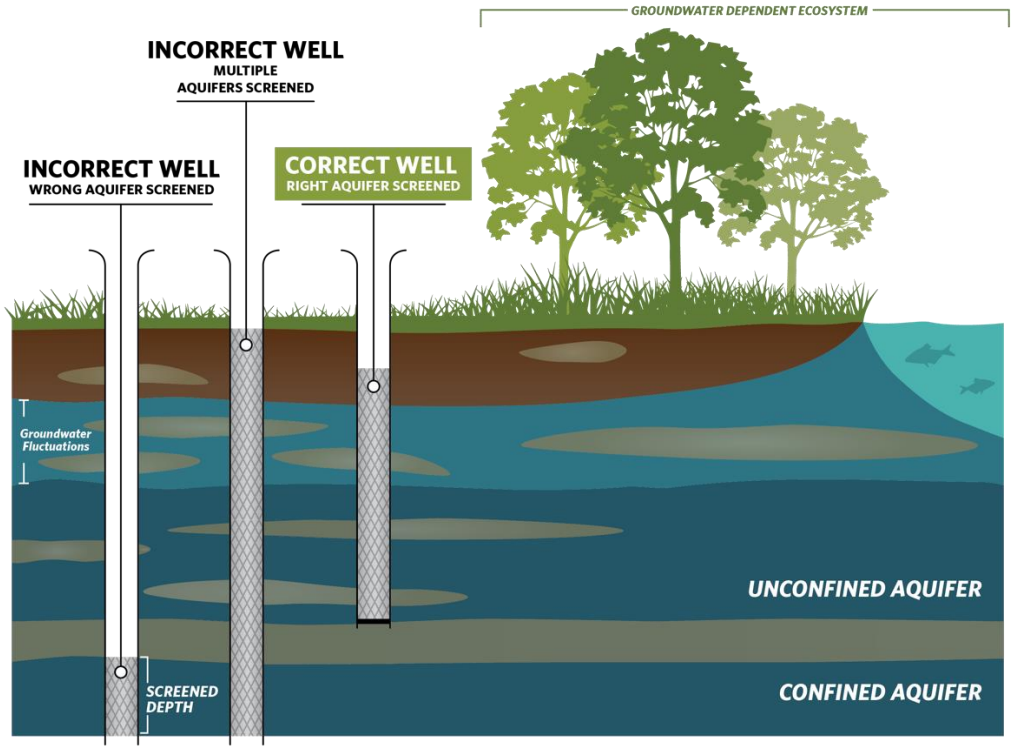


Figure 5. Selecting representative wells to characterize groundwater conditions near GDEs.

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)[15] 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.

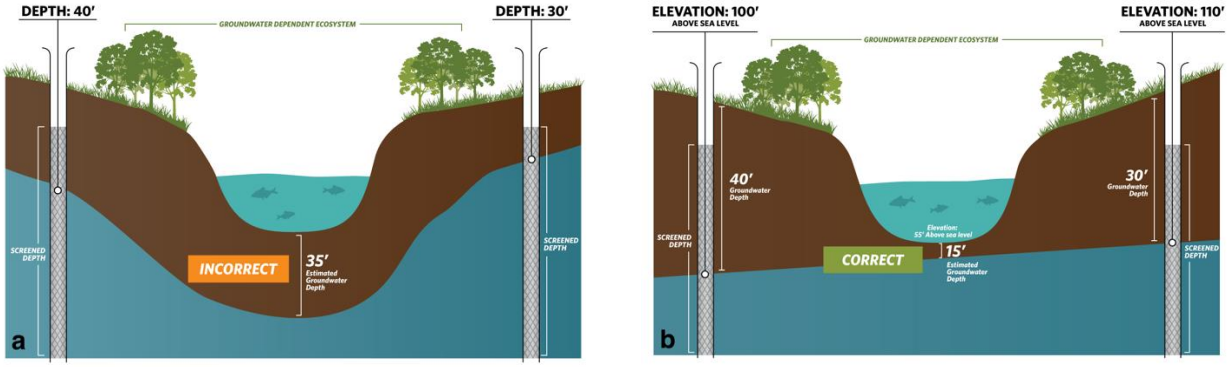


Figure 6. Contouring depth-to-groundwater around surface water features and GDEs. (a) Groundwater level interpolation using depth-to-groundwater data from monitoring wells. **(b)** Groundwater level interpolation using groundwater elevation data from monitoring wells and DEM data.

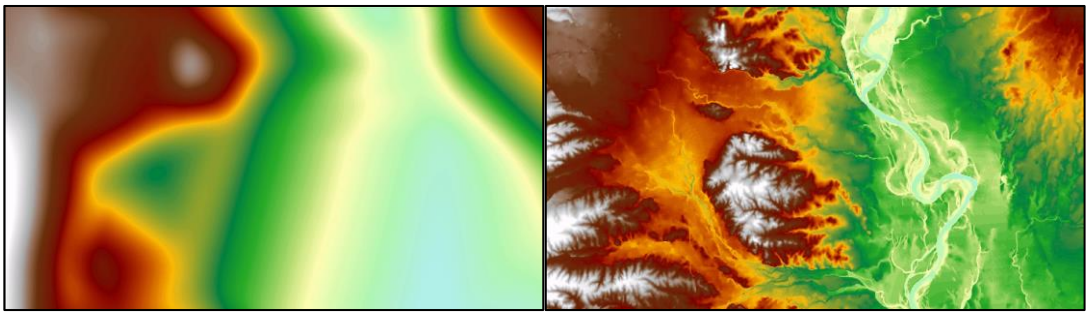


Figure 7. Depth-to-groundwater contours in Northern California. (Left) Contours were interpolated using depth-to-groundwater measurements determined at each well. **(Right)** Contours were determined by interpolating groundwater elevation measurements at each well and superimposing ground surface elevation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

[15] 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.

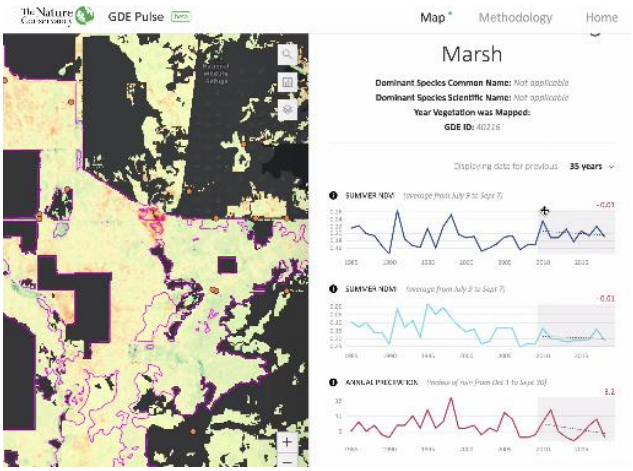
Attachment D

GDE Pulse

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

The Nature Conservancy
Protecting nature. Preserving life.®

Visit
https://gde.codefornature.org/



Remote sensing data from satellites has been used to monitor the health of vegetation all over the planet. GDE pulse has compiled 35 years of satellite imagery from NASA's Landsat mission for every polygon in the Natural Communities Commonly Associated with Groundwater Dataset[16]. The following datasets are included:

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

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

Annual Precipitation is the total precipitation for the water year (October 1st – September 30th) from the PRISM dataset[17]. The amount of local precipitation can affect vegetation with more precipitation generally leading to higher NDVI and NDMI.

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

[16] The Natural Communities Commonly Associated with Groundwater Dataset is hosted on the California Department of Water Resources' website: https://gis.water.ca.gov/app/NCDatasetViewer/#

[17] The PRISM dataset is hosted on Oregon State University's website: http://www.prism.oregonstate.edu/

RESOLUTION NO. 19-04

RESOLUTION ADOPTING THE ALISO WATER DISTRICT GROUND WATER SUSTAINABILITY AGENCY'S GROUND WATER SUSTAINABILITY PLAN

A. WHEREAS, in August 2014, the California Legislature passed, and in September 2014 the Governor signed, legislation creating the Sustainable Groundwater Management Act ("SGMA") "to provide local groundwater sustainability agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater" (Wat. Code, § 10720, (d)); and

B. WHEREAS, SGMA requires sustainable management through the development of groundwater sustainability plans ("GSPs"), which can be a single plan developed by one or more groundwater sustainability agency ("GSA") or multiple coordinate plans within a basin or subbasin (Wat. Code, § 10727); and

C. WHEREAS, SGMA requires that a GSA manage groundwater in all basins designated by the Department of Water Resources ("DWR") as a medium or high priority, including the Delta-Mendota Subbasin (designated basin number 5-22.07); and

D. WHEREAS, Aliso Water District GSA was formed for the purposes of sustainably managing groundwater in the Delta-Mendota Subbasin, within its jurisdictional boundaries, pursuant to the requirements of SGMA; and

E. WHEREAS, Aliso Water District GSA has the authority to draft, adopt, and implement a GSP (Wat. Code, § 10725 et seq.); and

F. WHEREAS, Aliso Water District GSA submitted an Initial Notification to DWR to develop a GSP for their respective portion of the Delta-Mendota Subbasin on April 25, 2018; and

G. WHEREAS, the Aliso Water District GSA has coordinated with all other GSP groups in the Delta-Mendota Subbasin; and

H. WHEREAS, all the Aliso Water District GSA developed the draft of the Aliso Water District GSA GSP and released the draft GSP for public comment on September 20,2019;

I. WHEREAS, on September 20,2019, the Aliso Water District GSA released the Notice of Intent pursuant to Water Code § 10728.4; and

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors of the Aliso Water District GSA finds as follows:

1. Aliso Water District GSA hereby approves and adopts the draft GSP and directs the staff to make editorial and non-substantial changes to the final version that will be provided to DWR; and

2. Aliso Water District GSA authorizes its board president, its consultants, and the Plan Manager to take such other actions as may be reasonably necessary to submit the GSP to DWR by January 31, 2020, and implement the purpose of this Resolution.

PASSED, APPROVED, AND ADOPTED this 19th day of December, 2019 by the following vote:

AYES: 4

NAYS: 0

ABSTAIN: 0

ABSENT: 1

Attest:

X Roy Catania
President

X
Ross Franson, Secretary

Date: 12-20-19

ALISO WATER DISTRICT GSA

RESOLUTION 2022-04

RESOLUTION REGARDING USE OF TELECONFERENCING

WHEREAS, the Brown Act, Government Code section 54953(e), makes provisions for remote teleconferencing participation in meetings by members of a legislative body, without compliance with the requirements of Government Code section 54953(b)(3), subject to the existence of certain conditions; and

WHEREAS, a required condition is that a state of emergency is declared by the Governor pursuant to Government Code section 8625; and

WHEREAS, the Governor's March 4, 2020 Proclamation declared a State of Emergency throughout the State of California due to the impacts of COVID-19; and

WHEREAS, although such state of emergency has expired, a legislative body may continue to use teleconferencing under Government Code section 54953(e)(3) if local officials have imposed or recommended measures to promote social distancing; and

WHEREAS, the County of Madera's "Health Officer Teleconferencing Recommendation" dated October 28, 2021, to assist local legislative bodies in the County of Madera to use certain available teleconferencing options as set forth in the Brown Act remains in effect.

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE ALISO WATER DISTRICT GSA does hereby resolve, declare and order as follows:

1. The above Recitals are deemed true and correct and are incorporated herein by this reference.

2. The Board has reconsidered the circumstances of the state of emergency, and finds that (a) the County of Madera's "Health Officer Teleconferencing Recommendation" dated October 28, 2021, attached as Exhibit A hereto, remains in effect, and (b) the circumstances described in such recommendation remain relevant.

3. Effective immediately, District staff and consultants are hereby authorized and directed to take all actions necessary to carry out the intent and purpose of this Resolution including conducting open and public meetings in accordance with Government Code section 54953(e) and other applicable provisions of the Brown Act.

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PASSED AND ADOPTED this 12th day of July, 2022, by the following vote to wit:

AYES:	4	Catania, Franson, Logoluso, Siebert
NOES:	0	
ABSTAIN:	0	
ABSENT:	1	Puget

CERTIFICATE OF SECRETARY
OF
ALISO WATER DISTRICT GSA

I, Ross Franson, do hereby certify that I am the duly authorized and appointed Secretary of the Aliso Water District GSA (the "District"); that the following is a true and correct copy of that certain resolution duly and unanimously adopted and approved by the Board of Directors of the District on the 12th day of July, 2022; and that said resolution has not been modified or rescinded and remains in full force and effect as the date hereof:

IN WITNESS WHEREOF, I have executed this Certificate on this 12th day of July, 2022.

Donald Ross Franson, Secretary
Aliso Water District GSA

RESOLUTION NO. 2022-05

RESOLUTION OF THE ALISO WATER DISTRICT GROUNDWATER SUSTAINABILITY AGENCY ADOPTING THE AMENDED ALISO WATER DISTRICT GROUNDWATER SUSTAINABILITY PLAN

A. **WHEREAS,** in August 2014, the California Legislature passed, and in September 2014 the Governor signed, legislation creating the Sustainable Groundwater Management Act ("SGMA") "to provide local groundwater sustainability agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater" (Wat. Code, § 10720, (d)); and

B. **WHEREAS,** SGMA requires sustainable management through the development of groundwater sustainability plans ("GSPs"), which can be a single plan developed by one or more groundwater sustainability agencies ("GSAs") or multiple coordinated plans within a basin or subbasin (Wat. Code, § 10727); and

C. **WHEREAS,** SGMA requires a GSP to be developed and implemented to manage groundwater in all basins designated by the Department of Water Resources ("DWR") as medium or high priority, including the Delta-Mendota Subbasin (basin number 5-22.07); and

D. **WHEREAS,** the Aliso Water District GSA was formed for the purposes of sustainably managing groundwater in the Delta-Mendota Subbasin, within its jurisdictional boundaries, pursuant to the requirements of SGMA; and

E. **WHEREAS,** the Aliso Water District GSA has the authority to draft, adopt, amend, and implement a GSP (Wat. Code, § 10725 et seq.; § 10728.4); and

F. **WHEREAS,** the Aliso Water District GSA submitted an Initial Notification to DWR to develop a GSP for their respective portion of the Delta-Mendota Subbasin on April 25, 2018; and

G. **WHEREAS,** other GSAs in the Delta-Mendota Subbasin prepared separate GSPs for other regions of the Delta-Mendota Subbasin for a total of six GSPs covering the entire Delta-Mendota Subbasin (each, a "GSP Group"); and

H. **WHEREAS,** the GSAs from all six GSP Groups entered into a Coordination Agreement effective December 12, 2018 (the "Coordination Agreement") to comply with SGMA and ensure that the multiple GSPs within the Delta-Mendota Subbasin would be developed and

implemented utilizing the same methodologies and assumptions, that the elements of the GSPs are appropriately coordinated to support sustainable management, and to show how the multiple GSPs will achieve the sustainability goal for the Subbasin. The Coordination Agreement also established a Coordination Committee composed of representatives from each GSP Group, outlined information sharing obligations, procedures for resolving conflicts, and designated the SLDMWA as the Plan Manager for the Delta-Mendota Subbasin; and

I. **WHEREAS,** SGMA states that a GSA "may adopt or amend a GSP after a public hearing, held at least 90 days after providing notice to a city or county within the area of the proposed plan or amendment" (Wat. Code, § 10728.4); and

J. **WHEREAS,** the Aliso Water District developed the Aliso Water District GSA GSP, which was adopted by the Aliso Water District GSA after a public hearing and 90-day notification to the affected city and counties on December 19, 2019; and

K. **WHEREAS,** on January 21, 2022, DWR completed its review of all the GSPs in the Delta-Mendota Subbasin and released a letter determining that the GSPs for the Delta-Mendota Subbasin as a whole were "Incomplete" and identified deficiencies and corrective actions for the GSAs in the Delta-Mendota Subbasin to take. Amended or modified GSPs addressing the corrective actions from each GSP Group must be submitted to DWR by July 20, 2022; and

L. **WHEREAS,** the Aliso Water District and the Coordination Committee have, in order to address the deficiencies and to effect the corrective actions identified by DWR, continued to coordinate to develop the Common Chapter of the amended Aliso Water District GSA GSP ("Amended AWDGSA GSP"); and

M. **WHEREAS,** on March 25, 2022, the Plan Manager transmitted the 90-Day Notice to affected cities and counties notifying them of the Aliso Water District GSAs' intent to adopt an Amended AWDGSA GSP at one or more public hearings to be scheduled not earlier than June 22, 2022, and inviting consultation with the affected cities and counties; and

N. **WHEREAS,** on June 20, 2022, the Coordination Committee recommended each of its GSAs adopt the final draft Common Chapter; and

O. **WHEREAS,** the AWDGSA publicly released the draft Amended AWDGSA GSP on July 8, 2022.

NOW, THEREFORE, BE IT RESOLVED THAT THE BOARD OF DIRECTORS OF THE ALISO WATER DISTRICT GSA declares and orders as follows:

1. The Recitals set forth above are true and correct and are incorporated into this Resolution by this reference.

2. After a public hearing, the Aliso Water District GSA hereby approves and adopts the final draft Amended AWDGSA GSP and Appendices in substantially the form presented, subject to such modifications as the executing officer shall approve, said execution to provide conclusive proof of approval of any such modifications.

3. The Aliso Water District GSA authorizes the SLDMWA and its consultants, as the Plan Manager, to take such other actions as may be reasonably necessary to submit the Amended Aliso GSP and Appendices to DWR by July 20, 2022 and implement the purpose of this Resolution.

PASSED, APPROVED, AND ADOPTED this 12th day of July, 2022 by the following vote:

AYES:	4	Catania, Franson, Logoluso, Siebert
NAYS:	0	
ABSTAIN:	0	
ABSENT:	1	Puget

CERTIFICATE OF SECRETARY
OF
ALISO WATER DISTRICT

I, Ross Franson, do hereby certify that I am the duly authorized and appointed Secretary of the Aliso Water District, a California water district (the "District"); that the following is a true and correct copy of that certain resolution duly and unanimously adopted and approved by the Board of Directors of the District on the 12th day of July 2022; and that said resolution has not been modified or rescinded and remains in full force and effect as the date hereof:

IN WITNESS WHEREOF, I have executed this Certificate on this 12th day of July, 2022.

Donald Ross Franson II, Secretary
Aliso Water District

Appendix G
Elements of the Plan

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
§ 354.			**Introduction to Plan Contents**					
			This Article describes the required contents of Plans submitted to the Department for evaluation, including administrative information, a description of the basin setting, sustainable management criteria, description of the monitoring network, and projects and management actions.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
SubArticle 1.			**Administrative Information**					
§ 354.2.			**Introduction to Administrative Information**					
			This Subarticle describes information in the Plan relating to administrative and other general information about the Agency that has adopted the Plan and the area covered by the Plan.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.4.			**General Information**					
			Each Plan shall include the following general information:					
(a)			An executive summary written in plain language that provides an overview of the Plan and description of groundwater conditions in the basin.	012:025, 274:280				
(b)			A list of references and technical studies relied upon by the Agency in developing the Plan. Each Agency shall provide to the Department electronic copies of reports and other documents and materials cited as references that are not generally available to the public.	201:213, 257:258, 449:456				
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10733.2 and 10733.4, Water Code.					
§ 354.6.			**Agency Information**					
			When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:					
(a)			The name and mailing address of the Agency.	033, 282	1.5			
(b)			The organization and management structure of the Agency, identifying persons with management authority for implementation of the Plan.	033, 286:291	1.5.1	CC-7	CC-4	
(c)			The name and contact information, including the phone number, mailing address and electronic mail address, of the plan manager.	033, 282	1.5.1			
(d)			The legal authority of the Agency, with specific reference to citations setting forth the duties, powers, and responsibilities of the Agency, demonstrating that the Agency has the legal authority to implement the Plan.	034, 292:298	1.5.2			
(e)			An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.	034, 194:197	7.1, 7.2		7-1	
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.8, 10727.2, and 10733.2, Water Code.					
§ 354.8.			**Description of Plan Area**					

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			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:					
	(1)		The area covered by the Plan, delineating areas managed by the Agency as an exclusive Agency and any areas for which the Agency is not an exclusive Agency, and the name and location of any adjacent basins.	036:039, 278, 283:285, 300:301	2.1.1, 2.1.2	2-1, 2-2, CC-1, CC-4:CC-6, CC-8:CC-9		
	(2)		Adjudicated areas, other Agencies within the basin, and areas covered by an Alternative.	036:039	2.1.1, 2.1.2	2-1, 2-2		N/A Not Applicable in the GSA.
	(3)		Jurisdictional boundaries of federal or state land (including the identity of the agency with jurisdiction over that land), tribal land, cities, counties, agencies with water management responsibilities, and areas covered by relevant general plans.	040:044, 301, 315, 317, 356		CC-9, CC-18: CC-19, CC-40		
	(4)		Existing land use designations and the identification of water use sector and water source type.	040:044, 314, 319	2.1.3, 2.1.4	CC-17, CC-20		
	(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.	040:042, 244, 308:310		CC-13:CC-15		
(b)			A written description of the Plan area, including a summary of the jurisdictional areas and other features depicted on the map.	036:044, 299:323				
(c)			Identification of existing water resource monitoring and management programs, and description of any such programs the Agency plans to incorporate in its monitoring network or in development of its Plan. The Agency may coordinate with existing water resource monitoring and management programs to incorporate and adopt that program as part of the Plan.	044:052, 320:322				
(d)			A description of how existing water resource monitoring or management programs may limit operational flexibility in the basin, and how the Plan has been developed to adapt to those limits.	044:052, 320:322				
(e)			A description of conjunctive use programs in the basin.	052, 241, 323	2.2.3			
(f)			A plain language description of the land use elements or topic categories of applicable general plans that includes the following:					
	(1)		A summary of general plans and other land use plans governing the basin.	052:053, 319	2.3.1			
	(2)		A general description of how implementation of existing land use plans may change water demands within the basin or affect the ability of the Agency to achieve sustainable groundwater management over the planning and implementation horizon, and how the Plan addresses those potential effects	053, 320	2.3.2			

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(3)		A general description of how implementation of the Plan may affect the water supply assumptions of relevant land use plans over the planning and implementation horizon.	053:054, 320	2.3.3			
	(4)		A summary of the process for permitting new or replacement wells in the basin, including adopted standards in local well ordinances, zoning codes, and policies contained in adopted land use plans.	054, 322:323	2.3.4			
	(5)		To the extent known, the Agency may include information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management.	054, 320	2.3.5			
(g)			A description of any of the additional Plan elements included in Water Code Section 10727.4 that the Agency determines to be appropriate.	054:062, 323	2.4.1:2.4.12			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10720.3, 10727.2, 10727.4, 10733, and 10733.2, Water Code.					
§ 354.10.			**Notice and Communication**					
			Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:					
(a)			A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.	063, 228, 447:448	2.5.1			
(b)			A list of public meetings at which the Plan was discussed or considered by the Agency.	063:065, 444:446	2.5.2			
(c)			Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.	691:709, 446				
(d)			A communication section of the Plan that includes the following:					
	(1)		An explanation of the Agency's decision-making process.	065, 446	2.5.3			
	(2)		Identification of opportunities for public engagement and a discussion of how public input and response will be used.	065:066, 446:448	2.5.4			
	(3)		A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.	065:066, 447:448	2.5.4			
	(4)		The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.	065:066, 444	2.5.4			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.8, 10728.4, and 10733.2, Water Code					
SubArticle 2.			**Basin Setting**					
§ 354.12.			**Introduction to Basin Setting**					

