Grant Proposal Summary Budget Table

Table 5A – Grant Proposal Summary Budget (No Components)

Grant Proposal Title: Kern County Subbasin Groundwater Sustainability Plan Support – Phase II

Applicant: Kern River Groundwater Sustainability Agency (KRGSA)

Grant Proposal serves a need of a DA?: X Yes ☐ No

Local Cost Share requested: ☐ 25% ☐ 15% ☐ 10% X 0%

Budget Categories[1]	(a) Requested Grant Amount	(b) Local Cost Share: Non-State Fund Source[2]	(c) Total Cost	(d) % Local Cost Share (Col (b)/ Col (c))
(a) Grant Agreement Administration	$25,000	$0	$25,000	0%
(b) Stakeholder Engagement / Outreach	$2,500	$0	$2,500	0%
(c) GSP Development – Subbasin DMS Scoping and Development	$472,500	$0	$472,500	0%
(d) Monitoring / Assessment	$0	$0	$0	$0
Grand Total *Sum rows (a) through (d) for each column*	**$500,000**	**$0**	**$500,000**	**0%**

[1] Only these Budget Categories shall be used. Tasks can be added for more detail.

[2] List sources of funding: *Assumes DAC waiver for local cost share*

Proposal/Component Detailed Budget Table

Table 6A – Proposal Detailed Budget (No Components)

Grant Proposal Title: Kern County Subbasin Groundwater Sustainability Plan Support - Phase II

Applicant: Kern River Groundwater Sustainability Agency (KRGSA)

Budget Categories[1]	(a) Requested Grant Amount	(b) Local Cost Share: Non-State Fund Source[2]	(c) Total Cost
(a) Grant Administration	**$25,000**	**$0**	***$25,000***
Task 1. Grant Management	$4,000	$0	
Task 2. Invoicing	$9,000	$0	
Task 3. Report Preparation	$12,000	$0	
(b) Stakeholder Engagement / Outreach	**$2,500**	**$0**	***$2,500***
Task 1. Technical Meetings	$2,500	$0	
(c) GSP Development: Subbasin DMS Scoping and Development	**$472,500**	**$0**	***$472,500***
Task 1. Retain Consultant to Assist with DMS Development	$2,500	$0	
Task 2. Identify Information Requirements for DMS	$2,500	$0	
Task 3. Investigate and Select an Appropriate DMS	$5,000	$0	
Task 4. Procure/Design and Customize the Selected DMS	$457,500	$0	
Task 5. Develop Data Protocols and Templates	$2,500	$0	
Task 6. Develop DMS User's Manual and Train GSA Staff	$2,500	$0	
Task 7. Review and Assessment of DMS	$0	$0	
(d) Monitoring / Assessment	**$0**	**$0**	
Grand Total *Sum rows (a) through (d) for each column*	***$500,000***	***$0***	***$500,000***

[1] Only these Budget Categories shall be used. Tasks can be added for more detail.

[2] List sources of funding: *Assumes DAC waiver for local cost share*

Budget Description

The Kern County Subbasin Groundwater Sustainability Plan Support – Phase II proposal includes one project, which will benefit the entire Kern County Subbasin. Since only one component (or project) is proposed, Grant Administration has been included with the budget for the project, and the required budget templates 5A and 6A, intended for proposals that do not include multiple components, have been completed and presented above.

This section summarizes costs included in each budget category and describes how the values included in Table 6A, Proposal Detailed Budget, for the Kern County Subbasin Groundwater Sustainability Plan Support – Phase II were developed.

Budget Category (a): Grant Administration

The Direct Project Administration provided by KRGSA on behalf of all the GSAs in the Kern County Subbasin will support this project and will also oversee the implementation of overall grant funding such as executing a grant agreement with DWR, conducting reporting and invoicing, and ensuring that grant requirements are met. These tasks ensure that the project will be completed, DWR receives Quarterly and Final Project Completion Reports, invoicing and record-keeping are current, and other grant administrative functions are completed.

The Grant Administration budget was developed in order to keep these administration costs to within 5% of the award amount and maximize the grant funding utilized for the Subbasin Data Management System Development project, which is the critical GSP planning need in the Subbasin at this time. The total Budget Category (a) costs are therefore estimated at $25,000 – 5% of the total grant amount of $500,000.

The total of $25,000 for this Budget Category (a) includes $4,000 for Grant Administration, $9,000 for Invoicing, and $12,000 for Report Preparation. The Administration budget is well within DWR's guidance to keep costs to within 10% of the Grant Request. The Grant Administration budget is considered reasonable as it does not exceed 5% of the overall project budget and is consistent with DWR's guidance. This cost estimate is considered standard and was developed based on KRGSA, KGA, and the other GSA experience managing IRWM and SGMA grants in recent years.

The Grant Administration work will include effort from KRGSA's legal and accounting functions, as well as project managers as well as the GSAs in the Kern subbasin who will coordinate with KRGSA, assuring the timely completion of reporting tasks detailed in the Work Plan. A consultant may be added to assist the project team. Grant Administration effort may exceed amounts included in this budget; additional effort and costs required to complete the Grant Administration task will constitute Other Cost Share.

It is anticipated that a full DA waiver for Local Cost Share will be received for this Proposal. In anticipation of the full waiver, no Local Cost Share has been included with the Proposal Budget. Please see Attachment 6 – SDAC, DAC, EDA for documentation and narrative describing Disadvantaged Areas within the Kern County Subbasin project area.

Budget Category (b): Stakeholder Engagement / Outreach

The total cost of Stakeholder Engagement / Outreach, Budget Category (b), is $2,500, included as Grant Request. This cost estimate was developed based on KRGSA, KGA, and other the GSA experience in conducting Stakeholder Engagement and Outreach work in recent years and through development of Groundwater Sustainability Plans for the Subbasin. These costs represent a minimal level of Stakeholder Engagement associated specifically with this proposed grant-funded project, in order that the bulk of available grant funding can be allocated to implementation of the Subbasin Data Management System Development project, which is the critical GSP planning need in the Subbasin at this time.

If the actual level of effort needs to exceed amounts included in this budget to achieve project objectives, the additional costs required to complete the task will be paid by the GSAs.

It is anticipated that a full DA waiver for Local Cost Share will be received for this Proposal. In anticipation of the full waiver, no Local Cost Share has been included with the Proposal Budget. Please see Attachment 6 – SDAC, DAC, EDA for documentation and narrative describing Disadvantaged Areas within the Kern County Subbasin project area.

Budget Category (c): GSP Development: Subbasin DMS Scoping and Development

The total cost of GSP Development: Subbasin DMS Scoping and Development, Budget Category (c), is $472,500, included as Grant Request. This total Budget Category (c) cost of $472,500 constitutes the bulk of requested grant funding, in order to launch the scoping and development of the Subbasin's critical GSP planning effort, to develop a DMS for the Subbasin. This $472,500 Category (c) grant request is spread the anticipated seven tasks that will result in a fully functioning DMS. $2,500 is budgeted for Task 1, which includes developing a Request for Proposals and ultimately contracting with a Data Management System professional consultant to lead the DMS development process. Task 2 is budgeted at $2,500 and includes identification of the information requirements for the DMS. Allocated for Task 3, to investigate and ultimately select an appropriate DMS for the Subbasin is $5,000. Task 4 constitutes the bulk of the grant request in the amount of $457,500. Task 4, Procure, Design, and Customize the Selected DMS, is the focus of the Kern County Subbasin to accomplish the coordination of monitoring, management, and annual reporting going forward. Tasks 5 and 6 are supportive tasks to complete the development of a basin-wide coordinated DMS. Each of these tasks is allocated $2,500. Task 7, Review and Assessment of DMS, would be funded by the GSAs as part of their ongoing GSP process.

Budget Category (d): Monitoring / Assessment

This project is a planning effort and does not involve on-the-ground monitoring activities.

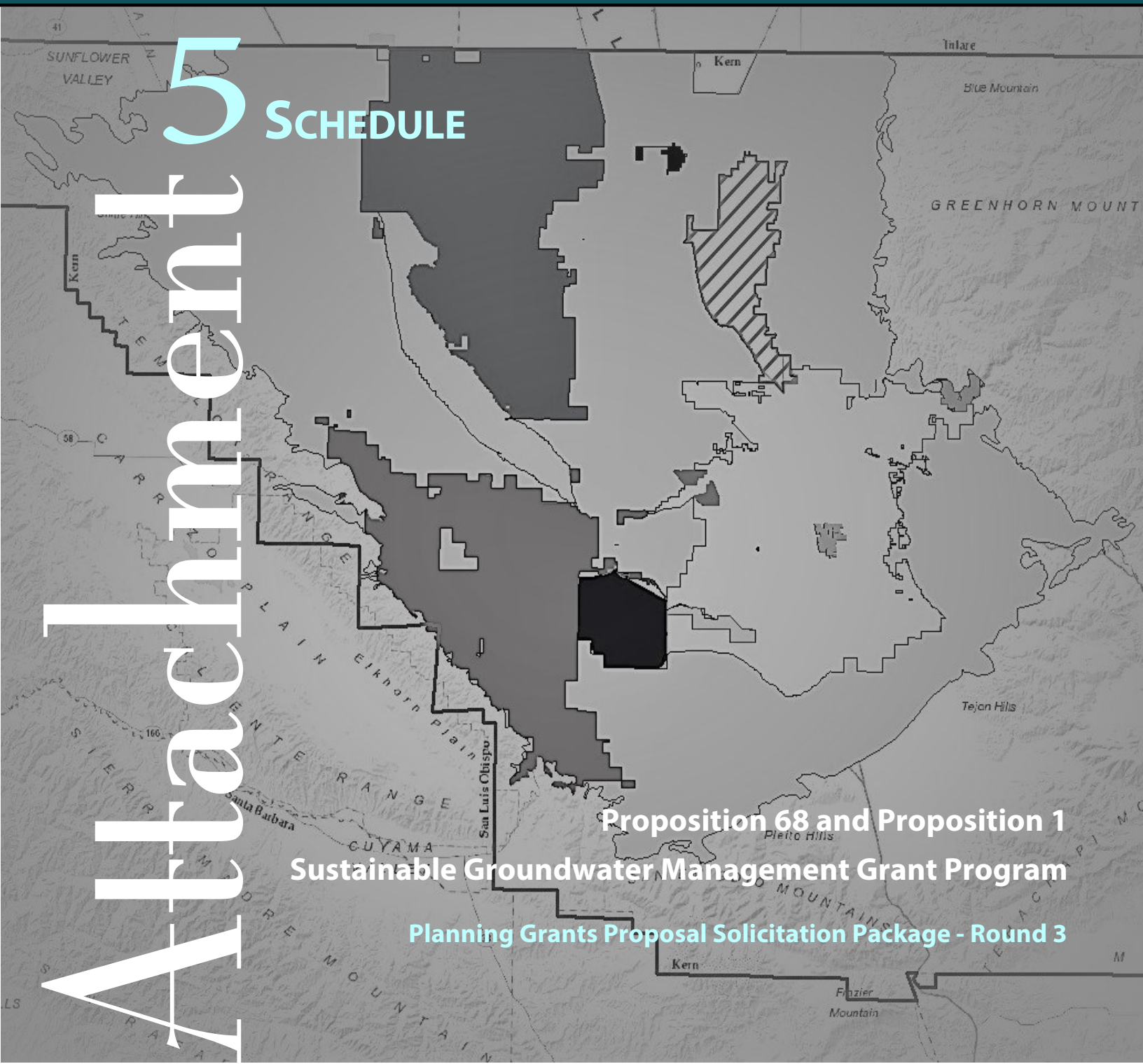
As described in Attachment 3, Work Plan, the intent is to make as much progress as possible toward development of a fully functioning DMS. The GSAs have committed to continue ongoing collaborative efforts towards accomplishing Subbasin-wide tasks to support GSP planning and implementation. The GSAs will support each task in the workplan as needed with the necessary level of effort to meet the project goals.

This cost estimate was developed based on KRGSA, KGA, and other GSA experience in contracting with professional consultants in recent years and through development of Groundwater Sustainability Plans for the Subbasin, as well as with input from consultants and industry professionals knowledgeable about DMS development and the data collection needs of the Subbasin's GSAs.

As described in Attachment 3, Work Plan, it is anticipated that the cost to fully develop an operational DMS for the Subbasin will far exceed grant funding available under this Round 3 Planning Grant opportunity. Additional resources beyond the funding available through this grant will be provided by Subbasin GSAs as necessary to complete the project and achieve a workable DMS that meets Subbasin needs. The Subbasin GSAs will coordinate to fund any additional project costs and have a demonstrated track record of doing so on many other GSP-related projects.

It is anticipated that a full DA waiver for Local Cost Share will be received for this Proposal. In anticipation of the full waiver, no Local Cost Share has been included with the Proposal Budget. Please see Attachment 6 – SDAC, DAC, EDA for documentation and narrative describing Disadvantaged Areas within the Kern County Subbasin project area.

Kern County Subbasin Groundwater Sustainability Plan Support - Phase II 2019 Grant Application



Attachment 5

SCHEDULE

Proposition 68 and Proposition 1

Sustainable Groundwater Management Grant Program

Planning Grants Proposal Solicitation Package - Round 3

Tables

Figures

None

Appendices

None

Schedule

Table 7A – Grant Proposal Schedule (No Components)

Grant Proposal Title: Kern County Subbasin Groundwater Sustainability Plan Support – Phase II

Applicant: Kern River Groundwater Sustainability Agency (KRGSA)

Categories	Start Date *(Earliest Start Date)*	End Date *(Latest End Date)*
(a) Grant Administration	**3/1/2020**	**7/31/2022**
Task 1. Grant Management	3/1/2020	7/31/2022
Task 2. Invoicing	6/1/2020	7/31/2022
Task 3. Report Preparation	6/1/2020	7/31/2022
(b) Stakeholder Engagement / Outreach	**4/1/2020**	**4/30/2022**
Task 1. Technical Meetings	4/1/2020	4/30/2022
(c) GSP Development: Subbasin DMS Scoping and Development	**2/1/2020**	**4/30/2022**
Task 1. Retain Consultant to Assist with DMS Development	2/1/2020	6/30/2020
Task 2. Identify Information Requirements for DMS	2/1/2020	9/30/2020
Task 3. Investigate and Select an Appropriate DMS	6/30/2020	4/30/2021
Task 4. Procure/Design and Customize the Selected DMS	5/1/2021	4/30/2022
Task 5. Develop Data Protocols and Templates	5/1/2020	4/30/2022
Task 6. Develop DMS User's Manual and Train GSA Staff	10/1/2021	4/30/2022
Task 7. Review and Assessment of DMS	7/1/2021	4/3/2022
(d) Monitoring / Assessment	N/A	N/A

Schedule Description

The Kern County Subbasin Groundwater Sustainability Plan Support – Phase II proposal includes one project, which provides benefits for the entire Kern County Subbasin. Since there are no additional components included with this proposal, Grant Administration has been included with the Work Plan, Budget, and Schedule for the single project, and the required Schedule Table 7A, intended for proposals that do not include multiple components, has been completed and presented above.

This section summarizes the schedule established (and presented in Table 7A) for the Kern County Subbasin Groundwater Sustainability Plan Support – Phase II proposal.

The tasks listed in the schedules align with the same tasks identified and described in the Work Plan (Attachment 3) and Budget (Attachment 4), and use March 2020 as the assumed award date of the grant and launch of Grant Administration. Project implementation will likely begin prior to notification of award, potentially by February 2020.

All project implementation work will be complete by the end of April 2022. The schedule for Grant Administration extends through July 2022 when all final reports and invoicing will be complete for the grant.

The anticipated order of activities for completion of the project is as follows:

- Category (c), GSP Development: Subbasin DMS Scoping and Development, will begin immediately upon grant award with the process of hiring a DMS consultant (Task 1). The selected consultant will assist the GSAs with identifying information requirements for the DMS (Task 2). Task 2 begins concurrently with Task 1 to allow the identification of requirements to inform the RFP process in Task 1; the task continues to allow communication and consultation with the DMS Consultant on system requirements. After working collaboratively with the GSAs in Task 2, the DMS consultant will then investigate and recommend appropriate DMS options for selection by the GSAs' Boards (Task 3). KRGSA and KGA, on behalf of all the Subbasin GSAs, will procure the selected DMS and the consultant will customize it as needed (Task 4). This process is expected to continue through April 2022 with ongoing adjustments and customization. Task 4 is expected to be partially funded by the GSAs when grant funds are expended for this task. Concurrently with this process, the consultant and GSAs will develop protocols and data templates (Task 5), and will train GSA staff to use and populate the DMS following completion of these tasks (Task 6). Task 7 commences in 2021 when the DMS development is underway and continues throughout the grant period, allowing additional modifications to the DMS as the project is implemented.
- Category (b), Stakeholder Engagement/Outreach, will involve coordination of technical meetings with stakeholders and DACs throughout the process of DMS scoping and development.
- Category (a), Grant Administration, will involve management of the grant, invoicing, and report preparation before, during, and after completion of the grant activities.
- Category (d), Monitoring / Assessment, does not apply to this project as it is a planning effort and does not involve on-the-ground monitoring activities.

Environmental Compliance and Permitting

The Kern County Subbasin Groundwater Sustainability Plan Support – Phase II proposal includes one project, which will benefit the entire Kern County Subbasin. This project, Subbasin Data Management System Development, is effectively a planning effort; no construction will take place under this project.

This grant proposal covers the preparation of Groundwater Sustainability Plans (GSPs) within the Kern County Subbasin. Under Water Code § 10728.6, CEQA does not apply to the preparation and adoption of Groundwater Sustainability Plans. Therefore, this Proposal is exempt from California Environmental Quality Act (CEQA) requirements.

The proposed Subbasin Data Management System Development project will initiate the key steps to develop and build a Subbasin DMS, which will ultimately support Subbasin GSAs by providing (1) improved coordination of groundwater monitoring and management actions and (2) the ability to meet the reporting and implementation

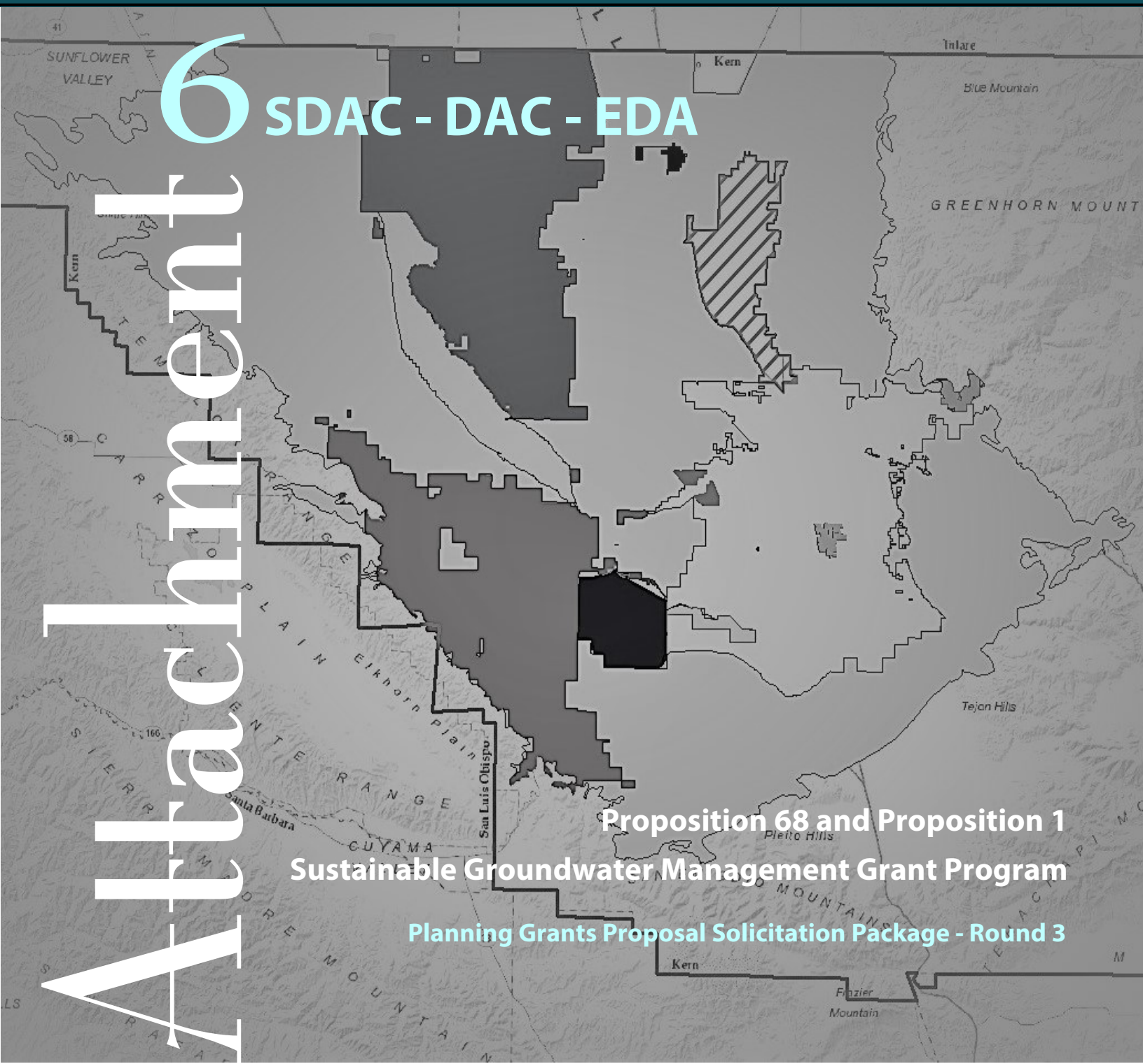
requirements of their respective GSPs and DWR. The development of a DMS does not meet the definition of a "Project" under CEQA, as it will not create any foreseeable impact on or alter the physical landscape in any shape, manner, or form. Under CEQA, a "Project" refers to an action that has the potential to result in a physical change to the environment (Pub. Res. Code § 21065). Therefore, CEQA does not apply to this project.

Development of a Subbasin Data Management System will not require any permits or regulatory agency approvals. Therefore, a process and schedule for securing permits and approvals is not necessary, and has not been included in this Proposal.