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			This Subarticle describes the information about the physical setting and characteristics of the basin and current conditions of the basin that shall be part of each Plan, including the identification of data gaps and levels of uncertainty, which comprise the basin setting that serves as the basis for defining and assessing reasonable sustainable management criteria and projects and management actions. Information provided pursuant to this Subarticle shall be prepared by or under the direction of a professional geologist or professional engineer.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.14.			**Hydrogeologic Conceptual Model**					
(a)			Each Plan shall include a descriptive hydrogeologic conceptual model of the basin based on technical studies and qualified maps that characterizes the physical components and interaction of the surface water and groundwater systems in the basin.	204:260, 324:356, 525:526				
(b)			The hydrogeologic conceptual model shall be summarized in a written description that includes the following:					
	(1)		The regional geologic and structural setting of the basin including the immediate surrounding area, as necessary for geologic consistency.	216, 324:325				
	(2)		Lateral basin boundaries, including major geologic features that significantly affect groundwater flow.	217, 329:330				
	(3)		The definable bottom of the basin.	217, 331				
	(4)		Principal aquifers and aquitards, including the following information:					
		(A)	Formation names, if defined.	219, 338:339				
		(B)	Physical properties of aquifers and aquitards, including the vertical and lateral extent, hydraulic conductivity, and storativity, which may be based on existing technical studies or other best available information.	243:245, 343:344				
		(C)	Structural properties of the basin that restrict groundwater flow within the principal aquifers, including information regarding stratigraphic changes, truncation of units, or other features.	219:220, 345				
		(D)	General water quality of the principal aquifers, which may be based on information derived from existing technical studies or regulatory programs.	247:253, 259:260, 345:347				
		(E)	Identification of the primary use or uses of each aquifer, such as domestic, irrigation, or municipal water supply.	228, 331:332				
	(5)		Identification of data gaps and uncertainty within the hydrogeologic conceptual model	231, 404				
(c)			The hydrogeologic conceptual model shall be represented graphically by at least two scaled cross-sections that display the information required by this section and are sufficient to depict major stratigraphic and structural features in the basin.	223:229, 335:340		CC-24:CC-30		

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(d)			Physical characteristics of the basin shall be represented on one or more maps that depict the following:					
	(1)		Topographic information derived from the U.S. Geological Survey or another reliable source.	210, 347, 349		CC-35		
	(2)		Surficial geology derived from a qualified map including the locations of cross-sections required by this Section.	210:213, 327, 335		CC-22, CC-24		
	(3)		Soil characteristics as described by the appropriate Natural Resources Conservation Service soil survey or other applicable studies.	212:215, 351		CC-37		
	(4)		Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas, including significant active springs, seeps, and wetlands within or adjacent to the basin.	241:243, 351:352		CC-39		
	(5)		Surface water bodies that are significant to the management of the basin.	215:216, 242, 348, 350		CC-36		
	(6)		The source and point of delivery for imported water supplies.	215:216, 242, 352, 356		CC-40		
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10733, and 10733.2, Water Code.					
§ 354.16.			**Groundwater Conditions**					
			Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:					
(a)			Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:					
	(1)		Groundwater elevation contour maps depicting the groundwater table or potentiometric surface associated with the current seasonal high and seasonal low for each principal aquifer within the basin.	231:236, 368:371		CC-45:CC-48		
	(2)		Hydrographs depicting long-term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers.	237:241, 365:367		CC-42:CC-44		
(b)			A graph depicting estimates of the change in groundwater in storage, based on data, demonstrating the annual and cumulative change in the volume of groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type.	245, 372:373		CC-49:CC-50		
(c)			Seawater intrusion conditions in the basin, including maps and cross-sections of the seawater intrusion front for each principal aquifer.	110	4.3.7			Seawater intrusion is not applicable to the Delta-Mendota Subbasin because the subbasin is not located near a seawater body.
(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.	247:253, 259:260, 373				

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(e)			The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	246:248, 373:387				
(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.	253:255, 388:391			CC-6	
(g)			Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	392:403		CC-62:CC-63	CC-7	
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10727.4, and 10733.2, Water Code.					
§ 354.18.			**Water Budget**					
(a)			Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.	067, 404:417, 527:531	3.3			
(b)			The water budget shall quantify the following, either through direct measurements or estimates based on data:					
	(1)		Total surface water entering and leaving a basin by water source type.	069:083, 408:413	3.3.2		CC-8:CC-13	
	(2)		Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.	069:083, 241:243, 408:413	3.3.2		CC-8:CC-13	
	(3)		Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.	069:083, 243:245, 408:409, 412:413	3.3.2		CC-9, CC-11, CC-13	
	(4)		The change in the annual volume of groundwater in storage between seasonal high conditions.	083:086, 245:246, 408:409, 412:413, 414	3.3.3	CC-64	CC-9, CC-11, CC-13	
	(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.	083:086, 245	3.3.3			
	(6)		The water year type associated with the annual supply, demand, and change in groundwater stored.	083:086, 408:413	3.3.3		CC-8:CC-13	
	(7)		An estimate of sustainable yield for the basin.	083:086, 415:417	3.3.3			

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				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(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.	086:087, 404:417, 527:531	3.3.4.1			
	(2)		Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:					
		(A)	A quantitative evaluation of the availability or reliability of historical surface water supply deliveries as a function of the historical planned versus actual annual surface water deliveries, by surface water source and water year type, and based on the most recent ten years of surface water supply information.	088:090, 404:417, 527:531	3.3.4.2			
		(B)	A quantitative assessment of the historical water budget, starting with the most recently available information and extending back a minimum of 10 years, or as is sufficient to calibrate and reduce the uncertainty of the tools and methods used to estimate and project future water budget information and future aquifer response to proposed sustainable groundwater management practices over the planning and implementation horizon.	088:090, 404:417, 527:531	3.3.4.2			
		(C)	A description of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability of the Agency to operate the basin within sustainable yield. Basin hydrology may be characterized and evaluated using water year type.	088:090, 404:417, 527:531	3.3.4.2			
	(3)		Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:					
		(A)	Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.	091:096, 404:417, 527:531	3.3.4.3			
		(B)	Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.	091:096, 404:417, 527:531	3.3.4.3			

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		(C)	Projected surface water supply shall utilize the most recent water supply information as the baseline condition for estimating future surface water supply. The projected surface water supply shall also be applied as the baseline condition used to evaluate future scenarios of surface water supply availability and reliability as a function of the historical surface water supply identified in Section 354.18(c)(2)(A), and the projected changes in local land use planning, population growth, and climate.	091:096, 404:417, 527:531	3.3.4.3			
(d)			The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:					
	(1)		Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use.	088:090, 404:417, 514:524, 527:531	3.3.4.2			
	(2)		Current water budget information for temperature, water year type, evapotranspiration, and land use.	086:087, 404:417, 514:524, 527:531	3.3.4.1			
	(3)		Projected water budget information for population, population growth, climate change, and sea level rise.	091:096, 404:417, 514:524, 527:531	3.3.4.3			
(e)			Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.	068:069, 404:417, 514:524, 527:531	3.3.1			
(f)			The Department shall provide the California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM) and the Integrated Water Flow Model (IWFM) for use by Agencies in developing the water budget. Each Agency may choose to use a different groundwater and surface water model, pursuant to Section 352.4.	068:069, 404:417, 514:524, 527:531	3.3.1			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10723.2, 10727.2, 10727.6, 10729, and 10733.2, Water Code.					
§ 354.20.			**Management Areas**					

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(a)			Each Agency may define one or more management areas within a basin if the Agency has determined that creation of management areas will facilitate implementation of the Plan. Management areas may define different minimum thresholds and be operated to different measurable objectives than the basin at large, provided that undesirable results are defined consistently throughout the basin.	096	3.4			No Management Areas
(b)			A basin that includes one or more management areas shall describe the following in the Plan:					
	(1)		The reason for the creation of each management area.	096	3.4			No Management Areas
	(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.	096	3.4			No Management Areas
	(3)		The level of monitoring and analysis appropriate for each management area.	096	3.4			No Management Areas
	(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.	096	3.4			No Management Areas
(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.	096	3.4			No Management Areas
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10733.2 and 10733.4, Water Code.					
SubArticle 3.			**Sustainable Management Criteria**					
§ 354.22.			**Introduction to Sustainable Management Criteria**					
			This Subarticle describes criteria by which an Agency defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the Agency shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.24.			**Sustainability Goal**					
			Each Agency shall establish in its Plan a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.	097:103, 418:419	4.1:4.3.1			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10727, 10727.2, 10733.2, and 10733.8, Water Code.					

Article 5.			Plan Contents for Sample Basin	GSP Document References				
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§ 354.26.			**Undesirable Results**					
(a)			Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.	101:110, 418:419, 532:533	4.3			
(b)			The description of undesirable results shall include the following:					
	(1)		The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.	105, 418:419	4.3.2			
	(2)		The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.	106:108, 418:419	4.3.3:4.3.4			
	(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.	108:109, 418:419	4.3.5			
(c)			The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.	109, 418:419	4.3.6			
(d)			An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.	110	4.3.7			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10723.2, 10727.2, 10733.2, and 10733.8, Water Code.					
§ 354.28.			**Minimum Thresholds**					
(a)			Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.	110:125, 419:429	4.3.7, 4.4		CC-14:CC-18	
(b)			The description of minimum thresholds shall include the following:					
	(1)		The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by uncertainty in the understanding of the basin setting.	110:111, 419:429	4.4.1		CC-14:CC-18	

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	(2)		The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.	121:122, 419:429	4.4.1.4		CC-14:CC-18	
	(3)		How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.	123:124, 419:429	4.4.1.6		CC-14:CC-18	
	(4)		How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.	124:125, 419:429	4.4.1.7		CC-14:CC-18	
	(5)		How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.	125, 419:429	4.4.1.8		CC-14:CC-18	
	(6)		How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.	125, 419:429	4.4.1.9		CC-14:CC-18	
(c)			Minimum thresholds for each sustainability indicator shall be defined as follows:					
	(1)		Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:					
		(A)	The rate of groundwater elevation decline based on historical trends, water year type, and projected water use in the basin.	111:115, 245, 419:429	4.4.1.1		CC-14:CC-18	
		(B)	Potential effects on other sustainability indicators.	111:115, 419:429	4.4.1.1		CC-14:CC-18	
	(2)		Reduction of Groundwater Storage. The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.	111:115, 245, 419:429	4.4.1.1		CC-14:CC-18	
	(3)		Seawater Intrusion. The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results. Minimum thresholds for seawater intrusion shall be supported by the following:					
		(A)	Maps and cross-sections of the chloride concentration isocontour that defines the minimum threshold and measurable objective for each principal aquifer.	110	4.3.7			Seawater intrusion is not applicable to the Delta-Mendota Subbasin because the subbasin is not located near a seawater body.
		(B)	A description of how the seawater intrusion minimum threshold considers the effects of current and projected sea levels.	110	4.3.7			Seawater intrusion is not applicable to the Delta-Mendota Subbasin because the subbasin is not located near a seawater body.

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				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(4)		Degraded Water Quality. The minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.	121, 254:257, 419:429	4.4.1.3		CC-14:CC-18	
	(5)		Land Subsidence. The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Minimum thresholds for land subsidence shall be supported by the following:					
		(A)	Identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how the Agency has determined and considered those uses and interests, and the Agency's rationale for establishing minimum thresholds in light of those effects.	116:120, 246:248, 419:429	4.4.1.2		CC-14:CC-18	
		(B)	Maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum threshold and measurable objectives.	116:120, 248, 419:429	4.4.1.2		CC-14:CC-18	
	(6)		Depletions of Interconnected Surface Water. The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results. The minimum threshold established for depletions of interconnected surface water shall be supported by the following:					
		(A)	The location, quantity, and timing of depletions of interconnected surface water.	110, 253:255, 419:429	4.3.7		CC-14:CC-18	
		(B)	A description of the groundwater and surface water model used to quantify surface water depletion. If a numerical groundwater and surface water model is not used to quantify surface water depletion, the Plan shall identify and describe an equally effective method, tool, or analytical model to accomplish the requirements of this Paragraph.	110, 253:255, 419:429	4.3.7		CC-14:CC-18	
(d)			An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.	123, 419:429	4.4.1.5		CC-14:CC-18	

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(e)			An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.	110	4.3.7			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10733, 10733.2, and 10733.8, Water Code.					
§ 354.30.			**Measurable Objectives**					
(a)			Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.	126:134, 419:429	4.5		CC-14:CC-18	
(b)			Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.	126:134, 419:429	4.5		CC-14:CC-18	
(c)			Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.	126:134, 419:429	4.5		CC-14:CC-18	
(d)			An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.	126:134, 419:429	4.5		CC-14:CC-18	
(e)			Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.	126:134, 419:429	4.5		CC-14:CC-18	
(f)			Each Plan may include measurable objectives and interim milestones for additional Plan elements described in Water Code Section 10727.4 where the Agency determines such measures are appropriate for sustainable groundwater management in the basin.	134, 419:429	4.5.4		CC-14:CC-18	
(g)			An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.	134, 419:429	4.5.4		CC-14:CC-18	
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10727.4, and 10733.2, Water Code.					
SubArticle 4.			**Monitoring Networks**					
§ 354.32.			**Introduction to Monitoring Networks**					

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			This Subarticle describes the monitoring network that shall be developed for each basin, including monitoring objectives, monitoring protocols, and data reporting requirements. The monitoring network shall promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the Plan.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.34.			**Monitoring Network**					
(a)			Each Agency shall develop a monitoring network capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation.	136, 430:440, 534:535	5.1	CC-65:CC-72		
(b)			Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:					
	(1)		Demonstrate progress toward achieving measurable objectives described in the Plan.	136:137, 430:440, 534:535	5.1.1	CC-65:CC-72		
	(2)		Monitor impacts to the beneficial uses or users of groundwater.	136:137, 430:440, 534:535	5.1.1	CC-65:CC-72		
	(3)		Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.	136:137, 430:440, 534:535	5.1.1	CC-65:CC-72		
	(4)		Quantify annual changes in water budget components.	136:137, 430:440, 534:535	5.1.1	CC-65:CC-72		
(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.	137:138, 430:440, 534:535	5.1.3.1	CC-65:CC-72		
		(B)	Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.	137:138, 430	5.1.3.1			

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				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(2)		Reduction of Groundwater Storage. Provide an estimate of the change in annual groundwater in storage.	138:139, 245, 430:440, 534:535	5.1.3.2	CC-65:CC-72		
	(3)		Seawater Intrusion. Monitor seawater intrusion using chloride concentrations, or other measurements convertible to chloride concentrations, so that the current and projected rate and extent of seawater intrusion for each applicable principal aquifer may be calculated.	139	5.1.3.3			
	(4)		Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.	139:140, 430:440, 534:535	5.1.3.4	CC-65:CC-72		
	(5)		Land Subsidence. Identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate method.	140:142, 246:248, 430:440, 534:535	5.1.3.5	CC-65:CC-72		
	(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.	142:143, 253:255, 430:440, 534:535	5.1.3.6	CC-65:CC-72		
		(B)	Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.	142:143, 253:255, 430:440, 534:535	5.1.3.6	CC-65:CC-72		
		(C)	Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.	142:143, 253:255, 430:440, 534:535	5.1.3.6	CC-65:CC-72		
		(D)	Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.	142:143, 253:255, 430:440, 534:535	5.1.3.6	CC-65:CC-72		
(d)			The monitoring network shall be designed to ensure adequate coverage of sustainability indicators. If management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.	143:150, 253:255, 430:440, 534:535	5.1.4	CC-65:CC-72		

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(e)			A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.	136:138, 253:255, 430:440, 534:535	5.1	CC-65:CC-72		
(f)			The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:					
	(1)		Amount of current and projected groundwater use.	151:153, 430:440, 534:535	5.1.5	CC-65:CC-72		
	(2)		Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.	151:153, 430:440, 534:535	5.1.5	CC-65:CC-72		
	(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.	151:153, 430:440, 534:535	5.1.5	CC-65:CC-72		
	(4)		Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.	151:153, 237, 430:440, 534:535	5.1.5	CC-65:CC-72		
(g)			Each Plan shall describe the following information about the monitoring network:					
	(1)		Scientific rationale for the monitoring site selection process.	153:154, 430:440, 534:535	5.1.6.1	CC-65:CC-72		
	(2)		Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.	154:155, 430:440, 534:535	5.1.6.2	CC-65:CC-72		
	(3)		For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.	155:156, 430:440, 534:535	5.1.6.3	CC-65:CC-72		
(h)			The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.	157:159, 430:440	5.1.7	CC-67:CC-72		
(i)			The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.	159, 430:440, 534:535	5.2	CC-65:CC-72		

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(j)			An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.	110, 139, 142, 430:440, 534:535	4.3.7, 5.1.3.3, 5.1.3.6	CC-65:CC-72		
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10727.4, 10728, 10733, 10733.2, and 10733.8, Water Code					
§ 354.36.			**Representative Monitoring**					
			Each Agency may designate a subset of monitoring sites as representative of conditions in the basin or an area of the basin, as follows:					
(a)			Representative monitoring sites may be designated by the Agency as the point at which sustainability indicators are monitored, and for which quantitative values for minimum thresholds, measurable objectives, and interim milestones are defined.	160, 430:440, 534:535	5.3.1	CC-65:CC-72		
(b)			(b) Groundwater elevations may be used as a proxy for monitoring other sustainability indicators if the Agency demonstrates the following:					
	(1)		Significant correlation exists between groundwater elevations and the sustainability indicators for which groundwater elevation measurements serve as a proxy.	160,231:241, 245:246, 430:440, 534:535	5.3.2	CC-65:CC-72		
	(2)		Measurable objectives established for groundwater elevation shall include a reasonable margin of operational flexibility taking into consideration the basin setting to avoid undesirable results for the sustainability indicators for which groundwater elevation measurements serve as a proxy.	160, 430:440, 534:535	5.3.2	CC-65:CC-72		
(c)			The designation of a representative monitoring site shall be supported by adequate evidence demonstrating that the site reflects general conditions in the area.	160, 430:440, 534:535	5.3	CC-65:CC-72		
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2 and 10733.2, Water Code					
§ 354.38.			**Assessment and Improvement of Monitoring Network**					
(a)			Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.	161, 430:440, 534:535	5.4.1	CC-65:CC-72		
(b)			Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.	161:163, 430:440, 534:535	5.4.2	CC-65:CC-72		
(c)			If the monitoring network contains data gaps, the Plan shall include a description of the following:					

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(1)		The location and reason for data gaps in the monitoring network.	163, 230:231, 430:440, 534:535	5.4.3	CC-65:CC-72		
	(2)		Local issues and circumstances that limit or prevent monitoring.	163, 430:440, 534:535	5.4.3	CC-65:CC-72		
(d)			Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.	163, 430:440, 534:535	5.4.3	CC-65:CC-72		
(e)			Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:					
	(1)		Minimum threshold exceedances.	164, 161:164, 430:440, 534:535	5.4.4, 5.4	CC-65:CC-72		
	(2)		Highly variable spatial or temporal conditions.	164, 161:164, 430:440, 534:535	5.4.4, 5.4	CC-65:CC-72		
	(3)		Adverse impacts to beneficial uses and users of groundwater.	164, 161:164, 430:440, 534:535	5.4.4, 5.4	CC-65:CC-72		
	(4)		The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.	164, 161:164, 430:440, 534:535	5.4.4, 5.4	CC-65:CC-72		
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10728.2, 10733, 10733.2, and 10733.8, Water Code					
§ 354.40.			**Reporting Monitoring Data to the Department**					
			Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10728, 10728.2, 10733.2, and 10733.8, Water Code.					
SubArticle 5.			**Projects and Management Actions**					
§ 354.42.			**Introduction to Projects and Management Actions**					

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			This Subarticle describes the criteria for projects and management actions to be included in a Plan to meet the sustainability goal for the basin in a manner that can be maintained over the planning and implementation horizon.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.44.			**Projects and Management Actions**					
(a)			Each Plan shall include a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.	165:193				
(b)			Each Plan shall include a description of the projects and management actions that include the following:					
	(1)		A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent. The Plan shall include the following:					
		(A)	A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management actions, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.	179, 188, 190, 191				
		(B)	The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.	65:66				
	(2)		If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.	179, 188, 190, 191				
	(3)		A summary of the permitting and regulatory process required for each project and management action.	184, 188, 191, 192				
	(4)		The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.	185, 188, 191, 192				
	(5)		An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.	185, 189, 191, 192				
	(6)		An explanation of how the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.	185, 189, 191, 193				

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(7)		A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.	185, 189, 191, 193				
	(8)		A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.	185, 189, 191, 193				
	(9)		A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.	185, 190, 191, 193				
(c)			Projects and management actions shall be supported by best available information and best available science.	204:260				
(d)			An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.	231, 404				
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10727.4, and 10733.2, Water Code.					

Appendix H
January 2022 DWR Determination Letter

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

January 21, 2022

John Brodie
Delta-Mendota Subbasin Point of Contact
San Luis & Delta-Mendota Water Authority
842 6th Street
Los Banos, CA 93635
john.brodie@sldmwa.org

RE: ”Incomplete” Determination of the 2020 Groundwater Sustainability Plans Submitted for the San Joaquin Valley – Delta-Mendota Subbasin

Dear John Brodie,

The Department of Water Resources (Department) has evaluated the six groundwater sustainability plans (GSPs) submitted for the San Joaquin Valley – Delta-Mendota Subbasin (Subbasin), as well as the materials considered to be part of the required coordination agreement. Collectively, the six GSPs and the coordination agreement are referred to as the Plan for the Subbasin. The Department has determined that the Plan is “incomplete” pursuant to Section 355.2(e)(2) of the GSP Regulations.

The Department based its incomplete determination on recommendations from the Staff Report, included as an enclosure to the attached Statement of Findings, which describes that the Subbasin’s Plan does not satisfy the objectives of the Sustainable Groundwater Management Act (SGMA) nor substantially comply with the GSP Regulations. The Staff Report also provides corrective actions which the Department recommends the Subbasin’s 23 groundwater sustainability agencies (GSAs) review while determining how and whether to address the deficiencies in a coordinated manner.

The Subbasin’s GSAs have 180 days, the maximum allowed by the GSP Regulations, to address the identified deficiencies. Where addressing the deficiencies requires modification of the Plan, the GSAs must adopt those modifications into their respective GSPs and all applicable coordination agreement materials, or otherwise demonstrate that those modifications are part of the Plan before resubmitting it to the Department for evaluation no later than July 20, 2022. The Department understands that much work has occurred to advance sustainable groundwater management since the GSAs submitted their GSPs in January 2020. To the extent to which those efforts are related or responsive to the Department’s identified deficiencies, we encourage you to document that as part of your Plan resubmittal. The Department prepared a Frequently Asked Questions document to provide general information and guidance on the process of addressing deficiencies in an “incomplete” determination.

Department staff will work expeditiously to review the revised components of your Plan resubmittal. If the revisions sufficiently address the identified deficiencies, the Department will determine that the Plan is “approved”. In that scenario, Department staff will identify additional recommended corrective actions that the GSAs should address early in implementing their GSPs (i.e., no later than the first required periodic evaluation). Among other items, those corrective actions will recommend the GSAs provide more detail on their plans and schedules to address data gaps. Those recommendations will call for significantly expanded

documentation of the plans and schedules to implement specific projects and management actions. Regardless of those recommended corrective actions, the Department expects the first periodic evaluations, required no later than January 2025 – one-quarter of the way through the 20-year implementation period – to document significant progress toward achieving sustainable groundwater management.

If the Subbasin's GSAs cannot address the deficiencies identified in this letter by July 20, 2022, then the Department, after consultation with the State Water Resources Control Board, will determine the GSP to be "inadequate". In that scenario, the State Water Resources Control Board may identify additional deficiencies that the GSAs would need to address in the state intervention processes outlined in SGMA.

Please contact Sustainable Groundwater Management Office staff by emailing sgmps@water.ca.gov if you have any questions about the Department's assessment, implementation of your Plan, or to arrange a meeting with the Department.

Thank you,

Paul Gosselin

Paul Gosselin
Deputy Director of Sustainable Groundwater Management

Attachment: Statement of Findings Regarding the Determination of Incomplete Status of the San Joaquin Valley – Delta-Mendota Subbasin Groundwater Sustainability Plans

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

STATEMENT OF FINDINGS REGARDING THE DETERMINATION OF INCOMPLETE STATUS OF THE SAN JOAQUIN VALLEY – DELTA-MENDOTA SUBBASIN GROUNDWATER SUSTAINABILITY PLANS

The Department of Water Resources (Department) is required to evaluate whether a submitted groundwater sustainability plan (GSP) conforms to specific requirements of the Sustainable Groundwater Management Act (SGMA), is likely to achieve the sustainability goal for the basin covered by the GSP, and whether the GSP adversely affects the ability of an adjacent basin to implement its GSP or impedes achievement of sustainability goals in an adjacent basin. (Water Code § 10733.) The Department is directed to issue an assessment of the GSP within two years of its submission. (Water Code § 10733.4.)

SGMA allows for multiple GSPs implemented by multiple groundwater sustainability agencies (GSAs) and coordinated pursuant to a single coordination agreement that covers the entire basin to be an acceptable planning scenario. (Water Code § 10727.) In the San Joaquin Valley – Delta-Mendota Subbasin (Subbasin), six separate GSPs were prepared by 23 GSAs pursuant to the required coordination agreement. This Statement of Findings explains the Department's decision regarding the multiple GSPs covering the Subbasin submitted jointly by the multiple GSAs. Collectively, the six GSPs and the coordination agreement are referred to as the Plan for the Subbasin. Individually, the GSPs include the following:

- *Aliso Water District Groundwater Sustainability Plan* (Aliso GSP) – the Aliso GSP is implemented by a single GSA, the Aliso Water District GSA.
- *Groundwater Sustainability Plan, Delta-Mendota Subbasin, Farmers Water District* (Farmers GSP) – the Farmers GSP is implemented by a single GSA, the Farmers Water District GSA.
- *Groundwater Sustainability Plan for County of Fresno GSA Management Area A & Management Area B – Delta-Mendota Subbasin* (Fresno County GSP) – the Fresno County GSP is implemented by a single GSA, the County of Fresno GSA.
- *Grassland Groundwater Sustainability Agency Groundwater Sustainability Plan* (Grassland GSP) – the Grassland GSP is implemented by two GSAs, the Grasslands GSA and the County of Merced GSA.
- *Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions* (Northern and Central GSP) – the Northern and Central GSP is

implemented by the following eight GSAs: Oro Loma GSA, DM-II GSA, Patterson Irrigation District GSA, Widren Water District GSA, City of Patterson GSA, Northwestern Delta-Mendota GSA, West Stanislaus Irrigation District GSA, and Central Delta-Mendota GSA.

- *Groundwater Sustainability Plan for the San Joaquin River Exchange Contractors GSP Group in the Delta-Mendota Subbasin* (SJREC GSP) – the SJREC GSP is implemented by the following 11 GSAs: San Joaquin River Exchange Contractors GSA; City of Firebaugh GSA, City of Los Banos GSA, City of Newman GSA, City of Dos Palos GSA, City of Guistine GSA, City of Mendota GSA, County of Merced GSA, County of Madera GSA, and Turner Island Water District GSA, as well as a portion of the County of Fresno Management Area B GSA.

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

A. The GSPs do not use the same data and methodologies.

1. The Plan makes general statements that the collection and presentation of data are coordinated throughout the Subbasin, but the Plan lacks detail and confirmation that the six GSPs not only consider the other GSPs within and adjacent to the Subbasin but have addressed the regulatory aspects of SGMA in a manner that substantially complies with the GSP Regulations.

    i. A statement that the GSPs are coordinated without accompanying explanation is not sufficient coordination. Department staff find that the Plan for the Subbasin does not utilize same data and methodologies to support the various water budget, change in storage, and sustainable yield approaches; therefore, it is unclear how the GSAs will reach, let alone track, sustainability throughout the Subbasin in a coordinated manner.

    ii. By allowing each of the GSPs to move forward with collecting, compiling, and analyzing data on its own, set sustainable management criteria that support the respective GSP area's definition of what is considered sustainable within its boundaries, and relying upon a "sum-of-the-parts" approach to reflect the

Subbasin's conditions, it is uncertain whether or how the six GSPs use the same data and methodologies.

B. The GSPs have not established common definitions of undesirable results in the Subbasin.

    1. Because each of the six GSPs prepared in the Subbasin defined its own sustainable management criteria, each applicable sustainability indicator has up to six different definitions of what are considered significant and unreasonable conditions.

        i. While this approach was agreed upon by the 23 GSAs in the Subbasin using the required coordination agreement, by approaching the sustainability indicators in such an individualistic and isolated manner, Department staff do not believe that the Plan satisfies the SGMA requirement to the use of same data and methodologies.

        ii. A broad, generic definition of undesirable results was developed for the entire Subbasin, but the various GSAs responsible for each GSP further defined what they considered "significant and unreasonable." This process has resulted in setting different thresholds with different metrics and establishing a wide range of measurable objectives, if at all, often for very small portions of the Subbasin that do not seem to align with adjacent areas governed by other GSPs. Department staff find that this fragmented approach towards establishing separate criteria that define sustainable conditions in various parts of the Subbasin does not meet the intent of SGMA or the requirements of the GSP Regulations.

C. The GSPs in the Subbasin have not set sustainable management criteria in accordance with the GSP Regulations.

    1. While a sustainability goal was agreed upon for the Subbasin, each of the six GSPs includes its own version of what its GSP-area goal is and does not correlate those goals with the Subbasin's sustainable yield.

        i. The individual GSPs do not include supporting information that is sufficiently detailed, but instead provide statements, for example, that the GSP areas have "a significant amount of flexibility in defining and implementing Sustainable Management Criteria in

the absence of undesirable results." Like the Subbasin's definition of undesirable results, which has up to six different GSP definitions of what is considered a significant and unreasonable condition, the Subbasin appears to have multiple definitions of its sustainability goal depending upon which GSP is referenced.

2. Each of the six GSPs prepared in the Subbasin defined its own sustainable management criteria and each sustainability indicator has up to six different definitions of what are considered significant and unreasonable conditions.

    i. As demonstrated by the review of each GSP's definition of undesirable results, the Plan, while purporting to be coordinated, actually presents a very complicated and disparate range of definitions for what constitutes an undesirable result for each category, such that whether or not something is considered an undesirable result depends on where in the Subbasin the condition is occurring.

3. The establishment of minimum thresholds and measurable objectives in the Subbasin are not coordinated, nor are they supported by information that is sufficiently detailed.

    i. Each GSP generally contains a wide variety of what are considered significant and unreasonable conditions, sets different interim goals, minimum thresholds, and measurable objectives, often with different units of measurement, or determines that a particular sustainability indicator is not applicable to its GSP area without providing sufficient justification.

D. The management areas established in the Plan have not sufficiently addressed the requirements specified in 23 CCR § 354.20.

1. The six GSPs prepared in the Subbasin have established a total of 17 management areas.

    i. While the use of management areas is technically allowed in a basin if the GSAs determine that the creation of management areas will facilitate implementation of their GSPs, the use of management areas in a basin that is already managed under six separate GSPs significantly complicates the Subbasin's implementation of SGMA. It also impedes the ability of

Department staff to determine if the sustainability goal established for the Subbasin is being met, especially if established management areas do not have monitoring points and it is uncertain what sustainable management criteria apply to each area.

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

Signed:

Karla Nemeth, Director
Date: January 21, 2022

Enclosure: Groundwater Sustainability Plan Assessment Staff Report – San Joaquin Valley – Delta-Mendota Subbasin

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

Groundwater Basin Name:	San Joaquin Valley Basin – Delta-Mendota Subbasin (No. 5-022.07)
Number of GSPs:	6 (see list below)
Number of GSAs:	23 (see list below)
Point of Contact:	John Brodie, San Luis & Delta-Mendota Water Authority
Recommendation:	Incomplete
Date:	January 21, 2022

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

In the Delta-Mendota Subbasin (Subbasin), six separate GSPs were prepared by 23 GSAs pursuant to a required coordination agreement.[5] Collectively, the six GSPs and the coordination agreement, for evaluation and assessment purposes, will be treated and referred to as the Plan for the Subbasin. Individually, the GSPs include the following:

- *Aliso Water District Groundwater Sustainability Plan* (Aliso GSP) – covers approximately 3.5 percent of the Subbasin. The Aliso GSP is implemented by a single GSA, the Aliso Water District GSA.
- *Groundwater Sustainability Plan, Delta-Mendota Subbasin, Farmers Water District* (Farmers GSP) – covers approximately 0.3 percent of the Subbasin. The Farmers GSP is implemented by a single GSA, the Farmers Water District GSA, and has two management areas.

[1] Water Code § 10720 *et seq*.
[2] Water Code § 10727.
[3] 23 CCR § 350 *et seq*.
[4] Water Code § 10733.4(d); 23 CCR § 355.2(e).
[5] Water Code § 10733.4(b).

- *Groundwater Sustainability Plan for County of Fresno GSA Management Area A & Management Area B – Delta-Mendota Subbasin* (Fresno County GSP) – covers approximately 3 percent of the Subbasin. The Fresno County GSP is implemented by a single GSA, the County of Fresno GSA, and has two management areas.

- *Grassland Groundwater Sustainability Agency Groundwater Sustainability Plan* (Grassland GSP) – covers approximately 14 percent of the Subbasin. The Grassland GSP is implemented by two GSAs, the Grasslands GSA and the County of Merced GSA.

- *Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions* (Northern and Central GSP) – covers approximately 41 percent of the Subbasin. The Northern and Central GSP creates two management areas and is implemented by the following eight GSAs: Oro Loma GSA, DM-II GSA, Patterson Irrigation District GSA, Widren Water District GSA, City of Patterson GSA, Northwestern Delta-Mendota GSA, West Stanislaus Irrigation District GSA, and Central Delta-Mendota GSA.

- *Groundwater Sustainability Plan for the San Joaquin River Exchange Contractors GSP Group in the Delta-Mendota Subbasin* (SJREC GSP) – covers approximately 39 percent of the Subbasin. The SJREC GSP creates 11 management areas and is implemented by the following 11 GSAs: San Joaquin River Exchange Contractors GSA; City of Firebaugh GSA, City of Los Banos GSA, City of Newman GSA, City of Dos Palos GSA, City of Guistine GSA, City of Mendota GSA, County of Merced GSA, County of Madera GSA, and Turner Island Water District GSA, as well as a portion of the County of Fresno Management Area B GSA.

Included as an appendix in each GSP is a document called the *Common Chapter for the Delta-Mendota Subbasin Groundwater Sustainability Plan* (Common Chapter)[6] which was prepared under the oversight of the Delta-Mendota Subbasin Coordination Committee (Coordination Committee) to "[integrate] key parts of the six GSPs to meet subbasin-level requirements per [SGMA and the GSP Regulations]."[7] The Common Chapter contains eight technical memoranda addressing a variety of SGMA topics (Technical Memoranda).[8] The Common Chapter and the following Technical Memoranda are referenced throughout this staff report:

[6] Aliso GSP, Appendix B, pp. 262-456; Farmers GSP, Appendix A, pp. 187-379; Fresno County GSP, Appendix A, pp. 226-418; Grassland GSP, Appendix A, pp. 236-430; Northern and Central GSP, Identified as Appendix B in the GSP Table of Contents but provided as Supporting Information on the SGMA Portal; SJREC GSP, Appendix B, pp. 226-419.
[7] Aliso GSP, Common Chapter, Section 1.1, p. 274. Note: While each GSP contains the same Common Chapter and Technical Memoranda, all footnote references herein will only be made with reference to the Aliso GSP.
[8] Aliso GSP, Appendix B, pp. 513-549; Farmers GSP, Appendix A, pp. 436-472; Fresno County GSP, Appendix B, pp. 475-511; Grassland GSP, Appendix B, pp. 487-523; Northern and Central GSP, Identified as Appendix B in the GSP Table of Contents but provided as Supporting Information on the SGMA Portal; SJREC GSP, Appendix B, pp. 476-512.

- Technical Memorandum #1 – *Common Datasets and Assumptions used in the Delta-Mendota Subbasin GSPs*
- Technical Memorandum #2 – *Assumptions for Hydrogeological Conceptual Model of the Delta-Mendota Subbasin*
- Technical Memorandum #3 – *Assumptions for the Historic, Current and Projected Water Budgets of the Delta-Mendota Subbasin, Change in Storage Cross-Check and Sustainable Yield*
- Technical Memorandum #4 – *Assumptions for Delta-Mendota Subbasin Management Areas, Sustainability Management Criteria*
- Technical Memorandum #5 – *Assumptions for Delta-Mendota Subbasin Monitoring Network*
- Technical Memorandum #6 – *Coordination of the Delta-Mendota Subbasin Data Management System*
- Technical Memorandum #7 – *Adoption and Use of the Subbasin Coordination Agreement*
- Technical Memorandum #8 – *Coordinated Noticing, Communication, and Outreach Activities in the Delta-Mendota Subbasin*

The Technical Memoranda are specified in the Plan's coordination agreement.[9] The Plan's coordination agreement addresses each of the components identified in the GSP Regulations. Department staff do not have comments on the legal aspects of that document but do have concerns regarding some of the explanations in the Common Chapter as they relate to Water Code Section 10733.4(b)(2) and the assumptions agreed upon in the Technical Memoranda – primarily how or whether the six GSPs have been applied and implemented in the Subbasin in a consistent and coordinated manner. As stated in the Common Chapter, "[g]iven the variability of conditions within the Delta-Mendota Subbasin, a subbasin-wide sustainability goal and definitions of undesirable results were developed at the subbasin-level, while the definitions of significant and unreasonable, minimum thresholds, measurable objectives and 5-year interim goals were established at the GSP Plan area-level."[10] This approach has created multiple sustainability goals, multiple definitions of undesirable results, and a wide variety of minimum thresholds, measurable objectives and interim goals, with several GSP-specific hydrogeological conceptual models.

The overall context presented in the Plan is that the critically overdrafted Subbasin has been operating sustainably in the past, the six GSP areas are currently sustainable and are not experiencing undesirable results, and the proposed management approach

[9] Aliso GSP, Delta-Mendota Subbasin Coordination Agreement, p. 472.
[10] Aliso GSP, Common Chapter, Section 5, p. 418.

moving forward is to generally maintain the status quo during SGMA's planning and implementation horizon while maintaining historical pumping amounts. This approach would further lower groundwater levels and does not appear to sufficiently account for recharge from depleting surface flows in the San Joaquin River, and would not eliminate or mitigate overdraft. Additionally, some of the GSPs have not set sustainable management criteria for applicable sustainability indicators as required by the GSP Regulations, and each of the applicable sustainability indicators has up to six undesirable result definitions for what are considered significant and unreasonable conditions.

Department staff have thoroughly evaluated the Plan, the Subbasin's coordination agreement, and other information provided or available and known to staff, and have exercised their professional expertise and judgment to identify several deficiencies that staff recommends should preclude its approval.[11] In addition, consistent with the GSP Regulations, Department staff have provided corrective actions that the GSAs should review while determining how and whether to address the deficiencies in a coordinated manner.[12] The deficiencies and corrective actions are explained in greater detail in Section 3 of this staff report but are generally related to the approach taken to coordinate the six GSPs, the creation of multiple definitions of what are considered significant and unreasonable conditions throughout the Subbasin, the insufficient application of sustainable management criteria used to evaluate sustainability, and the use of numerous management areas in an already fragmented Plan.

This assessment includes the following four sections:

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

[11] 23 CCR §355.2(e)(2).
[12] 23 CCR §355.2(e)(2)(B).

1 EVALUATION CRITERIA

The Department evaluates whether a Plan conforms to the statutory requirements of SGMA [13] and is likely to achieve the basin's sustainability goal. [14] To achieve the sustainability goal, the Plan must demonstrate that implementation will lead to sustainable groundwater management, which means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results. [15] Undesirable results are required to be defined quantitatively by the GSAs overlying a basin and occur when significant and unreasonable effects for any of the applicable sustainability indicators are caused by groundwater conditions occurring throughout the basin. [16] The Department is also required to evaluate whether the Plan will adversely affect the ability of an adjacent basin to implement its groundwater sustainability program or achieve its sustainability goal. [17]

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

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

[13] Water Code §§ 10727.2, 10727.4, 10727.6.
[14] Water Code § 10733(a).
[15] Water Code § 10721(v).
[16] 23 CCR § 354.26.
[17] Water Code § 10733(c).
[18] 23 CCR § 355.4(a)(1).
[19] 23 CCR §§ 355.4(a)(2), 355.4(a)(3).
[20] 23 CCR § 357.4.
[21] 23 CCR § 350 *et seq*.
[22] 23 CCR § 355.4(b).
[23] 23 CCR § 351(h).

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

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

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

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

[24] 23 CCR §§ 355.4(b)(1), (3), (4) and (5).
[25] 23 CCR § 355.4(b)(9).
[26] 23 CCR § 355.4(b)(6).
[27] 23 CCR § 355.4(b)(8).
[28] 23 CCR § 355.4(b)(2).
[29] 23 CCR § 355.4(b)(10).
[30] Water Code § 10733.4(d); 23 CCR § 355.2(e).
[31] Water Code § 10733.4(d); 23 CCR § 355.2(e).
[32] 23 CCR § 355.2(e)(1).
[33] 23 CCR § 355.2(e)(2).
[34] 23 CCR § 355.2(e)(3).
[35] 23 CCR § 355.2(e)(2)(B)(i).

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

The staff assessment of the Plan involves the review of information presented by the GSAs, including models and assumptions, and an evaluation of that information based on scientific reasonableness. In conducting its assessment, the Department does not recalculate or reevaluate technical information provided in the Plan or perform its own geologic or engineering analysis of that information. The recommendation to approve a Plan does not signify that Department staff, were they to exercise the professional judgment required to develop a Plan for the basin, would make the same assumptions and interpretations as those contained in the Plan, but simply that Department staff have determined that the assumptions and interpretations relied upon by the submitting GSAs are supported by adequate, credible evidence, and are scientifically reasonable.

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

[36] 23 CCR § 355.2(e)(3)(C).
[37] Water Code § 10733.8; 23 CCR § 355.6 *et seq*.
[38] Water Code §§ 10728 *et seq.*, 10728.2.

2 REQUIRED CONDITIONS

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

2.1 SUBMISSION DEADLINE

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

The Point of Contact representing 23 GSAs submitted the Subbasin's Plan on January 23, 2020, in compliance with the statutory deadline. The Plan consists of six adopted GSPs and the required coordination agreement.

2.2 COMPLETENESS

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

The Subbasin's 23 GSAs submitted six adopted GSPs that cover the Subbasin. Department staff found the GSPs, and the collective Plan, to be complete and include the required information, sufficient to warrant an evaluation by the Department. The Department posted the Subbasin's six GSPs and coordination agreement to its website on January 31, 2020.

[39] Water Code § 10720.7.
[40] 23 CCR § 355.4(a)(3).
[41] Water Code § 10733.4(b); 23 CCR § 357.4.
[42] Water Code § 10720.7(a)(1).
[43] 23 CCR § 355.4(a)(2).

2.3 BASIN COVERAGE

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

The Plan intends to manage the entire Delta-Mendota Subbasin and the jurisdictional boundaries of the submitting GSAs cover the entire Subbasin.

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

3 PLAN EVALUATION

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

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

GENERAL BACKGROUND

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

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

[45] 23 CCR § 355.4.
[46] 23 CCR § 355.4(a)(1).
[47] 23 CCR § 355.4(b)(1).
[48] 23 CCR §§ 355.4(b)(5), 355.4(b)(6).
[49] Water Code § 10727(b)(3).
[50] 23 CCR § 357.4; Water Code § 10727.6.
[51] 23 CCR § 357.4(a).
[52] Water Code § 10727.6 *et al;* 23 CCR §§ 357.4(b)(3)(B), 357.4(b)(3)(C), 357.4(c).

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

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

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

3.1 DEFICIENCY 1. THE GSPS DO NOT USE THE SAME DATA AND METHODOLOGIES.

3.1.1 Background

The Plan is subject to Water Code Section 10727.6 as well as Section 357.4 of the GSP Regulations. The GSPs require coordination to ensure that they utilize the same data and methodologies for the following sustainable groundwater management assumptions: *groundwater elevation data; groundwater extraction data; surface water supply; total water use; change in groundwater storage; water budget; and sustainable yield*.[54] For GSAs developing multiple GSPs, the GSAs are also required to jointly submit an explanation of how the GSPs implemented together satisfy Water Code Sections 10727.2, 10727.4 and 10727.6, as well as a copy of the coordination agreement.[55] Coordination agreements are required to address a variety of regulatory topics, including how the GSAs have used the same data and methodologies to prepare coordinated GSPs where the sustainable yield is supported by a description of the undesirable results and an explanation of how the minimum thresholds and measurable objectives relate to those undesirable results.[56]

3.1.2 Deficiency Details

The Plan makes general statements that the collection and presentation of data are coordinated throughout the Subbasin, but the Plan lacks detail and confirmation that the six GSPs not only consider the other GSPs within and adjacent to the Subbasin but have addressed the regulatory aspects of SGMA in a manner that substantially complies with the GSP Regulations. A statement that the GSPs are coordinated without accompanying explanation is not sufficient coordination. Department staff find that the Plan for the Subbasin does not utilize same data and methodologies to support the various water budget, change in storage, and sustainable yield approaches; therefore, it is unclear how the GSAs will reach, let alone track, sustainability throughout the Subbasin in a coordinated manner.

By allowing each of the GSPs to move forward with collecting, compiling, and analyzing data on its own, set sustainable management criteria that supports the respective GSP

[53] Water Code § 10733(b); 23 CCR § 355.4(b).
[54] Water Code § 10727.6.
[55] Water Code §§ 10733.4(b)(2), 10733.4(b)(3).
[56] 23 CCR § 357.4(b)(3).

area's definition of what is considered sustainable within its boundaries, and relying upon a "sum-of-the-parts" approach to reflect the Subbasin's conditions, it is uncertain whether or how the six GSPs use the same data and methodologies. Technical Memorandum documents do not resolve this uncertainty. In many cases, as presented below, the six GSPs do not use the same data and methodologies and do not provide a detailed explanation that complies with Water Code Section 10733.4(b)(2), other than general reference to insufficient discussions in the Common Chapter.

Common to all six GSPs is Technical Memorandum #1, which is "Common Datasets and Assumptions used in the Delta-Mendota Subbasin GSPs." [57] According to the memorandum, "[d]uring development of the six coordinated Groundwater Sustainability Plans (GSPs) for the Delta-Mendota Subbasin (Subbasin), the twenty-three Groundwater Sustainability Agencies (GSAs) in the Subbasin agreed upon methodologies and assumptions for water budgets, change in storage, and sustainable yield." The following briefly describes the approaches taken to address the three assumptions referenced in Technical Memoranda #1.

Water Budget

Water Budget information is presented in Section 4.3 of the Common Chapter and in Technical Memorandum #3.[58] While the categories of inflows and outflows were agreed upon by the Coordination Committee for the land surface budget and groundwater budget, each of the GSP areas prepared separate water budgets [59] using different modeling methods while often relying upon customized hydrogeological conceptual models[60] which were then "rolled-up" to the Subbasin level. It is uncertain whether the outflow from a particular GSP area within the Subbasin is comparable to the inflow from an adjacent GSP area, as there is no coordinated explanation provided in the Plan.