Kern County Subbasin Groundwater Sustainability Plan Support - Phase II 2019 Grant Application

Attachment 6

SDAC - DAC - EDA



Proposition 68 and Proposition 1

Sustainable Groundwater Management Grant Program

Planning Grants Proposal Solicitation Package - Round 3

Figures

Appendices

Introduction

According to Water Code § 79505.5, a disadvantaged community (DAC) is "a community with an annual median household income that is less than 80 percent of the Statewide annual median household income." These communities, widely dispersed throughout California and the Kern County Subbasin, are especially sensitive to groundwater overdraft and decreases in local water quality such as that in the Kern County Subbasin.

Attachment 6 – SDAC-DAC-EDA addresses the existence of DAC areas located within the Kern County Subbasin, and includes a map showing the Proposal benefit area and the location of DACs.

Location of DACs within the Proposal Area

The Kern County Subbasin (Proposal benefit area) is located in the Southern San Joaquin Valley, is a critically overdrafted, high priority groundwater basin and is home to numerous DAC Communities. The GSAs in the Kern County Subbasin identified DACs throughout the Subbasin by using the DWR's DAC Mapping Tool and ArcGIS Map Package. Geographically, the Kern County Subbasin is comprised of 79.5 percent Disadvantaged Communities.

The GSAs in the Subbasin have accurately discerned and mapped where DAC communities exist within the Subbasin. Figure 6-1, below, illustrates the Proposal benefit area and the location of DACs within the Kern County Subbasin.

The DAC Mapping tool and ArcGIS Map Package provide US Census data identifying DACs by "Block Groups", "Tracts", and "Places." The specific dataset used in the tool is the *US Census American Community Survey (ACS) 5-Year Data: 2012 – 2016* (with an MHI of $63,783 and hence calculated DAC threshold of $51,026).

According to the US Census Bureau:

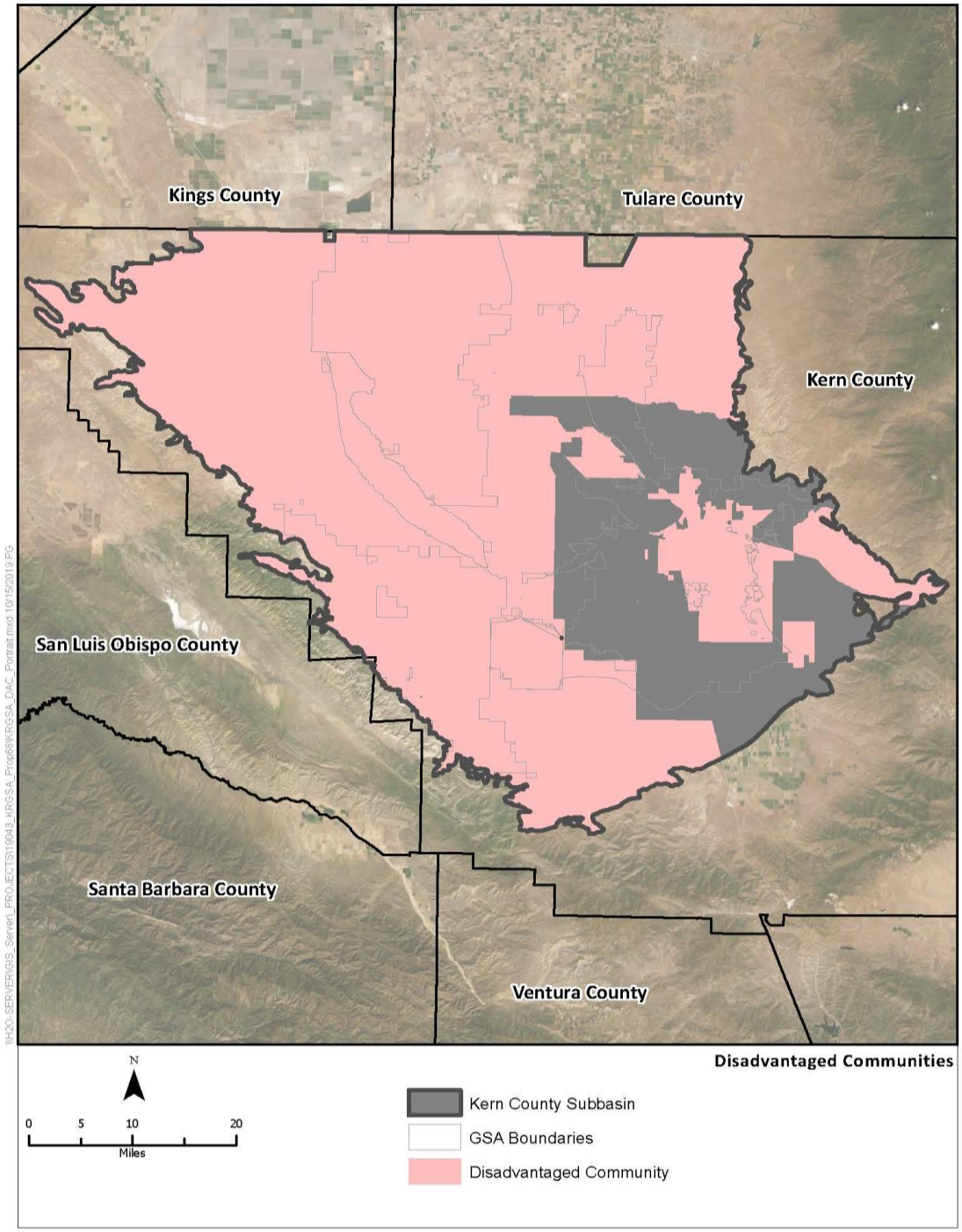
- Block Groups are statistical divisions of census tracts, generally defined to contain between 600 and 3,000 people.
- Census Tracts are small, relatively permanent statistical subdivisions of a county or equivalent entity. Census tracts generally have a population size between 1,200 and 8,000 people, with an optimum size of 4,000 people.
- Places can be defined as either incorporated or designated. Incorporated Places usually consist of a city, town, village, or borough, but can have other legal descriptions or boundaries. Designated Places usually coincide with visible features or the boundary of an adjacent incorporated place or another legal entity boundary, have no legal status, nor do these places have officials elected to serve traditional municipal functions.

For more information on the DAC Mapping Tool or ArcGIS Mapping Package, please visit: http://www.water.ca.gov/irwm/grants/resources_dac.cfm.

All communities qualifying as Disadvantaged Communities within the Kern County Subbasin (block groups, census tracts, and places) will benefit as a result of the Subbasin Data Management System Development project included in this Kern County Subbasin Groundwater Sustainability Plan Support – Phase II Proposal.

Figure 6-1 shows the location and extent of all Disadvantaged Communities within the Kern County Subbasin. These Disadvantaged Areas make up 79.5 percent of the Subbasin and Project area. All communities qualifying as DACs within the Kern County Subbasin will benefit as a result of the proposed project.

Figure 6-1. Disadvantaged Communities in the Kern County Subbasin



DAC Support and Outreach

The Kern County Subbasin Groundwater Sustainability Plan Support – Phase II grant application includes outreach, engagement, and technical support to benefit DACs throughout the entire Subbasin. All the GSAs in the Subbasin conduct regular Board meetings on a monthly basis to support development of their respective GSPs. All the GSAs in the Subbasin have undertaken coordination activities with the DACs in the Subbasin. Several of the DACs are represented by board members on the GSAs in the Subbasin.

The following DAC communities within the Kern County Subbasin are identified as cities or Census Designated Places (CDPs) in DWR's DAC database. All communities qualifying as DACs within the Kern County Subbasin will benefit as a result of the DMS project.

Arvin
Buttonwillow CDP
Delano
Edmundson Acres CDP
Ford City CDP
Fuller Acres CDP
Greenfield CDP
Lamont CDP
Lost Hills CDP
Maricopa
McFarland
McKittrick CDP
Mettler CDP
Mexican Colony CDP
Oildale CDP
Richgrove CDP
Shafter
Smith Corner CDP
South Taft CDP
Taft
Taft Heights CDP
Tupman CDP
Valley Acres CDP
Wasco
Weedpatch CDP

As part of the DMS project, the GSAs in the Subbasin would conduct outreach to all the DACs that will be required to report to DWR under SGMA. GSA staff would work with local DACs within their boundaries, relying on the existing relationships they have established and maintained during the GSP development process.

A joint letter of support for the Kern County Subbasin Groundwater Sustainability Plan Support – Phase II 2019 Grant Application endorsed by the GSAs and stakeholders that would benefit from the project is provided in Appendix C. As noted previously, outreach to DACs will continue to occur throughout development of the DMS. With grant funding, the DMS project will be better situated to conduct outreach to, engage, and include DACs and DAC concerns so that DACs will benefit from easier access to groundwater sustainability information.

Appendix C

Joint Letter of Support

HENRY MILLER WATER DISTRICT

TEJON-CASTAC WATER DISTRICT

Olcese Water District

November 15, 2019

Mr. Zaffar Eusuff, Program Manager
Financial Assistance Branch
California Department of Water Resources
PO Box 942836
Sacramento, CA 94326-0001

Ms. Kelley List, Project Manager
Sustainable Groundwater Management
Program, Round 3 Planning Grant
California Department of Water Resources
901 P Street
Sacramento, CA 94236

Subject: Letter of Support for Kern River Groundwater Sustainability Agency Leading the Kern County Subbasin Proposition 1 Round 3/Proposition 68 Planning Grant Application

Dear Mr. Eusuff and Ms. List:

The undersigned groups are submitting this letter in support of the Sustainable Groundwater Management – Proposition 1 Round 3/Proposition 68 Planning Grant Application submitted by the Kern River Groundwater Sustainability Agency (KRGSA), in coordination with the all the GSAs in the Kern County Subbasin. The demographics of the Subbasin service area establish it as a geographic area of largely disadvantaged communities in need of assistance and support. As representatives and water providers of Disadvantaged Communities (DACs) in the Kern County Subbasin, we jointly support this effort to achieve sustainable groundwater planning in the Kern County Subbasin.

Since the enactment of the Sustainable Groundwater Management Act (SGMA), the Kern County Subbasin GSAs have worked together to achieve sustainable groundwater management. Through a collaborative process involving more than a dozen member agencies and landowner representatives,

GSAs in the Kern County Subbasin have coordinated on numerous GSP activities, including the following milestones:

- Produced a Subbasin-wide Sustainability Goal for achieving and maintaining sustainable groundwater management;
- Developed Sustainable Management Criteria to apply to the entire Subbasin, while allowing flexibility for local GSA control;
- Coordinated on a Subbasin-wide monitoring network and agreed on monitoring protocols for coordinated monitoring and groundwater evaluations;
- Shared costs and tasks for the development of a Subbasin-wide integrated surface water–groundwater model to analyze Subbasin water budgets and to support an evaluation of projects and management actions;
- Held two widely attended SGMA Open Houses to allow stakeholders to discuss the GSP process and requirements directly with GSA managers;
- Hosted numerous community, Board, public outreach, and stakeholder meetings, including many that were focused on the disadvantaged communities in the Subbasin; and
- Organized numerous committees to guide policy decisions, coordinate communication and outreach activities, and provide a forum for GSA managers to discuss and coordinate GSP elements.

While individual GSAs and their member agencies have developed separate Groundwater Sustainability Plans (GSPs) to comply with the SGMA regulations, the Kern GSAs recognized the need to develop a centralized, Subbasin-wide data management system (DMS) to support monitoring, evaluation, reporting, management, and, importantly, GSP implementation. We recognize that compilation of our individual systems will require significant manipulation and re-structuring to create a centralized relational DMS that is populated with consistent data sets across the Subbasin. For this reason, the GSAs of the Kern County Subbasin have agreed to coordinate to submit a Proposition 1 Round 3/Proposition 68 Planning Grant Application to take the first key steps in this process. Participating in the DWR grant funding program through continued Subbasin-wide Groundwater Sustainability Planning efforts is a good and essential step forward for DAC communities in the Kern County Subbasin.

We are pleased and supportive to see the inclusion and participation of Disadvantaged Communities and related stakeholders in the Kern County Subbasin's Groundwater Sustainability Planning efforts, and we believe that funding from this Grant Application will contribute to basin-wide groundwater planning efforts and benefit our community members. By funding the KRGSA's grant application in the full allotment of $500,000, DWR will ensure that all that disadvantaged communities in the Kern County Subbasin will benefit from improved groundwater management and sustainability. The grant funds will be instrumental to the DACs in the Kern County Subbasin by providing the mechanism for meeting their reporting requirements under SGMA and also providing the ability to review each other's data in the Subbasin.

We hope that DWR will fully fund the Kern County Subbasin Round 3 Planning Grant Application, and we look forward to seeing the benefits of this program within all of our service areas in the near future.

Sincerely,

Art Chianello
Water Resources Manager
City of Bakersfield

David Beard
Manager
Improvement District No. 4
Kern County Water Agency

Holly Melton
Water Resources Manager
Kern County Water Agency

L. Mark Mulkay
General Manager
Kern Delta Water District

Phil Nixon
General Manager
Westside District Water Authority

Jeof Wyrick
President
Henry Miller Water District

Dennis Atkinson
President of the Board
Tejon-Castac Water District

James L. Nickel
President
Olcese Water District

Jason Gianquinto
General Manager
Semitropic Water Storage District

Richard A. Diamond
General Manager
North Kern Water Storage District

Jonathan Parker
General Manager
Kern Water Bank Authority

Raul Barraza, Jr.
General Manager
Arvin Community Service District

Chad Hathaway
Board President
Eastside Water Management Area

Steven C. Dalke
General Manager
Kern-Tulare Water District

David Ansolabehere
General Manager
Cawelo Water District

Sheridan Nicholas, P.E.
Engineer-Manager
Wheeler Ridge-Maricopa Water Storage District

Tim Ashlock
Manager
Buena Vista GSA

Dana Munn
General Manager
Shafter-Wasco Irrigation District

Eric Averett
General Manager
Rosedale-Rio Bravo Water Storage District

Jeevan Muhar, P.E.
Engineer-Manager
Arvin-Edison Water Storage District

Greg A. Hammett
General Manager
West Kern Water District

KERN
GROUNDWATER AUTHORITY

November 20, 2019

To: **Kern River GSA**
Buena Vista WSD GSA
Henry Miller WD GSA
Olcese WD GSA

Re: Reimbursement Agreement for Annual Reporting of the Kern Sub-basin

The Kern Groundwater Authority (KGA), the Kern River Groundwater Sustainability Agency (KRGSA), the Buena Vista WSD Groundwater Sustainability Agency (BVGSA), the Henry Miller WD Groundwater Sustainability Agency (HMGSA), and the Olcese WD Groundwater Sustainability Agency (OGSA) wish to participate in the Reimbursement agreement for the Kern County Subbasin – 2020 Annual Reporting Requirement under SGMA.

On behalf of the Subbasin, the KGA has approved a contract with TODD Groundwater (Attachment 1) which includes a scope of work with the following tasks:
1) Prepare Data Requests and Templates ($10,554)
2) Prepare Groundwater Elevation Contour Maps ($26,749)
3) Review and Compile Hydrographs ($9,458)
4) Compile and Present Water Supply Data ($19,373)
5) Analyze Change in Groundwater in Storage ($32,518)
6) Document Progress in GSP Implementation ($10,639)
7) Prepare Drafts/Final Annual Report and Submit to DWR ($32,322)
8) Communication and Meetings ($33,216)
for a total amount of the contract of $174,830.

Also, on behalf of the Subbasin, the KGA has approved a contract with ITRC (Attachment 2) which includes a scope of work with the following tasks:
1) Provide monthly and annual ITRC-METRIC actual crop evapotranspiration (ETc) for the Kern Subbasin for 2017-2019.
2) Data will be extracted for each GSA within the subbasin and each irrigated field in each GSA monthly for 2017-2019
3) Data will be provided tabularly and monthly ETc images will be provided in GIS format
4) Short report discussing the general process and overall results will be provided
for a total amount of the contact of $16,000

All parties agree to cost share this effort according to following terms and conditions:

1. The participant signatories below will pay their share of the proposed budget of $190,830 as shown on Exhibit 1.
2. All payments from shall be due 45 days after the receipt of invoice from the KGA

If the above terms and conditions are acceptable, please sign and date this letter and return them to the KGA.

Sincerely,

KGA
Vice Chair

Accepted:

Kern River GSA

By:_____

Title:_____

Date:_____

Buena Vista WSD GSA

By:_____

Title:_____

Date:_____

Henry Miller WD GSA

By:_____

Title:_____

Date:_____

Olcese WD GSA

By:_____

Title:_____

Date:_____

Sincerely,

KGA
Vice Chair

Accepted:

Kern River GSA

By:

Title:

Date: 12/5/19

Buena Vista WSD GSA

By:

Title:

Date:

Henry Miller WD GSA

By:

Title:

Date:

Olcese WD GSA

By:

Title:

Date:

Sincerely,

KGA
Vice Chair

Accepted:

Kern River GSA

By: _____

Title: _____

Date: _____

Buena Vista WSD GSA

By: _____

Title: Engineer - Manager

Date: 1-8-2020

Henry Miller WD GSA

By: _____

Title: _____

Date: _____

Olcese WD GSA

By: _____

Title: _____

Date: _____

Sincerely,

KGA
Vice Chair

Accepted:

Kern River GSA

By: _____

Title: _____

Date: _____

Buena Vista WSD GSA

By: _____

Title: _____

Date: _____

Henry Miller WD GSA

By: Jeff Wyrick

Title: PRESIDENT

Date: 11-19-19

Olcese WD GSA

By: _____

Title: _____

Date: _____

Sincerely,

KGA
Vice Chair

Accepted:

Kern River GSA

By: _____

Title: _____

Date: _____

Buena Vista WSD GSA

By: _____

Title: _____

Date: _____

Henry Miller WD GSA

By: _____

Title: _____

Date: _____

Olcese WD GSA

By: _____

Title: James L. Nickel, President

Date: Dec 17, 2019

ATTACHMENT 1

TODD GROUNDWATER

November 19, 2019

MEMORANDUM

To: Kern Groundwater Authority (KGA)
Patty Poire, Kern County Subbasin GSP Plan Manager

Cc: Kern River Groundwater Sustainability Agency (KRGSA)
Art Chianello, David Beard, and Mark Mulkay, KRGSA Plan Managers

From: Phyllis Stanin, Vice President

Re: Proposal – Preparation of GSP Annual Report for WY 2019
Kern County Subbasin Groundwater Sustainability Plans (GSP)

The Kern Groundwater Authority (KGA) is leading Subbasin-wide coordination efforts for development of Groundwater Sustainability Plans (GSP) including annual reporting on GSP implementation. Subbasin GSAs are cooperating in preparation of this first GSP Annual Report covering Water Year (WY) 2019 for the Kern County Subbasin. Todd Groundwater has been asked to prepare a proposal to prepare and submit the 2019 Annual Report.

The Kern County Subbasin is required to submit adopted GSPs covering the entire Subbasin to the Department of Water Resources (DWR) by January 31, 2020. Annual Reports are due to DWR "by April 1 of each year following the adoption of the Plan." (§356.2). Accordingly, the 2019 Annual Report is due to DWR by April 1, 2020, only two months after submittal of the GSPs.

1 APPROACH

Collectively, the extensive analyses and hydrogeologic products available in Subbasin GSPs provide a firm foundation for the 2019 Annual Report. Monitoring sites have already been identified, data are being collected, and water budget results are readily available from the historical and current study periods. We envision working cooperatively with Subbasin agencies and their consultants to compile and incorporate information that either is currently available or is being collected as part of GSP implementation.

Preparation of the 2019 Annual Report will follow regulatory guidance. Regulatory requirements for the GSP Annual Reports are provided in Article 7 of the GSP regulations (§ 356). Reporting standards for Annual Report data are provided in Article 3 (§352.4) and reporting provisions can be found in Article 4 (§353.4).

This first Annual Report will require extra analysis of the Subbasin water budget to "bridge" the time period between the end of the Subbasin current Study Period (WY 2015) and the reporting period of WY 2019. Although GSP Annual Reports are designed to describe conditions from the preceding water year only (i.e., WY 2019), regulations also require water budget results (i.e., change in groundwater in storage) to use "historical data to the greatest extent available, including from January 1, 2015 to the current reporting year." (§356.2 (b)(1)(B) and §356.2 (b)(5)(B)). The bridge analysis, combined with the GSP current Study Period, will cover the requirement of "January 1, 2015 to the current reporting year." GSP analyses from the Subbasin-wide historical and current Study Periods –covering WY 1995 through WY 2015 – can be used to satisfy the requirement of "historical data to the greatest extent available."

Regulations only appear to require historical data for hydrographs and change in groundwater in storage. Additional data, including reporting of groundwater extractions, surface water, and total water use by sectors, appear to only refer to the preceding year and not the "bridge" period.

It is anticipated that we will require clarification and interaction with DWR on several issues for the 2019 Annual Report. We recommend working directly with the Subbasin Plan Manager (Patty Poire) on any communications with DWR to ensure that the 2019 Annual Report will comply with regulations. In coordination with the Plan Manager, we will confirm with DWR the specific time period for which these other data sets must cover, seek DWR acceptance of recommended methods to incorporate into the 2019 Annual Report, and work with agencies to comply with DWR requirements.

In our role as the Watermaster Engineer for the Antelope Valley Watermaster, we have been submitting SGMA-compliant annual reports to DWR for several years. Although requirements for adjudicated basins are significantly different from critically over-drafted basins, many of the requested data sets and attachments are the same. This provides us with some insight as to how GSP annual reporting might be managed by DWR; some of these insights are incorporated into this scope of services, as relevant.

2 SCOPE OF SERVICES

In order for Subbasin agencies to begin planning for the required components of the 2019 Annual Report, an example template of the report has been prepared and provided with this proposal as **Attachment 1**. The template has been annotated with a mix of GSP requirements, assumptions for report development, and example text. Annotations also include assumptions and details of our proposed scope of services to allow agencies to better visualize how Subbasin data will be compiled, analyzed, and used in the Annual Report. Accordingly, **Attachment 1** serves as a companion document to this scope of services and is incorporated into the scope by reference.

Tasks associated with the proposed scope of services are summarized below. Also, please refer to **Attachment 1** for GSP requirements and additional assumptions and details for including the information in the 2019 Annual Report.