The historical water budget reflects water years 2003-2012 (the minimum number of years required under the GSP Regulations), the current water budget is for 2013, and the projected budget is years 2014-2070. A series of analyses were done for periods ranging from 1990-2015, but it was decided by the Subbasin's Coordination Committee that the period chosen should avoid the most recent drought.[61] The Plan also acknowledges that, "[w]hile 'current water budget conditions' are defined in the GSP Emergency Regulations §354.18(c)(1) as the year with 'the most recent population, land use, and hydrologic

[57] Aliso GSP, Technical Memorandum #1, pp. 514-524.
[58] Aliso GSP, Common Chapter, Section 4.3, pp. 404-414, Technical Memorandum #3, pp. 527-531.
[59] Aliso GSP, Section 3.3.1, pp. 68-69; Farmers GSP, Section 3.3, pp. 115-134; Fresno County GSP, Water Budget Section, p. 22; Fresno County GSP, Section 3.3, pp. 131-155; Grassland GSP, Section 3.3.1, pp. 129-154; Northern and Central GSP, Section 5.4.4, p. 404; SJREC GSP, Sections 2.2.3 through 2.2.5, pp. 77-119.
[60] Aliso GSP, Common Chapter, Section 4.1, pp. 324-356, Appendix A, pp. 204-260; Farmers GSP, Section 3.1, pp. 60-80; Fresno County GSP, Section 3.1, pp. 73-95; Grassland GSP, Section 3.1, pp. 89-109; Northern and Central GSP, Section 5.2. pp. 213-244; SJREC GSP, Section 2.2.1. p. 77, Appendix I, pp. 810-1018.
[61] Aliso GSP, Section 3.3.1, p. 69.

conditions,' WY2015, WY2016 and WY2017 were not thought to be representative of the Delta-Mendota Subbasin under 'normal' or 'average' conditions."[62]

As presented below, some of the GSP groups used numerical models to calculate the inflows and outflows from the respective GSP areas while others used non-numerical and spreadsheet models – there was no explanation in the Common Chapter that indicated how these differing modeling approaches used the same data or methodology. Additionally, some of the GSP groups used a hydrogeological conceptual model that was prepared specifically for its GSP area, which was different than the hydrogeological conceptual model submitted as part of the Common Chapter and Technical Memorandum #2.[63]

In general, the details in the respective GSPs are presented in a manner that support each GSP area's perspective that no undesirable results are currently present within its boundaries and will not occur in the future, essentially setting the stage for maintaining the status quo during SGMA's planning and implementation horizon. The following briefly describes the process for developing different water budgets in each of the respective GSP areas:

- *Aliso GSP*: "Due to the homogeneous nature of the District area regarding water use, cropping patterns, and climate, AWD has decided to use an analytical accounting tool to quantify the historic water budget conditions and project historic trends into the future while incorporating factors such as climate change and land use that may alter these trends going forward."[64]

- *Farmers GSP*: "For the FWD GSA in the Delta-Mendota Subbasin, a numerical model tool was developed and used to simulate the geographic extent of the FWD and adjacent areas."[65]

- *Fresno County GSP*: "For the FCMA GSA in the DM Subbasin, a numerical model tool was developed utilizing the United States Geological Survey's MODFLOW-NWT and used to simulate the geographic extent of the FCMA and adjacent areas."[66]

- *Grassland GSP*: "In order to gain a greater understanding of operational and natural conditions in the Plan Area, the GSAs decided to use an analytical accounting tool to quantify the water budget conditions for specific year types where data was prevalent."[67]

[62] Northern and Central GSP, Section 5.4.3, p. 400. Note: 23 CCR § 354.18(c)(1) states, "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."
[63] Aliso GSP, Common Chapter, Section 4.1, pp. 324-356, Technical Memorandum #2, pp. 525-526.
[64] Aliso GSP, Section 3.3.1, pp. 68-69.
[65] Farmers GSP, Section 3.3, pp. 115-134.
[66] Fresno County GSP, Water Budget Section, p. 22; Section 3.3, pp. 131-155.
[67] Grassland GSP, Section 3.3, pp. 129-154.

- *Northern and Central GSP*: "The selected alternative approach for water budget development for the Northern and Central Delta-Mendota Regions is a hybrid approach that combines the use of local data and CVHM2 parameters with standard numerical calculations derived from peer-reviewed literature or professional judgment. All water budgets presented herein are based primarily on local land use, water supply, and groundwater elevation data received from agencies as well as data from publicly available sources. Where local data are unavailable, data from CVHM2 is used."[68]

- *SJREC GSP*: "The Historical, Current and Projected Water Budgets were prepared primarily by the SJREC GSA Staff and KDSA in close coordination with the other GSP groups in the Delta-Mendota Subbasin to ensure that each GSP uses the same data and methodologies."[69] However, the methodology, or methodologies, used to develop the various water budgets in the SJREC GSP area is not clearly defined, other than general reference to modified versions of the Department's Best Management Practices documents that address water budgets and modeling, which are provided as Appendices K and L in the SJREC GSP.[70] The SJREC GSP contains a water budget for only the SJREC GSA area, as well as a combined budget that represents the collective SJREC GSP group, which includes the SJREC GSA and the SJREC GSP's 11 management areas.[71] The water budget information for the 11 management areas is far less detailed and relies upon information provided in sections 7 through 16 of the GSP, often relying upon separate hydrogeological conceptual models.[72]

Change in Groundwater Storage

The explanation related to coordinated change in storage calculations and water budgets is insufficient, especially since information presented in text, and data displayed in figures and tables, do not seem to correlate with each other and it is uncertain what the current loss of storage is throughout the Subbasin.[73] Statements in Common Chapter Section 4.2.3, state that, "*For information on how change in storage was calculated, refer to Section 4.3.2 – Water Budgets of this Common Chapter*." However, Section 4.3.2 only states, "*Individual historical, current, and projected water budgets were developed by each GSP Group for their respective Plan Area. For more information on the development of those water budgets, as well as tabular and graphical representation of the results, refer to the respective sections of the individual GSPs*." This fragmented and multi-staged

[68] North and Central GSP, Section 5.5.4, p. 404.
[69] SJREC GSP, Section 2.2.3, pp. 77-112.
[70] SJREC GSP, Section 2.2.3, p. 78, Appendix K, pp. 1038-1079, Appendix L, pp. 1080-1113.
[71] SJREC GSP, Sections 2.2.3 and 2.2.4, pp. 77-115; Section 2.2.5, p. 115-119.
[72] SJREC GSP, Section 2.2.5, pp. 115-119, Section 7.0 through 16.5, pp. 151-215, Appendices Q through W, pp. 1210-1643.
[73] Aliso GSP, Technical Memorandum #3, pp. 527-531, Section 3.3.3.1, p. 84; Farmers GSP, Section 3.2.4, p. 84; Fresno County GSP, Section 3.2.2, p. 99; Grassland GSP, Section 3.2.6, pp. 121-122; Northern and Central GSP, Section 5.3.3, p. 331; SJREC GSP, Section 3.3.2, p. 126.

presentation of information is insufficient to demonstrate that the various GSPs are coordinated – Section 4.2.3 of the Common Chapter refers readers to Section 4.3.2, which then refers readers to six different GSP sections.

The Plan's change in groundwater storage assessment considered a sum-of-the-parts methodology, combining the change in groundwater storage from each GSP area to determine the overall change in groundwater storage for the Subbasin without a clear quantification of overdraft occurring throughout the Subbasin. Per the Common Chapter, despite recharge outpacing extractions, an overall declining trend in groundwater storage was observed in both aquifers between 2003-2013.[74] Cumulative change in storage declined more rapidly in the Upper Aquifer compared to the Lower Aquifer, declining by about 1,300,000 acre-feet in the Upper Aquifer and 678,000 acre-feet in the Lower Aquifer (a total of 1,978,000 acre-feet). However, when "rolling-up" the water budget information in Tables CC-9 and CC-11, which reflect the Subbasin's historical and current water budgets, the cumulative change in storage in the Upper Aquifer reflects a loss of 624,000 acre-feet and a loss of 375,000 acre-feet in the Lower Aquifer, with a total loss of storage within the Subbasin of 1,003,000 acre-feet.[75] Clarification on the Subbasin's cumulative change in storage and total amount of overdraft is required, because the overdraft information does not align throughout the six GSPs.

For the Upper Aquifer, Technical Memorandum #1 states, "Upper aquifer change in groundwater storage was evaluated using annual groundwater level contours from Spring 2003 to Spring 2013 developed using the same datasets identified above and applying specific yield (defined as the volume of water released from storage by an unconfined aquifer per unit surface area of aquifer per unit decline of the water table) provided by each individual GSP Group. The Delta-Mendota Subbasin upper aquifer change in groundwater storage assessment considered a 'sum-of-the-parts' methodology, combining the change in groundwater storage for each GSP to determine the overall change in groundwater storage for the Subbasin."[76] However, according to the annual report filed for water year 2020, "four methods [were] chosen by the respective GSP regions and summed to a Subbasin total [for the Upper Aquifer]: change in groundwater elevation contours used by Aliso Water District, Farmers Water District, and Fresno County Management Areas A and B GSP regions; water budget with calibration to historic below normal water year conditions by Grassland GSP Region; a combination of change in groundwater elevation contours and representative hydrograph methods by the Northern & Central Delta-Mendota Region GSP Region; and representative hydrographs used by the San Joaquin River Exchange Contracts GSP Region."[77] Although it therefore appears that the GSPs use different methodologies and data, there is no coordinated

[74] Aliso GSP, Common Chapter, Section 4.2.3, pp. 372-373.
[75] Aliso GSP, Common Chapter, Tables CC-9 and CC-11, pp. 408-409.
[76] Aliso GSP, Technical Memorandum #1, p. 517.
[77] Delta-Mendota Subbasin WY 2020 Annual Report, p. 31.

explanation in the Plan of how or why the four change in storage methods can be considered as using the same data and methodology.

For the Lower Aquifer, Technical Memorandum #1 states, "On January 15, 2019, the Technical Working Group discussed addressing the historic period change in groundwater storage in the lower aquifer. Instead of using scarce data, the change was compared against loss of storage from inelastic land subsidence as calculated using change in land surface elevation multiplied by the area and supplemented by change in groundwater levels and storativity in areas of the Subbasin where those data were available."[78] But the annual report filed for water year 2020 states, "two methods [were] chosen by the respective GSP regions and summed to a Subbasin total: change in land surface elevation using the best available data was used by the Aliso Water District, Grassland, Northern & Central Delta-Mendota Region, and San Joaquin River Exchange Contractors GSP regions…", where the Northern & Central Delta-Mendota Region used additional data sources "to provide complete spatial coverage…"; and "change in groundwater elevation at GSP monitoring wells was utilized by the Farmers Water District and Fresno Management Areas A and B GSP regions."[79] Again, there is no coordinated explanation in the Plan of how the two approaches to estimate change in storage can be considered as using the same data and methodology.

Additional explanation of historical, current, and projected change in groundwater storage for the Subbasin is warranted, as well as a straightforward quantification of overdraft throughout the Subbasin. The compilation of water budgets and the estimation of change in groundwater storage for the Subbasin do not appear to use the same data and methodology, or the Plan lacks adequate explanation for how or why the various approaches in the GSPs can be considered as using the same data and methodologies.

Sustainable Yield

The Common Chapter (Section 4.3.4)[80] and Technical Memoranda #3[81] address the methodology for calculating sustainable yield in the Subbasin. Of the six GSPs, three provide a sustainable yield specifically for the GSP area while the other three rely upon the estimate for the entire Subbasin. Similar to the discussion for Deficiency #2, each GSP established its own definitions of significant and unreasonable conditions for each of the appliable sustainability indicators, which allows for up to six different situations of what is considered an undesirable result in the Subbasin for each sustainability indicator. Four of the six GSPs have a total of 17 management areas, as discussed in Deficiency #4, and it is uncertain what sustainable management criteria are being followed in all these management areas to define or reach sustainable conditions, especially since some of the management areas do not have monitoring sites.

[78] Aliso GSP, Technical Memorandum #1, pp. 517-518.
[79] Delta-Mendota Subbasin WY 2020 Annual Report, p. 32.
[80] Aliso GSP, Common Chapter, Section 4.3.4, pp. 415-417.
[81] Aliso GSP, Technical Memorandum #3, pp. 527-531.

The SJREC GSP states, "*The sustainable yield is determined independent of sustainability criteria and is provided as a guide for water budget planning purposes*."[82] Therefore, it does not appear that the various approaches used in the Subbasin to define sustainable yield have been set by considering undesirable results. As indicated throughout the Plan, a sustainable yield estimate is not established for each GSP area and those estimates are not correlated with undesirable results. Department staff note that under management presented in the Plan, groundwater overdraft in the critically overdrafted Subbasin does not appear to stop by 2040 or during SGMA's 50-year planning and implementation horizon.

As stated in the Common Chapter, "Given existing Subbasin data gaps and uncertainties associated with the data used to develop the water budgets and this estimate, it was also decided that a +/- 10% factor should be applied to determine a range for the Upper Aquifer sustainable yield value. The +/- 10% factor is applied based on the percentage difference between the values from change in storage Subbasin contour mapping for the historic water budget period and the reported changes in storage from the Subbasin consolidated historic water budgets (WY2003-2012) for the Upper Aquifer."[83] However, at a Subbasin scale, the Common Chapter did not clarify what the "data gaps and uncertainties associated with the data used" were and did not further explain why the 10 percent factor was chosen. Additionally, Technical Memorandum #3 states, "[t]he distribution of known lower aquifer water level data and extraction volume data are limited and not sufficient to allow for a calculation of lower aquifer sustainable yield."[84]

The following briefly describes the process for developing sustainable yield estimates in the respective GSP areas:

- *Aliso GSP*: "The sustainable yield for the AWD GSA upper aquifer was calculated as the sum of the average pumping in the upper aquifer and the average change in storage calculated using the specific yield method."[85] The Aliso GSP does not differentiate between the Upper Aquifer and Lower Aquifer when calculating sustainable yield because "the GSP area has a significant number of composite wells which draw water from both the upper and lower aquifers" and the GSA considers the two principal aquifers to "act as a single system." The sustainable yield for the Aliso GSP area is estimated to be 83,600 AFY.
- *Farmers GSP*: "Based on the projected water budget analysis, FWD will be sustainably pumping groundwater at an average annual rate of 9,200 AFY. This value is intended to represent a long-term average and not an annual maximum."[86]

[82] SJREC GSP, Section 3.1.1, p. 120.
[83] Aliso GSP, Common Chapter, Section 4.3.4, p. 415.
[84] Aliso GSP, Technical Memorandum #3, p. 531.
[85] Aliso GSP, Section 3.3.3.2, pp. 85-86.
[86] Farmers GSP, Section 3.3.3, p. 122.

- *Fresno County GSP*: There is no sustainable yield established for the Fresno County GSP area, only for the entire Subbasin.[87]

- *Grassland GSP*: A sustainable yield for the GSP area is not defined for either the Upper Aquifer or the Lower Aquifer.[88] Section 3.3.3.2 of the GSP states, "The Plan Area does minimal pumping on a per-acre basis, and undesirable results have not been observed. It is unknown whether increases in pumping will affect the groundwater storage volume or cause undesirable results. Because of the lack of understanding regarding how pumping affects the aquifer, calculating sustainable yield can be complicated."

- *Northern and Central GSP*: There is no sustainable yield established for the North and Central GSP area, only for the entire Subbasin.[89]

- *SJREC GSP*: A sustainable yield of 189,000 AFY (with a one-year sustainable yield of at least 268,000 AFY) has been calculated for the Upper Aquifer. The Lower Aquifer sustainable yield is "primarily driven by avoiding an Undesirable Result for land subsidence."[90]

Additional Coordination Components

In addition to water budget, change in groundwater storage, and sustainable yield, Water Code Section 10727.6 requires the following additional components to use the same data and methodologies when developing a Plan. As summarized below, these components also do not appear to use the same data and methodologies, or the Plan lacks sufficient explanation of how or why these various approaches should be considered as using the same data or methodologies.

Groundwater Elevation Data

General statements in the Technical Memoranda indicate groundwater elevation data would use information provided by local agencies, State and federal sources, and rely upon best management practices and/or best modeled or projected data available; however, few details were provided to explain what those sources were.[91] Most details were spread throughout the six GSPs in an uncoordinated manner.[92] Some GSP areas plan to measure groundwater elevations to the nearest 0.01 foot while others state elevations will be measured to the nearest 1.0 foot. Some of the GSPs state that measuring to the nearest 0.1 foot or 0.01 foot is not feasible for most measurement

[87] Fresno County GSP, Section 3.3.5, p. 137.
[88] Grassland GSP, Section 3.3.3.2, p. 145.
[89] North and Central GSP, Section 5.4.11, pp. 449-450.
[90] SJREC GSP, Sections 3.1.1 and 3.1.2, pp. 120-121.
[91] Aliso GSP, Technical Memorandum #1, pp. 514-524, Technical Memorandum #5, pp. 534-535, Technical Memorandum #6, pp. 536-538.
[92] Aliso GSP, Section 5.1, p. 136, Section 5.2, pp. 159-160; Farmers GSP, Section 4.6.2.1, p. 158; Grassland GSP, Section 5.3, p. 211; Northern and Central GSP, Section 7.2.5.1.2, pp. 551-553; SJREC GSP, Section 3.5.2, p. 135, Appendix N, p. 1152.

methodologies, which is not an accurate statement. The GSP Regulations require measuring groundwater elevations to an accuracy of at least 0.1 feet.[93]

Groundwater Extraction Data

Technical Memorandum #1 states, "Extraction data were estimated or measured by local GSAs for use in the development of individual GSPs. Groundwater extraction volumes used for the Delta-Mendota Subbasin water budgets were compiled from the six individual GSP water budgets."[94] Other than stating groundwater extraction data were estimated or measured by local GSAs for use in individual GSPs, no other organized effort to describe this coordination requirement was provided in the Common Chapter – information was found throughout the six GSPs covering the Subbasin.[95] As presented in the six GSPs, groundwater extraction data was estimated using cropping data, recorded by meters, was "well documented" using land use and climatic data, compiled and estimated through model output, or was voluntarily reported by others. Few details, if any, were found in the six GSPs that describe the coordinated extraction data collection methodology and how it will be applied comparably throughout the Subbasin's groundwater sustainability program.

Surface Water Supply

Technical Memorandum #1 states, "Surface Water Supply allocations, deliveries, imports, and projected supplies were provided or estimated by local GSAs for use in the development of individual GSPs. Applied surface water volumes used for the Delta-Mendota Subbasin water budgets were compiled from the six individual GSP water budgets."[96] Surface water supply and the methods used to quantify that supply is provided using modeling assumptions, landowner reported data, and other methodology. Few details, if any, were found in the six GSPs that describe the coordinated surface water supply data collection methodology, other than using a "sum-of-the-parts" water budgeting approach.[97]

Total Water Use

Historical, current, and projected water budgets for land surface and groundwater are provided in tables CC-8 through CC-13 of the Common Chapter; however, total water use is not provided for the Subbasin.[98] Technical Memorandum #1 states, "Total Water Use

[93] 23 CCR § 352.4(a)(3).
[94] Aliso GSP, Technical Memorandum #1, p. 517.
[95] Aliso GSP, Section 3.3.2.4.1, p. 83, Section 3.3.2.1.5, p. 72; Farmers GSP, Section 3.3.1.2.2, p. 121; Fresno County GSP, Section 3.3.3.2, p. 136; Grassland GSP, Section 3.3.2.1, p. 137; Northern and Central GSP, Appendix D, p. 11 (Appendix D available on the SGMA Portal); SJREC GSP, Section 2.1.2, p. 60, Section 2.2.3.1, p. 81.
[96] Aliso GSP, Technical Memorandum #1, p. 517.
[97] Aliso GSP, Section 3.3.2.1.1, p. 70; Farmers GSP, Section 3.3.1.1.1, p. 119; Fresno County GSP, Section 3.3.2.1, pp. 134-135; Grassland GSP, Section 3.3.2.1, p. 136; Northern and Central GSP, Appendix D, p. 10 (Appendix D available on the SGMA Portal); SJREC GSP, Section 2.2.3.1, p. 81.
[98] Aliso GSP, Common Chapter, Tables CC-8 through CC-13, pp. 408-413.

was estimated or measured by local GSAs for use in the development of individual GSPs. Total water use included in the Delta-Mendota Subbasin water budgets was compiled from the individual GSP water budgets."[99] Total inflows and total outflows are presented on the tables, but not total water use. [100]

3.1.3 Corrective Action

The Common Chapter and the Technical Memoranda do not provide sufficient explanation to confirm that the GSPs have been developed using the same data and methodologies and that elements of the GSPs have been based upon consistent interpretations of the Subbasin's setting. As presented, the GSPs use different data and different methodologies that rely upon multiple versions of the Subbasin setting, with many of the GSPs defining their own version of a hydrogeological conceptual model, often for very small areas of the Subbasin. The 23 GSAs developing the six GSPs should provide supporting information that is sufficiently detailed and provide explanations that are sufficiently thorough and reasonable to explain how the various components of each GSP will together achieve the Subbasin's common sustainability goal. The explanation should describe how the sustainable management criteria established for each GSP (including the management areas if applicable) relate to each other and how they are collectively informed by the basin setting, including the water budget, change in groundwater storage, and sustainable yield, on the Subbasin-wide level.

3.2 Deficiency 2. The GSPs have not established common definitions of undesirable results in the Subbasin.

3.2.1 Background

Section 354.26 of the GSP Regulations states that GSAs shall describe the processes and criteria relied upon to define undesirable results *applicable to the basin* and that undesirable results in a basin occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions *occurring throughout the basin*. The description of undesirable results applicable to the basin shall include the following:[101]

- The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results.
- The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator.

[99] Aliso GSP, Technical Memorandum #1, p. 517.
[100] Aliso GSP, Section 3.3.4.2, Table 3-7, p. 90; Farmers GSP, Executive Summary, p. 21, Section 3.3.4, pp. 122-128; Fresno County GSP, Tables 3-7 and 3-8, pp. 142-143; Grassland GSP, Section 3.3.4.2, Table 3-6, pp. 149-150; Northern and Central GSP, Section 5.4.6, through 5.4.10, pp. 412-449; SJREC GSP, Section 2.2.3, pp. 77-112, Section 2.2.4, pp. 113-119.
[101] 23 CCR § 354.26(b)(1), 354.26(b)(2), 354.26(b)(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.

The definition of sustainable yield in a basin is directly tied to undesirable results. As established in SGMA, sustainable yield means the maximum quantity of water, calculated over a base period representative of long-term conditions in a basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result.[102]

3.2.2 Deficiency Details

Because each of the six GSPs prepared in the Subbasin defined its own sustainable management criteria, each applicable sustainability indicator has up to six different definitions of what are considered significant and unreasonable conditions. While this approach was agreed upon by the 23 GSAs in the Subbasin using the required Coordination Agreement, by approaching the sustainability indicators in such an individualistic and isolated manner, Department staff do not believe that the Plan satisfies the SGMA requirement to the use of same data and methodologies.[103] Department staff also believe that this approach does not achieve a coordinated Plan for the Subbasin, and that this approach fragments the Department's ability to track sustainable conditions that are common throughout the Subbasin.

Sustainable management criteria are discussed in Section 5 of the Common Chapter and in Technical Memorandum #4.[104] Section 5 "*describes the coordinated sustainability goal and definition of undesirable results at a subbasin-level and the sustainable management criteria at a GSP-level*." Technical Memorandum #4 acknowledges that "*definitions of undesirable results must be provided at the Subbasin level*." A broad, generic definition of undesirable results was developed for the entire Subbasin, but the various GSAs responsible for each GSP further defined what they considered "significant and unreasonable." This process has resulted in setting different thresholds with different metrics and establishing a wide range of measurable objectives, if at all, often for very small portions of the Subbasin that do not seem to align with adjacent areas governed by other GSPs. Department staff find that this fragmented approach towards establishing separate criteria that define sustainable conditions in various parts of the Subbasin does not meet the intent of SGMA or the requirements of the GSP Regulations.

The following is what was agreed upon in the Subbasin to define undesirable results for each of the six sustainability indicators (main bullet), with multiple definitions of what each GSP group considers to be significant and unreasonable (sub-bullet); this information is presented in tables CC-14 through CC-18 in the Common Chapter.[105] As shown, each sustainability indicator has up to six different definitions of what is considered significant

[102] Water Code § 10721(w).
[103] 23 CCR § 357.4(a).
[104] Aliso GSP, Common Chapter, Section 5, pp. 418-429, Technical Memorandum #4, pp. 532-533.
[105] Aliso GSP, Common Chapter, Section 5.4, Tables CC-14 through CC-18, pp. 420-429.

and unreasonable in the Subbasin, which makes tracking basinwide SGMA implementation and sustainability challenging for Department staff, interested parties, and the beneficial uses and users of groundwater located throughout the Subbasin. Additionally, while each of the six GSPs provided some general discussion related to how the beneficial uses and users of groundwater were considered when setting sustainable management criteria, the individual GSPs were generally concerned with only those beneficial uses and users located within the respective GSP areas and not those collectively located throughout the Subbasin.

- **Chronic lowering of groundwater levels**: *Significant and unreasonable chronic change in water levels, as defined by each GSP Group, that has an impact on the beneficial users of groundwater in the Subbasin through either intra- and/or inter-basin actions*.

    - A wide range of definitions of significant and unreasonable conditions related to groundwater levels were established throughout the Subbasin depending on GSP coverage.[106] For instance, the **Aliso GSP** states its GSP area is not experiencing significant and unreasonable effects associated with water levels or storage and has linked minimum thresholds with rates of subsidence while setting groundwater level thresholds to provide a 100-foot buffer from the top of the Corcoran Clay.[107] The **Farmers GSP** and the **Fresno County GSP** define groundwater levels dropping below historical lows (2015-2016) as significant and unreasonable.[108] The **Grassland GSP** defines significant and unreasonable as the "lowering of groundwater levels that would lead to increased costs associated with higher total lift, lowering pumps, need to drill deeper wells or costs securing alternative water sources."[109] The **Northern and Central GSP** indicates a significant and unreasonable condition would be " dropping below the Minimum Threshold criteria at 40% of representative monitoring locations concurrently over a given water year resulting in shallow domestic wells going dry in the same subregion as the representative monitoring points in violation, higher pumping costs, and/or the need to modify wells to obtain groundwater."[110] And the **SJREC GSP** states, "The San Joaquin River Exchange Contractors (SJREC) GSP Group has a positive impact on the aquifer and is unlikely to cause Significant and/or Unreasonable lowering of groundwater levels. Triggers have been established to recover aquifer water levels before nearing an Undesirable Result. Currently, an approximation of 25% below historic low for each management area is used

[106] Aliso GSP, Common Chapter, Table CC-14, pp. 420-421.
[107] Aliso GSP, Table 4-1, p. 100.
[108] Farmers GSP, Table 4-6, p. 146; Fresno County GSP, Table 4-6, p. 167.
[109] Grassland GSP, Table 4-5, p. 171.
[110] Northern and Central GSP, Tables 6-1 and 6-2, pp. 477 and 478.

to indicate an Undesirable Result which will be refined based on annual updates and integration with other GSP Groups."[111]

- **Reduction in groundwater storage**: *Significant and unreasonable chronic decrease in groundwater storage, as defined by each GSP Group, that has an impact on the beneficial users of groundwater in the Subbasin through either intra- and/or inter-basin actions*.

    - A wide range of significant and unreasonable definitions related to groundwater storage were established throughout the Subbasin.[112] The **Aliso GSP** has defined significant and unreasonable conditions of chronic reduction in groundwater storage in the same manner as it did for groundwater elevations. The **Farmers GSP** and the **Fresno County GSP** have identified depletion of storage greater than the 2012-2016 period as significant and unreasonable. For the **Grassland GSP**, significant and unreasonable groundwater storage is defined as "insufficient water storage to develop necessary water to maintain critical habitat. Reduction in storage would lead to increased costs associated with higher total lift, lowering pumps, need to drill deeper wells or costs securing alternative water sources. Impacts to habitat would require mitigation, including alternative water supplies and habitat restoration." In the **Northern and Central GSP**, no definition is provided, other than the following statement: "If water levels are managed to meet the Minimum Thresholds, the Northern & Central Delta-Mendota Region GSP Group does not anticipate long-term reductions in storage." The **SJREC GSP** takes a similar approach towards defining significant and unreasonable conditions of groundwater storage as it does groundwater levels, stating that its GSP has a positive impact on the aquifer.

- **Seawater Intrusion**: Determined not applicable to the Subbasin.

- **Degraded water quality**: *Significant and unreasonable degradation of groundwater quality, as defined by each GSP Group, that has an impact on the beneficial users of groundwater in the Subbasin through either intra- and/or inter-basin actions and/or activities*.

    - A wide range of significant and unreasonable definitions related to the degradation of water quality were applied throughout the Subbasin.[113] The **Aliso GSP** states, "Significant and unreasonable is defined as a reduction in crop production due to water quality issues and if 30% of the wells exceed the minimum threshold value on a 4-year consecutive average without treatment." The **Farmers GSP**, which has two management areas, provides the following: "(1) Continued migration of the Steffens plume (elevated Total

[111] SJREC GSP, Section 3.3.1, pp. 122-125.
[112] Aliso GSP, Common Chapter, Table CC-15, pp. 422-423.
[113] Aliso GSP, Common Chapter, Table CC-16, pp. 424-425.

dissolved solids [TDS]) in Upper Aquifer both within Management Area A and towards Farmers Water District. (2) Unreasonable rates of migration of groundwater in the Upper Aquifer with naturally-occurring elevated concentrations of total dissolved solids in Management Area B. (3) Potential effects on the beneficial uses of groundwater include agricultural and domestic uses. (4) Degraded water quality in the Fresno Slough effect [sic] beneficial users of surface water." The **Fresno County GSP**, which also has two management areas, indicates that the following would be considered significant and unreasonable: "(1) Impairment of groundwater quality from the migration of the Steffens Plume from Fresno County's Management Area A. Impacts from the Steffens plume impacts Farmers Water District's ability to utilize groundwater for adjacent use and discharge into the Mendota Pool. (2) Potential effects on the beneficial users of groundwater include water quality levels that impact crops and drinking water standards for domestic uses. (3) Degraded water quality in the Fresno Slough effecting beneficial users of surface water." In the **Grassland GSP**, significant and unreasonable is described as "Degradation of groundwater quality resulting in reduced ability to develop and manage groundwater for habitat productivity." The **Northern and Central GSP** applies the following, "(1) Exceedance of maximum contaminant levels (MCLs) or water quality objectives (WQOs) for irrigation in public water systems for three (3) consecutive sampling events in non- drought years or the additional degradation of current groundwater quality where current groundwater quality exceeds the MCLs or WQOs for irrigation. (2) Water quality degradation due to recharge projects that exceeds 20% of the aquifer's assimilative capacity for one or more constituents without justification of a greater public benefit achieved." And the **SJREC GSP** defines significant and unreasonable as, "[m]igration of contamination plume that makes the water unusable for beneficial use"; however, beneficial use is not expressly defined when establishing significant and unreasonable conditions.

- **Land subsidence**: *Changes in ground surface elevation that cause damage to critical infrastructure that would cause significant and unreasonable reductions of conveyance capacity, damage to personal property, impacts to natural resources or create conditions that threaten public health and safety*.
    - The **Aliso GSP** states, "Aliso is not currently experiencing any significant and unreasonable effects of subsidence. Significant and unreasonable impacts are assumed to occur when the levees within the District have subsided to an elevation causing impacts to the water carrying capacity of the San Joaquin River and Chowchilla Bypass beyond their design flow rates, causing significant and unreasonable flooding or crop damage."[114] In

[114] Aliso GSP, Common Chapter, Table CC-17, p. 426-427.

the **Farmers GSP**, significant and unreasonable is defined as "Damage to infrastructure and loss of conveyance capacity in neighboring Groundwater Sustainability Agencies" and in the **Fresno County GSP** it is defined as "Damage to infrastructure, loss of conveyance capacity, and potential inability to flood or drain by gravity and associated habitat impacts." The **Grassland GSP** considers "Damage to infrastructure, permanent loss of conveyance capacity beyond mitigation, and potential inability to flood or drain by gravity and associated habitat impacts" to be a significant and unreasonable condition. The definition applied by the **Northern and Central GSP** in the WSID-TID management area is: "Impacts to laterals from differential settlement that reduces the ability to deliver surface water supplies" and in the TRID management area "Inadequate freeboard on levee system in wet years as a result of significant additional land subsidence resulting from groundwater extractions." In the remaining Northern and Central GSP area, significant and unreasonable is defined as, "Increases in 2014-2016 subsidence rates due to groundwater pumping in two or more subregions that results in 50% loss of standup capacity and/or 75% overtopping of lining in the Delta-Mendota Canal as a result of inelastic land subsidence." In the **SJREC GSP**, "Reduction in the conveyance capacity for water distribution and/or damage to critical infrastructure" is considered significant and unreasonable.

- **Depletions of interconnected surface water**: *Depletions of interconnected surface water, as defined by each GSP Group, that have significant and unreasonable adverse impacts on the beneficial uses of surface water*.
    - The **Aliso GSP** does not consider the depletion of interconnected surface water to be applicable to its area, but states, "A significant and unreasonable result would be a reduction in water availability to downstream beneficial users beyond what was experienced in similar water years in recent history as a result of groundwater extractions."[115] The **Farmers GSP** considers the following to constitute a significant and unreasonable condition, "(1) San Joaquin River Restoration Project (SJRRP) operations and groundwater extractions from the Upper Aquifer that will influence stream depletion along San Joaquin River; (2) Water level measurements along the San Joaquin River in the shallow zone of the Upper Aquifer to determine degree of vertical gradient; (3) Potential degradation to groundwater dependent ecosystems (GDEs) along San Joaquin River primarily dependent on SJRRP operations of San Joaquin River flows since groundwater pumping expected to remain stable and consistent with historical (pre-SJRRP) levels." The **Fresno County GSP** has applied the following definition, "Decrease in surface water stage in

[115] Aliso GSP, Common Chapter, Table CC-18, p. 428-429.

> Mendota Pool from Bureau of Reclamation and Central California Irrigation District (CCID) operations that impact groundwater dependent ecosystems (GDEs) and operations in Mendota Wildlife Area." The **Grassland GSP** states groundwater pumping does not influence surface water depletion but defines a significant and unreasonable undesirable result to be impaired habitat directly associated with interconnected surface waters." The **Northern and Central GSP** has not defined what a significant and unreasonable condition related to depletions of interconnected surface water would be, and the **SJREC GSP** states, "When groundwater extraction directly decreases streamflow in losing stretch of the San Joaquin River."

As demonstrated by the review of each specific GSP's definition of undesirable results, the Plan, while purporting to be coordinated, actually presents a very complicated and disparate range of definitions for what constitutes an undesirable result for each category, such that whether or not something is considered an undesirable result depends on where in the Subbasin the condition is occurring and the definition applicable to that location. Department staff find that this methodology does not conform to the requirement of Water Code Section 10727.6 that individual plans utilize the same data and methodologies for the assumed sustainable yield in developing a basin's Plan.

3.2.3 Corrective Action

The GSAs in the Subbasin should modify each of their respective GSPs, as well as any applicable coordination materials, to substantially comply with the GSP Regulations and define undesirable results in a manner that addresses groundwater conditions occurring throughout the Subbasin, not for only the small portion of the Subbasin represented by the respective GSPs. One way for this deficiency to be remedied is for each of the six separate GSPs to use the same quantitative minimum thresholds, or the same methodology to develop the thresholds, and explicit criteria for undesirable results. Alternatively, if the GSAs believe it is not possible, or for some other reason still desire to use different definitions and metrics for undesirable results within each of the Subbasin's six GSP areas, the Plan must specifically explain how any differences do not affect the requirement to utilize the same data and methodologies for the assumed sustainable yield of the Subbasin. Additionally, if a GSP determines that a sustainability indicator is not applicable within the defined GSP area, then that information must be supported by the best available information and best available science.

3.3 Deficiency 3. The GSPs in the Subbasin have not set sustainable management criteria in accordance with the GSP Regulations.

3.3.1 Background

The GSP Regulations, in Subarticle 3, describe criteria by which a GSA defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the GSA, or GSAs, shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable

sustainability indicator.[116] The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.[117] Additionally, each GSA shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin, which occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.[118] Finally, each GSA in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.[119] Minimum thresholds for each sustainability indicator shall be defined as follows:[120]

- The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results.
- The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results.
- The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results. Note that this sustainability indicator is not applicable to the Subbasin.
- The minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the GSA that may lead to undesirable results.
- The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results.
- The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has

[116] 23 CCR § 354.22.
[117] 23 CCR § 354.24.
[118] 23 CCR § 354.26.
[119] 23 CCR § 354.28(a).
[120] 23 CCR § 354.28(b).

adverse impacts on beneficial uses of the surface water and may lead to undesirable results.

3.3.2 Deficiency Details

Coordinated sustainable management criteria are briefly discussed in Section 5 of the Common Plan and in Technical Memorandum #4.[121] The following summarizes the deficiencies associated with the approaches taken to define the Subbasin's sustainability goal, undesirable results, and minimum thresholds.

Sustainability Goal

Section 5.2 of the Common Chapter states, "The sustainability goal for the Delta-Mendota Subbasin was established to succinctly state the objectives and desired conditions of the Subbasin that culminates in the absence of undesirable results by 2040."[122] The sustainability goal for the Subbasin is:

> *The Delta-Mendota Subbasin will manage groundwater resources for the benefit of all users of groundwater in a manner that allows for operational flexibility, ensures resource availability under drought conditions, and does not negatively impact surface water diversion and conveyance and delivery capabilities. This goal will be achieved through the implementation of the proposed projects and management actions to reach identified measurable objectives and milestones through the implementation of the GSP(s), and through continued coordination with neighboring subbasins to ensure the absence of undesirable results by 2040.*

While this is the agreed upon sustainability goal for the Subbasin, each of the six GSPs includes its own version of what its GSP-area goal is and does not correlate those goals with the Subbasin's sustainable yield.[123] As indicated in the GSP Regulations, the Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.[124] The Common Chapter does not provide any of this required information, but instead references the individual GSPs which present this information in a manner that is not sufficiently detailed nor coordinated. The individual GSPs also do not include supporting information that is sufficiently detailed, but instead provide statements, for example, that the GSP areas have "a significant amount of flexibility in defining and implementing Sustainable Management Criteria in the absence of undesirable results."[125]

[121] Aliso GSP, Common Chapter, Section 5, pp. 418-429, Technical Memorandum #4, pp. 532-533.
[122] Aliso GSP, Common Chapter, Section 5.2, pp. 418-419.
[123] Aliso GSP, Section 4.1, pp. 97-98; Farmers GSP, Section 4.1, p. 138; Fresno County GSP, Section 4.1, p. 159; Grassland GSP, Section 4.1, pp. 156-157; Northern and Central GSP, Section 6.2, pp. 470-471; SJREC GSP, Section 3.1, p. 120.
[124] 23 CCR § 354.24.
[125] Grassland GSP, Section 4.1, pp. 156-157.

Like the Subbasin's definition of undesirable results, which has up to six different GSP definitions of what is considered a significant and unreasonable condition, the Subbasin appears to have multiple definitions of its sustainability goal depending upon which GSP is referenced.

Undesirable Results

The details associated with this insufficient aspect of the Plan's sustainable management criteria are presented in the discussion for Deficiency #2. As previously stated, each of the six GSPs prepared in the Subbasin defined its own sustainable management criteria and each sustainability indicator has up to six different definitions of what are considered significant and unreasonable conditions.[126] While this approach was agreed upon by the 23 GSAs in the Subbasin using the required coordination agreement, by approaching the sustainability indicators in such an individualistic and isolated manner, Department staff do not believe that the Plan satisfies the SGMA requirement to use the same data and methodologies.[127] Department staff also believe that this approach does not achieve a coordinated Plan for the Subbasin, and this approach fragments the Department's ability to track sustainable conditions that are common throughout the Subbasin.

As demonstrated by the review of each specific GSP's definition of undesirable results, the Plan, while purporting to be coordinated, actually presents a very complicated and disparate range of definitions for what constitutes an undesirable result for each category, such that whether or not something is considered an undesirable result depends on where in the Subbasin the condition is occurring. Department staff find that this methodology does not conform to the requirement of Water Code Section 10727.6 that individual plans utilize the same data and methodologies for the assumed sustainable yield in developing a Plan.

Minimum Thresholds and Measurable Objectives

The establishment of minimum thresholds and measurable objectives in the Subbasin are not coordinated, nor are they supported by information that is sufficiently detailed. Section 5.3 of the Common Chapter simply states, "For more information on the development of the sustainable management criteria and information used to support the established sustainable management criteria for the individual GSP Groups, refer to the individual GSPs. Each GSP Group defined what is considered significant and unreasonable in their Plan Area for each applicable sustainability indicators, in addition to establishing minimum thresholds, measurable objectives and 5-year interim goals for their Plan Area."[128] Section 5.4 of the Common Chapter provides, in Tables CC-14 through CC-18,[129] a summary of the Subbasin-wide definition of an undesirable result, GSP-level definition of significant and unreasonable, sustainability goals, 5-year interim goals, minimum

[126] Aliso GSP, Common Chapter, Tables CC-14 through CC-18, pp. 420-429.
[127] Water Code § 10727.6; 23 CCR § 357.4(a).
[128] Aliso GSP, Common Chapter, Section 5.3, p. 419.
[129] Aliso GSP, Common Chapter, Tables CC-14 through CC-18, pp. 420-429.

thresholds, and measurable objectives. However, as shown in the tables, each GSP generally contains a wide variety of what are considered significant and unreasonable conditions, sets different interim goals, minimum thresholds, and measurable objectives, often with different units of measurement, or determines that a particular sustainability indicator is not applicable to its GSP area without providing sufficient justification. Below is a summary of what the minimum thresholds are for each of the five applicable sustainability indicators – note that some of the GSPs have determined that relevant sustainability indicators are not applicable and have not set thresholds or objectives.

- Chronic lowering of groundwater levels: Table CC-14 in the Common Chapter summarizes sustainable management criteria for groundwater levels.[130]
    - The Aliso GSP has set its minimum thresholds in four wells to provide a 100-foot buffer from the top of the Corcoran Clay to the top of the water table.[131] However, some of the wells used in the Aliso GSP to monitor groundwater levels are composite wells screened through the Corcoran Clay which cannot provide an accurate indication of Upper Aquifer and Lower Aquifer conditions. The Aliso GSP assumes, differently than the other GSPs, that the Upper and Lower aquifers function as "one aquifer." Additionally, the definition of significant and unreasonable is linked to accelerated rates of subsidence which is stated to occur "if 30% of the wells in the monitoring zone exceed the minimum threshold value on a 4-year consecutive average under normal or average year conditions,"[132] which needs further explanation to understand how or why this threshold was selected and precisely how it will be applied.
    - The Farmers GSP and the Fresno County GSP have identified seasonal highs and seasonable lows in units of feet below ground surface (ft bgs) in the Common Chapter, indicating that an undesirable result would be exceeding historic lows from 2015-2016, but the details in the respective GSPs present different descriptions, such as elevation declines observed between 2011-2016, and threshold metrics are shown as an elevation not feet below ground surface.[133]
    - The Grassland GSP defines its water level thresholds to "not exceed a 20% lowered water elevation from the recent historical low set uniquely at each representative monitoring site. Recent Historical is defined as the period from 2000 to the present." Some of the monitoring wells in the Grassland GSP do not have any historical data.[134]

[130] Aliso GSP, Common Chapter, Table CC-14, pp. 420-421.
[131] Aliso GSP, Table 4-2, p. 111.
[132] Aliso GSP, Common Chapter, Table CC-14, p. 420.
[133] Farmers GSP, Section 4.3.1, pp. 145-147; Fresno County GSP, Section 4.3.1, pp. 167-169.
[134] Grassland GSP, Table 4-5, p. 171.

- For the Northern and Central GSP, minimum thresholds are set at the hydrologic low for wells perforated in the Upper Aquifer and 95 percent of the hydrologic low for the Lower Aquifer, but an undesirable result would not occur until 40 percent of monitoring locations exceed thresholds (7 out of 17 wells in the Upper Aquifer and/or 8 out of 18 wells in the Lower Aquifer).[135] If these conditions were to occur, the GSP anticipates that shallow domestic wells would go dry and/or these conditions would result in higher pumping costs and/or the need to modify wells to obtain groundwater.
- And in the SJREC GSP, trigger levels have been established in each of the 11 management areas, which if exceeded, would not allow groundwater to be transferred out of the management area, but would not limit the extraction and application of groundwater on the overlying land. The minimum threshold represents a 25 percent increase in the depth to water than the trigger water surface elevation.[136]

- Reduction in groundwater storage: Table CC-15 in the Common chapter summarizes sustainable management criteria for groundwater storage.[137]
  - The Aliso GSP has set minimum thresholds for reduction of groundwater storage just as it has for chronic lowering of groundwater levels – the GSP is using groundwater levels as a proxy and ties undesirable results with rates of subsidence.[138]
  - The minimum thresholds set in the Farmers GSP do not match what is presented in the Common Chapter.[139] The Farmers GSP states annual change in storage will be estimated based on changes observed between seasonal high contours and indicates the threshold for total storage change in the Upper Aquifer is 11,000 acre-feet and 4,400 acre-feet in the Lower Aquifer – the Common Chapter indicates 12,000 acre-feet and 4,600 acre-feet, respectively, but over an extended dry period.
  - The Fresno County GSP takes a similar approach as the Farmers GSP, and the thresholds presented in the GSP do not match the Common Chapter.[140] The Fresno County GSP indicates the threshold for total storage change in the Upper Aquifer is 110,000 acre-feet and 38,000 acre-feet in the Lower Aquifer – the Common Chapter indicates 90,000 acre-feet and 55,000 acre-feet, respectively, but over an extended dry period.

[135] Northern and Central GSP, Sections 6.3.1.1.2 and 6.3.1.2, pp. 472-474.
[136] SJREC GSP, Section 3.3, pp. 122-125.
[137] Aliso GSP, Common Chapter, Table CC-15, pp. 422-423.
[138] Aliso GSP, Section 4.4.1.1, pp. 111-113.
[139] Farmers GSP, Section 4.3.2, pp. 147-148, Common Chapter, Table CC-15, p. 345.
[140] Fresno County GSP, Section 4.3.2, pp. 169-170, Common Chapter Table CC-15, p. 384.

- The Grassland GSP uses groundwater levels as a proxy to determine change in storge and applies a "20% lowered water elevation from recent historic low" as its minimum threshold (recent historical is the period 2000 to present).[141]
- The Northern and Central GSP uses groundwater elevations as a proxy for groundwater storage.[142]
- The SJREC GSP uses groundwater elevations as a proxy for groundwater storage.[143]

- Degraded water quality: Table CC-16 in the Common Chapter summarizes sustainable management criteria for degraded water quality.[144]
  - In the Aliso GSP minimum thresholds have been set for electrical conductivity (4.5 dS/m), chloride (13.3 meq/L), and nitrate as nitrogen (30 mg/L) following Food and Agriculture Organization guidelines. None of the monitoring wells within the Aliso GSP area have historical or current water quality information attributed to them.[145]
  - The Common Chapter indicates the Farmers GSP, which has created a water quality management area due to the Steffens Plume, has established "an annual rate of degradation of 60 mg/L total dissolved solids (TDS) for the saline front" but the Farmers GSP states the minimum threshold was set "at a slightly higher value than historic high TDS to maintain agricultural practices".[146] The threshold set in five wells is 1,200 mg/L for TDS – the Farmers GSP acknowledges that the EPA secondary standard for TDS in drinking water is 500 mg/L, but states it is a non-enforceable guideline.
  - The minimum thresholds for degraded water quality in the Fresno County GSP "were set by two different methods depending on the cause of degraded groundwater. Wells along the west side of the Fresno Sough affected by naturally occurring saline water had values set based on the maximum annual change in TDS concentration, and wells in areas where groundwater quality is affected by the Steffens Plume were set at a fixed concentration of TDS."[147] The Common Chapter indicates the minimum threshold for TDS is 1,100 mg/L, which is different than what the Fresno County GSP presents.[148]

[141] Grassland GSP, Section 4.4.1, pp. 170-173.
[142] Northern and Central GSP, Section 6.3.2, pp. 480-482.
[143] SJREC GSP, Section 3.3.2, p. 126.
[144] Aliso GSP, Common Chapter, Table CC-16, pp. 424-425.
[145] Aliso GSP, Table 4-6, p. 134.
[146] Farmers GSP, Section 4.3.4, pp. 149-150.
[147] Fresno County GSP, Section 4.3.4.1, pp. 171-172.
[148] Fresno County GSP, Common Chapter, Table CC-16, p. 386.