Table 1: 2019 Annual Report, Kern County Subbasin

Todd Groundwater

	Task	Principal QA/QC $245	PM $245	Senior Engineer $230	Senior Hydrogeo $220	Staff Hydrogeo $165	Total Labor Hours	Total Labor	2% Comm Fee	GIS/ Graphics $125	Admin Costs $115	Other Direct Costs	10% Expense Fee	Total Costs
1	Prepare Data Requests and Templates		8	24		16	48	$ 10,120	$ 202	$ -	$ 230		$ -	$ 10,554
2	Prepare Groundwater Elevation Contour Maps		8	18	60	24	110	$ 23,260	$ 465	$ 3,000	$ -		$ -	$ 26,749
3	Review and Compile Hydrographs		6	16		16	38	$ 7,790	$ 156	$ 1,500	$ -		$ -	$ 9,458
4	Compile and Present Water Supply Data		14	36	14	12	76	$ 16,770	$ 335	$ 2,250	$ -		$ -	$ 19,373
5	Analyze Change in Groundwater in Storage		24	48	40	12	124	$ 27,700	$ 554	$ 4,000	$ 230		$ -	$ 32,518
6	Document GSP Progress		16	24		6	46	$ 10,430	$ 209	$ -	$ -	$ -	$ -	$ 10,639
7	Prepare Drafts/Final Annual Report and Submit to DWR	12	40	36	16	12	116	$ 26,520	$ 530	$ 5,000	$ 230		$ -	$ 32,322
8	Management, Communication and Meetings	4	80	24	12		120	$ 28,740	$ 575	$ 1,500	$ 460	$ 1,750	$ 175	$ 33,216
	Project Budget	**16**	**196**	**226**	**142**	**98**	**678**	**$ 151,330**	**$ 3,027**	**$ 17,250**	**$ 1,150**	**$ 1,750**	**$ 175**	**$ 174,830**

Task 1: Prepare Data Requests and Templates

The first step in this process involves development of a data request memorandum by Todd Groundwater, which will provide a list of data requirements from all Subbasin agencies and include data templates to facilitate data compilation and presentation. Todd Groundwater assumes introducing the data request memorandum and templates at a KGA-coordinated Subbasin Managers' Meeting, tentatively scheduled for November 8, 2019 (included in Task 8).

Task 2: Prepare Groundwater Elevation Contour Maps

We will obtain water level data from individual agencies for Spring and Fall 2019 measurements. We assume that data will be provided for the GSP water level monitoring sites but would be pleased to incorporate more data, if available. We will also work with KCWA, who leads an extensive water level monitoring program and may be able to provide additional data to improve map accuracy. Given the need for developing separate maps for each Principal Aquifer, the KCWA supplemental data from wells without construction information may not be included.

It is our understanding that GSAs have identified two primary Principal Aquifers that can be mapped in the Subbasin. Groundwater elevation contour maps will be prepared for each Principal Aquifer for Spring and Fall 2019 (4 total maps). It is also our understanding that two deeper Principal Aquifers, the Olcese Formation and the Santa Margarita Formation, have been identified in limited areas in the eastern Subbasin. If sufficient data are available for contouring groundwater elevations in these aquifers, we can also include them in the Annual Report. We assume that all groundwater elevations available for contouring will be provided by others (except for KRGSA data, which we will produce separately from this proposal).

We assume that groundwater level data will be provided in electronic (Excel) spreadsheets and include, at a minimum, well identifiers (matching hydrographs), date, X/Y or Lat/Long (with datum), depth to water, reference point elevation, water level elevations, and associated Principal Aquifer. GIS shapefiles are also appreciated, if available.

Data will be contoured initially using commercially-available software and then iteratively hand-modified for more accurate representations of groundwater elevations across the Subbasin. We will work directly with individual agencies if data issues are identified or if we require further clarification. If agencies have already developed groundwater elevation contour maps and wish to use the current contours, we can coordinate with the agency to obtain electronic maps or discuss other options. Several drafts of water level contour maps will be developed for review by individual agencies, as needed.

Task 3: Review and Compile Hydrographs

Groundwater elevation hydrographs will be compiled from Subbasin agencies for inclusion in the Annual Report. Hydrographs should be formatted to adhere with the *Data and*

Reporting Standards as prescribed in §352.4(e) of the GSP regulations and summarized in Section 2.2 of **Attachment 1**. In brief, each hydrograph should include a unique site identification number, ground surface elevation, and use the same scale to the greatest extent practical.

We will work with agencies to ensure relatively similar hydrograph formats including the same horizontal scale of October 1, 1994 through September 30, 2019 (WY 1995 – WY 2019), as needed; similar formats may facilitate DWR review. Closely-spaced hydrographs should incorporate the same vertical scales to the extent practicable in adherence with GSP regulations. Hydrographs may also include annotations to allow for easy well identification and understanding by DWR reviewers.

Overall trends and fluctuations as shown by the hydrographs for WY 2016 through WY 2019 will be described briefly in the context of water year type and the groundwater elevation contour maps. A map showing the location of submitted hydrographs will be developed and PDF files of each hydrograph will be included in an appendix of the Annual Report.

Task 4: Compile and Present Water Supply Data

Working with the individual agencies, Todd Groundwater will compile water supply data for the following categories:

- Groundwater Extractions
- Surface Water Supply
- Total Water Use.

For groundwater extractions, total extraction amounts for the preceding year are required, along with a map showing locations and volumes of production. Although data can be combined to report a total extraction from the Subbasin, some local data will be needed to develop groundwater extraction maps. First, we recommend development of a map showing general locations of active wells by type (agricultural, urban, banking recovery, etc.). This will illustrate concentrations of the various extraction types across the Subbasin. To meet the requirement of volumes, we recommend development of various "bubble" maps that illustrate relative volumes for various areas using circles of increasing diameter. We will recommend appropriate illustrations after a review of the available extraction data.

We will emphasize to DWR that management actions are being implemented for estimating groundwater extractions, but those actions were not in place in WY 2019. Therefore, the data will represent estimates, and can potentially be based on extractions associated with recent time periods as provided in the C2VSimFG-Kern model; extractions could be adjusted for current changes in local land use or known changes in extractions, as needed.

In addition to the map, groundwater extractions must be tabulated by water use sector (generally Urban, Agricultural, Managed Recharge, and Other - see Section 3 of **Attachment 1**). Methods and accuracy of measurements must also be included.

Data for total surface water supply (Section 4 in **Attachment 1**) are more likely to be available, but volumes are also required to be tabulated by water use source type. This categorization may be complicated for parties that frequently use water exchanges as part of their ongoing operations. We are assuming that surface water supply data will be provided to us by others (except for the KRGSA agencies), similar to the process conducted for the C2VSimFG-Kern model development.

Groundwater extractions and surface water supply will be combined for Total Water Use in Section 5 of the 2019 Annual Report. As indicated in **Attachment 1**, total water use must be categorized by both water use sector and water source type.

As noted in Sections 3, 4, and 5 of **Attachment 1**, DWR categories of water use sectors, methods/accuracy of measurement, and water use sources have been pulled from the DWR website used for SGMA reporting in adjudicated basins. Given the similarity of the SGMA reporting website organization and the requirements in the GSP regulations of Article 7, it seems reasonable to conclude that this organization will be maintained for reporting data in the GSP annual reports. Data requests and templates will be developed for these water use sectors, measurement methods, accuracy of measurements, and water source types for inclusion, as available (**Attachment 1**).

DWR will recognize that previous data were not likely collected in a manner to differentiate among these categories and some categorization of data will not be available for this first Annual Report. We will confirm with DWR that some data categorization will be unavailable and also that these data only need to be reported for WY 2019; GSP regulations do not indicate that these data need to be provided on an historical basis.

Finally, much of the requested data in this task overlaps with requirements for the updates of Agricultural Water Management Plans (AWMP) and Urban Water Management Plans (UWMPs) for 2020, due in 2021. We will note in the Annual Report that many of these requested data sets are currently being developed/revised in compliance with other planning processes, and data in this Annual Report will be superseded with improved data sets in future annual reports.

Task 5: Analyze Change in Groundwater in Storage

GSP regulations (§ 356.2 (b)(5)(B)) for the Annual Report require both a map and graph of changes in groundwater in storage be developed over the entire groundwater basin that meet the following requirements:

- Graphs depicting the annual and cumulative change in groundwater in storage "based on historical data to the greatest extent available, including from January 1, 2015 to the current reporting year," and
- "Change in groundwater in storage maps for each principal aquifer in the basin".

These requirements presents numerous technical challenges for the Kern County Subbasin (see also the discussion in Section 6.1 of **Attachment 1**).

Based our November 8, 2019, discussion at the Kern County Manager's Meeting, Todd Groundwater will develop change in groundwater in storage maps and graphs for the entire Kern County Subbasin using the C2VSimFG-Kern model. By doing so, we continue to update and use the primary DWR modeling tool with our local Kern County updates for evaluating basin conditions. For this task, we will use a methodology consistent with that used to develop change in groundwater storage graphs for the C2VSimFG-Kern Model Results technical memorandum, which is included in the KGA Umbrella and KRGSA GSPs. Using this approach, we will maintain consistency of method in presenting the basinwide change in groundwater in storage.

For this task, we will request WY2016 through WY2019 data from each district for measured managed water supply and demand data following the methodology used to update the C2VSimFG-Kern model for the Kern County historical water budgets. To meet this Annual Report schedule, this data needs to be delivered to Todd Groundwater no later than January 10, 2020. We will provide data templates to each district to provide monthly data for the following:

- Surface water imports and diversions (inflows and outflows) by source
- Application of surface water imports by category (e.g. irrigated agriculture, urban, managed aquifer recharge, or other uses).
- Groundwater banking and managed aquifer recharge by water district or agency,
- Groundwater banking pumping for export from the basin,
- Metered district groundwater recovery pumping,
- Metropolitan Bakersfield urban water deliveries and wastewater disposal, and
- Any other locally relevant water supply use or demands.

Todd Groundwater will update the natural hydrology for precipitation and flows in gauged streams (Kern River and Poso Creek). Precipitation data will be updated using publicly-available precipitation data from the PRISM Climate Group at Oregon State University. The monthly rainfall data for Kern County for WY2016 through WY2019 will be mapped into C2VSimFG-Kern input files. The Kern River and Poso Creek streamflow for WY2016 through WY2019 will be updated based on locally measured weir data.

Kern County GSAs will also separately contract with the Irrigation Training & Research Center (ITRC) at Cal Poly San Luis Obispo to deliver evapotranspiration (ET) using remote sensing data across the entire subbasin for determining agricultural demand corresponding to the WY 2016 through WY 2019. Todd Groundwater will utilize the ITRC ET data to develop ET rates for Kern County for this period for model input. To meet this Annual Report schedule, this data needs to be delivered to Todd Groundwater no later than January 17, 2020.

As mentioned previously, GSP regulations require a graph depicting the annual and cumulative change in groundwater in storage "based on historical data to the greatest extent available, including from January 1, 2015 to the current reporting year." (§ 356.2 (b)(5)(B)). To meet this requirement, the updated C2VSimFG-Kern subbasin-wide results will be appended to the historical C2VSimFG-Kern results for WY 1995 – WY 2015. One annual

change in groundwater storage map will be developed for each year from WY2016 through WY2019 for the entire Kern County Subbasin using the C2VSimFG-Kern model results.

We will work with agencies to determine the best method for meeting this requirement and then coordinate through the Plan Manager to confirm acceptance of the method by DWR. Additional details are provided in Section 6.2 of **Attachment 1**.

Task 6: Document Progress in GSP Implementation

For this section, Todd Groundwater will work with individual agencies to obtain descriptions and information relating to GSP implementation plans and progress. For the 2019 Annual Report, this section will likely be relatively brief. DWR will recognize that the GSPs were only submitted two months prior to the preparation of this Annual Report and will understand that there will not be substantial progress in plan implementation. Nonetheless, we will document any ongoing activities toward plan implementation that agencies would like to include. In particular, the collection of the preceding year monitoring data and preparation of this First Annual Report are significant steps toward implementation.

Task 7: Prepare Administrative Draft, Draft, and Final Annual Report and Submit to DWR

Based on the tasks above, an Administrative Draft will be prepared for review by Subbasin agencies. Given the condensed schedule, this Administrative Draft will be provided in early February to allow agency input into the development process. It is recognized that the Administrative Draft will contain deficiencies, but the early release will allow comments on analysis methods and results prior to finalization of the technical analysis.

Comments will be incorporated into the Administrative Draft to develop a Draft Annual Report (probably release in early March). This will provide a more complete document for agency review and comment. A Final Draft will also be available prior to submittal for any last-minute minor additions or corrections. The target for the Final Draft is March 13. Todd Groundwater will coordinate with the Plan Manager on submittal of the report prior to the deadline of April 1.

Task 8: Communications and Meetings

As indicated above, there will be a need for communication with Subbasin GSAs and KGA member agencies to obtain comparable data across the entire Subbasin for inclusion in the 2019 Annual Report. Communications will include individual calls/emails with Subbasin agencies, conference calls during periodic meetings of GSA managers, and local in-person meetings to present progress to date and discuss outstanding items or issues.

The preparation of the Annual Report will occur at a busy time for Subbasin agencies. Finalization of GSPs and preparation for GSP submittals will be ongoing. To keep to the expedited schedule of the 2019 Annual Report, a significant amount of communication will be needed to allow Subbasin agencies to focus on required details of the 2019 Annual Report.

To expedite the process, Todd Groundwater will coordinate directly with the Subbasin Plan Manager, Patty Poire, to ensure timely data compilation, review, and incorporation of the required analyses to meet GSP Annual Report requirements. In particular, any questions or contacts with DWR regarding clarifications of Annual Report requirements will be coordinated through the Subbasin Plan Manager.

For budget and planning purposes, four in-person meetings are assumed as part of this scope. Because of the large number of attendees, the KGA Managers Meetings – typically held on Friday mornings – will be used as a forum for data requests, discussion, and comments regarding the Annual Report preparation process. These four meetings, along with the primary objectives and tentative dates, are summarized as follows:

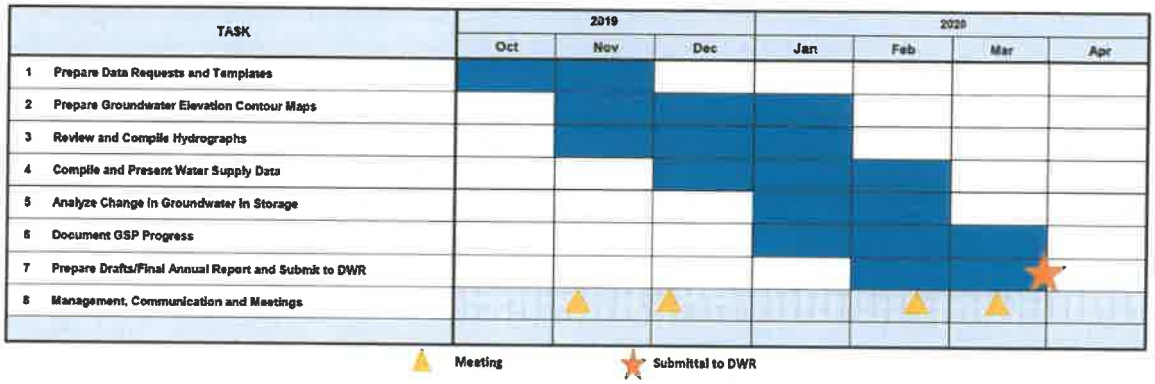
- Meeting No. 1: Provide data request memorandum and templates to agencies and discuss approach for technical analyses including historical change in groundwater in storage; tentatively scheduled for November 8, 2019
- Meeting No. 2: Finalize technical approach for Change in Groundwater in Storage and other technical analyses; tentatively scheduled for December 6, 2019
- Meeting No. 3: Review Administrative Draft Annual Report and address deficiencies; tentatively scheduled for February 21, 2019
- Meeting No. 4: Review Final Draft Annual Report; tentatively scheduled for March 13, 2019.

3 BUDGET AND SCHEDULE

Execution of the scope of work described herein is estimated to cost $174,830. This cost allows for a variety of technical methods to be considered and employed to meet regulatory requirements and the condensed schedule for Annual Report development. Table 1 shows costs by task, along with estimated labor hours and rates.

Our work on the Annual Report can begin in October with additional work on approach for Annual Report items. Technical work can begin in November when water level data from Fall 2019 have been collected and requested data have been compiled. With a submittal date of April 1, 2020, most of the work on the 2019 Annual Report will occur over four months (November through February) with final review and edits of the report targeted for March 2020. A proposed schedule, including the four meetings described in Task 8 is shown below.

Proposed Schedule for 2019 Annual Report, Kern County Subbasin



Please let us know if you have questions regarding this proposal. For the 2019 Annual Report, time is of the essence, and we stand ready to move the effort forward as soon as possible.

ATTACHMENT 1: EXAMPLE ANNOTATED TEMPLATE FOR 2019 ANNUAL REPORT

KERN COUNTY SUBBASIN

GROUNDWATER SUSTAINABILITY AGENCIES

Kern County Subbasin

Groundwater Sustainability Plans (GSPs)

First Annual Report
Water Year 2019

April 1, 2020

TODD GROUNDWATER

2490 Mariner Square Loop, Suite 215
Alameda, CA 94501
510.747.6920
www.toddgroundwater.com

Table of Contents

List of Tables

No table of contents entries found.

Potential List of Figures and Required Maps

Figure 1	Kern County Subbasin
Figure 2	Kern County GSAs
Figure 3	Kern County GSPs
Figure 4	Groundwater Elevation Contour Map, Principal Aquifer 1, Spring 2019
Figure 5	Groundwater Elevation Contour Map, Principal Aquifer 2, Spring 2019
Figure 6	Groundwater Elevation Contour Map, Principal Aquifer 1, Fall 2019
Figure 7	Groundwater Elevation Contour Map, Principal Aquifer 2, Fall 2019
Figure 8	Location Map, Water Level Hydrographs in Appendix A
Figure 9	Location and Type of Groundwater Extraction Wells (several maps may be needed for meeting regulatory requirements of this item)
Figure 10	Change in Groundwater in Storage for WY 2019 (required *map*)
Figure 10	Annual and Cumulative Change in Groundwater in Storage, WY 1995 – WY 2019 (required *graph*)

Other figures, as needed

Appendices

APPENDIX A:	Hydrographs of Groundwater Elevations and Water Year Type, October 1, 1994 through September 30, 2019, including Location Map
APPENDIX B:	Coordination Agreement (or refer to original in GSPs)

List of Acronyms

AFY acre feet per year

...

EXECUTIVE SUMMARY

*Provide an **executive summary** and **location map** depicting the basin covered by the report (Reg. § 356.2(a)).*

1 INTRODUCTION

Include general information and location map for the basin covered by the report (Reg. § 356.2(a)).

This First Annual Report (2019 Annual Report) for the collective implementation of the Groundwater Sustainability Plans (GSPs) in the Kern County Subbasin is being prepared under the guidance of Water Code Section 10728. The 2019 Annual Report provides data and information for the entire Kern County Subbasin, including 11 GSAs that have cooperated in the preparation of five GSPs. Subbasin GSAs and GSP are shown on Figures 2 and 3, respectively.

1.1 PURPOSE OF THE 2019 ANNUAL REPORT

The purpose of the 2019 Annual Report is to demonstrate that the GSPs in the Kern County Subbasin are being implemented in a manner that will achieve the sustainability goals that have been developed for the Subbasin and individual GSAs. The 2019 Annual Report provides an update on the groundwater conditions for **Water Year 2019**, and documents progress on GSP implementation. Data and analyses cover the period from October 1, 2018 through September 30, 2019; historical analyses are provided for context for some components, as required by the regulations.

Specifically, for this First Annual Report, some additional analyses have been required to cover the time period from October 1, 2015 through September 30, 2019 (WY 2016 through WY 2019). Inclusion of data from this four-year period provides a bridge between the end of the Current Study Period (WY 2015) of the Subbasin GSPs and the reporting period for this 2019 Annual Report (i.e., WY 2019).

1.2 COORDINATED SUBMITTAL

Describe process by which Subbasin data were submitted and compiled.

All of the GSAs in the Kern County Subbasin have cooperated to prepare and submit this First Annual Report.

Figures and tables will be included for the GSAs and GSPs in the Subbasin.

As required by GSP regulations, this Annual Report contains... ***summarize organization and contents***.

2 GROUNDWATER ELEVATIONS

§ 356.2(b)(1)(A) Describe and present graphically, groundwater elevation data from monitoring wells identified in the monitoring network.

2.1 GROUNDWATER ELEVATION CONTOUR MAP FOR EACH PRINCIPAL AQUIFER

§ 356.2(b)(1)(A) ...illustrating, at a minimum, seasonal high and seasonal low. Assume submittal of 2 sets of maps with this Annual Report – Spring and Fall 2019, with a map per Principal Aquifer (4 maps total). Will we have Santa Margarita maps from Kern Tulare and others on the Eastside?

Assume that water level data will be provided in Excel and include, at a minimum, well identifiers (matching hydrographs), date, depth to water, reference point elevation, and water level elevations.

Data will be contoured initially using commercially-available software and then iteratively hand-modified for more accurate representations of groundwater elevations across the Subbasin. Multiple drafts of water level contour maps will be developed for review by individual agencies, as needed.

2.2 HYDROGRAPHS FROM WY 1995 THROUGH SEPTEMBER 2019

Assume that wells in the GSP monitoring networks used for GSP compliance monitoring will be provided by each agency for inclusion in the 2019 Annual Report. Hydrographs can be provided as pdf, described briefly in this section, and incorporated in an appendix.

Section will include and describe:

- Table of Wells and Submitting Agencies
- Figure 8: Hydrograph Location Map.
- Hydrographs to be included in Appendix A.

Hydrograph requirements for Annual Report *§ 356.2(b)(1)(B)*:

- Groundwater elevations
- Water Year Type
- Historical data to the greatest extent possible (WY 1995 – WY 2019)
- Locations, tied to the same datum

Hydrograph requirements from Data and Reporting Standards §352.4(e):

- Hydrographs shall be submitted electronically in accordance with the procedures in Article 4.
- Hydrographs shall include a unique site identification number and the ground surface elevation for each site
- Hydrographs shall use the same datum and scaling to the greatest extent practical

We assume that all submitted hydrographs from each agency will have the same horizontal scale beginning with October 1, 1994 and ending with September 30, 2019. The horizontal axis will have major tick marks for each water year (WY 1995 through WY 2019).

3 GROUNDWATER EXTRACTIONS

GSP requirements in § 356.2(b)(2).

3.1 SUMMARY EXTRACTIONS BY SUBBASIN FOR WY 2019

Total groundwater extractions for the Subbasin for the preceding water year (WY 2019) will be summarized and provided in this section. Data should be collected by "best available measurement methods."