- The Grassland GSP states, "The minimum threshold for water quality is set to a TDS measurement of 2500 mg/L for all representative monitoring wells in both the Upper Aquifer and Lower Aquifer."[149]
- In the Northern and Central GSP, minimum thresholds for water quality "are set as the upper Secondary MCL for TDS (1,000 mg/L), the Primary MCL for nitrate (10 mg/L as N), and the agricultural WQO for irrigation for boron (0.7 mg/L) or current groundwater quality as of December 2018 for both the Upper Aquifer and Lower Aquifer if the listed MCL or WQO is already exceeded." [150] Minimum thresholds assigned to the Upper Aquifer and Lower Aquifer in the Northern and Central GSP are shown in Tables 6-5 and 6-6, respectively, and thresholds for TDS range from 1,000 mg/L to 4,000 mg/L.
- And in the SJREC GSP, the minimum threshold is simply defined as the amount of poor-quality groundwater that is greater than what can be successfully managed through the management actions.

- Land subsidence: Table CC-17 in the Common Chapter summarizes sustainable management criteria for land subsidence.[151]
  - In the Aliso GSP, the minimum threshold is based on the average rate of subsidence observed by the San Joaquin River Restoration Program and the U.S. Bureau of Reclamation and is set at 0.2 feet per year, or a total of 4.0 feet of additional subsidence by 2040. However, Department staff note that this rate of subsidence is not projected to cease after 2040.[152]
  - The Farmers GSP states, "The minimum threshold was established as the maximum rate of subsidence or compaction that occurred during the historic groundwater period (2000-present)." [153] The minimum threshold at the Yearout site is 0.017 ft per year and 0.1 feet per year at site P304 – both representing rates for the Upper Aquifer only.
  - The Fresno County GSP is similar to the Farmers GSP – minimum thresholds for "were based on conditions observed during historic groundwater conditions. The MT was established as the maximum rate of subsidence or compaction that occurred during historic groundwater conditions. These values coincided with the greatest decline in groundwater elevation which occurred between the years of 2011 and 2016."[154] The

[149] Grassland GSP, Table 4-5, p. 171, Section 4.4.1.4, p. 175.
[150] Northern and Central GSP, Section 6.3.3.2, pp. 484-487.
[151] Aliso GSP, Common Chapter Table CC-17, pp. 426-427.
[152] Aliso GSP, Section 4.4.1.2, pp. 116-120, Appendix A, 246-248.
[153] Farmers GSP, Section 4.3.3, p. 148.
[154] Fresno County GSP, Section 4.3.3, pp. 170-171.

minimum threshold at the Fordel site is 0.011 ft per year and 0.1 feet per year at site P304.

- In the Grassland GSP the minimum threshold "is set to not exceed the historical annual average rate of subsidence from December 2011 to December 2015."[155] At subsidence monitoring points 108, 152 and 137 the minimum thresholds in feet per year are -0.11, -0.15 and -0.13, respectively.
- The Northern and Central GSP has subsidence management areas.[156] In the WSID-PID Management Area "the minimum threshold is set as the acceptable loss in distribution capacity as a result of subsidence resulting from groundwater pumping as based on future capacity study." In the TRID Management Area "the minimum threshold is set as four (4) feet additional subsidence compared to 2019 benchmark elevation." In the remaining GSP area, "The minimum threshold is set as target rate/goal by monitoring subregion, based on the average 2014-2016 elevation change from recent DMC surveys." Subsidence threshold rates are generally between -0.13 and -0.26 ft/year.
- And in the SJREC GSP, no numerical minimum thresholds are provided. The minimum threshold for land subsidence "shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Minimum thresholds shall be supported by maps and graphs showing the extent and rate of subsidence and the potential impact to land use and property interests."[157]

- Depletions of interconnected surface water: Table CC-18 in the Common Chapter summarizes sustainable management criteria for interconnected surface water.[158]
  - The Aliso GSP has not established sustainable management criteria for interconnected surface water because of an existing legal agreement, despite the GSP area being located adjacent to the San Joaquin River.[159]
  - The Farmers GSP acknowledged interaction between surface water and groundwater but set a minimum threshold as a gradient between two wells.[160]
  - The Fresno County GSP set its minimum threshold "based on the historic decline in stage values in the Mendota Pool and Fresno Slough. The historic average stage was set as the MO and the MT was determined from the average historic decline of 0.5 ft/year from the MO which corresponds with

[155] Grassland GSP, Table 4-5, p. 171.
[156] Northern and Central GSP, Section 6.3.5.2, pp. 494-496, Table 6-9, p. 499.
[157] SJREC GSP, Section 3.3.5, pp. 127-129.
[158] Aliso GSP, Common Chapter, Table CC-18, pp. 428-429.
[159] Aliso GSP, Section 4.3.7, p. 110.
[160] Farmers GSP, Section 3.2.8, p. 87, Section 4.3.5, pp. 151-152.

recent stage levels." The minimum threshold at the Mendota Pool Staff Gauge is 13 feet and the measurable objective is 14 feet.[161]

- The Grassland GSP proposes to use groundwater elevation as a proxy and states, "If a twenty percent or greater decrease from the recent historical (2000 to 2019) upper aquifer groundwater level lows are experienced or exceeded at more than fifty percent of the representative monitoring network wells for three consecutive years, then it can be assumed that significant and unreasonable undesirable results have occurred."[162]
- Sustainable management criteria for interconnected surface water have not been established for the Northern and Central GSP. The Northern and Central GSP states, "At the time of GSP development, there are insufficient data available to set numeric values for minimum thresholds for the depletions of interconnected surface water sustainability indicator in a manner that is not subjective. A qualitative statement of minimum thresholds has been developed in the interim for this sustainability indicator as follows: An X percent increase in surface water depletions along interconnected stretches of surface water as a result of groundwater pumping, where 'X' is the present increase in depletions to be determined from monitoring data collected between 2020 and 2025 and associated analyses of these data."[163]
- The SJREC GSP has not set numerical sustainable management criteria for interconnected surface water. The qualitative minimum threshold is, "Observed increase in seepage from the San Joaquin River due to groundwater extractions in the SJREC GSP Group area. The SJREC plan to work with the counties to restrict perforating wells above the first encountered restrictive clay layer (near the San Joaquin River) to prevent induced seepage similar to the established operations defined in the Herminghaus Agreement on Reach 2 of the San Joaquin River."[164]

3.3.3 Corrective Action

The GSAs in the Subbasin should adhere to Subarticle 3 of the GSP Regulations which describes sustainable management criteria. The Plan should explain the coordinated criteria by which the GSAs define conditions occurring throughout the Subbasin that constitute sustainable groundwater management, including the process or processes by which the GSAs characterize undesirable results, establish minimum thresholds, and set measurable objectives for each applicable sustainability indicator. Undesirable results should be coordinated and should define when significant and unreasonable effects for any of the sustainable indicators are caused by groundwater conditions occurring

[161] Fresno County GSP, Section 4.2.5, pp. 165-166, Section 4.3.5, pp. 174-176.
[162] Grassland GSP, Section 4.3.3, pp. 163-165, Table 4-5, p. 171.
[163] Northern and Central GSP, Section 6.3.6.2, p. 503.
[164] SJREC GSP, Section 3.3.6, p. 130.

throughout the Subbasin, not only in small GSP areas or even smaller management areas. The minimum thresholds must set numeric values that, if exceeded, may cause undesirable results, and must be defined in accordance with 23 CCR § 354.28(c). The supporting information must be sufficiently detailed and the analyses sufficiently thorough and reasonable, and any effort to disregard the applicability of a sustainability indicator in a GSP must be supported by the best available information and best available science. Additionally, if management areas will continue to be used throughout the Subbasin, the management areas must comply with 23 CCR § 354.20, as discussed in Deficiency #4.

3.4 Deficiency 4: The management areas established in the Plan have not sufficiently addressed the requirements specified in 23 CCR § 354.20.

3.4.1 Background

The term "management area" refers to an area within a basin for which a Plan may identify different minimum thresholds, measurable objectives, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors.[165] The use of management areas is optional in a Plan, and each GSA may define one or more management areas within a basin "if the GSA has determined that creation of management areas will facilitate implementation of the Plan. Management areas may define different minimum thresholds and may be operated to different measurable objectives than the basin at large, provided that undesirable results are defined consistently throughout the basin."[166] As previously discussed, undesirable results are not defined consistently throughout the Subbasin – each GSP group has defined differently what is considered significant and unreasonable for each of the applicable sustainability indicators, and each of the GSP groups have decided which areas of the Subbasin are subject to a range of established thresholds and measurable objectives.

If a GSA determines that the creation of management areas will help facilitate Plan implementation, the GSA must provide the following, while including descriptions, maps, and other information sufficient to describe the conditions in those areas:[167]

- The reason for the creation of each management area.
- 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.
- The level of monitoring and analysis appropriate for each management area.

[165] 23 CCR § 351(r).
[166] 23 CCR § 354.20(a).
[167] 23 CCR § 354.20(b).

- 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.

Additionally, if management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.[168]

3.4.2 Deficiency Details

This deficiency is related to the use of management areas in four of the six GSPs prepared for the Subbasin. There are a total of 17 management areas in the Subbasin.

Technical Memorandum #4 addresses the use of management areas with the following statement: "*The Coordination Committee left management areas and management of their respective GSPs to the six GSP Groups. Management areas were determined individually by each GSP Group with Woodard & Curran preparing a map showing all management areas ('sum of the parts' approach)*."[169] However, the map referenced was not part of the Technical Memoranda and could not be found as part of the Common Chapter – management area maps are only found in the respective GSPs. The following describes the use of management areas in each of the six GSPs prepared for the Subbasin:

- Aliso GSP: No management areas are being used.[170]
- Farmers GSP: Two management areas appear to be used. The Farmers GSP states, "FWD elected to become a management area for two of the five applicable sustainability indicators, Degraded Water Quality and Interconnected Surface Waters. A management area was created for these sustainability indicators due to their high sensitivity to the management actions of surrounding areas."[171] Without further explanation, it is uncertain why management areas were created in the Farmers GSP, particularly in light of the fact that the Farmers GSP area occupies such a small portion of the Subbasin (0.3 percent).
- Fresno County GSP: Two management areas appear to be used. The Fresno County GSP states, " FCMA elected to become a management area for two of the five applicable sustainability indicators, degraded water quality and Interconnected Surface Waters. A management area was created for degraded water quality due to the existing contamination and Regional Board regulatory requirements for the Steffens plume in MAA [Management Area A]. A management area for interconnected surface waters for MAB [Management Area B] was developed because levels in the Fresno Slough are managed by SJREC, SLDMWA and

[168] 23 CCR § 354.34(d).
[169] Aliso GSP, Technical Memorandum #4, pp. 532-533.
[170] Aliso GSP, Section 3.4, p. 96.
[171] Farmers GSP, Section 3.4, pp. 135-136.

USBR and not a function of naturally occurring conditions."[172] While the Fresno County GSP provides an explanation as to why two management areas were created in its small GSP area (3 percent of the Subbasin), it is not clear how the use of management areas in the GSP will work in conjunction with the SJREC GSP, since the management area is managed by other entities. The Fresno County GSP should provide an explanation of how the management area can operate under different sustainable management criteria without causing undesirable results which, as discussed in this staff report, have not be set following the GSP Regulations.

- Grassland GSP: No management areas are being used.[173]
- North and Central GSP: Two management areas have been established for land subsidence.[174] The West Stanislaus Irrigation District and Patterson Irrigation District (WSID-PID) Management Area and the Tranquility Irrigation District (TRID) Management Area were "established to better manage progress toward sustainability through sustainable management criteria for the land subsidence sustainability indicator." The TRID Management Area is in the southern tip of the Subbasin and is adjacent to the Fresno County GSP. The GSP states, "subsidence occurring within this [WSID-PID] MA is expected to be minimal and is not anticipated to have significant potential to impact water conveyance infrastructure of statewide importance" because "WSID and PID both hold appropriative water rights…and minimal pumping occurs from the Lower Aquifer..." The TRID Management Area was established "because it is geographically separated from the remainder of the Plan Area and distant from the DMC [Delta-Mendota Canal]." Each of these management areas have their own defined thresholds and measurable objectives and versions of what conditions are considered undesirable results.
- SJREC GSP: The SJREC GSP has established 11 management areas.[175] The management areas defined as Management Areas A through K appear to roughly follow the boundaries of the 11 GSAs included in the SJREC GSP. The management areas are reportedly defined by water supply, aquifer, and drainage characteristics, but detailed maps of those management areas and how well they correlate with established GSA boundaries do not seem to be readily available. Additional descriptions of the areas, with customized hydrologic conceptual models, are provided in Sections 7 through 16 of the SJREC GSP[176] and in Appendices Q through W.[177] Not all the management areas have monitoring

[172] Fresno County GSP, Section 3.4, pp. 156-157.
[173] Grassland GSP, Section 3.4, p. 155.
[174] North and Central GSP, Section 5.5, pp. 450-452.
[175] SJREC GSP, Section 2.2.4, pp. 113-115.
[176] SJREC GSP, Sections 7 through 16, pp. 151-215.
[177] SJREC GSP, Appendices Q through W, pp. 1210-1643.

locations to determine if thresholds or objectives are being met.[178] Additionally, as discussed in other sections of this document, the SJREC GSP has not set numerical sustainable management criteria for a variety of sustainability indicators and it is uncertain what thresholds or objectives these management areas must adhere to. Most of the management areas are assigned individual basin settings, hydrogeologic conceptual models, water budgets, and "sustainable management criteria," and each of the descriptions generally have statements that the SJREC GSP management areas are operating sustainably. Additionally, the information related to the separate GSA areas indicate whether the thresholds and measurable objectives relevant to the SJREC GSP are applicable to those sub-areas – many management areas disregard the sustainable management criteria set for the GSP area. One complexity of using the management area approach in the SJREC GSP is the creation of a management area for the Fresno County GSA areas since Fresno County prepared its own GSP for its small portion of the Subbasin. It is not clear how the use of management areas in the SJREC GSP will work with the Fresno County GSP, and it raises the question as to whether the creation of a Fresno County GSP was justified if portions of that small GSP area are being managed by the SJREC GSP group.

While the use of management areas is technically allowed in a basin if the GSAs determine that the creation of management areas will facilitate implementation of their GSPs, the use of management areas in a basin that is already managed under six separate GSPs significantly complicates the Subbasin's implementation of SGMA. It also impedes the ability of Department staff to determine if the sustainability goal established for the Subbasin is being met, especially if established management areas do not have monitoring points and it is uncertain what sustainable management criteria apply to each area.

3.4.3 Corrective Action

As previously stated, if management areas are used in a basin, the management areas must adhere to Section 354.20 of the GSP Regulations. The GSAs in their respective GSPs have not: (1) clearly defined a reasonable reason for the creation of each management area; (2) explained what the thresholds and measurable objectives are for each of the management areas; (3) presented the levels of monitoring and analysis appropriate for each of the management areas; and (4) explained using the best available information and best available science, with supporting data, that the management areas can operate under different thresholds and objectives without causing undesirable results outside of the management area.

The Common Chapter and coordination materials prepared for the Subbasin should describe all the management areas established in each of the six GSPs and clearly define the applicable minimum thresholds and measurable objectives and indicate where the monitoring points are within each of the management areas for all applicable sustainability

[178] SJREC GSP, Figure 22, p. 125.

indicators. Also, because many of the defined management areas follow GSA boundaries, additional information related to legal authority and financial resources necessary to implement the respective GSPs should be explained. If details specific to the management areas are not available or the GSAs cannot justify, in accordance with the GSP Regulations, the use of management areas, then the GSAs in the Subbasin should reconsider the use of management areas in the Subbasin's Plan.

4 STAFF RECOMMENDATION

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

Appendix I
AWD GSA Water Budgets As Submitted For The Common Chapter

The Delta-Mendota Subbasin GSAs met to develop consistent, standardized water budget terminology and categorize the data to reflect these standardized water budget components. Presented herein is the Aliso WD GSA's contribution to the coordinated Delta-Mendota Subbasin water budget, along with a crosswalk to assist in the correlation between the 2020 Aliso GSP water budget components to the 2022 amended water budget components in the Common Chapter.

Included in this Appendix are the following:

Historic-Current Water Budget

- Aliso data utilized in the 2020 Common Chapter historic-current water budget.
- A crosswalk correlating the 2020 Aliso GSP historic-current water budget components to the Subbasin's 2022 coordinated historic-current water budget components discussed in the Common Chapter.
- Aliso data utilized in the 2022 amended Common Chapter historic-current water budget

Projected Water Budget

- Aliso data utilized in the 2020 Common Chapter projected water budget.
- A crosswalk correlating the 2020 Aliso GSP projected water budget components to the Subbasin's 2022 coordinated projected water budget components in the Common Chapter.
- Aliso data utilized in the 2022 amended Common Chapter projected water budget.

Historic-Current Water Budget

AWD GSA Contribution to Delta-Mendota Subbasin

Historic - Current Water Budget - 2020 GSP

Period of Record: (2003-2013)

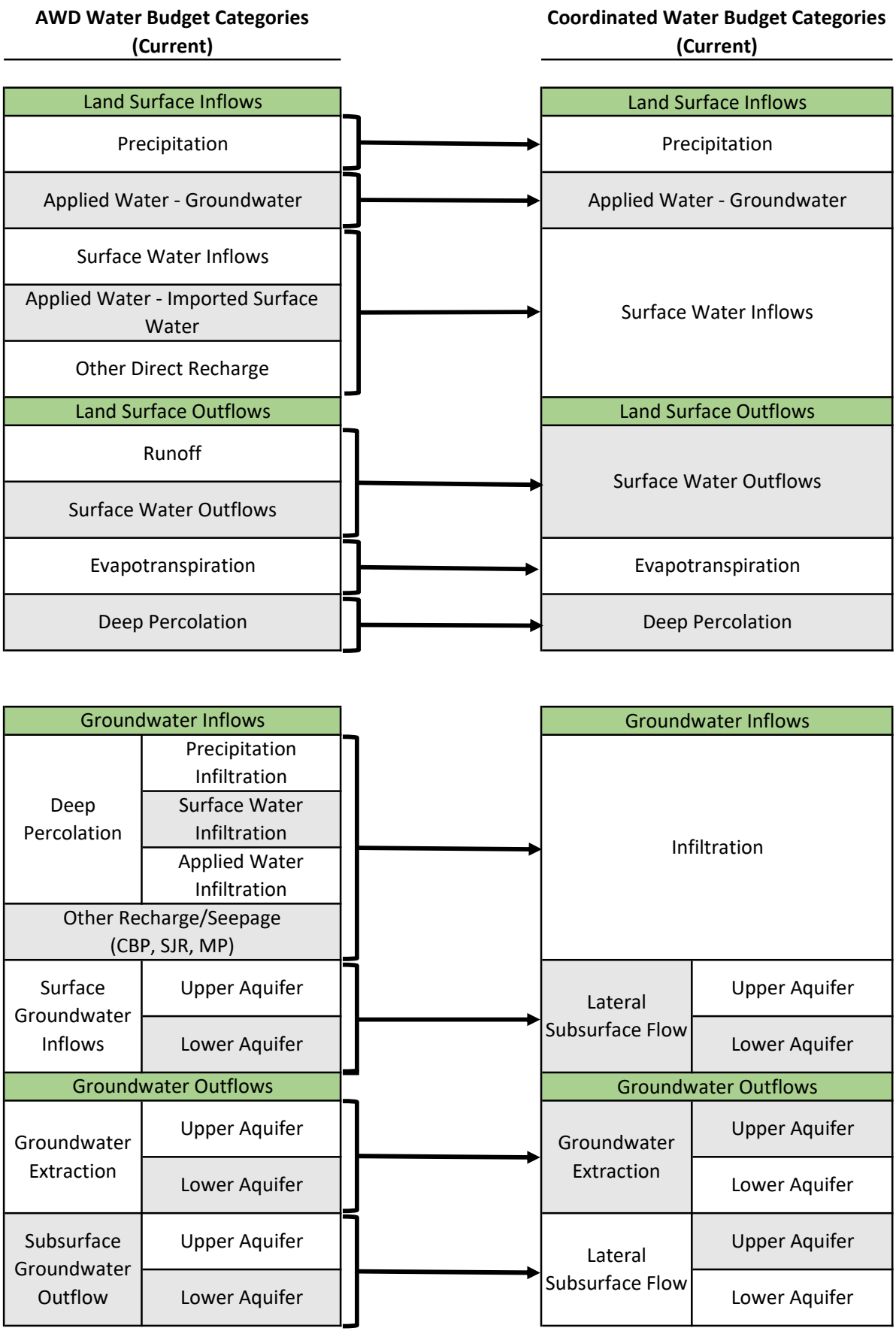
(all units in acre-feet)

Land Surface Budget

		Inflows						Outflows				
		Precipitation	Surface Water Inflows	Applied Water - Groundwater	Applied Water - Imported Surface Water	Other Direct Recharge	**Total Inflows**	Runoff	Evapotranspiration	Surface Water Outflows	Deep Percolation	**Total Outflows**
2003	N	18,200	0	90,100	0	0	**108,300**	7,300	72,000	700	31,400	**111,400**
2004	D	12,900	0	88,300	0	0	**101,200**	5,200	68,100	700	30,400	**104,400**
2005	W	28,500	0	57,200	19,600	0	**105,300**	11,400	67,900	700	28,500	**108,500**
2006	W	24,800	0	62,800	16,700	0	**104,300**	9,900	67,900	700	28,900	**107,400**
2007	D	7,800	0	73,900	0	0	**81,700**	3,100	55,500	700	25,500	**84,800**
2008	D	10,400	0	106,900	0	0	**117,300**	4,200	79,900	700	35,600	**120,400**
2009	N	5,800	0	102,900	0	0	**108,700**	2,300	74,800	700	34,000	**111,800**
2010	N	17,700	0	91,800	3,300	200	**113,000**	7,100	75,300	700	33,100	**116,200**
2011	W	20,400	0	45,800	37,100	14,300	**117,600**	8,200	68,100	700	43,700	**120,700**
2012	D	8,900	0	101,900	500	1,500	**112,800**	3,600	76,000	700	35,700	**116,000**
2013	D	10,600	0	103,471	0	0	**114,071**	4,200	76,000	700	36,300	**117,200**