3.2 TABLE OF EXTRACTIONS

Based on our SGMA reporting in Adjudicated Basins, we anticipate the following formats from DWR regarding extraction data reporting. Data may not be available for all sectors for this first report.

- Water Use Sector (including volume, explanation, and uncertainty)
    - Urban
        - Large Landscape
        - Commercial
        - Industrial
        - Residential
    - Agricultural
    - Managed Wetlands
    - Managed Recharge
    - Other Sector

- Measurement Method (direct or estimate)
    - Meters
    - Electrical Records
    - Land use
    - Groundwater model
    - Reported by pumper
    - Other

- Accuracy of Measurements
    - Low, medium, high

3.3 EXTRACTIONS MAP

Map that illustrates the general location and volume of groundwater extractions § 356.2(b)(2).

This map will be developed with various formats, depending on the data provided. At a minimum, we assume preparation of a map will showing extraction wells by well type (agricultural, municipal, etc.), using available information from the agencies. To meet the criteria of showing volumes of extractions, we anticipate developing various "bubble" maps showing groundwater extractions for general areas.

4 SURFACE WATER SUPPLY

§ 356.2(b)(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.

4.1 TOTAL SURFACE WATER USE

Total surface water use will be reported for the Kern County Subbasin, including a summary of the methods used to determine the volume and the associated uncertainty (high, medium, low). These data will be compiled from the individual agencies in the Subbasin.

4.2 SURFACE WATER BY SOURCE TYPE

Tables will be developed to document the volumes and associated uncertainty by Water Source Type:

- Local Surface Deliveries
- Local Imported Deliveries
- Colorado River Deliveries
- CVP Base and Project Deliveries
- Other Federal Deliveries
- State Water Project Deliveries
- Recycled Water
- Desalination Water
- Other

5 TOTAL WATER USE

§ 356.2(b)(4) Total water use.

Provide total volume of water used in the Subbasin for WY 2019, including the method used to determine and the level of uncertainty (low, medium, high)

- Collected using the best available measurement methods
- Table containing total water use by:
    - Water Use Sector
        - Urban
            - Large Landscape
            - Commercial
            - Industrial
            - Residential
        - Agricultural
        - Managed Wetlands
        - Managed Recharge
        - Other Sector
    - Water Source Type
        - Groundwater
        - Surface water
        - Recycled or reused water
        - Other

6 CHANGE IN GROUNDWATER IN STORAGE

6.1 MAP OF CHANGE IN GROUNDWATER IN STORAGE FOR THE SUBBASIN

*§ 356.2(b)(5)(A) Change in **groundwater in storage maps** for each principal aquifer in the basin.*

GSP regulations require an annual change in groundwater in storage map for the entire Kern County Subbasin be included in the Annual Report. We will follow up with DWR whether this requirement is for only the preceding year (WY 2019) or whether it applies to all four intervening water years (WYs 2016 through 2019).

Based our November 8, 2019, discussion at the Kern County Manager's Meeting, Todd Groundwater will develop change in groundwater in storage maps and graphs for the entire Kern County Subbasin using the C2VSimFG-Kern model. By doing so, we continue to update and use the primary DWR modeling tool with our local Kern County updates for evaluating basin conditions. For this task, we will use a consistent methodology to that used to develop change in groundwater storage graphs for the C2VSimFG-Kern Model Results technical memorandum that is included in the KGA Umbrella and KRGSA GSPs. Using this approach, we will maintain consistency of method in presenting the basinwide change in groundwater storage. One annual change in groundwater storage map will be developed for each year from WY2016 through WY2019 for the entire Kern County Subbasin using the C2VSimFG-Kern model results.

6.2 GRAPHS OF CHANGE IN GROUNDWATER IN STORAGE

§ 356.2(b)(5)(A) Graphs of Change of Groundwater in Storage showing:

- Water Year Type (Wet, Above Normal, Below Normal, Dry, Critically Dry)
- Groundwater Use
- Annual Change in groundwater in storage
- Cumulative change in groundwater in storage
- Based on historical data, to the greatest extent available, including from January 1, 2015 to the current reporting year

GSP regulations require a graph depicting the annual and cumulative change in groundwater in storage "based on historical data to the greatest extent available, including from January 1, 2015 to the current reporting year." (§ 356.2 (b)(5)(B)).

For the Kern County Subbasin, this graph will present annual changes in groundwater in storage from the C2VSimFG-Kern model. Model results provide an annual change in groundwater in storage for each year in the historical and current study periods (WY 1995 – WY 2015). New water budget analyses will be developed for the remaining time period WY 2016 – WY 2019. To meet the regulatory requirement for this graph, the updated C2VSimFG-Kern subbasin-wide results will be appended to the historical C2VSimFG-Kern results for WY 1995 – WY 2015.

7 PROGRESS IN GSP IMPLEMENTATION

§ 356.2(b)(5)(C) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.

For this section, we assume receipt of text from each GSAs/Districts that describes ongoing implementation of each GSP. A brief description of the projects and management actions being implemented will be included, as relevant. This section is not meant to repeat information in the recently-submitted GSPs and will simply refer to the GSPs as appropriate.

In particular, this section will describe relevant monitoring data and how these data are being used. GSP monitoring data can be summarized/included in an appendix. We will confirm with DWR how much of the data and formats are required to accompany the submission of the Annual Report.

8 REFERENCES AND TECHNICAL STUDIES

To be listed as needed.

9 APPENDICES

- Hydrographs and other data.
- Possible inclusion of other information, if determined to be needed by DWR.

ATTACHMENT 2

ITRC
moving water in new directions

Agreement for ITRC-METRIC 2017-2019

Date: October 7, 2019

To: Patty Poire, Planning Manager
Kern Groundwater Authority
ppoire@kerngwa.com, Mobile: (661)706-1989

From: Dan Howes, Ph.D., P.E.
Project Manager/Senior Engineer
Irrigation Training and Research Center
Cal Poly/ San Luis Obispo, CA 93407
Cell: 858-354-0504
djhowes@calpoly.edu

Subject: **Proposal for ITRC-METRIC evapotranspiration for Kern Subbasin (2017-2019)**

This proposal is being submitted to Kern Groundwater Authority (KGWA) by the Irrigation Training and Research Center (ITRC) at Cal Poly State University, San Luis Obispo.

Scope of Work

Update of ITRC-METRIC 2017-2019 Water Year and Calendar Year

ITRC will provide monthly and annual ITRC-METRIC actual crop evapotranspiration (ETc) for the Kern Subbasin for 2017-2019. The following items will be completed:

1. Data will be extracted for each GSA within the subbasin and each irrigated field in each GSA monthly for 2017-2019. We can also provide the data for parcels (larger than 5 acres).
2. Data will be provided tabularly and monthly ETc images will be provided in GIS format.
3. Short report discussing the general process and overall results will be provided.

Cost: **$16,000**

Deliverables

ETc data in tabular (MS EXCEL) and other formats (such as imager) provided on a flash drive or file transfer service.

Timeline for Project

Assuming the full 2019 results are desired, report and data will be provided by February 1, 2020. If water year only results are desired, results will be provided by November 20, 2019.

Contract

The person responsible for technical aspects of this contract will be:

Dan Howes
Project Manager, Irrigation Training and Research Center
Cal Poly
San Luis Obispo, CA 93401-0730
djhowes@calpoly.edu

The contract will be administered by:

Cal Poly Corporation
Building #15
One Grand Avenue
San Luis Obispo, CA 93407

Note: Dr. Howes should be the contact person.

Budget

The total budget is a fixed price Fee for Service of $16,000. The full amount will be invoiced when the draft results are transmitted to KGWA. The Cal Poly Corporation requests that a KGWA representative agree to the Standard Terms and Conditions, which are attached to this proposal. The signed approval can be scanned and submitted via e-mail to Dan Howes.

Invoicing and Payment

ITRC will submit to KGWA (Patty Poire), an invoice of the full fixed cost when transmitting the draft results.

Payment should be made payable to "Cal Poly Corporation" and sent to:

Dr. Dan Howes
Irrigation Training and Research Center (ITRC)
One Grand Ave
Bldg 8A
California Polytechnic State University
San Luis Obispo, CA 93407-0730

Authorization/Approval

Name of authorized ITRC representative: Daniel Howes

Signature of ITRC representative

10/7/2019
date

Named of authorized Kern GWA representative: Patty Poire

Signature of the representative:

11/20/2019
date

Irrigation Training & Research Center (ITRC)
Standard Terms and Conditions

THIS AGREEMENT is between the **Kern Groundwater Authority ("Client")** and the Cal Poly Corporation, a separate non-profit auxiliary organization for the California Polytechnic State University, hereinafter referred to as **"ITRC."**

1) **Ordering**: Clients may order services (specify a "Scope of Work") by submitting a written purchase order, a written request for services, by sending confirming e-mail, or by placing a telephone order. The Client must subsequently confirm all telephone orders in writing or via e-mail confirmation prior to commencement of work.
2) **Change Orders:** A Client may request additions or changes to an Order, but must be confirmed by written notice. Email is an acceptable form of writing. The Client will remain responsible for all work performed under the original agreement up until the time ITRC is officially notified of the change.
3) **Suspending or Stopping ITRC's Performance**: The Client may direct ITRC to suspend a portion or all of the work to be performed. In such case, the Client will remain responsible for all work performed up until the time ITRC became aware of Client's desire to discontinue the services. Any uncompleted services in progress at the time of discontinuation will be billed on a prorated basis, as determined by ITRC.
4) **Confidentiality:** ITRC shall keep documents and information identified by Client as confidential to the extent permitted by law, and will not disclose any such information to third parties. ITRC may publish announcements and summaries containing *non-confidential information* about this project in campus newsletters and annual report and other published documents on campus.
5) **Warranties**: Client understands that ITRC performs services only as specified by Client in the Services Agreement accepted by ITRC. ITRC does not make any express or implied warranties or guarantees of any kind to the Client. By their very nature, technical services, testing, analysis and other ITRC services are limited to expected measurement variability. ITRC represents that the Services shall be performed within the limits agreed with Client, and in a manner consistent with the level of care and skill ordinarily exercised by other providers of similar services under similar circumstances.
6) **Ownership of Data:** Data or information provided to ITRC by the Client shall remain the Client's property. Upon full payment to ITRC for all services provided by ITRC, data or information generated by ITRC for the Client shall become the Client's property. ITRC will retain exclusive ownership of any and all analytical methods, Quality Assurance/Quality Control protocols, and equipment developed by ITRC for performance of work by ITRC. ITRC Reports are for the exclusive use of the Client to whom they are addressed. The name of ITRC, Cal Poly Corporation, or California Polytechnic State University, or any symbols of them are not to be used by Client without prior written approval by the appropriate authorized representative.
7) **Indemnification:** Client and ITRC agree that by performing services hereunder, ITRC does not assume, shorten, cancel or undertake to discharge any duty or responsibility of Client to any other party or parties. No one other than Client shall have any right to rely on any Report or other representation or conduct of ITRC, and ITRC disclaims any obligations of any nature whatsoever with respect to such person. Client and ITRC agree, in consideration of ITRC under-taking to perform the ordered service(s) to protect, defend, indemnify, same harmless and exonerate each other from any and all claims, damages, expenses, either direct or consequential for injuries to persons or property arising out of or in consequence of the performance of the services hereunder unless caused by the sole negligence of the other party.
8) **Insurance:** Cal Poly Corporation maintains insurance coverage for its employees to perform professional services. If Client seeks greater protection than is provided by Cal Poly Corporation insurance, Client should obtain appropriate protection from suppliers or insurers.
9) **Limitation of Liability:** If ITRC should be found liable for any losses or damages attributable to the services hereunder in any respect, its liability shall in no event exceed the amount of the fee paid by Client for such services and Client's sole remedy at law or in equity shall be the right to recover up to such amount.
10) **Force Majeure:** Whenever performance by either party is delayed or prevented by an extraordinary event beyond the control of Client or ITRC, such delay or prevention shall be excused and the time of performance extended for the duration of the causative factor. In no event shall the occurrence of any such conditions excuse the Client of its obligations hereunder if services have been performed by ITRC.
11) **Payment of Invoices:** Client agrees to pay all invoices to ITRC within 30 days of invoice date, and if payment is not timely received, the Client agrees to pay a late payment charge on the unpaid balance at the maximum allowed by law.
12) **Governing Law**: This Agreement shall be governed in accordance with the laws of the State of California.

EXHIBIT 1

Funding Contributions

Total Contracts	$190,830.00	
Todd Groundwater	$174,830.00	
ITRC	$16,000.00	

	Funding Entity	Funding Request
1	Arvin-Edison Water Storage District	$8,674.09
2	Buena Vista Water Storage District	$8,674.09
3	Cawelo Water District	$8,674.09
4	City of Bakersfield	$8,674.09
5	Eastside Water Management Area	$8,674.09
6	Henry Miller	$8,674.09
7	Improvement District No. 4	$8,674.09
8	Kern Delta Water District	$8,674.09
9	Kern County Water Agency - Pioneer Project	$8,674.09
10	Kern-Tulare Water District	$8,674.09
11	Kern Water Bank Authority	$8,674.09
12	North Kern Water Storage District	$8,674.09
13	Olcese Water District	$8,674.09
14	Rosedale-Rio Bravo Water District	$8,674.09
15	Semitropic Water Storage District	$8,674.09
16	Shafter-Wasco Irrigation District	$8,674.09
16	Shafter-Wasco 7th Standard Annex	$8,674.09
17	South San Joaquin Municipal Utilities District	$8,674.09
18	Tejon-Castac Water District	$8,674.09
19	West Kern Water District	$8,674.09
20	Westside District Water Authority	$8,674.09
21	Wheeler Ridge-Maricopa Water Storage District	$8,674.09
	Totals	$190,830.00

Invoices:	
KGA:	$138,785.45
KRGSA:	$26,022.27
BV	$8,674.09
Henry Miller:	$8,674.09
Olcese	$8,674.09
	$190,830.00

Appendix B

Henry Miller Board Meeting Minutes

MINUTES OF THE REGULAR
MEETING OF THE BOARD OF DIRECTORS
HENRY MILLER WATER DISTRICT

Held: June 21, 2017

A regular meeting of the Board of Directors of Henry Miller Water District was held at the Law Offices of McMurtrey, Hartsock & Worth on June 21, 2017.

CALL TO ORDER AND APPOINTMENT OF SECRETARY PRO TEM

President Jeof Wyrick called the meeting to order at 4:00 p.m. and appointed James A. Worth as Secretary Pro Tem.

ROLL CALL

The following Directors were present: Jeof Wyrick, Joey Mendonca, and Charles Riddle. Thomas Hurlbutt appeared telephonically.

The following were absent: None.

Others present were: Max Bricker, Asst. Manager; James A. Worth, General Counsel; Ron Dow, Treasurer; and Slavisa Pavlovic.

WATER TRANSFER TO BELRIDGE WSD AND BERRENDA MESA WD

President Wyrick advised of a proposed transfer of up to 30,175 acre-feet of the District's 2017 water supplies stored in the State Water Project's San Luis Reservoir. The water will be delivered to the Westside Districts in 2017, upon a delivery schedule mutually agreeable to the parties. The point of delivery will be in the San Luis Reservoir. The transfer of water will not require Henry Miller to pump water from the groundwater basin and should reduce groundwater pumping within Belridge Water Storage District and Berrenda Mesa Water District. The purpose of the Project is to help meet current year demands within Belridge Water Storage District and Berrenda Mesa Water District and to provide Henry Miller with needed flexibility in managing its water supplies in this extremely wet year. After some discussion, it was moved by Director Riddle, seconded by Director Mendonca, and unanimously carried by a roll-call vote to approve the proposed transfer of up to 30,175 acre-feet of the District's 2017 water supplies and to direct staff to file a Notice of Exemption for the proposed transfer and to take any other needed action in relation to the proposed transfer. The draft Notice of Exemption is attached hereto as Exhibit "A".

CELLS 1 & 2 WATER RECOVERY BY BUENA VISTA WATER STORAGE DISTRICT

President Wyrick advised the Board that Buena Vista is expected to receive 5,000 AF of water back from its use of Cells 1 and 2. Committees from the District and Buena Vista were formed to facilitate discussions and work out the details. The water evacuation process has commenced and is expected to last 4 to 6 weeks. This was an informational item only.

SUSTAINABLE GROUNDWATER MANAGEMENT ACT – MOU WITH KERN COUNTY

President Wyrick advised the Board that the District is participating in a cost share agreement on data for the portion of the Kern County Subbasin (5-22.4) of the San Joaquin Valley Groundwater Basin portion of the Tulare Lake Hydrologic Region, as defined in DWR Bulletin 118. The District presently has a 1/7 interest. The data will be used to develop Groundwater Sustainability Plans within the basin. A Memorandum of Understanding between the District and Kern County was discussed and is intended to resolve any overlap issues between the District and Kern County with respect to formation of Groundwater Sustainability Agencies. After some discussion, it was moved by Director Mendonca, seconded by Director Riddle, and unanimously carried by a roll-call vote to approve the MOU with Kern County. The MOU is attached hereto as Exhibit "B".

UPDATE ON VACANT BOARD SEAT

District legal counsel Worth provided the Board with an update on the upcoming District election and filling the vacant board seat. This was an informational item only.

UPDATE ON HENRY MILLER WATER DISTRICT EASEMENTS WITHIN THE DISTRICT BOUNDARIES

District legal counsel Worth provided the Board with an update on District easements within District boundaries and was instructed to continue working with District staff on how to proceed with the easements.

PUBLIC COMMENT

None.

EXECUTIVE SESSION

None.

ADJOURNMENT

There being no further business to come before the Board, the meeting was adjourned at 4:26 p.m.

Respectfully submitted,

James A. Worth, Secretary Pro Tem

ATTEST:

Jeof Wyrick, President

EXHIBIT "A"

NOTICE OF EXEMPTION

To: Office of Planning and Research
P.O. Box 3044, Room 113
Sacramento, CA 95812-3044

County Clerk, County of Kern
1115 Truxtun Avenue
Bakersfield, CA 93301

From: Henry Miller Water District
c/o 2001 22nd Street, Suite 100
Bakersfield, CA 93301

Project Title:

Henry Miller Water District 2017 Water Transfer ("2017 Transfer")

Project Location - Specific:

The water ("Water") that is the subject of the Henry Miller Water District 2017 Water Transfer is located at various locations within the State of California Aqueduct system, and/or ancillary and/or related facilities, that may include but is not limited to storage reservoirs. The Water will be transferred in place and delivered to lands within Belridge Water Storage District and Berrenda Mesa Water District ("Westside Districts).

Description of Nature, Purpose, and Beneficiaries of Project:

The purpose of the 2017 Transfer is for Henry Miller Water District ("Henry Miller") to provide the Westside Districts with up to 30,175 acre-feet of Henry Miller's 2017 water supplies that are stored in the State Water Project's San Luis Reservoir. The water will be delivered to the Westside Districts in 2017, upon a delivery schedule mutually agreeable to the parties. The point of delivery will be in the San Luis Reservoir. The transfer of Water will not require Henry Miller to pump water from the groundwater basin and should reduce groundwater pumping within Belridge Water Storage District and Berrenda Mesa Water District. The purpose of the Project is to help meet current year demands within Belridge Water Storage District and Berrenda Mesa Water District and to provide Henry Miller with needed flexibility in managing its water supplies in this extremely wet year. The beneficiaries of the project are the landowners within the Westside Districts as well as the landowners within Henry Miller.

Public Agency Approving Project:

Henry Miller Water District

Agency Carrying Out Project:

Henry Miller Water District

Exempt Status:

Existing Facilities: State CEQA Guidelines Section 15301(b)

General Rule Exemption: State CEQA Guidelines Section 15061(b)(3)

Reasons why project is exempt:

California Code of Regulations Section 15301(b) (Class 1):

The project is limited to the continued operation of existing structures with negligible or no expansion of use. The project would not involve the construction of any new facilities, but would utilize existing delivery facilities.

Reason why project is exempt (continued):

APPROVED
6-21-17

California Code of Regulations Section 15061(b)(3):

The primary component of the project involves the exchange of water supplies between Henry Miller and the Westside Districts. The transfer will be an in place transfer and the point of delivery will be in the San Luis Reservoir. The transfer of Water will not require Henry Miller to pump water from the groundwater basin and should reduce groundwater pumping within Belridge Water Storage District and Berrenda Mesa Water District.

In light of the foregoing, it can be seen with certainty that there is no possibility that the proposed project has the potential to have a significant adverse effect on the environment. As such, the proposed project is exempt from CEQA pursuant to CEQA Guidelines Section 15061(b)(3).

Agency Contact Person:

Telephone

Max Bricker

(661) 327-3551

Date:_____

Signature_____

Max Bricker, Assistant Manager of the Henry Miller Water District

EXHIBIT "B"

MEMORANDUM OF UNDERSTANDING
RE: HENRY MILLER WATER DISTRICT'S ELECTION
TO FORM A GROUNDWATER SUSTAINABILITY AGENCY

This MEMORANDUM OF UNDERSTANDING (**MOU**) is made as of June 20, 2017, by and between the County of Kern (**County**) and Henry Miller Water District (**Henry Miller**), collectively the "Parties", each of who agree as follows:

RECITALS

A. On or about April 13, 2017, Henry Miller filed a notice of determination to become a Groundwater Sustainability Agency (GSA) under the Sustainable Groundwater Management Act (SGMA) for areas that are included within the jurisdictional boundaries of Henry Miller with the Department of Water Resources (**DWR**), which notice was posted by DWR on May 1, 2017.

B. The County has considered the actions of Henry Miller as described in Recital A and will file a GSA notice of determination that overlaps with Henry Miller's GSA notice of determination ~~or~~ unless the Parties reach agreement on certain issues that are of importance to the County.

C. The Parties now desire to resolve the potential overlap by agreeing to the terms and conditions set forth in this MOU.

MEMORANDUM

In consideration of the mutual promises and obligations set forth below, the Parties agree as follows:

1. The County agrees to not file its notice of determination to become a GSA with respect to lands within the jurisdictional boundaries of Henry Miller conditioned on the following assurances:

a. Participation: The County may opt to participate in the Henry Miller GSA as a non-voting "additional entity", but shall not be entitled to participate in closed session items or review privileged communications.

b. Indemnification: If the County is asked by Henry Miller to use the County's police powers for a specific purpose for Henry Miller's GSA, then Henry Miller shall indemnify and defend the County against liability for the exercise of the County's police powers.

c. Land Use Authority: If Henry Miller prepares its own GSP, then Henry Miller will provide that, except as provided for in Cal. Govt. Code §§53091 & 53096, nothing in its GSP or any actions taken by Henry Miller in its capacity as a GSA, shall supersede the land use authority of the County. (Water Code § 10726.8(f).) If Henry Miller prepares a GSP in conjunction with one or more other GSA's then Henry Miller will not support any provision of the GSP that threatens to supersede the County's land use authority. The County shall not designate, zone or approve a project with an expectation that Henry Miller will provide a water supply or approve a project that is inconsistent with Henry Miller's water supply rules, regulations and policies, including any

rules, regulations or policies adopted as part of SGMA or Henry Miller's GSP. Furthermore, Henry Miller will not restrict the use of water within its boundaries to a specific use.

d. White Lands: If any "white lands" are included within the boundaries of the Henry Miller GSA, Henry Miller may manage those areas if requested to do so by the County.

e. Well Permits: The Henry Miller GSA shall not issue permits for the construction, modification, or abandonment of groundwater wells except as authorized by the County. (Water Code § 10726.4(b).) Henry Miller will not transform the well-permitting process from a ministerial function (which does not trigger CEQA) to a discretionary function (which triggers CEQA) without prior consultation with the County. If Henry Miller causes CEQA to be triggered with respect to any particular well permitting application within Henry Miller, then Henry Miller, or the well applicant, shall indemnify and defend the County against such action and any attorney's fees and costs awarded to petitioner(s) in any CEQA challenge to that particular well permitting application.

f. Water Transfers: The parties understand and agree that water transfers within the Basin are essential to economic stability, Basin sustainability, and future development opportunities. Henry Miller will consider these factors in the GSP that will cover the Henry Miller area.

To the extent that GSP covering the Henry Miller area includes extraction allocations of native groundwater pursuant to Water Code section 10726.4, the GSP will allow transfers of native groundwater under reasonable conditions.

g. Unincorporated Communities: The needs and water resources of unincorporated communities within Henry Miller's boundaries, if any, will be considered in Henry Miller's GSP.

h. Participation: The County will have a continuous opportunity to participate in the preparation, review, and adoption of Henry Miller's GSP. The term "participate" in this context means access to all non-privileged drafts, reports, technical information, and other materials, and an ability to be actively engaged in all open meetings related to the preparation, review, and adoption of the GSP. "Actively engaged" means, in particular, that Henry Miller will make all reasonable efforts to keep designated County officials apprised of the preparation, review, and adoption of the GSP in a timely fashion which allows complete and thorough County review and comment, which shall not be unreasonably withheld or delayed.

i. Oil & Gas: The Parties will work together to preserve and protect available water supplies. Before adopting any GSP covering the Henry Miller GSA's jurisdiction or agreeing to the coordination of the GSP with other GSPs, Henry Miller shall consider the mitigation measures adopted in the County's certified Final Oil and Gas Environmental Impact Report (SCH# 2013081079), which was adopted by the Kern County Board of Supervisors on November 9, 2015, to address the creation of GSP practices related to the implementation of SGMA and the Oil and Gas permitting.

2. Termination: This MOU shall terminate if and when Henry Miller withdraws as a GSA.

APPROVED AS TO CONTENT:

COUNTY OF KERN

By: _____
Mick Gleason, Board Chair

DATE:_____

APPROVED AS TO CONTENT:

HENRY MILLER WATER DISTRICT

By: _____
Jeof Wyrick, Board President

DATE:_____

MINUTES OF THE REGULAR
MEETING OF THE BOARD OF DIRECTORS
HENRY MILLER WATER DISTRICT

Held: June 12, 2018

A regular meeting of the Board of Directors of Henry Miller Water District was held at the Law Offices of McMurtrey, Hartsock & Worth on June 12, 2018.

CALL TO ORDER AND APPOINTMENT OF SECRETARY PRO TEM

President Jeof Wyrick called the meeting to order at 3:00 p.m. and appointed James A. Worth as Secretary Pro Tem.

ROLL CALL

The following Directors were present: Joey Mendonca, Slavisa Pavlovic, and Charles Riddle. Jeof Wyrick and Thomas Hurlbutt appeared telephonically.

The following were absent: None.

Others present were: Max Bricker, Asst. Manager; James A. Worth, General Counsel; Vicki Martinez and Elena Wiebe. Walter Bricker appeared telephonically.

CLOSED SESSION

a. Max Bricker was considered for appointment as Manager of the District. He will be filling this position that was recently vacated by Walter Bricker on June 8, 2018, due to his resignation. After discussion, Director Riddle moved, Director Mendonca seconded, and the motion was unanimously carried by a roll call vote to appoint Max Bricker as the Manager of the District.

b. Vicki Martinez was considered for appointment as Treasurer and Elena Wiebe was considered for appointment as Assistant Treasurer of the District. After discussion, Director Riddle moved, Director Pavlovic seconded, and the motion was unanimously carried by a roll call vote to appoint Vicki Martinez as Treasurer and Elena Wiebe as Assistant Treasurer of the District.

APPROVAL OF BOARD MEETING MINUTES

After discussion, and upon motion by Director Riddle, seconded by Director Pavlovic, the minutes of the December 17, 2015, December 19, 2016, February 23, 2017, March 15, 2017 and June 21, 2017, were unanimously approved by a roll call vote.

TREASURER'S REPORT

a. Ratify Warrants – Operating Fund: Treasurer Martinez and Vice-Treasurer Wiebe presented the Income Detail and Expense Detail for the period March 1, 2017 through February 28, 2018, including total receipts in the amount of $4,741,660.67 and total checks in the amount of $5,056,595.73.

Treasurer Martinez and Vice-Treasurer Wiebe also presented the Budget for the year ending February 28, 2018 and Proposed Budget for the year ending February 28, 2019. After some discussion, it was moved by Director Hurlbutt, seconded by Director Pavlovic, and unanimously carried by a roll call vote that the paid warrants are ordered ratified and the February 28, 2018 budget be approved.

b. 2017-2018 Fiscal Year Audit Proposal from CPA Jeffery Goossen: Manager Bricker presented the 2017-2018 FY audit proposal from CPA Jeffery Goossen. After some discussion, it was moved by Director Mendonca, seconded by Director Hurlbutt, and unanimously carried by a roll call vote, that the 2017-2018 FY audit proposal from CPA Jeffery Goossen be approved and that Manager Bricker is authorized to sign and return the proposal to CPA Goossen.

c. Addition of Check Signers for District LAIF Investment Account: Attorney Worth stated that an item arose after the posting of agenda which needed immediate attention and that pursuant to California Government Code Section 54954.2(b)(2), the Board could place the item on the agenda with a 2/3 vote of the Board. The matter that needed to be added and placed on the agenda: Addition of Check Signers for District Local Agency Investment Fund ("LAIF"). It was moved by Director Riddle, seconded by Director Hurlbutt, and unanimously carried by a roll call vote, to approve the amended agenda. Manager Bricker explained that a portion of the District's assets are held in the LAIF. In order to access the fund, the District needs to appoint new authorized District representatives to access the fund. After some discussion, it was moved by Director Riddle, seconded by Director Hurlbutt, and unanimously carried by a roll call vote, to approve Resolution 2018-01 Authorizing Investment of Surplus Monies in Local Agency Investment Fund naming Director Mendonca, Treasurer Vicki Martinez and Assistant Treasurer Elena Wiebe as the authorized account representatives.

DISCUSSION OF 2018 WATER SUPPLY AND OPERATIONS

a. SWP Allocation: Manager Bricker advised the Board of the status of the SWP entitlement transfer to Berrenda Mesa Water District and Belridge Water District. The current allocation of SWP is 35%.

b. Local Supplies: Manager Bricker advised the Board that the current April-July Kern River runoff is approximately 50% of the average, resulting in about 2,000 acre-feet for District use.

c. Pioneer Project: Manager Bricker advised the Board of the current status of the Pioneer Project maintenance/repair plans. KCWA has contracted with Engineer Richard Meyer to perform feasibility/prioritization studies for the slate of projects that should be completed to improve existing infrastructure or add new infrastructure to maximize recharge capacity.

SUSTAINABLE GROUNDWATER MANAGEMENT ACT

a. Resolution of Intent to Adopt a GSP: President Wyrick initiated the discussion to consider providing notice of the District's intent to adopt a GSP pursuant to the Sustainable Groundwater Management Act. After discussion, Director Mendonca moved, Director Riddle seconded, and the motion was unanimously carried by a roll call vote to provide notice of the District's intent to develop a GSP.

b. Review of Local SGMA Activities: Manager Bricker provided the Board with the latest status of local SGMA activities.

IRRIGATED LANDS REGULATORY PROGRAM

Manager Bricker advised the Board that the ILRP was looking for increased landowner participation and provided a further update on the latest activity within the KRWCA.

CALIFORNIA WATERFIX

President Wyrick shared that the District's position of zero participation in the California WaterFix has not changed; it is yet to be determined exactly how State Water Contractors that do not wish to participate in the project will be able to offload cost/benefit without compromising the success of the whole project.

DISCUSSION OF HENRY MILLER WATER DISTRICT ABANDONED CANALS WITHIN DISTRICT BOUNDARIES

Legal Counsel Worth shared that progress has been made with determining the proper method to manage the ownership of certain parcels which were formerly HMWD canals.

AMEND CONFLICT OF INTEREST CODE

No action required.

ADJOURNMENT

There being no further business to come before the Board, the meeting was adjourned at 4:30 p.m.

Respectfully submitted,

James A. Worth, Secretary Pro Tem

ATTEST:

Jeof Wyrick, President

MINUTES OF THE REGULAR
MEETING OF THE BOARD OF DIRECTORS
HENRY MILLER WATER DISTRICT

Held: December 18, 2018

A regular meeting of the Board of Directors of Henry Miller Water District was held at the Law Offices of McMurtrey, Hartsock & Worth on December 18, 2018.

CALL TO ORDER AND APPOINTMENT OF SECRETARY PRO TEM

President Jeof Wyrick called the meeting to order at 3:06 p.m. and appointed James A. Worth as Secretary Pro Tem.

ROLL CALL

The following Directors were present: Jeof Wyrick, Joey Mendonca (who arrived at 3:57 p.m.), Slavisa Pavlovic, and Charles Riddle. Thomas Hurlbutt appeared telephonically.

The following were absent: None.

Others present were: Max Bricker, Manager; James A. Worth, General Counsel; Vicki Martinez, Treasurer; Elena Wiebe, Assistant Treasurer. Walter Bricker appeared telephonically.

PUBLIC COMMENT

None.

APPROVAL OF BOARD MEETING MINUTES

After discussion, and upon motion by Director Riddle, seconded by Director Pavlovic, the minutes of the June 12, 2018, were unanimously approved by a roll call vote. Director Mendonca was not present for the vote.

TREASURER'S REPORT

a. 2018 FY Audit Report: Manager Bricker presented the Board with the District's 2018 FY Audit Report, performed by CPA Jeffery Goosen. After discussion, and upon motion by Director Riddle, seconded by Director Pavlovic, the Audit Report was unanimously accepted and approved by a roll call vote. The District's Audit is attached as Exhibit "A".

b. 2019 District FY Budget to-Date: Treasurer Martinez and Assistant Treasurer Wiebe presented the Board with the District's current FY budget with actuals/projections, along with an income statement. This was for information purposes only.

c. 2020 FY Budget Approval: Treasurer Martinez and Assistant Treasurer Wiebe presented the Board with the proposed 2020 FY budget. The Board instructed staff to include new expense line items, such as costs associated with SGMA and California WaterFix. After discussion, and upon motion by Director Riddle, seconded by Director Pavlovic, the 2020 FY budget was unanimously accepted and approved by a roll call vote.

d. Ratification of Approving Slavisa Pavlovic as a District Signatory: Manager Bricker brought to the Board's attention the need to ratify the granting of authority to Director Pavlovic to sign District checks. On June 14, 2018, it was conditionally approved by the Board to give Director Pavlovic this authority. After discussion, and upon motion by Director Riddle, seconded by Director Hurlbutt, the ratification was unanimously approved by a roll call vote.

e. California Farm Water Coalition Request for Funds: Manager Bricker presented the Board with the CFWC's request for a $2,550 contribution by the District. After discussion, and upon motion by Director Riddle, seconded by Director Pavlovic, the Board unanimously approved the contribution of $2,550.

WATER SUPPLY AND OPERATIONS

a. Review of 2018 Operations: Manager Bricker distributed to the Board the District's 2018 WY Schedule. This included information on District water supplies, demands, and transfers. The 2018 allocation of SWP was 35% and the 2018 Kern River April-July runoff was roughly 50% of average, yielding approximately 2,000 ac-ft of surface water for the District to use. The District currently has 426 ac-ft of carryover water in San Luis Reservoir to be delivered in 2019.

b. 2019 SWP Allocation: Manager Bricker informed the Board that DWR recently announced an initial SWP allocation of 10%. The District is currently using groundwater and Kern River water to meet demands.

c. 2019 Local Supplies: Manager Bricker provided the Board with the latest update on Kern River operations and the upcoming completion of the Borel Canal project, anticipated by the USACE to take place in January, which will lift temporary storage restrictions.

d. Pioneer Project: Manager Bricker informed the Board that the District is still waiting on the KCWA to provide an update on which Pioneer Project improvement/maintenance projects will be prioritized and approved by the Participants in 2019. At this time, the Participants have budgeted for certain projects and are waiting for a few final designs and details.

SUSTAINABLE GROUNDWATER MANAGEMENT ACT

a. Review of Local SGMA Activities: Manager Bricker provided the Board with the latest status of local SGMA activities, including the coordination activities between GSAs and the County's departure from the KGA.

b. Update on HMWD GSP Development: Manager Bricker informed the Board of his initial efforts on the GSP document. Many technical aspects of the report are to be completed in early 2019, as the document must be made available for public comment by July 2019.

c. Adoption of Subbasin "Undesirable Results" Definitions: Manager Bricker presented to the Board the working definitions of Subbasin-wide SGMA "Undesirable Results" that have been created through the coordinated efforts of GSA/District Managers. After discussion, and upon motion by Director Riddle, seconded by Director Pavlovic, the Board unanimously approved by a roll call vote the usage of these definitions with respect to HMWD's GSP.

IRRIGATED LANDS REGULATORY PROGRAM

Manager Bricker and Director Riddle provided the Board with updates related to the KRWCA. These discussions involved CV-SALTS and the revised Tulare Lake Basin General Order.

CALIFORNIA WATERFIX

President Wyrick provided update on the latest happenings with the California WaterFix. At this time it is still uncertain how the project may change with the Governor-Elect Gavin Newsom taking office next month. Ag Contractors continue to look for a way to opt-out of the project.

DISCUSSION OF HENRY MILLER WATER DISTRICT ABANDONED CANALS WITHIN DISTRICT BOUNDARIES

Legal Counsel Worth shared that progress has been made with determining the proper method to manage the ownership of certain parcels which were formerly HMWD canals. Staff was directed to prepare legal descriptions for the former District canals. It is expected that at the next meeting action will be taken to properly identify these lands.

CLOSED SESSION

The Board went into closed session to discuss the following matters at 4:32.

Pending Litigation
Conference with Legal Counsel
Food and Water Watch et al. vs. *Metropolitan Water District and All Interested Persons,* Los Angeles County Superior Court, Case No. BC 720692
(Government Code Section 54956(d)(1)

Pending Litigation
Conference with Legal Counsel
One Matter
(Government Code Section 54956.9(d)(2)

The meeting was recalled to Open Session at 5:02 p.m.

There was no action taken that would require disclosure under the Brown Act.

ADJOURNMENT

There being no further business to come before the Board, the meeting was adjourned at 5:04 p.m.

Respectfully submitted,

James A. Worth, Secretary Pro Tem

ATTEST:

Jeof Wyrick, President

Jeffery C. Goossen
Certified Public Accountant

2010 Truxtun Avenue
Bakersfield, CA 93301

(661) 631-1040
Fax (661) 631-1720

October 16, 2018

Mr. Max Bricker
District Manager
Henry Miller Water District
P.O. Box 9759
Bakersfield, CA 93389

Mr. Bricker:

As requested by Elena Wiebe, enclosed please find the following:

- Henry Miller Water District 2/28/2018 audited financial statements. Three bound and one unbound are enclosed.
- The related audit summary letter, prepared by me.

Please contact me with any thoughts or questions you might have.

Sincerely,

Jeffery C. Goossen

Jeffery C. Goossen
Certified Public Accountant

EXHIBIT A

ACCEPTED
12-19-19
BOARD MEET

Jeffery C. Goossen
Certified Public Accountant

2010 Truxtun Avenue
Bakersfield, CA 93301

(661) 631-1040
Fax (661) 631-1720

August 30, 2018

To the Board of Directors and Management of Henry Miller Water District:

In planning and performing my audit of the financial statements of Henry Miller Water District (the "District") as of and for the year ended February 28, 2018, in accordance with auditing standards generally accepted in the United States of America, I considered the District's internal control over financial reporting (internal control) as a basis for designing my auditing procedures for the purpose of expressing my opinion on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of the District's internal control. Accordingly, I do not express an opinion on the effectiveness of the District's internal control.

My consideration of internal control was for the limited purpose described in the preceding paragraph and was not designed to identify all deficiencies in internal control that might be significant deficiencies or material weaknesses and therefore, there can be no assurance that all such deficiencies have been identified. However, as discussed below, I identified certain deficiencies in internal control that I consider to be significant deficiencies.

A deficiency in internal control exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct misstatements on a timely basis. A material weakness is a deficiency, or combination of deficiencies in internal control, such that there is a reasonable possibility that a material misstatement of the District's financial statements will not be prevented, or detected and corrected, on a timely basis. I did not identify any deficiencies in internal control that I consider to be material weaknesses.

A significant deficiency is a deficiency, or a combination of deficiencies, in internal control that is less severe than a material weakness, yet important enough to merit attention by those charged with governance. I consider the following deficiencies in the District's internal control to be significant deficiencies:

- A fundamental concept in a good system of internal control is the separation of duties. The basic premise is that no one employee should have access to both physical assets and the related accounting records, or to all phases of a transaction. If the separation of duties is inadequate, there is a resulting danger that intentional fraud or unintentional errors could occur and not be detected.

The size and structure of the District's operations and staff makes complete adherence to this concept difficult, however, review of potential improvements should be on-going with any related risk evaluated and accepted. Due to the District's recent turnover, both at the Board and management levels, prior controls identified specific to 1) the completeness of District revenues and 2) the validity of District expenditures, should be reviewed and updated, as deemed necessary.

- The District maintains a fixed asset register/depreciation expense report, updated annually for current year activity. This report does not include asset descriptions. Recently added assets are easily traced to that year's back-up/support. Identification of older assets would be more difficult.

  If asset descriptions are not shown, adjustments for assets retired, sold or impaired would be difficult to evaluate.

  It is recommended asset descriptions be added to the fixed asset/depreciation report. Should the District proceed, I could be of assistance in this project using audit files from the various prior years.

OTHER MATTERS

- My engagement and the planned scope of the audit was communicated to the District in my annual engagement letter dated April 14, 2018.

- There were no 1) significant difficulties encountered during the audit or 2) disagreement with management about matters significant to the financial statements.

- All financial statement changes were reviewed with management.

- I have requested certain representations from management that are included in the management representation letter dated August 30, 2018.

This communication is intended solely for the information and use of management, the Board of Directors, and others within the organization, and is not intended to be and should not be used by anyone other than these specified parties.

Jeffery C. Goossen

Jeffery C. Goossen
Certified Public Accountant
Bakersfield, California

HENRY MILLER WATER DISTRICT

REPORT AND FINANCIAL STATEMENTS

FEBRUARY 28, 2018

HENRY MILLER WATER DISTRICT

FEBRUARY 28, 2018

CONTENTS

HENRY MILLER WATER DISTRICT

FEBRUARY 28, 2018

BOARD OF DIRECTORS

Name	Office
Jeof Wyrick	President
Thomas Hurlbutt	Vice-President
Charles Riddle	Director
Joey Mendonca	Director
Slavo Pavlovic	Director

ADMINISTRATION

Name	Office
Walter Bricker	Manager (Resigned in June, 2018)
Max Bricker	Assistant Manager (Appointed Manager in June, 2018)
Vicki Martinez	Treasurer (Appointed in June, 2018)
Elena Wiebe	Assistant Treasurer
James Worth	Secretary-Attorney

Jeffery C. Goossen
Certified Public Accountant

2010 Truxtun Avenue
Bakersfield, CA 93301

(661) 631-1040
Fax (661) 631-1720

INDEPENDENT AUDITOR'S REPORT

The Board of Directors
Henry Miller Water District
Bakersfield, California

I have audited the accompanying financial statements of Henry Miller Water District which comprise the Statement of Net Position as of February 28, 2018, and the related Statements of Revenue and Expense and Changes in Net Position and of Cash Flows for the year then ended, and the related notes to the financial statements.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

My responsibility is to express an opinion on these financial statements based on my audit. I conducted my audit in accordance with auditing standards generally accepted in the United States of America. Those standards require that I plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, I express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

INDEPENDENT AUDITOR'S REPORT

Opinion

In my opinion, the financial statements referred to above present fairly, in all material respects, the financial position of Henry Miller Water District as of February 28, 2018, and the results of its operations and its cash flows for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Other Matters - Supplementary Information

Management's Discussion and Analysis and the Supplementary Information are not required parts of the basic financial statements, but are supplementary information required by accounting principles generally accepted in the United States of America. I have applied certain limited procedures, which consisted principally of inquiries of management regarding the methods of measurement and presentation of the supplementary information. However, I did not audit the information and express no opinion on it.

Jeffery C. Goossen

Jeffery C. Goossen
Certified Public Accountant
August 30, 2018

HENRY MILLER WATER DISTRICT

MANAGEMENT'S DISCUSSION AND ANALYSIS

As management of the Henry Miller Water District, we offer readers of the District's financial statements this narrative overview and analysis of the District's financial performance during the fiscal year ending February 28, 2018. Please read it in conjunction with the District's financial statements, which follow this section.

OVERVIEW OF THE FINANCIAL STATEMENTS

This annual report includes this management's discussion and analysis report, the independent auditor's report and the basic financial statements of the District. The financial statements also include notes that explain in more detail some of the information in the financial statements. In addition, this report presents certain Supplementary Information.