Groundwater Budget

		Inflows							Outflows					Change in Storage				
		Deep Percolation			Subsurface Groundwater Inflows		Other Direct Recharge	**Total Inflows**	Groundwater Extraction from Upper Aquifer	Groundwater Extraction from Lower Aquifer	Subsurface Groundwater Outflows		**Total Outflows**	**Estimated Annual Change in Groundwater Storage**				
		Precipitation Infiltration	*Surface Water Infiltration*	*Applied Water Infiltration*	*Upper Aquifer*	*Lower Aquifer*					*Upper Aquifer*	*Lower Aquifer*		Inflows	Outflows	Change in Storage - Upper Aquifer	Change in Storage - Lower Aquifer	Change in Storage - Total
2003	N	1,800	2,600	27,000	21,300	-	11,400	**64,100**	90,800	-	11,100	-	**101,900**	64,100	101,900	(37,800)	(4,000)	(41,800)
2004	D	1,300	2,600	26,500	21,300	-	10,000	**61,700**	89,000	-	11,100	-	**100,100**	61,700	100,100	(38,400)	(4,000)	(42,400)
2005	W	2,900	2,600	23,000	21,300	-	48,500	**98,300**	57,900	-	11,100	-	**69,000**	98,300	69,000	29,300	(4,000)	25,300
2006	W	2,500	2,600	23,800	21,300	-	75,000	**125,200**	63,500	-	11,100	-	**74,600**	125,200	74,600	50,600	(4,000)	46,600
2007	D	800	2,600	22,100	21,300	-	27,900	**74,700**	74,600	-	11,100	-	**85,700**	74,700	85,700	(11,000)	(4,000)	(15,000)
2008	D	1,000	2,600	32,000	21,300	-	20,200	**77,100**	107,600	-	11,100	-	**118,700**	77,100	118,700	(41,600)	(4,000)	(45,600)
2009	N	600	2,600	30,800	21,300	-	13,300	**68,600**	103,600	-	11,100	-	**114,700**	68,600	114,700	(46,100)	(4,000)	(50,100)
2010	N	1,800	2,800	28,500	21,300	-	44,400	**98,800**	92,500	-	11,100	-	**103,600**	98,800	103,600	(4,800)	(4,000)	(8,800)
2011	W	2,000	16,900	24,800	21,300	-	78,300	**143,300**	46,500	-	11,100	-	**57,600**	143,300	57,600	85,700	(4,000)	81,700
2012	D	900	4,100	30,700	21,300	-	42,000	**99,000**	102,600	-	11,100	-	**113,700**	99,000	113,700	(14,700)	(4,000)	(18,700)
2013	D	1,100	2,600	32,600	21,300	-	44,500	**102,100**	103,271	-	11,100	-	**114,371**	102,100	114,371	(12,271)	(4,000)	(16,271)


AWD Water Budget Categories (Current)
Coordinated Water Budget Categories (Current)
Land Surface Inflows
Precipitation
Applied Water - Groundwater
Surface Water Inflows
Applied Water - Imported Surface Water
Other Direct Recharge
Land Surface Outflows
Runoff
Surface Water Outflows
Evapotranspiration
Deep Percolation
Land Surface Inflows
Precipitation
Applied Water - Groundwater
Surface Water Inflows
Land Surface Outflows
Surface Water Outflows
Evapotranspiration
Deep Percolation
Groundwater Inflows
Deep Percolation
Precipitation Infiltration
Surface Water Infiltration
Applied Water Infiltration
Other Recharge/Seepage (CBP, SJR, MP)
Surface Groundwater Inflows
Upper Aquifer
Lower Aquifer
Groundwater Outflows
Groundwater Extraction
Upper Aquifer
Lower Aquifer
Subsurface Groundwater Outflow
Upper Aquifer
Lower Aquifer
Groundwater Inflows
Infiltration
Lateral Subsurface Flow
Upper Aquifer
Lower Aquifer
Groundwater Outflows
Groundwater Extraction
Upper Aquifer
Lower Aquifer
Lateral Subsurface Flow
Upper Aquifer
Lower Aquifer

AWD GSA Contribution to Coordinated Delta-Mendota Subbasin

Historic - Current Water Budget - 2022 Amendment

Period of Record: (2003-2013)

(all units in acre-feet)

Land Surface Budget									
		Inflows				Outflows			
		Precipitation	Applied Water - Groundwater	Applied Water - Imported Surface Water	**Total Inflows**	Runoff	Evapotranspiration	Deep Percolation	**Total Outflows**
2003	N	18,200	90,100	0	**108,300**	8,000	72,000	31,400	**111,400**
2004	D	12,900	88,300	0	**101,200**	5,900	68,100	30,400	**104,400**
2005	W	28,500	57,200	19,600	**105,300**	12,100	67,900	28,500	**108,500**
2006	W	24,800	62,800	16,700	**104,300**	10,600	67,900	28,900	**107,400**
2007	D	7,800	73,900	0	**81,700**	3,800	55,500	25,500	**84,800**
2008	D	10,400	106,900	0	**117,300**	4,900	79,900	35,600	**120,400**
2009	N	5,800	102,900	0	**108,700**	3,000	74,800	34,000	**111,800**
2010	N	17,700	91,800	3,500	**113,000**	7,800	75,300	33,100	**116,200**
2011	W	20,400	45,800	51,400	**117,600**	8,900	68,100	43,700	**120,700**
2012	D	8,900	101,900	2,000	**112,800**	4,300	76,000	35,700	**116,000**
2013	D	10,600	103,471	0	**114,071**	4,900	76,000	36,300	**117,200**

Groundwater Budget												
		Inflows				Outflows					Change in Storage		
		Infiltration	Lateral Subsurface Flow		**Total Inflows**	Groundwater Extraction	Lateral Subsurface Flow			**Total Outflows**	Estimated Annual Change in Groundwater Storage		
			Upper Aquifer	*Lower Aquifer*		Upper Aquifer	Lower Aquifer	*Upper Aquifer*	*Lower Aquifer*		*Upper Aquifer*	*Lower Aquifer*	*Total*
2003	N	42,800	21,300		**64,100**	90,800		11,100		**101,900**	(37,800)	(4,000)	(41,800)
2004	D	40,400	21,300		**61,700**	89,000		11,100		**100,100**	(38,400)	(4,000)	(42,400)
2005	W	77,000	21,300		**98,300**	57,900		11,100		**69,000**	29,300	(4,000)	25,300
2006	W	103,900	21,300		**125,200**	63,500		11,100		**74,600**	50,600	(4,000)	46,600
2007	D	53,400	21,300		**74,700**	74,600		11,100		**85,700**	(11,000)	(4,000)	(15,000)
2008	D	55,800	21,300		**77,100**	107,600		11,100		**118,700**	(41,600)	(4,000)	(45,600)
2009	N	47,300	21,300		**68,600**	103,600		11,100		**114,700**	(46,100)	(4,000)	(50,100)
2010	N	77,500	21,300		**98,800**	92,500		11,100		**103,600**	(4,800)	(4,000)	(8,800)
2011	W	122,000	21,300		**143,300**	46,500		11,100		**57,600**	85,700	(4,000)	81,700
2012	D	77,700	21,300		**99,000**	102,600		11,100		**113,700**	(14,700)	(4,000)	(18,700)
2013	D	80,800	21,300		**102,100**	103,271		11,100		**114,371**	(12,271)	(4,000)	(16,271)

Projected Water Budget

AWD GSA Contribution to Delta-Mendota Subbasin

Projected Water Budget (Land Surface) - 2020 GSP

Period of Record: Projected with Climate Change Factors and with Projects and Management Actions (2014-2070)

(all units in acre-feet)

SC = Shasta Critical

Land Surface Budget													
		Inflows							Outflows				
		Precipitation	Surface Water Inflows	Applied Water - Groundwater	Applied Water - Imported Surface Water	Surface Water for Recharge	Other Pumping (M&I)	**Total Inflows**	Runoff/Evaporation of Precipitation	Crop Evapotranspiration	Canal/Reservoir Evaporation	Deep Percolation	**Total Outflows**
2014	SC	9,013	0	82,800	500	1,500	200	**94,013**	3,607	62,800	700	30,000	**97,107**
2015	SC	11,083	0	82,600	500	1,500	200	**95,883**	4,441	63,700	700	30,100	**98,941**
2016	D	23,508	0	81,000	500	1,500	200	**106,708**	9,354	68,800	700	31,000	**109,854**
2017	W	23,508	0	68,700	16,700	0	200	**109,108**	9,354	71,500	700	30,700	**112,254**
2018	N	23,137	0	81,200	3,300	200	200	**108,037**	9,269	70,746	700	30,400	**111,115**
2019	W	22,154	0	62,300	16,700	0	200	**101,354**	8,877	66,393	700	28,500	**104,470**
2020	D	18,514	0	88,400	500	1,500	200	**109,114**	7,357	71,488	700	32,700	**112,245**
2021	W	27,671	0	57,700	16,700	0	200	**102,271**	11,036	65,907	700	27,700	**105,343**
2022	W	38,978	0	49,600	16,700	0	200	**105,478**	15,589	65,889	700	26,400	**108,578**
2023	N	14,995	0	88,400	3,300	200	200	**107,095**	5,998	71,714	700	31,800	**110,212**
2024	D	18,606	0	84,900	500	1,500	200	**105,706**	7,403	69,071	700	31,600	**108,774**
2025	W	30,860	0	58,900	16,700	0	200	**106,660**	12,330	68,359	700	28,400	**109,789**
2026	D	17,002	0	85,700	500	1,500	200	**104,902**	6,801	68,844	700	31,700	**108,045**
2027	D	18,827	0	83,700	500	1,500	200	**104,727**	7,513	68,365	700	31,200	**107,778**
2028	D	17,912	0	83,900	500	1,500	200	**104,012**	7,156	68,060	700	31,200	**107,116**
2029	D	19,327	0	82,200	500	1,500	200	**103,727**	7,764	67,561	700	30,800	**106,825**
2030	SC	21,411	0	79,500	500	1,500	200	**103,111**	8,606	66,680	700	30,200	**106,186**
2031	SC	22,451	0	83,500	500	1,500	200	**108,151**	9,026	70,043	700	31,500	**111,269**
2032	W	39,263	0	50,900	16,700	0	200	**107,063**	15,731	66,973	700	26,800	**110,204**
2033	D	22,771	0	82,000	500	1,500	200	**106,971**	9,086	69,116	700	31,200	**110,102**
2034	W	40,505	0	47,700	16,700	0	200	**105,105**	16,153	65,348	700	26,000	**108,201**
2035	W	27,204	0	64,500	16,700	0	200	**108,604**	10,902	70,452	700	29,700	**111,754**
2036	W	32,196	0	56,700	16,700	0	200	**105,796**	12,898	67,510	700	27,800	**108,908**
2037	W	51,582	0	37,200	16,700	0	200	**105,682**	20,591	63,549	700	23,900	**108,740**
2038	N	18,011	0	77,800	3,300	200	200	**99,511**	7,205	65,768	700	28,900	**102,573**
2039	N	29,270	0	75,100	3,300	200	200	**108,070**	11,735	69,508	700	29,200	**111,143**
2040	D	24,380	0	82,400	500	1,500	200	**108,980**	9,790	70,215	700	31,400	**112,105**
2041	D	20,581	0	84,600	500	1,500	200	**107,381**	8,191	69,829	700	31,800	**110,520**
2042	N	24,609	0	77,100	3,300	200	200	**105,409**	9,805	68,555	700	29,400	**108,460**
2043	D	16,542	0	87,800	500	1,500	200	**106,542**	6,571	70,100	700	32,300	**109,671**
2044	W	43,127	0	46,600	16,700	0	200	**106,627**	17,263	65,842	700	25,900	**109,705**
2045	W	29,692	0	58,200	16,700	0	200	**104,792**	11,846	67,281	700	28,100	**107,927**
2046	D	12,631	0	92,800	500	1,500	200	**107,631**	5,016	71,595	700	33,400	**110,711**
2047	D	18,263	0	88,200	500	1,500	200	**108,663**	7,331	71,203	700	32,500	**111,734**
2048	N	17,861	0	87,200	3,300	200	200	**108,761**	7,130	72,257	700	31,800	**111,887**
2049	N	30,190	0	73,100	3,300	200	200	**106,990**	12,095	68,563	700	28,700	**110,058**
2050	W	37,430	0	54,600	16,700	0	200	**108,930**	15,015	68,634	700	27,700	**112,049**
2051	D	24,311	0	85,900	500	1,500	200	**112,411**	9,756	72,669	700	32,400	**115,525**
2052	D	22,935	0	86,600	500	1,500	200	**111,735**	9,168	72,420	700	32,500	**114,788**
2053	SC	20,742	0	84,300	500	1,500	200	**107,242**	8,271	69,742	700	31,600	**110,313**
2054	SC	10,016	0	93,600	500	1,500	200	**105,816**	4,008	70,872	700	33,300	**108,880**
2055	D	20,024	0	88,600	500	1,500	200	**110,824**	8,012	72,384	700	32,800	**113,896**
2056	W	37,430	0	54,600	16,700	0	200	**108,930**	15,015	68,634	700	27,700	**112,049**
2057	W	17,251	0	71,200	16,700	0	200	**105,351**	6,926	70,189	700	30,600	**108,415**
2058	N	14,891	0	92,800	3,300	200	200	**111,391**	5,946	74,734	700	33,100	**114,480**
2059	W	27,402	0	66,400	16,700	0	200	**110,702**	11,001	71,894	700	30,200	**113,795**
2060	D	13,948	0	95,500	500	1,500	200	**111,648**	5,574	74,152	700	34,300	**114,726**
2061	W	37,924	0	58,800	16,700	0	200	**113,624**	15,162	71,828	700	29,000	**116,690**
2062	N	16,750	0	89,500	3,300	200	200	**109,950**	6,675	73,324	700	32,400	**113,099**
2063	N	16,707	0	86,600	3,300	200	200	**107,007**	6,654	71,294	700	31,500	**110,148**
2064	D	7,047	0	98,700	500	1,500	200	**107,947**	2,824	72,966	700	34,600	**111,090**
2065	N	32,101	0	77,000	3,300	200	200	**112,801**	12,851	72,241	700	30,100	**115,892**
2066	W	20,480	0	71,900	16,700	0	200	**109,280**	8,240	72,253	700	31,200	**112,393**
2067	W	17,703	0	72,000	16,700	0	200	**106,603**	7,051	70,974	700	31,000	**109,725**
2068	D	20,742	0	84,300	500	1,500	200	**107,242**	8,271	69,742	700	31,600	**110,313**
2069	D	10,016	0	93,600	500	1,500	200	**105,816**	4,008	70,872	700	33,300	**108,880**
2070	W	45,500	0	51,400	16,700	0	200	**113,800**	18,150	70,395	700	27,700	**116,945**

AWD GSA Contribution to Delta-Mendota Subbasin

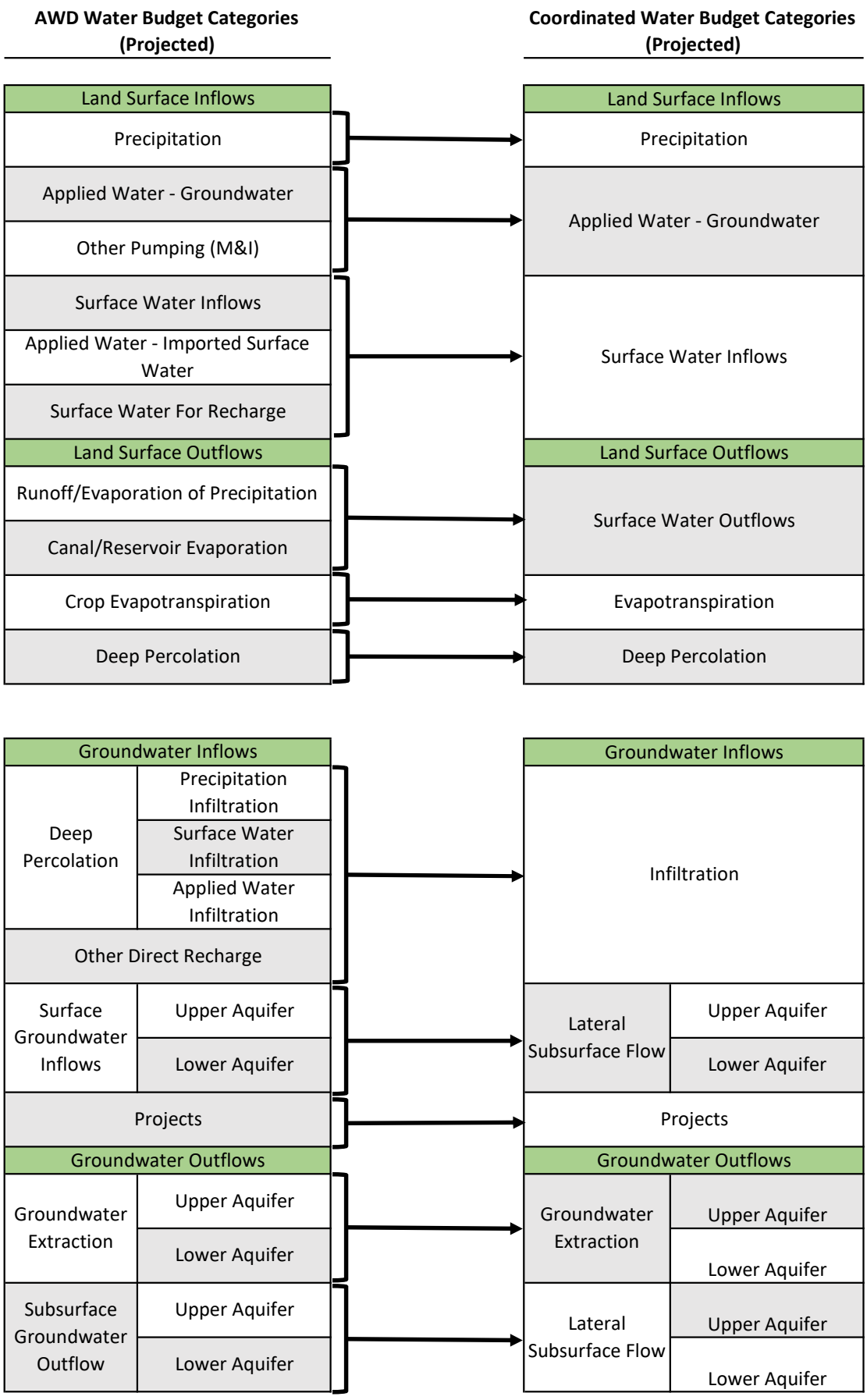
Projected Water Budget (Groundwater) - 2020 GSP

Period of Record: Projected with Climate Change Factors and with Projects and Management Actions (2014-2070)

(all units in acre-feet)

SC = Shasta Critical

Groundwater Budget																				
		Inflows								Outflows					Change in Storage				
		Deep Percolation			Subsurface Groundwater Inflows		Other Direct Recharge	Projects	Total Inflows	Groundwater Extraction from Upper Aquifer	Groundwater Extraction from Lower Aquifer	Subsurface Groundwater Outflows		Total Outflows	Estimated Annual Change in Groundwater Storage				
		Precipitation Infiltration	*Surface Water Infiltration*	*Applied Water Infiltration*	*Upper Aquifer*	*Lower Aquifer*						*Upper Aquifer*	*Lower Aquifer*		Inflows	Outflows	Change in Storage - Upper Aquifer	Change in Storage - Lower Aquifer	Change in Storage - Total
2014	SC	900	4,100	25,000	20,000		42,000	0	**92,000**	83,700		40,000		**123,700**	92,000	123,700	(31,700)		(31,700)
2015	SC	1,100	4,100	24,900	20,000		42,000	0	**92,100**	83,500		40,000		**123,500**	92,100	123,500	(31,400)		(31,400)
2016	D	2,400	4,100	24,500	20,000		42,000	0	**93,000**	81,900		40,000		**121,900**	93,000	121,900	(28,900)		(28,900)
2017	W	2,400	2,600	25,700	10,000		75,000	10,000	**125,700**	69,600		6,000		**75,600**	125,700	75,600	50,100		50,100
2018	N	2,300	2,800	25,300	15,000		44,400	0	**89,800**	82,100		30,000		**112,100**	89,800	112,100	(22,300)		(22,300)
2019	W	2,200	2,600	23,700	10,000		75,000	10,000	**123,500**	63,200		6,000		**69,200**	123,500	69,200	54,300		54,300
2020	D	1,900	4,100	26,700	20,000		42,000	0	**94,700**	89,300		40,000		**129,300**	94,700	129,300	(34,600)		(34,600)
2021	W	2,800	2,600	22,300	10,000		54,300	0	**92,000**	58,600		10,000		**68,600**	92,000	68,600	23,400		23,400
2022	W	3,900	2,600	19,900	10,000		75,000	10,000	**121,400**	50,500		6,000		**56,500**	121,400	56,500	64,900		64,900
2023	N	1,500	2,800	27,500	15,000		44,400	0	**91,200**	89,300		30,000		**119,300**	91,200	119,300	(28,100)		(28,100)
2024	D	1,900	4,100	25,600	20,000		42,000	0	**93,600**	85,800		40,000		**125,800**	93,600	125,800	(32,200)		(32,200)
2025	W	3,100	2,600	22,700	10,000		75,000	10,000	**123,400**	59,800		6,000		**65,800**	123,400	65,800	57,600		57,600
2026	D	1,700	4,100	25,900	20,000		42,000	0	**93,700**	86,600		40,000		**126,600**	93,700	126,600	(32,900)		(32,900)
2027	D	1,900	4,100	25,200	20,000		42,000	0	**93,200**	84,600		40,000		**124,600**	93,200	124,600	(31,400)		(31,400)
2028	D	1,800	4,100	25,300	20,000		42,000	0	**93,200**	84,800		40,000		**124,800**	93,200	124,800	(31,600)		(31,600)
2029	D	1,900	4,100	24,800	20,000		42,000	0	**92,800**	83,100		40,000		**123,100**	92,800	123,100	(30,300)		(30,300)
2030	SC	2,100	4,100	24,000	20,000		42,000	0	**92,200**	80,400		40,000		**120,400**	92,200	120,400	(28,200)		(28,200)
2031	SC	2,200	4,100	25,200	20,000		42,000	0	**93,500**	84,400		40,000		**124,400**	93,500	124,400	(30,900)		(30,900)
2032	W	3,900	2,600	20,300	10,000		54,300	0	**91,100**	51,800		10,000		**61,800**	91,100	61,800	29,300		29,300
2033	D	2,300	4,100	24,800	20,000		42,000	0	**93,200**	82,900		40,000		**122,900**	93,200	122,900	(29,700)		(29,700)
2034	W	4,100	2,600	19,300	10,000		75,000	10,000	**121,000**	48,600		6,000		**54,600**	121,000	54,600	66,400		66,400
2035	W	2,700	2,600	24,400	10,000		54,300	0	**94,000**	65,400		10,000		**75,400**	94,000	75,400	18,600		18,600
2036	W	3,200	2,600	22,000	10,000		75,000	10,000	**122,800**	57,600		6,000		**63,600**	122,800	63,600	59,200		59,200
2037	W	5,200	2,600	16,100	10,000		75,000	10,000	**118,900**	38,100		6,000		**44,100**	118,900	44,100	74,800		74,800
2038	N	1,800	2,800	24,300	15,000		44,400	0	**88,300**	78,700		30,000		**108,700**	88,300	108,700	(20,400)		(20,400)
2039	N	2,900	2,800	23,500	15,000		44,400	0	**88,600**	76,000		30,000		**106,000**	88,600	106,000	(17,400)		(17,400)
2040	D	2,400	4,100	24,900	20,000		42,000	0	**93,400**	83,300		40,000		**123,300**	93,400	123,300	(29,900)		(29,900)
2041	D	2,100	4,100	25,600	20,000		42,000	0	**93,800**	85,500		40,000		**125,500**	93,800	125,500	(31,700)		(31,700)
2042	N	2,500	2,800	24,100	15,000		44,400	0	**88,800**	78,000		30,000		**108,000**	88,800	108,000	(19,200)		(19,200)
2043	D	1,700	4,100	26,500	20,000		42,000	0	**94,300**	88,700		40,000		**128,700**	94,300	128,700	(34,400)		(34,400)
2044	W	4,300	2,600	19,000	10,000		75,000	27,500	**138,400**	47,500		6,000		**53,500**	138,400	53,500	84,900		84,900
2045	W	3,000	2,600	22,500	10,000		75,000	27,500	**140,600**	59,100		6,000		**65,100**	140,600	65,100	75,500		75,500
2046	D	1,300	4,100	28,000	20,000		42,000	0	**95,400**	93,700		40,000		**133,700**	95,400	133,700	(38,300)		(38,300)
2047	D	1,800	4,100	26,600	20,000		42,000	0	**94,500**	89,100		40,000		**129,100**	94,500	129,100	(34,600)		(34,600)
2048	N	1,800	2,800	27,200	15,000		44,400	0	**91,200**	88,100		30,000		**118,100**	91,200	118,100	(26,900)		(26,900)
2049	N	3,000	2,800	22,900	15,000		44,400	0	**88,100**	74,000		30,000		**104,000**	88,100	104,000	(15,900)		(15,900)
2050	W	3,700	2,600	21,400	10,000		75,000	27,500	**140,200**	55,500		6,000		**61,500**	140,200	61,500	78,700		78,700
2051	D	2,400	4,100	25,900	20,000		42,000	0	**94,400**	86,800		40,000		**126,800**	94,400	126,800	(32,400)		(32,400)
2052	D	2,300	4,100	26,100	20,000		42,000	0	**94,500**	87,500		40,000		**127,500**	94,500	127,500	(33,000)		(33,000)
2053	SC	2,100	4,100	25,400	20,000		42,000	0	**93,600**	85,200		40,000		**125,200**	93,600	125,200	(31,600)		(31,600)
2054	SC	1,000	4,100	28,200	20,000		42,000	0	**95,300**	94,500		40,000		**134,500**	95,300	134,500	(39,200)		(39,200)
2055	D	2,000	4,100	26,700	20,000		42,000	0	**94,800**	89,500		40,000		**129,500**	94,800	129,500	(34,700)		(34,700)
2056	W	3,700	2,600	21,400	10,000		75,000	27,500	**140,200**	55,500		6,000		**61,500**	140,200	61,500	78,700		78,700
2057	W	1,700	2,600	26,300	10,000		54,300	0	**94,900**	72,100		10,000		**82,100**	94,900	82,100	12,800		12,800
2058	N	1,500	2,800	28,800	15,000		44,400	0	**92,500**	93,700		30,000		**123,700**	92,500	123,700	(31,200)		(31,200)
2059	W	2,700	2,600	24,900	10,000		75,000	27,500	**142,700**	67,300		6,000		**73,300**	142,700	73,300	69,400		69,400
2060	D	1,400	4,100	28,800	20,000		42,000	0	**96,300**	96,400		40,000		**136,400**	96,300	136,400	(40,100)		(40,100)
2061	W	3,800	2,600	22,600	10,000		75,000	27,500	**141,500**	59,700		6,000		**65,700**	141,500	65,700	75,800		75,800
2062	N	1,700	2,800	27,900	15,000		44,400	0	**91,800**	90,400		30,000		**120,400**	91,800	120,400	(28,600)		(28,600)
2063	N	1,700	2,800	27,000	15,000		44,400	0	**90,900**	87,500		30,000		**117,500**	90,900	117,500	(26,600)		(26,600)
2064	D	700	4,100	29,800	20,000		42,000	0	**96,600**	99,600		40,000		**139,600**	96,600	139,600	(43,000)		(43,000)
2065	N	3,200	2,800	24,100	15,000		44,400	0	**89,500**	77,900		30,000		**107,900**	89,500	107,900	(18,400)		(18,400)
2066	W	2,000	2,600	26,600	10,000		54,300	0	**95,500**	72,800		10,000		**82,800**	95,500	82,800	12,700		12,700
2067	W	1,800	2,600	26,600	10,000		54,300	0	**95,300**	72,900		10,000		**82,900**	95,300	82,900	12,400		12,400
2068	D	2,100	4,100	25,400	20,000		42,000	0	**93,600**	85,200		40,000		**125,200**	93,600	125,200	(31,600)		(31,600)
2069	D	1,000	4,100	28,200	20,000		42,000	0	**95,300**	94,500		40,000		**134,500**	95,300	134,500	(39,200)		(39,200)
2070	W	4,600	2,600	20,500	10,000		75,000	27,500	**140,200**	52,300		6,000		**58,300**	140,200	58,300	81,900		81,900