REQUIRED FINANCIAL STATEMENTS

The financial statements of the District report information of the District using accounting methods similar to those used by private sector companies. These statements offer short- and long-term financial information about its activities. The Statement of Net Position includes all of the District's assets and liabilities and provides information about the nature and amounts of investments in resources (assets) and the obligations to District creditors (liabilities). It also provides the basis for evaluating the capital structure of the District and assessing the liquidity and financial flexibility of the District.

All of the current year's revenues and expenses are accounted for in the Statement of Revenue and Expense and Changes in Net Position. This statement measures the success of the District's operations over the past year and can be used to determine whether the District has successfully recovered all its costs through its user fees and other charges, profitability and credit worthiness.

The final required financial statement is the Statement of Cash Flows. The statement reports cash resulting from operations, investing, and financing activities and provides answers to such questions as where did cash come from, what was cash used for, and what was the change in the cash balance during the reporting period.

HENRY MILLER WATER DISTRICT

MANAGEMENT'S DISCUSSION AND ANALYSIS

CONDENSED FINANCIAL STATEMENTS

A summary of the District's Statement of Net Position is as follows:

	February 28	
	2018	2017
Current assets	$ 273,184	$ 254,881
Capital assets	3,731,976	3,881,758
Total assets	$ 4,005,160	$ 4,136,639
Current liabilities	$ 494,772	$ 285,487
Long-term liabilities	-0-	-0-
Total liabilities	$ 494,772	$ 285,487
Net Position:		
Invested in capital assets - net	$ 3,731,976	$ 3,881,758
Unrestricted net position	(221,588)	(30,606)
Total net position	$ 3,510,388	$ 3,851,152

A summary of the District's Statement of Revenue and Expense and Changes in Net Position is as follows:

	Year ended February 28	
	2018	2017
Total revenue	$ 4,741,701	$ 5,396,006
Total expense	5,082,465	5,941,934
Expense in excess of revenue	(340,764)	(545,928)
Net Position, beginning of year	3,851,152	4,397,080
Net Position, end of year	$ 3,510,388	$ 3,851,152

HENRY MILLER WATER DISTRICT

MANAGEMENT'S DISCUSSION AND ANALYSIS

FINANCIAL HIGHLIGHTS

- The largest portion of the District's assets is its investment in capital assets. The District uses these assets to provide service and consequently, these assets are not available to liquidate liabilities or other spending.

- Revenues were $4,741,701 for the year ended February 28, 2018, and included $3,268,132 in water tolls and $933,582 in assessments.

- Purchased water costs totaled $3,699,063 for the year ended February 28, 2018, comparable to the prior year expense.

- Pumping costs totaled $186,687 for the year ended February 28, 2018, a $1,337,606 decrease versus the prior year expense.

CAPITAL ASSETS AND LONG-TERM DEBT

During the year ended February 28, 2018, additions to capital assets totaled $197,196, for new pipe installation and coating.

The District has no long-term debt.

ECONOMIC FACTORS

The District financial condition is impacted by water supply conditions in the State of California.

HENRY MILLER WATER DISTRICT

STATEMENT OF NET POSITION

FEBRUARY 28, 2018

ASSETS

Current Assets:	
Cash (Note 2)	$ 122,583
Investments (Note 3)	4,166
Accounts receivable	146,435
Total Current Assets	273,184
Fixed Assets (Note 4)	3,731,976
	$ 4,005,160

LIABILITIES AND NET POSITION

Current Liabilities:	
Accounts payable	$ 494,772
Total Current Liabilities	494,772
Net Position:	
Invested in capital assets, net	3,731,976
Unrestricted net position	(221,588)
Total Net Position	3,510,388
	$ 4,005,160

The accompanying notes are an integral part of these financial statements.

HENRY MILLER WATER DISTRICT

STATEMENT OF REVENUE AND EXPENSE AND CHANGES IN NET POSITION

FOR THE YEAR ENDED FEBRUARY 28, 2018

Revenue:	
Water tolls	$ 3,268,132
Assessments - Operating and maintenance	933,582
Ag Trust Fund distribution	308,835
Tax allocation	87,336
Interest	41
Land rent	143,775
	4,741,701
Expenses:	
Purchased water, net (Note 6)	3,699,063
Pumping costs	186,687
Maintenance of system	415,019
Groundwater management	333,480
Other operating expense	6,000
Depreciation and amortization	346,978
Administration	95,238
	5,082,465
Expense in excess of revenue	(340,764)
Net Position, March 1, 2017	3,851,152
Net Position, February 28, 2018	$ 3,510,388

The accompanying notes are an integral part of these financial statements.

HENRY MILLER WATER DISTRICT

STATEMENT OF CASH FLOWS

FOR THE YEAR ENDED FEBRUARY 28, 2017

CASH FLOWS FROM OPERATING ACTIVITIES:	
Cash received from customer/user	$ 4,199,054
Other cash receipts	396,171
Cash paid to suppliers of goods and services	(4,561,284)
Net cash provided by operating activities	33,941
CASH FLOWS FROM INVESTING ACTIVITIES:	
Fixed asset expenditures	(162,114)
Net cash (used in) investing activities	(162,114)
CASH FLOWS FROM FINANCING ACTIVITIES:	-0-
Net (decrease) in cash	(128,173)
Cash - beginning of year	250,756
Cash - end of year	$ 122,583
RECONCILIATION TO NET CASH PROVIDED BY OPERATIONS:	
Expense in excess of revenue	$ (340,764)
Adjustments to reconcile expense in excess of revenue to net cash provided by operating activities:	
Depreciation and amortization	346,978
(Increase) in investments	(41)
(Increase) in accounts receivable	(146,435)
Increase in accounts payable - operations	174,203
Net cash provided by operating activities	$ 33,941

The accompanying notes are an integral part of these financial statements.

HENRY MILLER WATER DISTRICT

NOTES TO THE FINANCIAL STATEMENTS

FEBRUARY 28, 2018

NOTE 1 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES:

History

The Henry Miller Water District (the "District") was formed in 1964, pursuant to Division 13 of the California Water Code, for the purpose of providing a water supply and distribution systems to deliver an adequate quantity of good quality water to all lands within the District. The District encompasses an area of approximately 25,000 acres of land in southwest Kern County, California.

Method of Accounting

The District has segregated each distinct function in order to utilize the special district accounting systems as prescribed by the Controller of the State of California. Each function using its own system of operating accounts records the financial transactions in accordance with generally accepted accounting principles. The accrual method of accounting is employed. Under the accrual method, revenues are recognized when earned and expenses recognized when incurred.

Fixed Assets

Fixed assets are stated at cost. Depreciation is provided over the useful life of the assets by use of the straight-line and double declining balance methods. Maintenance and repairs which do not increase the useful life of the assets are charged to expense as incurred. Major renewals and betterments are capitalized. When items of property or equipment are sold or retired, the related cost and accumulated depreciation are removed from the accounts and any gain or loss is included in income.

Use of Estimates

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

Cash Flows

For purposes of preparing the statement of cash flows all transactions that are not classified as financing activities or investing activities are classified as operating activities.

NOTE 2 - CASH:

The cash on deposit of $122,583 as of February 28, 2018 is all at JPMorgan Chase Bank, N.A.

NOTE 3 - INVESTMENTS:

Investments consist of the following at February 28, 2018:

State of California, Local Agency Investment Fund	$ 4,166

The funds deposited in this State fund are invested in a Pooled Money Investment Account.

NOTE 4 - FIXED ASSETS:

Fixed assets consist of the following at February 28, 2018:

	Cost	Estimated Life (Years)
Capitalized intangible costs	$ 17,772	40
Aqueduct turnouts and structures	785,765	7-50
Canals, reservoirs and pipelines	799,288	16-20
Wells and pumps	4,352,908	10-20
Land and distribution systems	1,275,140	--
	7,230,873	
Less: accumulated depreciation and amortization	3,510,239	
	3,720,634	
Construction in progress	11,342	
	$ 3,731,976	

NOTE 5 - EMPLOYEES:

The District has no employees. All necessary services are contracted. System maintenance is provided by J. G. Boswell Company, the District's landowner.

NOTE 6 - PURCHASED WATER:

The District's water provider charges the District its share of applicable costs based on estimated rates. Subsequent to each year, the District's water provider adjusts rates to actual and bills or refunds the difference to the District. These adjustments are included as adjustments to current year purchased water expense in the accompanying financial statements.

NOTE 7 - COMMITMENTS AND CONTINGENCIES:

In July, 2014, the District entered into a water exchange/purchase agreement with West Kern Water District ("West Kern") in which West Kern will deliver up to 2,000 acre-feet of water to J.G. Boswell Company, the District's landowner.

J.G. Boswell Company has fulfilled their obligation under the agreement and consequently, the District no longer has any responsibility or liability as a result of this agreement.

NOTE 8 - SUBSEQUENT EVENTS:

Events that occur after the statement of net assets date but before the financial statements were available to be issued must be evaluated for recognition or disclosure. Management evaluated the activity of the District and concluded that no subsequent events have occurred that would require recognition in the financial statements or disclosure in financial statement notes.

NOTE 9 - WATER TRANSFER:

In June, 2017, the Board of Directors of the District approved the transfer of 30,175 acre-feet of water stored in the State Water Project's San Luis Reservoir. The water was transferred to lands within Belridge Water Storage District and Berrenda Mesa Water District (the "Westside Districts").

This transfer of water will not require the District to pump water from the groundwater basin and should reduce groundwater pumping within the Westside Districts. The purpose of this transfer is to help meet current year demands within the Westside Districts and to provide the District with needed flexibility in managing its own water supplies.

HENRY MILLER WATER DISTRICT

STATEMENT OF REVENUE AND EXPENSE - BUDGET AND ACTUAL

FOR THE YEAR ENDED FEBRUARY 28, 2018

(UNAUDITED)

	BUDGET	ACTUAL
Revenue:		
Water tolls	$ 3,590,782	$ 3,268,132
Assessments-Operating and maintenance	789,807	933,582
Ag Trust Fund distribution	308,635	308,835
Tax allocation	81,535	87,336
Interest	-0-	41
Land rent	143,775	143,775
	4,914,534	4,741,701
Expenses:		
Purchased water	3,999,640	3,699,063
Pumping costs	155,944	186,687
Maintenance of system	244,007	415,019
Groundwater management	282,641	333,480
Other operating expense	22,770	6,000
Depreciation and amortization	360,000	346,978
Administration	69,085	95,238
	5,134,087	5,082,465
Expense in excess of revenue	$ (219,553)	$ (340,764)

MINUTES OF THE REGULAR
MEETING OF THE BOARD OF DIRECTORS
HENRY MILLER WATER DISTRICT

Held: March 12, 2019

A regular meeting of the Board of Directors of Henry Miller Water District was held at the Law Offices of McMurtrey, Hartsock & Worth on March 12, 2019.

CALL TO ORDER AND APPOINTMENT OF SECRETARY PRO TEM

President Jeof Wyrick called the meeting to order at 3:02 p.m. and appointed Isaac L. St. Lawrence as Secretary Pro Tem.

ROLL CALL

The following Directors were present: Jeof Wyrick, Joey Mendonca, Slavisa Pavlovic, and Charles Riddle. Thomas Hurlbutt appeared telephonically.

The following were absent: None.

Others present were: Max Bricker, Manager; Isaac L. St. Lawrence, General Counsel; Vicki Martinez, Treasurer; Lindsey McGuire, Brown Armstrong CPAs; Cesar Ramos, Public.

PUBLIC COMMENT

None.

APPROVAL OF BOARD MEETING MINUTES

After discussion, and upon motion by Director Riddle, seconded by Director Pavlovic, the minutes of the December 18, 2018 meeting were unanimously approved by a roll call vote.

TREASURER'S REPORT

a. Review 2019 District FY Budget: Treasurer Martinez presented preliminary actuals, and highlighted areas where costs were less than budgeted amounts and over budgeted amounts. Treasurer Martinez noted that the numbers presented were very preliminary and depreciation as well as other incomes and expenses still need to be reconciled.

b. Review 2020 District FY Budget: Treasurer Martinez presented the current FY budget to the Board. Manager Bricker informed the Board that the budget had been revised to reflect the changes at the last meeting, which include reclassifying

certain budget items to account for SGMA and California WaterFix expenses. After discussion, and upon motion by Director Pavlovic, seconded by Director Riddle, the revised budget was unanimously approved by a roll call vote.

c. Ratification of a New Service Agreement with Brown Armstrong CPAs: Treasurer Martinez presented the Service Agreement Proposal from Brown Armstrong CPAs that the District received the prior month. Pursuant to the proposal, the District would pay approximately $9,000 annually for bookkeeping and District Treasurer services. After discussion, and upon motion by Director Riddle, seconded by Director Mendonca, the Board unanimously ratified the Service Agreement with Brown Armstrong CPAs effective February 21, 2019, and appointed Lindsey McGuire as District Treasurer and Vicki Martinez Assistant District Treasurer.

d. Proposal from M. Green & Company LLC to Perform 2019 FY Audit: Assistant Treasurer Martinez presented the Board with a proposal from M. Green to perform the 2019 FY Audit for the District for the price of $7,500. The Auditor that has been historically used, Jeffery Goossen, has retired will no longer be performing auditing services for the District. After discussion, and upon motion by Director Mendonca, seconded by Director Riddle, the Board unanimously accepted the proposal and approved contracting M. Green for their auditing services.

WATER SUPPLY AND OPERATIONS

a. Review of 2019 District Operations: Manager Bricker distributed to the Board the actual and projected District's 2019 WY Schedule. This included information on District water supplies, demands, and transfers. It is expected that there will be roughly 6,000 acres of pistachios, 1,000 acres of cotton, 1,100 acres of tomatoes, and 300 acres of onion planted within the District in 2019.

b. 2019 SWP Allocation: Manager Bricker informed the Board that DWR recently raised the SWP allocation to 35%. The District currently has delivered its entire 426 ac-ft of 2018 carryover water in San Luis Reservoir, and is currently delivering Article 21 water to both the District and the Pioneer Project.

c. 2019 Local Supplies: Manager Bricker provided the Board with the latest update on Kern River operations and informed them that the USACE completed the Borel Canal Project, lifting temporary storage restrictions at Lake Isabella, in January. The most recent DWR Bulletin 120 update included a median forecast of 135% of average April-July runoff year for the Kern River.

d. Pioneer Project: Manager Bricker informed the Board that the District is delivering Article 21 water to the Pioneer Project for banking purposes. The

District is still working with KCWA and the other Participants to manage maintenance/repairs projects on the facilities.

SUSTAINABLE GROUNDWATER MANAGEMENT ACT

a. Review of Local SGMA Activities: Manager Bricker provided the Board with the latest status on local SGMA activities, including the discussions between GSAs over the Subbasin's Water Budget and Sustainable Yield, and the near completion of the Coordination Agreement.

b. Update on HMWD GSP Development: Manager Bricker informed the Board of the progress being made on the development of the GSP. Manager Bricker has been working with the GSA's consultant, Luhdorff & Scalmanini, to complete chapters of the document that are applicable solely to HMWD, while waiting on other GSAs/consultants to complete components that will be included in all GSPs in the Subbasin. The intent is to make the document available for public comment by July 2019.

IRRIGATED LANDS REGULATORY PROGRAM

Manager Bricker and Director Riddle provided the Board with updates related to the KRWCA. They discussed the potential for additional grower-reporting requirements with Nitrogen Management Plans beginning in 2020, with irrigation information being added into the Plans; this is already being done in 2019 in the East San Joaquin area.

CALIFORNIA WATERFIX

President Wyrick provided an update on the latest happenings with the California WaterFix. Much remains uncertain at this time, as the newly-elected Governor Newsom has publicly stated his desire for a single-tunnel project but has not provided a new description for the project. Validation Action cases are ongoing, and it is expected that Ag Districts will not change their position until they are confident they have the option to either opt in or opt out of the project.

DISCUSSION OF HENRY MILLER WATER DISTRICT ABANDONED CANALS WITHIN DISTRICT BOUNDARIES

Manager Bricker reported to the Board that he had gathered information regarding the parcels of land that have remained under the ownership of the District despite the canals not currently being in operation. Director Hurlbutt requested that the District look into leasing this land to the landowner using that land today, similar to its leasing of Cell 2 & 2R land to JG Boswell Company. Manager Bricker will work with Legal Counsel to explore the feasibility of leasing this land and will bring a recommendation to the next Board meeting.

CLOSED SESSION

The Board went into closed session to discuss the following matters at 3:56 p.m.

Pending Litigation
Conference with Legal Counsel
Food and Water Watch, et al. vs. *Metropolitan Water District and All Interested Persons,* Los Angeles County Superior Court, Case No. BC 720692
(Government Code Section 54956(d)(1))

Public Employee Performance Evaluation
Positions: Manager and Treasurer
(Government Code Section 54957(b)(1))

The meeting was recalled to Open Session at 4:18 p.m.

Upon returning to open session, Legal Counsel reported that there was no action taken that would require disclosure under the Brown Act.

ADJOURNMENT

There being no further business to come before the Board, the meeting was adjourned at 4:19 p.m.

Respectfully submitted,

Isaac L. St. Lawrence, Secretary Pro Tem

ATTEST:

Jeof Wyrick, President

MINUTES OF THE REGULAR
MEETING OF THE BOARD OF DIRECTORS
HENRY MILLER WATER DISTRICT

Held: June 3, 2019

A regular meeting of the Board of Directors of Henry Miller Water District was held at the Law Offices of McMurtrey, Hartsock & Worth on June 3, 2019.

CALL TO ORDER AND APPOINTMENT OF SECRETARY PRO TEM

President Jeof Wyrick called the meeting to order at 3:10 p.m. and appointed Jim Worth as Secretary Pro Tem.

ROLL CALL

The following Directors were present: Joey Mendonca, Slavisa Pavlovic, and Charles Riddle. Jeof Wyrick and Thomas Hurlbutt appeared telephonically.

The following Directors were absent: None.

Others present were: Max Bricker, Manager; Jim Worth, General Counsel; Lindsey McGuire, Treasurer; Vicki Martinez, Assistant Treasurer; Elena Wiebe, Public.

PUBLIC COMMENT

None.

APPROVAL OF BOARD MEETING MINUTES

After discussion, and upon motion by Director Riddle, seconded by Director Pavlovic, the minutes of the March 12, 2019 meeting were unanimously approved by a roll call vote.

TREASURER'S REPORT

a. Accept FY19 Incomes/Expenses - Final Actuals: Assistant Treasurer Martinez presented the prior Fiscal Year Incomes/Expenses, which had been finalized since the March Board meeting. The Incomes totaled $4,802,087.21 and the Expenses totaled $4,705,789.75. The totals came in $641,711.79 and $593,970.25 under their budgeted amounts, respectively. After discussion, and upon motion by Director Riddle, seconded by Director Mendonca, the Board unanimously accepted the FY19 Income/Expense Report by a roll call vote.

b. Review 2020 District FY Budget: Treasurer McGuire presented the first quarter financial information to the Board. This included: Balance sheet, Income/Expense details (and variances from Budget), and Statement of Changes in Cash Position. Manager Bricker informed the Board that certain costs related to SGMA may be reclassified to Groundwater Management as the year continues.

c. M. Green FY19 Audit Update: Manager Bricker informed the Board that he had signed and returned the Service Agreement with M. Green and Company LLC for the audit of the District's prior FY. It is expected that the auditor will coordinate with Assistant Treasurer Martinez to ensure all necessary documents are supplied in order to complete the audit this summer.

WATER SUPPLY AND OPERATIONS

a. 2019 SWP Supplies: Manager Bricker informed the Board that the current SWP allocation is 70%. This corresponds to a Table A supply of 24,850 ac-ft. The District is transferring those supplies to Berrenda Mesa WD and Belridge WSD; the KCWA has previously approved both transfers.

Manager Bricker also reported on Article 21 supply/delivery quantities. Between February and March, the District took delivery of approximately 3,087 ac-ft of Article 21 supplies – 1,938 ac-ft in-District and 1,148 ac-ft to the Pioneer Project for banking.

b. 2019 Kern River Supplies: Manager Bricker informed the Board that the District's Kern River supply, from the "Carmel" right, is projected to be 11,900 ac-ft. This is based on the most recent B120 River runoff forecast from DWR, published on 5/28/19, which included a median forecast that yields a 199 percent of average Kern River runoff year. The final entitlement amount will not be known until after August.

In addition to the District's own River supply, there are also additional River supplies available via purchase due to the abundance of snowmelt this spring/summer. These supplies are made available in order to maintain high releases from Isabella Dam so that the reservoir storage stays below its restricted cap of 361,250 ac-ft. As of 6/3/19, the District had purchased a combined 2,236 ac-ft of Lower River and City of Bakersfield River supplies, ranging in cost from $5/ac-ft to $100/ac-ft. These supplies are expected to be delivered to the Pioneer Project for banking.

c. District Operations: Manager Bricker distributed to the Board an updated version of the 2019 WY Water Schedule. This document includes water supplies by type, deliveries by location, water demand in-District, and remaining storage balances. The updated version includes actual numbers through April and projected numbers

for the remainder of the WY. Between crop ET and system losses, it is expected that there will be 14,600 ac-ft of in-District water demand, while total supplies are projected to be 20,700 ac-ft. Of the 6,100 ac-ft of excess supply, it is projected that 3,900 ac-ft will be delivered to the Pioneer Project, and the remaining 2,200 ac-ft will remain in San Luis and Isabella storage as carryover into the 2020 WY.

d. Pioneer Project: Manager Bricker informed the Board that the Pioneer is in recharge operations and is currently at maximum capacity, with approximately 400 CFS of deliveries to the Project. Once recharge operations cease as supplies are exhausted, it is expected that the KCWA will move forward with the repairs/replacements that were budgeted to take place this year.

STATE WATER PROJECT

a. Delta Conveyance: President Wyrick provided the latest update on Delta Conveyance, which includes the end of the "California WaterFix" as it has been known. DWR recently withdrew its permits and application for the WaterFix, and rescinded its bond resolutions. Governor Newsom has voiced his desire to reduce the project to one tunnel, and issued an Executive Order that calls for the development of a water resiliency portfolio.

b. Consider Approving KCWA's Execution of Amendment #40 (Contract Extension): President Wyrick reported on the current status of Amendment #40, which is the Contract Extension Amendment to the SWP Water Supply Contract between DWR and the State Water Project Contractors. Because of the recent termination of the California WaterFix, those parties opposed to the issuance of WaterFix bonds no longer have the same level of fear that the Extension of the SWP Water Supply Contract will enable DWR to proceed with the WaterFix to the detriment of said parties. Additionally, because significant costs related to the Oroville Dam repair may be borne by the Contractors, it benefits them to extend the period for the repayment of bonds past 2035. The Amendment would extend the contract period of the SWP an additional 50 years. Legal counsel of various Member Units have worked to prepare a letter to the KCWA, on behalf of the Member Units, that confirms their approval of KCWA executing Amendment #40, subject to two conditions.

KCWA approved the execution of Amendment #40 at its May Board meeting, subject to receiving approval from all Member Units. Therefore, the HMWD Board was presented with the option to consider signing the letter, indicating its approval that KCWA executes the Amendment with DWR. After discussion, and upon motion by Director Hurlbutt, seconded by Director Riddle, the Board unanimously approved by a roll call vote, President Wyrick signing the letter and returning to the KCWA.

SUSTAINABLE GROUNDWATER MANAGEMENT ACT

a. Review of Local SGMA Activities: Manager Bricker provided the Board with the latest status on local SGMA activities, including the efforts of the GSAs in the subbasin to coordinate on water budgets and sustainable management criteria. Other notable activity included the Outreach Event and Coordination Committee meeting in May, which featured staff from DWR and SWRCB in attendance at both events.

b. Update on HMWD GSP Development: Manager Bricker informed the Board of the progress being made on the development of the GSP. He presented the same poster board that was used at the Outreach Event in May, which included HMWD GSA maps, hydrographs, and water supply/demand data. It was also reported that the GSP is beginning to be finalized and should be ready to be released for public comment by August.

c. Discussion of Un-Districted Lands Outside of GSA Boundaries: Manager Bricker updated the Board on the issue of un-Districted lands in the context of SGMA. Because the County of Kern withdrew its participation from the KGA, any un-Districted lands are now inherently not covered by a GSA; if the subbasin contains lands that are not managed by a GSP, it could potentially lead to SWRCB intervention and a "probationary" status. In efforts to minimize the amount of un-Districted lands, HMWD GSA is seeking to include three parcels into its GSA that are presently outside of its boundaries. These parcels are either owned by the District or by J.G. Boswell Co., a landowner within the District. After discussion, and upon motion by Director Mendonca, seconded by Director Riddle, the Board unanimously approved by a roll call vote, the GSA's attempts to include the District-owned parcels into its GSA, as well as the J.G. Boswell-owned parcel, if the KRGSA is unable to do so.

IRRIGATED LANDS REGULATORY PROGRAM

Manager Bricker and Director Riddle provided the Board with updates related to the KRWCA. There were no notable items.

ISABELLA DAM SAFETY MODIFICATION PROJECT – REIMBURSEMENT WITH BVWSD

Manager Bricker informed the group of the pending Agreement between Buena Vista Water Storage District and the J.G. Boswell Co. for the repayment of costs associated with the Isabella Dam Modification Project. J.G. Boswell, through its "Carmel" right, has a share of approximately 3.45% of the Kern River water and Isabella reservoir storage owned by 2nd Point, of which BVWSD is the majority owner. The U.S. Army Corps of Engineers and their contractors

are currently performing the construction work to bring the Dam up to recent safety standards. It is expected that the total cost of the project will be $641 million, of which BVWSD will owe $6.676 million and Boswell will owe approximately $230k; the payments are due over a 50-year period, interest free. This item was for informational purposes only, as HMWD has the ability to utilize Boswell's river water and storage for other water transactions.

DISCUSSION OF HENRY MILLER WATER DISTRICT ABANDONED CANALS WITHIN DISTRICT BOUNDARIES

Manager Bricker summarized the prior discussions that had taken place regarding the abandoned HMWD-owned parcels within the District. After extensive review, Manager Bricker has recommended to the Board that they consider including these parcels into the existing Lease Agreement between the District and J.G. Boswell Co.; said Agreement allows Boswell to lease HMWD-owned land for farming purposes. Manager Bricker and Legal Counsel prepared an Extension & Amendment to the Lease Agreement, which was presented to the Board for consideration. After discussion, and upon motion by Director Hurlbutt, seconded by Director Mendonca, the Board unanimously approved by a roll call vote, the execution of the Extension & Amendment to the Lease Agreement, thereby including the HMWD-owned abandoned parcels into the existing lease with J.G. Boswell Co.

CLOSED SESSION

The Board went into closed session to discuss the following matters at approximately 4:15 p.m.

> Pending Litigation
> Conference with Legal Counsel
> *Food and Water Watch, et al.* vs. *Metropolitan Water District and All Interested Persons,* Los Angeles County Superior Court, Case No. BC 720692
> (Government Code Section 54956(d)(1))
>
> Public Employee Performance Evaluation
> Positions: Manager and Treasurer
> (Government Code Section 54957(b)(1))

The meeting was recalled to open session at 4:31 p.m.

Upon returning to open session, Legal Counsel reported that there was no action taken that would require disclosure under the Brown Act.

ADJOURNMENT

There being no further business to come before the Board, the meeting was adjourned at 4:31 p.m.

Respectfully submitted,

James Worth, Secretary Pro Tem

ATTEST:

Jeof Wyrick, President

MINUTES OF THE SPECIAL
MEETING OF THE BOARD OF DIRECTORS
HENRY MILLER WATER DISTRICT

Held: August 30, 2019

A special meeting of the Board of Directors of Henry Miller Water District was held at the Law Offices of McMurtrey, Hartsock & Worth on August 30, 2019.

CALL TO ORDER AND APPOINTMENT OF SECRETARY PRO TEM

President Jeof Wyrick called the meeting to order at 11:01 a.m. and appointed Isaac L. St. Lawrence as Secretary Pro Tem.

ROLL CALL

The following Directors were present in person: Joey Mendonca, Slavisa Pavlovic, and Charles Riddle. Jeof Wyrick and Thomas Hurlbutt appeared telephonically.

The following were absent: None.

Others present were: Dominic Sween; Isaac L. St. Lawrence, General Counsel; and Walter Bricker appeared telephonically.

PUBLIC COMMENT

None.

ADDITION OF AGENDA ITEM

Pursuant to Government Code section 54954.2(b)(2), and upon motion duly made by Director Hurlbutt, seconded by Director Mendonca, and unanimously carried by the Board members present, it was determined that there was a need to consider/take immediate action on one item, and that the need for action came to the attention of the District subsequent to the agenda being posted. Therefore, the Board approved to add "Appointment of Acting Manager" as Open Session agenda item number 3 and renumbered all other agenda items accordingly.

APPOINTMENT OF ACTING MANAGER

After discussion, and upon motion by Director Hurlbutt, seconded by Director Riddle, and unanimously carried by the Board, Dominic Sween was appointed to the position of Acting District Manager.

APPROVAL OF BOARD MEETING MINUTES

After discussion, and upon motion by Director Riddle, seconded by Director Mendonca, the minutes of the June 3, 2019 meeting were unanimously approved.

WATER SUPPLY AND OPERATIONS

a. 2019 SWP Supplies: Manager Sween provided an update to the Board on State Water Project water supplies and schedule.

b. 2019 Kern River Supplies: Manager Sween provided an update to the Board on 2019 Kern River water supplies.

c. Review of 2019 District Operations: Manager Sween stated there was nothing new or out of the ordinary to report regarding District operations.

d. Pioneer Project: Manager Sween reported that the District should have approximately 5,200 AF of water delivered into the Pioneer Banking Project this year.

SUSTAINABLE GROUNDWATER MANAGEMENT ACT

a. Authorization for Public Release of HMWD Draft GSP: After discussion, and upon motion by Director Mendonca, seconded by Director Riddle, and unanimously carried by the Board, public release of the HMWD Draft GSP was approved, staff was directed to publish and provide the required notices, and a December 2, 2019 public hearing was set to consider approval of the GSP. Director Wyrick also updated the Board on the status of the Coordination Agreement, advising that it was not complete.

ADJOURNMENT

There being no further business to come before the Board, the meeting was adjourned at 11:19 a.m.

Respectfully submitted,

Isaac L. St. Lawrence, Secretary Pro Tem

ATTEST:

Jeof Wyrick, President

MINUTES OF THE REGULAR
MEETING OF THE BOARD OF DIRECTORS
HENRY MILLER WATER DISTRICT

Held: December 2, 2019

A regular meeting of the Board of Directors of Henry Miller Water District was held at the Law Offices of McMurtrey, Hartsock & Worth on December 2, 2019.

CALL TO ORDER AND APPOINTMENT OF SECRETARY PRO TEM

President Jeof Wyrick called the meeting to order at 3:30 p.m. and appointed James Worth as Secretary Pro Tem.

ROLL CALL

The following Directors were present: Slavisa Pavlovic, Charles Riddle, Jeof Wyrick and Thomas Hurlbutt appeared telephonically.

The following Directors were absent: Joey Mendonca.

Others present were: Dominic Sween, Manager; Jim Worth, General Counsel; Lindsey McGuire, Treasurer.

PUBLIC COMMENT

None.

APPROVAL OF BOARD MEETING MINUTES

After discussion, and upon motion by Director Hurlbutt, seconded by Director Riddle, the minutes of the August 30, 2019 Special meeting were unanimously approved by a roll call vote. Director Mendonca was absent.

TREASURER'S REPORT

a. 2019 District FY Budget to-date: Treasurer McGuire presented the prior Fiscal Year Income and Expenses for the period March 1, 2019 through October 31, 2019. The Income totaled $1,489,380.97 and the Expenses totaled $1,979,717.73. After discussion, and upon motion by Director Riddle, seconded by Director Pavlovic, the Board unanimously accepted the FY19 Income/Expense Report by a roll call vote. Director Mendonca was absent.

b. Review 2020 District FY Budget: Treasurer McGuire presented the 2020-2021 FY Projected and Actual Cash Flows. After discussion, and upon motion by Director Riddle, seconded by Director Pavlovic, the Board unanimously approved the 2020-2021 FY Budget. Director Mendonca was absent.

c. California Farm Water Coalition Request for Funds: Manager Sween informed the Board that the California Farm Water Coalition had made a request for funds. After Board discussion, no action was taken.

WATER SUPPLY AND OPERATIONS

a. 2019 SWP Supplies: Manager Sween informed the Board that it is too early for projections but an estimate of SWP allocation is 25%. Carmel Carryover is presently estimated at 1,700 AF for 2020.

b. 2019 Kern River Supplies: Manager Sween provided the Board with an update of 2019 Kern River supplies.

c. District Operations: No report was given.

d. Pioneer Project: No report was given.

SUSTAINABLE GROUNDWATER MANAGEMENT ACT

a. Master Coordination Agreement: President Wyrick provided the Board with the latest status on local SGMA activities, including the Master Coordination Agreement. After Board discussion, and upon motion by Director Hurlbutt, and seconded by Director Riddle, the Board unanimously approved the District signing the Master Coordination Agreement.

b. Public Hearing for Comments on HMWD draft GSP: President Wyrick opened the public hearing to receive comments on the HMWD draft GSP. Hearing no comments, the public hearing was closed. No action was taken.

OTHER ITEMS

No Website Resolution: President Wyrick advised the Board of the requirement that special districts maintain a website, subject to certain exceptions enumerated in California Government Code Section 53087.8. After discussion, and upon motion by Director Riddle, and seconded by Director Pavlovic, the Board unanimously approved Resolution No. 2019-01, District Determination of Insufficient Resources to Maintain an Internet Website. Director Mendonca was absent.

ADJOURNMENT

There being no further business to come before the Board, the meeting was adjourned at 3:54 p.m.

Respectfully submitted,

_____

James Worth, Secretary Pro Tem

ATTEST:

_____

Jeof Wyrick, President

MINUTES OF THE SPECIAL
MEETING OF THE BOARD OF DIRECTORS
HENRY MILLER WATER DISTRICT

Held: January 10, 2020

A special meeting of the Board of Directors of Henry Miller Water District was held at the Law Offices of McMurtrey, Hartsock & Worth on January 10, 2020.

CALL TO ORDER AND APPOINTMENT OF SECRETARY PRO TEM

President Jeof Wyrick called the meeting to order at 11:01 a.m. and appointed Isaac L. St. Lawrence as Secretary Pro Tem.

ROLL CALL

The following Directors were present in person: Jeof Wyrick, Joey Mendonca, and Slavisa Pavlovic. Thomas Hurlbutt appeared telephonically.

The following were absent: Charles Riddle.

Others present were: Dominic Sween and Isaac L. St. Lawrence, General Counsel.

PUBLIC COMMENT

None.

ADDITION OF AGENDA ITEM

Pursuant to Government Code section 54954.2(b)(2), and upon motion duly made by Director Mendonca, seconded by Director Pavlovic, and unanimously carried by the Board members present, it was determined that there was a need to consider/take immediate action on one item, and that the need for action came to the attention of the District subsequent to the agenda being posted. Therefore, the Board approved to add "Northwest Kern Resource Conservation District Contribution" as Open Session agenda item number 2.5 and renumbered all other agenda items accordingly.

NORTHWEST KERN RESOURCE CONSERVATION DISTRICT CONTRIBUTION

After discussion, and upon motion by Director Pavlovic, seconded by Director Mendonca, and unanimously carried by the Board members present, it was agreed it was in the best interest of the District to participate in, and pay the required contribution of $2,500.00, to support the Northwest Kern Resource Conservation District project and its mobile lab which assists the District with water conservation.

SUSTAINABLE GROUNDWATER MANAGEMENT ACT

a. Resolution No. 2020-01 - Authorization to Approve the HMWD GSP: Upon motion by Director Mendonca, seconded by Director Pavlovic, and unanimously carried by the Board members present, District Resolution 2020-01 was adopted whereby the HMWD GSP was approved, and staff was directed to take all necessary steps to file the HDWD GSP with DWR.

OTHER ITEMS:

None.

ADJOURNMENT

There being no further business to come before the Board, the meeting was adjourned at 11:10 a.m.

Respectfully submitted,

_____

Isaac L. St. Lawrence, Secretary Pro Tem

ATTEST:

_____

Jeof Wyrick, President

Appendix C

Groundwater Sustainability Agency Formation Documents

HENRY MILLER WATER DISTRICT
Post Office Box 9759
Bakersfield, California 93389-9759
Telephone (661) 327-3551
FAX (661) 763-1557

Jeof Wyrick, *President*
Joey Mendonca, *Vice President*
Thomas R. Hurlbutt
Charles Riddle

Ron Dow, *Treasurer*
Walter Bricker, *Manager*
James Worth,
Secretary-Attorney

April 12, 2017

VIA EMAIL AND U.S. MAIL
Mark Nordberg, GSA Project Manager
Sustainable Groundwater Management Program
California Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236
Email: Mark.Nordberg@water.ca.gov

Mike McKenzie, Senior Engineering Geologist
Sustainable Groundwater Management Program
California Department of Water Resources
3374 East Shields Avenue
Fresno, CA 93726
Email: Charles.McKenzie@water.ca.gov

RE: ***Notice of Henry Miller Water District Intent to Serve as a Groundwater Sustainability Agency for a Portion of the Kern County Subbasin***

Dear Mr. Nordberg and Mr. McKenzie:

Pursuant to California Water Code Section 10723.8 of the Sustainable Groundwater Management Act (SGMA), Henry Miller Water District (Agency) provides this notice of its intent to become a Groundwater Sustainability Agency (GSA) for a portion of Kern County Subbasin (5-22.14) of the San Joaquin Valley Groundwater Basin. The Agency intends to cover a portion of Kern County Subbasin in Kern County. All applicable information listed in Water Code §10723.8(a) is provided herein.

The Agency is a California Water District pursuant to Water Code Section 34000, *et seq*. The Agency has not adopted any new bylaws, authorities, or ordinances due to intending to become a GSA.

In accordance with California Water Code Section 10723(b) and California Government Code Section 6066, a notice of public hearing was published in the local newspaper, The Bakersfield Californian, regarding the Agency's consideration in becoming a GSA. Attached hereto as Exhibit A is the notice of public hearing and the certification of publication from the publisher. Immediately following the public hearing, the Board of Directors of Agency adopted the Resolution 2017-01 (Exhibit B).

Pursuant to Water Code 10723.8(a)(1), a map of Agency service area boundary is enclosed as Exhibit C. The enclosed flash drive contains a GIS shape file of the GSA boundary. The Agency acknowledges that separate GSAs will be formed for other portions of the Basin. The Agency intends to work collaboratively with other GSAs on the development and implementation of groundwater sustainability plans (whether through a single plan or multiple coordinated plans) for the sustainable management of the Basin.

Pursuant to Water Code 10723.8(a)(4), the Agency developed a list of interested parties that the Agency will consider as necessary during the GSA formation process and Groundwater Sustainability Plan (GSP) development process. As required, the Agency will consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing the GSP.

The following list identifies interested parties and how their interest will be considered in accordance with Water Code §10723.2:

(a) Holders of overlying groundwater rights:

1. Agricultural users are represented through the board members of the California Water District forming the GSA.
2. The one known domestic well owner is represented due to the landowner having a representative on the board. If any other domestic wells are discovered, the operators will be contacted.

(b) Municipal well operators are not known to exist within the Agency. If any are discovered, they will be contacted.

(c) Public water systems are not known to exist within Agency. If any are discovered, they will be contacted.

(d) The local land use planning agency, the County of Kern, is represented via ongoing contact and coordination within the subbasin.

(e) Environmental users of groundwater, if any, in the covered portion of the Kern County Subbasin, have been investigated but not determined. Environmental groups could seek participation at their request. Agency will continue to consider and evaluate whether such use does exist.

(f) Surface water users where waters are connected between surface and groundwater bodies, may or may not be present in the Kern County Subbasin. Agency will continue to consider and evaluate whether such connection does exist. In any event, surface water users are represented through the board of Agency.

(g) The federal government users, including, but not limited to the military and managers of federal lands are not represented because there are no known federal or military lands in the covered portion of the Kern County Subbasin.

(h) California Native American tribes have and will continue to be contacted by agencies in the Kern County Subbasin. No tribal lands are believed to be present in the covered portion of the Kern County Subbasin. A tribal representative could seek representation if desired.

(i) Disadvantaged Communities are not known to be present within the covered area. If disadvantaged communities do exist, they could seek representation if desired.

(j) Entities monitoring and reporting groundwater elevations in all or a part of a groundwater basin are represented by the California Water District forming the GSA via CASGEM reporting. The Agency will continue to evaluate and consider any other entities which might fall within Section 10927 of the California Water Code.

The interests of the parties identified above will be considered in the operation of the proposed Henry Miller Water District GSA and the development and implementation of a GSP. The Districts are committed to an open and inclusive process to implement SGMA. Interested parties will have opportunities to provide input through written public comments and opportunities to appear and provide comments at regular and special board meetings of Agency.

Agency intends to work cooperatively with other agencies, water providers, and other interested stakeholders within Kern County, surrounding counties, and the State of California, regarding the sustainable management of groundwater within the Subbasin. If any additional information is required, please contact Jeof Wyrick at jwyrick@jgboswell.com or (626) 583-3000.

Sincerely,

Jeof Wyrick
President

Attachments:
Exhibit A Notice of public hearing and Certification of Publishing
Exhibit B Resolution to Serve as GSA
Exhibit C Map of Agency Service Area

Encl: Flash Drive Containing GIS Shape File of GSA Boundary

EXHIBIT A

NOTICES OF PUBLIC HEARING AND CERTIFICATION OF PUBLICATION

PROOF OF PUBLICATION

The BAKERSFIELD CALIFORNIAN
P.O. BOX 440
BAKERSFIELD, CA 93302

MCMURTREY, HARTSOCK & WORTH
2001 22ND STREET, SUITE 100
BAKERSFIELD, CA 93301

Ad Number:	14308837	**PO #:**	
Edition:	1TBC	**Run Times**	2
Class Code	Legal Notices		
Start Date	3/1/2017	**Stop Date**	3/8/2017
Billing Lines	17	**Inches**	102.92
Total Cost	$ 314.02	**Account**	55684308
Billing Address	MCMURTREY, HARTSOCK & WOR 2001 22ND STREET, SUITE 100 BAKERSFIELD,CA 93301		

MAR 13 2017

STATE OF CALIFORNIA
COUNTY OF KERN

I AM A CITIZEN OF THE UNITED STATES AND A RESIDENT OF THE COUNTY AFORESAID: I AM OVER THE AGE OF EIGHTEEN YEARS, AND NOT A PARTY TO OR INTERESTED IN THE ABOVE ENTITLED MATTER. I AM THE ASSISTANT PRINCIPAL CLERK OF THE PRINTER OF THE BAKERSFIELD CALIFORNIAN, A NEWSPAPER OF GENERAL CIRCULATION, PRINTED AND PUBLISHED DAILY IN THE CITY OF BAKERSFIELD COUNTY OF KERN,

AND WHICH NEWSPAPER HAS BEEN ADJUDGED A NEWSPAPER OF GENERAL CIRCULATION BY THE SUPERIOR COURT OF THE COUNTY OF KERN, STATE OF CALIFORNIA, UNDER DATE OF FEBRUARY 5, 1952, CASE NUMBER 57610; THAT THE NOTICE, OF WHICH THE ANNEXED IS A PRINTED COPY, HAS BEEN PUBLISHED IN EACH REGULAR AND ENTIRE ISSUE OF SAID NEWSPAPER
AND NOT IN ANY SUPPLEMENT THEREOF ON THE FOLLOWING DATES, TO WIT: 3/1/17
3/8/17

ALL IN YEAR 2017

I CERTIFY (OR DECLARE) UNDER PENALTY OF PERJURY THAT THE FOREGOING IS TRUE AND CORRECT.

DATED AT BAKERSFIELD CALIFORNIA

3-8-17

Solicitor I.D.: 0

First Text
NOTICE OF PUBLIC HEARINGNOTICE IS HEREBY

Ad Number 14308837

NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that, pursuant to California Water Code Section 10723(b), Henry Miller Water District (District) will hold a public hearing during a special meeting on Wednesday, March 15, 2017, commencing at 3:00 p.m. at the Law Offices of McMurtrey, Hartsock & Worth, 2001 22nd Street, Suite 100, Bakersfield, CA 93301, to consider and determine whether the District will become a Groundwater Sustainability Agency for a portion of the Kern County Subbasin (5-22.14) of the San Joaquin Valley Groundwater Basin. Written comments may be submitted to the District, Attn: Jeof Wyrick, 2001 22nd Street, Suite 100, Bakersfield, CA 93301, no later than 3:00 p.m. on March 15, 2017. During the hearing the District will allow oral comments and will receive additional written comments before making a decision. Additional information may be obtained by calling Counsel for the District, James Worth, at 661 322-4417.