AWD Water Budget Categories (Projected)
Coordinated Water Budget Categories (Projected)
Land Surface Inflows
Precipitation
Applied Water - Groundwater
Other Pumping (M&I)
Surface Water Inflows
Applied Water - Imported Surface Water
Surface Water For Recharge
Land Surface Outflows
Runoff/Evaporation of Precipitation
Canal/Reservoir Evaporation
Crop Evapotranspiration
Deep Percolation
Land Surface Inflows
Precipitation
Applied Water - Groundwater
Surface Water Inflows
Land Surface Outflows
Surface Water Outflows
Evapotranspiration
Deep Percolation
Groundwater Inflows
Deep Percolation
Precipitation Infiltration
Surface Water Infiltration
Applied Water Infiltration
Other Direct Recharge
Surface Groundwater Inflows
Upper Aquifer
Lower Aquifer
Projects
Groundwater Outflows
Groundwater Extraction
Upper Aquifer
Lower Aquifer
Subsurface Groundwater Outflow
Upper Aquifer
Lower Aquifer
Groundwater Inflows
Infiltration
Lateral Subsurface Flow
Upper Aquifer
Lower Aquifer
Projects
Groundwater Outflows
Groundwater Extraction
Upper Aquifer
Lower Aquifer
Lateral Subsurface Flow
Upper Aquifer
Lower Aquifer

AWD GSA Contribution to Coordinated Delta-Mendota Subbasin

Projected Water Budget (Land Surface) - 2022 Amendment

Period of Record: Projected with Climate Change Factors and with Projects and Management Actions (2014-2070)

(all units in acre-feet)

SC = Shasta Critical

Land Surface Budget																
		Inflows							Outflows							
		Precipitation	Applied Water - Groundwater	Applied Water - Imported Surface Water	Applied Water - Groundwater (Project Effects) - NCDM Only	Applied Water - Imported Surface Water (Project Effects) - NCDM Only	Project Effects - All GSP Groups	**Total Inflows**	Runoff	Evapotranspiration	Crop Evaporanspiration - Aliso Only	Canal/Reservoir Evaporation - Aliso Only	Deep Percolation	Runoff (Project Effects) - NCDM Only	Project Effects - All GSP Groups	**Total Outflows**
2014	SC	9,013	83,000	2,000	N/A	N/A	0	**94,013**	4,307	62,800			30,000	N/A		**97,107**
2015	SC	11,083	82,800	2,000	N/A	N/A	0	**95,883**	5,141	63,700			30,100	N/A		**98,941**
2016	D	23,508	81,200	2,000	N/A	N/A	0	**106,708**	10,054	68,800			31,000	N/A		**109,854**
2017	W	23,508	68,900	16,700	N/A	N/A	0	**109,108**	10,054	71,500			30,700	N/A		**112,254**
2018	N	23,137	81,400	3,500	N/A	N/A	0	**108,037**	9,969	70,746			30,400	N/A		**111,115**
2019	W	22,154	62,500	16,700	N/A	N/A	0	**101,354**	9,577	66,393			28,500	N/A		**104,470**
2020	D	18,514	88,600	2,000	N/A	N/A	0	**109,114**	8,057	71,488			32,700	N/A		**112,245**
2021	W	27,671	57,900	16,700	N/A	N/A	0	**102,271**	11,736	65,907			27,700	N/A		**105,343**
2022	W	38,978	49,800	16,700	N/A	N/A	0	**105,478**	16,289	65,889			26,400	N/A		**108,578**
2023	N	14,995	88,600	3,500	N/A	N/A	0	**107,095**	6,698	71,714			31,800	N/A		**110,212**
2024	D	18,606	85,100	2,000	N/A	N/A	0	**105,706**	8,103	69,071			31,600	N/A		**108,774**
2025	W	30,860	59,100	16,700	N/A	N/A	0	**106,660**	13,030	68,359			28,400	N/A		**109,789**
2026	D	17,002	85,900	2,000	N/A	N/A	0	**104,902**	7,501	68,844			31,700	N/A		**108,045**
2027	D	18,827	83,900	2,000	N/A	N/A	0	**104,727**	8,213	68,365			31,200	N/A		**107,778**
2028	D	17,912	84,100	2,000	N/A	N/A	0	**104,012**	7,856	68,060			31,200	N/A		**107,116**
2029	D	19,327	82,400	2,000	N/A	N/A	0	**103,727**	8,464	67,561			30,800	N/A		**106,825**
2030	SC	21,411	79,700	2,000	N/A	N/A	0	**103,111**	9,306	66,680			30,200	N/A		**106,186**
2031	SC	22,451	83,700	2,000	N/A	N/A	0	**108,151**	9,726	70,043			31,500	N/A		**111,269**
2032	W	39,263	51,100	16,700	N/A	N/A	0	**107,063**	16,431	66,973			26,800	N/A		**110,204**
2033	D	22,771	82,200	2,000	N/A	N/A	0	**106,971**	9,786	69,116			31,200	N/A		**110,102**
2034	W	40,505	47,900	16,700	N/A	N/A	0	**105,105**	16,853	65,348			26,000	N/A		**108,201**
2035	W	27,204	64,700	16,700	N/A	N/A	0	**108,604**	11,602	70,452			29,700	N/A		**111,754**
2036	W	32,196	56,900	16,700	N/A	N/A	0	**105,796**	13,598	67,510			27,800	N/A		**108,908**
2037	W	51,582	37,400	16,700	N/A	N/A	0	**105,682**	21,291	63,549			23,900	N/A		**108,740**
2038	N	18,011	78,000	3,500	N/A	N/A	0	**99,511**	7,905	65,768			28,900	N/A		**102,573**
2039	N	29,270	75,300	3,500	N/A	N/A	0	**108,070**	12,435	69,508			29,200	N/A		**111,143**
2040	D	24,380	82,600	2,000	N/A	N/A	0	**108,980**	10,490	70,215			31,400	N/A		**112,105**
2041	D	20,581	84,800	2,000	N/A	N/A	0	**107,381**	8,891	69,829			31,800	N/A		**110,520**
2042	N	24,609	77,300	3,500	N/A	N/A	0	**105,409**	10,505	68,555			29,400	N/A		**108,460**
2043	D	16,542	88,000	2,000	N/A	N/A	0	**106,542**	7,271	70,100			32,300	N/A		**109,671**
2044	W	43,127	46,800	16,700	N/A	N/A	0	**106,627**	17,963	65,842			25,900	N/A		**109,705**
2045	W	29,692	58,400	16,700	N/A	N/A	0	**104,792**	12,546	67,281			28,100	N/A		**107,927**
2046	D	12,631	93,000	2,000	N/A	N/A	0	**107,631**	5,716	71,595			33,400	N/A		**110,711**
2047	D	18,263	88,400	2,000	N/A	N/A	0	**108,663**	8,031	71,203			32,500	N/A		**111,734**
2048	N	17,861	87,400	3,500	N/A	N/A	0	**108,761**	7,830	72,257			31,800	N/A		**111,887**
2049	N	30,190	73,300	3,500	N/A	N/A	0	**106,990**	12,795	68,563			28,700	N/A		**110,058**
2050	W	37,430	54,800	16,700	N/A	N/A	0	**108,930**	15,715	68,634			27,700	N/A		**112,049**
2051	D	24,311	86,100	2,000	N/A	N/A	0	**112,411**	10,456	72,669			32,400	N/A		**115,525**
2052	D	22,935	86,800	2,000	N/A	N/A	0	**111,735**	9,868	72,420			32,500	N/A		**114,788**
2053	SC	20,742	84,500	2,000	N/A	N/A	0	**107,242**	8,971	69,742			31,600	N/A		**110,313**
2054	SC	10,016	93,800	2,000	N/A	N/A	0	**105,816**	4,708	70,872			33,300	N/A		**108,880**
2055	D	20,024	88,800	2,000	N/A	N/A	0	**110,824**	8,712	72,384			32,800	N/A		**113,896**
2056	W	37,430	54,800	16,700	N/A	N/A	0	**108,930**	15,715	68,634			27,700	N/A		**112,049**
2057	W	17,251	71,400	16,700	N/A	N/A	0	**105,351**	7,626	70,189			30,600	N/A		**108,415**
2058	N	14,891	93,000	3,500	N/A	N/A	0	**111,391**	6,646	74,734			33,100	N/A		**114,480**
2059	W	27,402	66,600	16,700	N/A	N/A	0	**110,702**	11,701	71,894			30,200	N/A		**113,795**
2060	D	13,948	95,700	2,000	N/A	N/A	0	**111,648**	6,274	74,152			34,300	N/A		**114,726**
2061	W	37,924	59,000	16,700	N/A	N/A	0	**113,624**	15,862	71,828			29,000	N/A		**116,690**
2062	N	16,750	89,700	3,500	N/A	N/A	0	**109,950**	7,375	73,324			32,400	N/A		**113,099**
2063	N	16,707	86,800	3,500	N/A	N/A	0	**107,007**	7,354	71,294			31,500	N/A		**110,148**
2064	D	7,047	98,900	2,000	N/A	N/A	0	**107,947**	3,524	72,966			34,600	N/A		**111,090**
2065	N	32,101	77,200	3,500	N/A	N/A	0	**112,801**	13,551	72,241			30,100	N/A		**115,892**
2066	W	20,480	72,100	16,700	N/A	N/A	0	**109,280**	8,940	72,253			31,200	N/A		**112,393**
2067	W	17,703	72,200	16,700	N/A	N/A	0	**106,603**	7,751	70,974			31,000	N/A		**109,725**
2068	D	20,742	84,500	2,000	N/A	N/A	0	**107,242**	8,971	69,742			31,600	N/A		**110,313**
2069	D	10,016	93,800	2,000	N/A	N/A	0	**105,816**	4,708	70,872			33,300	N/A		**108,880**
2070	W	45,500	51,600	16,700	N/A	N/A	0	**113,800**	18,850	70,395			27,700	N/A		**116,945**

AWD GSA Contribution to Coordinated Delta-Mendota Subbasin

Projected Water Budget (Groundwater) - 2022 Amendment

Period of Record: Projected with Climate Change Factors and with Projects and Management Actions (2014-2070)

(all units in acre-feet)

SC = Shasta Critical

Groundwater Budget																			
		Inflows								Outflows							Change in Storage		
		Infiltration	Lateral Subsurface Flow		Seepage Through Corcoran Clay - SJREC Only	Applied Water Infiltration (Project Effects) - NCDM Only	Deep Percolation (Project Effects) - NCDM Only	Project Effects	Total Inflows	Groundwater Extraction		Lateral Subsurface Flow		Flow to Lower Aquifer - Grassland Only	Discharge to Surface Water/Consumptive Use by GDEs/Lateral Flow - Grassland Only	Total Outflows	Estimated Annual Change in Groundwater Storage		
			Upper Aquifer	*Lower Aquifer*						*Upper Aquifer*	*Lower Aquifer*	*Upper Aquifer*	*Lower Aquifer*				*Upper Aquifer*	*Lower Aquifer*	*Total*
2014	SC	72,000	20,000		N/A	N/A	N/A	0	**92,000**	83,700		40,000		N/A	N/A	**123,700**	(31,700)		(31,700)
2015	SC	72,100	20,000		N/A	N/A	N/A	0	**92,100**	83,500		40,000		N/A	N/A	**123,500**	(31,400)		(31,400)
2016	D	73,000	20,000		N/A	N/A	N/A	0	**93,000**	81,900		40,000		N/A	N/A	**121,900**	(28,900)		(28,900)
2017	W	105,700	10,000		N/A	N/A	N/A	10,000	**125,700**	69,600		6,000		N/A	N/A	**75,600**	50,100		50,100
2018	N	74,800	15,000		N/A	N/A	N/A	0	**89,800**	82,100		30,000		N/A	N/A	**112,100**	(22,300)		(22,300)
2019	W	103,500	10,000		N/A	N/A	N/A	10,000	**123,500**	63,200		6,000		N/A	N/A	**69,200**	54,300		54,300
2020	D	74,700	20,000		N/A	N/A	N/A	0	**94,700**	89,300		40,000		N/A	N/A	**129,300**	(34,600)		(34,600)
2021	W	82,000	10,000		N/A	N/A	N/A	0	**92,000**	58,600		10,000		N/A	N/A	**68,600**	23,400		23,400
2022	W	101,400	10,000		N/A	N/A	N/A	10,000	**121,400**	50,500		6,000		N/A	N/A	**56,500**	64,900		64,900
2023	N	76,200	15,000		N/A	N/A	N/A	0	**91,200**	89,300		30,000		N/A	N/A	**119,300**	(28,100)		(28,100)
2024	D	73,600	20,000		N/A	N/A	N/A	0	**93,600**	85,800		40,000		N/A	N/A	**125,800**	(32,200)		(32,200)
2025	W	103,400	10,000		N/A	N/A	N/A	10,000	**123,400**	59,800		6,000		N/A	N/A	**65,800**	57,600		57,600
2026	D	73,700	20,000		N/A	N/A	N/A	0	**93,700**	86,600		40,000		N/A	N/A	**126,600**	(32,900)		(32,900)
2027	D	73,200	20,000		N/A	N/A	N/A	0	**93,200**	84,600		40,000		N/A	N/A	**124,600**	(31,400)		(31,400)
2028	D	73,200	20,000		N/A	N/A	N/A	0	**93,200**	84,800		40,000		N/A	N/A	**124,800**	(31,600)		(31,600)
2029	D	72,800	20,000		N/A	N/A	N/A	0	**92,800**	83,100		40,000		N/A	N/A	**123,100**	(30,300)		(30,300)
2030	SC	72,200	20,000		N/A	N/A	N/A	0	**92,200**	80,400		40,000		N/A	N/A	**120,400**	(28,200)		(28,200)
2031	SC	73,500	20,000		N/A	N/A	N/A	0	**93,500**	84,400		40,000		N/A	N/A	**124,400**	(30,900)		(30,900)
2032	W	81,100	10,000		N/A	N/A	N/A	0	**91,100**	51,800		10,000		N/A	N/A	**61,800**	29,300		29,300
2033	D	73,200	20,000		N/A	N/A	N/A	0	**93,200**	82,900		40,000		N/A	N/A	**122,900**	(29,700)		(29,700)
2034	W	101,000	10,000		N/A	N/A	N/A	10,000	**121,000**	48,600		6,000		N/A	N/A	**54,600**	66,400		66,400
2035	W	84,000	10,000		N/A	N/A	N/A	0	**94,000**	65,400		10,000		N/A	N/A	**75,400**	18,600		18,600
2036	W	102,800	10,000		N/A	N/A	N/A	10,000	**122,800**	57,600		6,000		N/A	N/A	**63,600**	59,200		59,200
2037	W	98,900	10,000		N/A	N/A	N/A	10,000	**118,900**	38,100		6,000		N/A	N/A	**44,100**	74,800		74,800
2038	N	73,300	15,000		N/A	N/A	N/A	0	**88,300**	78,700		30,000		N/A	N/A	**108,700**	(20,400)		(20,400)
2039	N	73,600	15,000		N/A	N/A	N/A	0	**88,600**	76,000		30,000		N/A	N/A	**106,000**	(17,400)		(17,400)
2040	D	73,400	20,000		N/A	N/A	N/A	0	**93,400**	83,300		40,000		N/A	N/A	**123,300**	(29,900)		(29,900)
2041	D	73,800	20,000		N/A	N/A	N/A	0	**93,800**	85,500		40,000		N/A	N/A	**125,500**	(31,700)		(31,700)
2042	N	73,800	15,000		N/A	N/A	N/A	0	**88,800**	78,000		30,000		N/A	N/A	**108,000**	(19,200)		(19,200)
2043	D	74,300	20,000		N/A	N/A	N/A	0	**94,300**	88,700		40,000		N/A	N/A	**128,700**	(34,400)		(34,400)
2044	W	100,900	10,000		N/A	N/A	N/A	27,500	**138,400**	47,500		6,000		N/A	N/A	**53,500**	84,900		84,900
2045	W	103,100	10,000		N/A	N/A	N/A	27,500	**140,600**	59,100		6,000		N/A	N/A	**65,100**	75,500		75,500
2046	D	75,400	20,000		N/A	N/A	N/A	0	**95,400**	93,700		40,000		N/A	N/A	**133,700**	(38,300)		(38,300)
2047	D	74,500	20,000		N/A	N/A	N/A	0	**94,500**	89,100		40,000		N/A	N/A	**129,100**	(34,600)		(34,600)
2048	N	76,200	15,000		N/A	N/A	N/A	0	**91,200**	88,100		30,000		N/A	N/A	**118,100**	(26,900)		(26,900)
2049	N	73,100	15,000		N/A	N/A	N/A	0	**88,100**	74,000		30,000		N/A	N/A	**104,000**	(15,900)		(15,900)
2050	W	102,700	10,000		N/A	N/A	N/A	27,500	**140,200**	55,500		6,000		N/A	N/A	**61,500**	78,700		78,700
2051	D	74,400	20,000		N/A	N/A	N/A	0	**94,400**	86,800		40,000		N/A	N/A	**126,800**	(32,400)		(32,400)
2052	D	74,500	20,000		N/A	N/A	N/A	0	**94,500**	87,500		40,000		N/A	N/A	**127,500**	(33,000)		(33,000)
2053	SC	73,600	20,000		N/A	N/A	N/A	0	**93,600**	85,200		40,000		N/A	N/A	**125,200**	(31,600)		(31,600)
2054	SC	75,300	20,000		N/A	N/A	N/A	0	**95,300**	94,500		40,000		N/A	N/A	**134,500**	(39,200)		(39,200)
2055	D	74,800	20,000		N/A	N/A	N/A	0	**94,800**	89,500		40,000		N/A	N/A	**129,500**	(34,700)		(34,700)
2056	W	102,700	10,000		N/A	N/A	N/A	27,500	**140,200**	55,500		6,000		N/A	N/A	**61,500**	78,700		78,700
2057	W	84,900	10,000		N/A	N/A	N/A	0	**94,900**	72,100		10,000		N/A	N/A	**82,100**	12,800		12,800
2058	N	77,500	15,000		N/A	N/A	N/A	0	**92,500**	93,700		30,000		N/A	N/A	**123,700**	(31,200)		(31,200)
2059	W	105,200	10,000		N/A	N/A	N/A	27,500	**142,700**	67,300		6,000		N/A	N/A	**73,300**	69,400		69,400
2060	D	76,300	20,000		N/A	N/A	N/A	0	**96,300**	96,400		40,000		N/A	N/A	**136,400**	(40,100)		(40,100)
2061	W	104,000	10,000		N/A	N/A	N/A	27,500	**141,500**	59,700		6,000		N/A	N/A	**65,700**	75,800		75,800
2062	N	76,800	15,000		N/A	N/A	N/A	0	**91,800**	90,400		30,000		N/A	N/A	**120,400**	(28,600)		(28,600)
2063	N	75,900	15,000		N/A	N/A	N/A	0	**90,900**	87,500		30,000		N/A	N/A	**117,500**	(26,600)		(26,600)
2064	D	76,600	20,000		N/A	N/A	N/A	0	**96,600**	99,600		40,000		N/A	N/A	**139,600**	(43,000)		(43,000)
2065	N	74,500	15,000		N/A	N/A	N/A	0	**89,500**	77,900		30,000		N/A	N/A	**107,900**	(18,400)		(18,400)
2066	W	85,500	10,000		N/A	N/A	N/A	0	**95,500**	72,800		10,000		N/A	N/A	**82,800**	12,700		12,700
2067	W	85,300	10,000		N/A	N/A	N/A	0	**95,300**	72,900		10,000		N/A	N/A	**82,900**	12,400		12,400
2068	D	73,600	20,000		N/A	N/A	N/A	0	**93,600**	85,200		40,000		N/A	N/A	**125,200**	(31,600)		(31,600)
2069	D	75,300	20,000		N/A	N/A	N/A	0	**95,300**	94,500		40,000		N/A	N/A	**134,500**	(39,200)		(39,200)
2070	W	102,700	10,000		N/A	N/A	N/A	27,500	**140,200**	52,300		6,000		N/A	N/A	**58,300**	81,900		81,900