March 1, 8, 2017
14308837

EXHIBIT B

RESOLUTION TO SERVE AS GSA

BEFORE THE BOARD OF DIRECTORS OF
THE HENRY MILLER WATER DISTRICT
RESOLUTION 2017-01

RESOLUTION OF THE HENRY MILLER WATER DISTRICT DECLARING ITS DECISION TO BECOME A GROUNDWATER SUSTAINABILITY AGENCY PURSUANT TO THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT FOR A PORTION OF THE KERN COUNTY SUBBASIN (5-22.14) OF THE SAN JOAQUIN VALLEY GROUNDWATER BASIN

WHEREAS, on September 16, 2014, Governor Jerry Brown signed into law Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act ("SGMA"); and

WHEREAS, SGMA went into effect on January 1, 2015; and

WHEREAS, SGMA requires all high and medium priority groundwater basins, as designated by the California Department of Water Resources ("DWR") Bulletin 118, to be managed by a Groundwater Sustainability Agency(s) ("GSAs"); and

WHEREAS, the Kern County Subbasin has been designated by DWR as a high priority basin; and

WHEREAS, pursuant to California Water Code Section 10723(a) "any local agency or combination of local agencies (as defined in California Water Code Section 10721(n)) may decide to become a GSA for that basin"; and

WHEREAS, Henry Miller Water District ("District") is a California Water District formed and operating pursuant to and in accordance with Division 13 of the California Water Code (commencing with Water Code Section 34000) and overlies a portion of the Kern County Subbasin (5-22.14) of the San Joaquin Valley Groundwater Basin portion of the Tulare Lake Hydrologic Region, as defined in DWR Bulletin 118 and is therefore a "Local Agency" eligible to serve as a GSA; and

WHEREAS, California Water Code Section 10723.2 requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing Groundwater Sustainability Plans ("GSPs"); and

WHEREAS, California Water Code Section 10723.8 requires that a "local agency" deciding to become or form a GSA notify DWR of its decision to become a GSA and intention to undertake sustainable groundwater management within a basin; and

WHEREAS, pursuant to California Water Code Section 10723(b), Henry Miller Water District held a public hearing on March 15, 2017 after publication pursuant to California Government Code Section 6066, to consider the adoption of this Resolution and its decision to become a GSA in the Kern County Subbasin; and

WHEREAS, at the public hearing, the Henry Miller Water District Board of Directors considered oral and written comments to the extent provided by the public; and

WHEREAS, it would be in the best interests of the District to form a GSA and exercise the powers and authorities granted by SGMA.

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

1. That the foregoing is true and correct.

2. That Henry Miller Water District hereby decides to become or form a GSA and undertake sustainable groundwater management in the portion of the Kern County Subbasin (Subbasin5-22.14 of the San Joaquin Valley Basin as defined by DWR Bulletin 118) underlying Henry Miller Water District's boundaries.

3. That Henry Miller Water District shall develop an outreach program to include all stakeholders to ensure all beneficial users of groundwater are considered.

4. That the Board of Directors of the Henry Miller Water District intends to negotiate a memorandum of understanding, participation agreement, or other necessary cooperative agreements or other forms of agreement with other local agencies that have water supply, water management or land use responsibility or entities utilizing groundwater in the Kern County Subbasin, for the purpose of implementing a cooperative, coordinated structure for the management of the Kern County Subbasin pursuant to SGMA.

5. That the Board of Directors of Henry Miller Water District is authorized to submit to DWR on behalf of Henry Miller Water District notice of its intent to undertake sustainable groundwater management in accordance with SGMA (Part 2.74 of the California Water Code).

6. That staff is directed to send to DWR the Henry Miller Water District's notification of its decision to become a GSA and such notification shall include the boundaries of the Kern County Subbasin that the Henry Miller Water District intends to manage, which shall include lands within Henry Miller Water District's boundaries as set forth in the map attached hereto as Exhibit "A," a copy of this resolution, a list of the interested parties developed pursuant to Section 10723.2 of SGMA, and an explanation of how their

of SGMA, and an explanation of how their interests will be considered in the development and operation of the GSA and in the development and implementation of the GSA's GSP.

PASSED AND ADOPTED this 15th day of March, 2017, by the following vote, to wit:

Director	Aye	Nay	Abstain	Absent
Director Hurlbutt	X			
Director Mendonca	X			
Director Riddle	X			
Director Wyrick	X			
Vacant Seat				

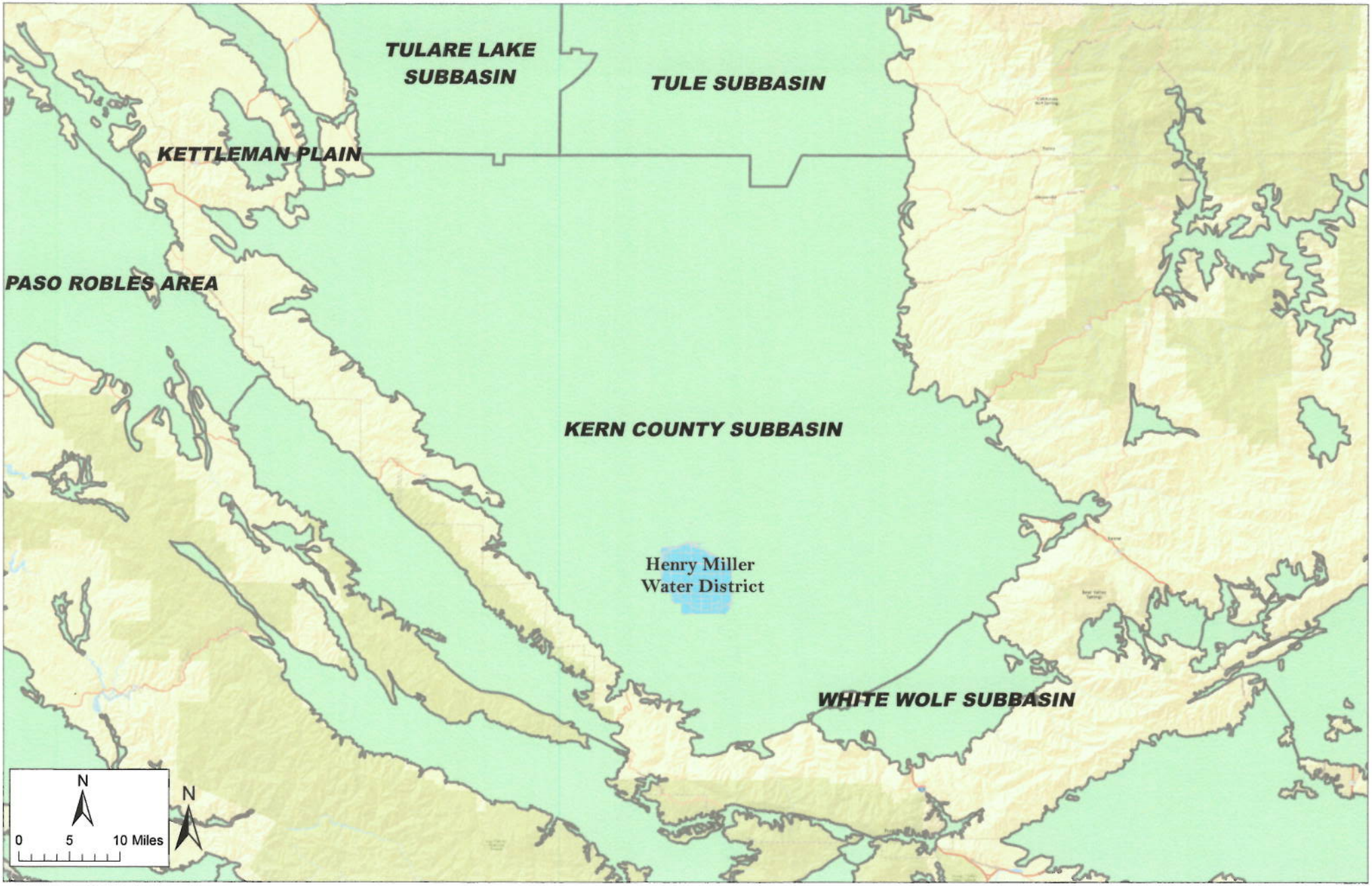
I HEREBY CERTIFY that the foregoing resolution is the resolution of the Henry Miller Water District as duly passed and adopted by its Board of Directors at a legally convened meeting held on the 15th day of March, 2017.

Jeof Wyrick
President of the Board of Directors
HENRY MILLER WATER DISTRICT

ATTESTED:

James A. Worth
Secretary Pro Tem of the Board of Directors
HENRY MILLER WATER DISTRICT

[SEAL]



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DRAFT Date: 4/7/2017

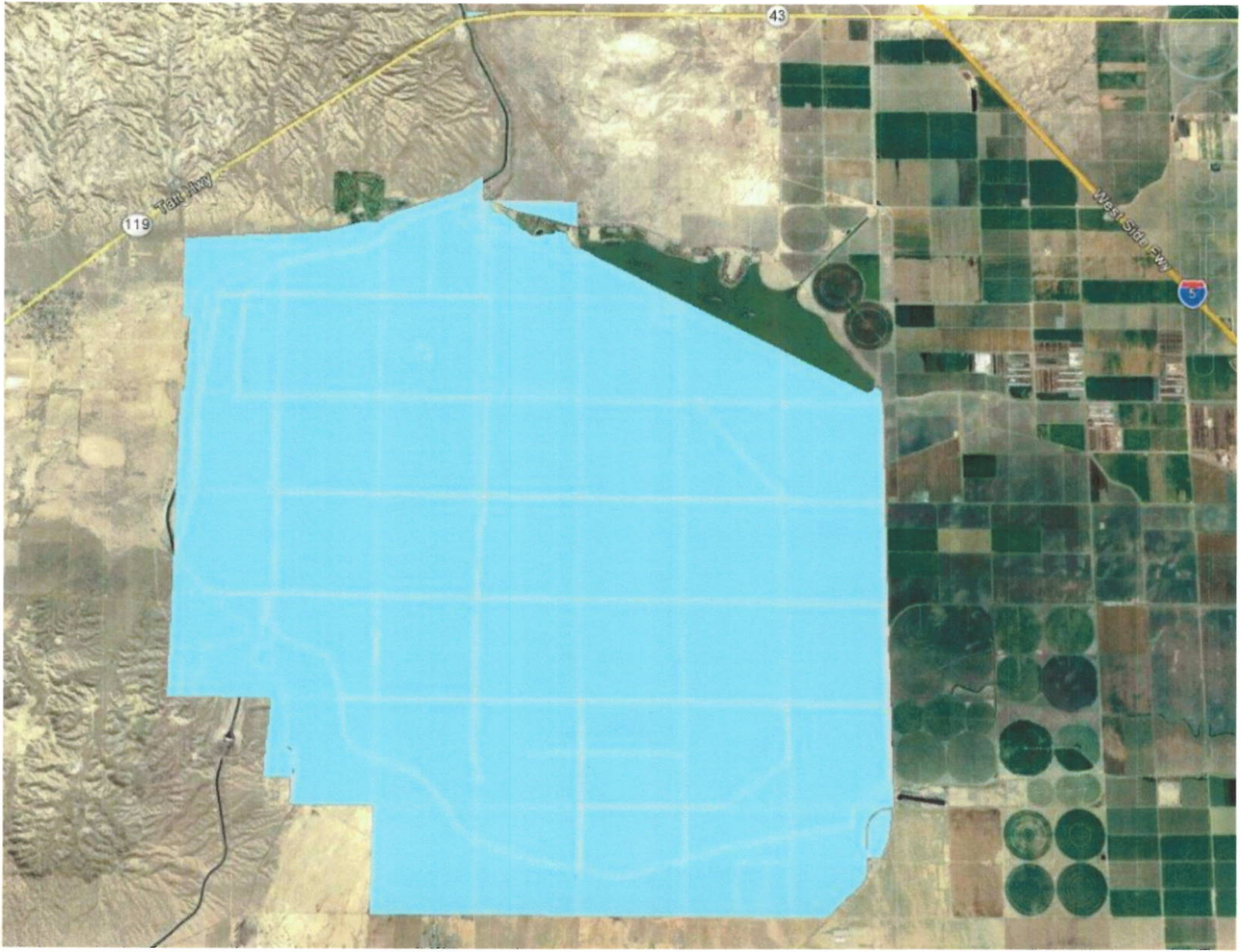
43
119
Taft Hwy
West Side Hwy
5

EXHIBIT C

MAP OF AGENCY SERVICE AREA

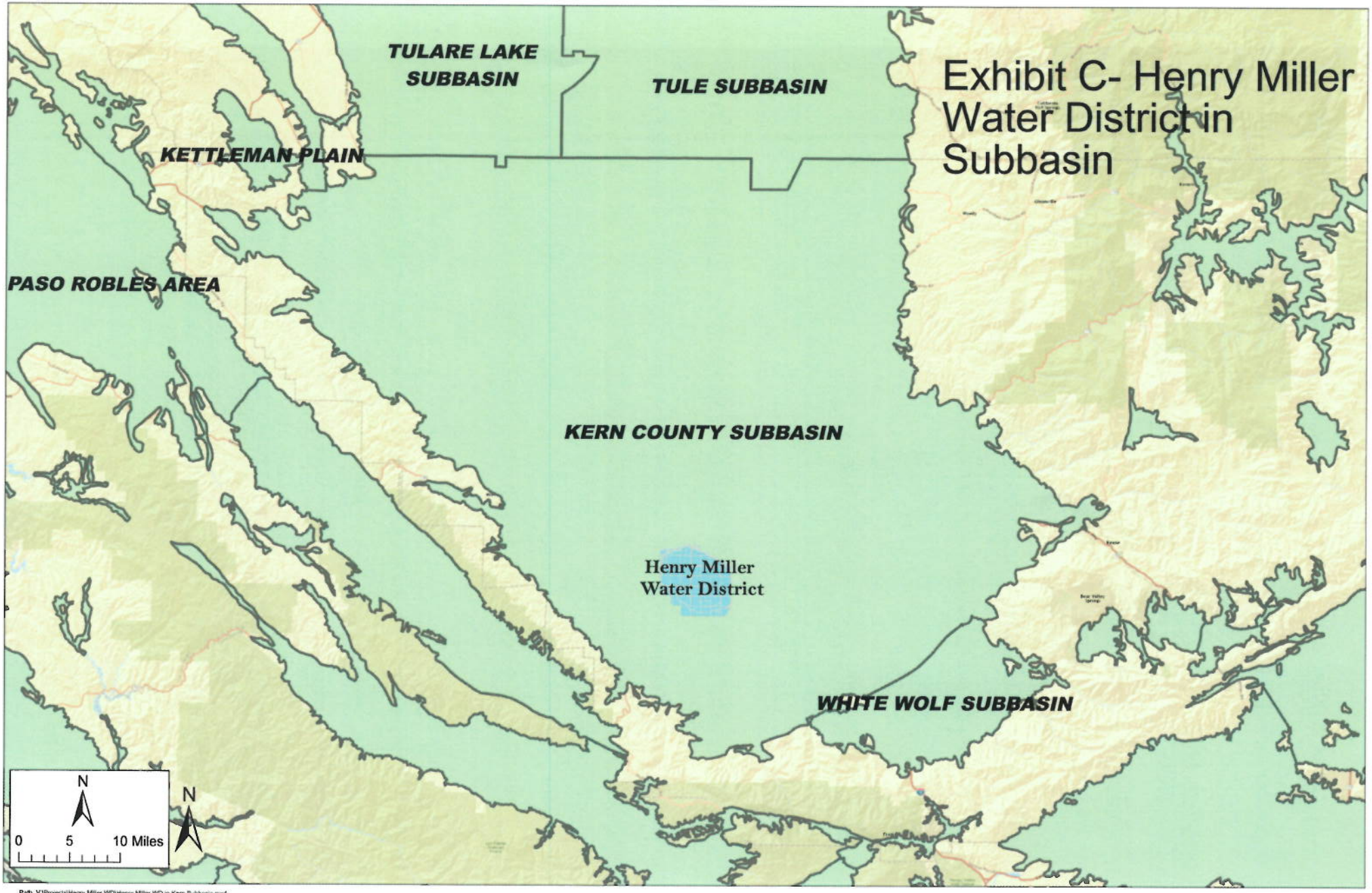

Exhibit C- Henry Miller Water District in Subbasin

Path: V:\Projects\Henry Miller WD\Henry Miller WD in Kern Subbasin.mxd

DRAFT Date: 4/7/2017

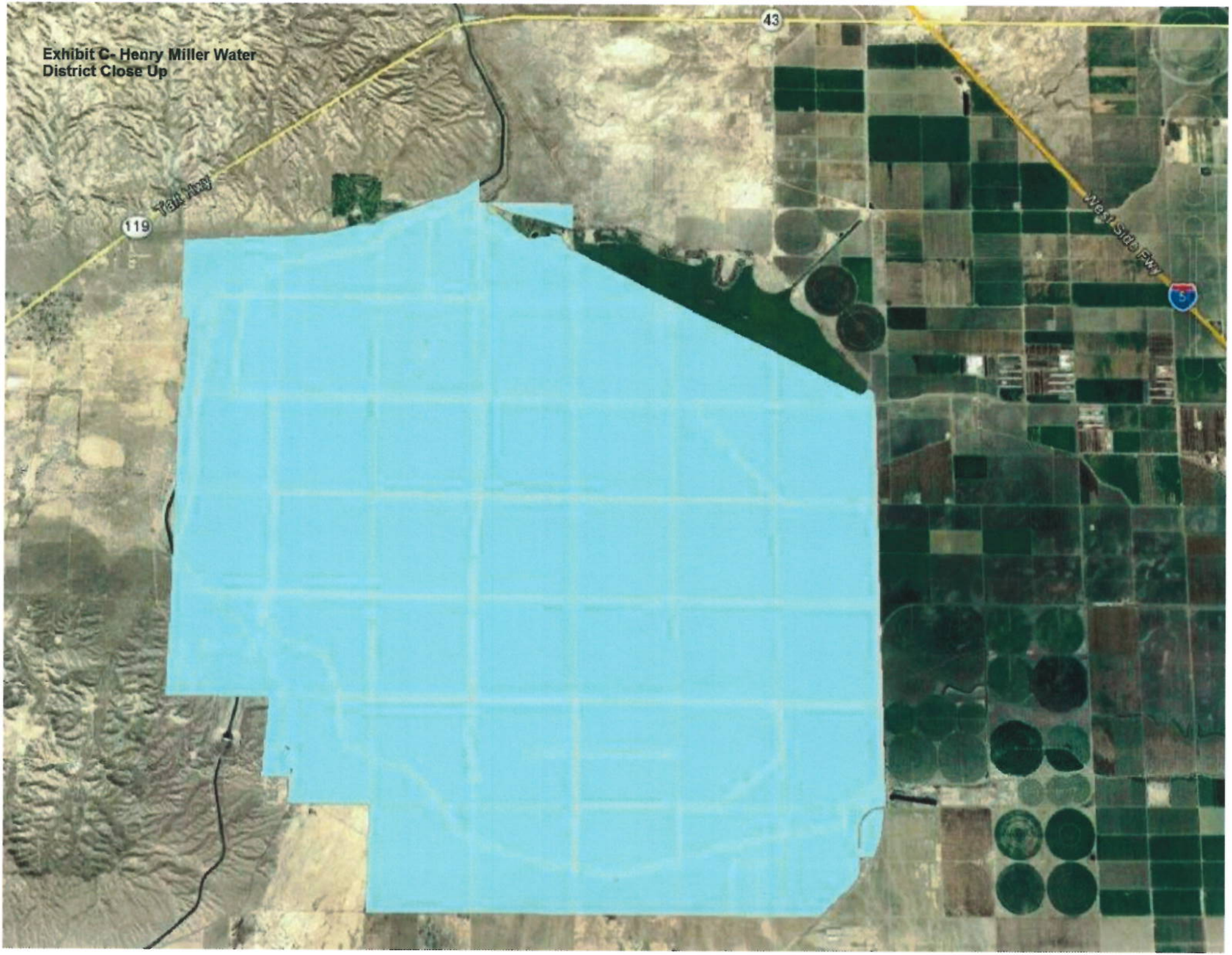
Exhibit C- Henry Miller Water District Close Up
43
119
Tail Ave
West Side Hwy
5

BEFORE THE BOARD OF DIRECTORS OF
THE HENRY MILLER WATER DISTRICT
RESOLUTION 2017-01

RESOLUTION OF THE HENRY MILLER WATER DISTRICT DECLARING ITS DECISION TO BECOME A GROUNDWATER SUSTAINABILITY AGENCY PURSUANT TO THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT FOR A PORTION OF THE KERN COUNTY SUBBASIN (5-22.14) OF THE SAN JOAQUIN VALLEY GROUNDWATER BASIN

WHEREAS, on September 16, 2014, Governor Jerry Brown signed into law Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act ("SGMA"); and

WHEREAS, SGMA went into effect on January 1, 2015; and

WHEREAS, SGMA requires all high and medium priority groundwater basins, as designated by the California Department of Water Resources ("DWR") Bulletin 118, to be managed by a Groundwater Sustainability Agency(s) ("GSAs"); and

WHEREAS, the Kern County Subbasin has been designated by DWR as a high priority basin; and

WHEREAS, pursuant to California Water Code Section 10723(a) "any local agency or combination of local agencies (as defined in California Water Code Section 10721(n)) may decide to become a GSA for that basin"; and

WHEREAS, Henry Miller Water District ("District") is a California Water District formed and operating pursuant to and in accordance with Division 13 of the California Water Code (commencing with Water Code Section 34000) and overlies a portion of the Kern County Subbasin (5-22.14) of the San Joaquin Valley Groundwater Basin portion of the Tulare Lake Hydrologic Region, as defined in DWR Bulletin 118 and is therefore a "Local Agency" eligible to serve as a GSA; and

WHEREAS, California Water Code Section 10723.2 requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing Groundwater Sustainability Plans ("GSPs"); and

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WHEREAS, pursuant to California Water Code Section 10723(b), Henry Miller Water District held a public hearing on March 15, 2017 after publication pursuant to California Government Code Section 6066, to consider the adoption of this Resolution and its decision to become a GSA in the Kern County Subbasin; and

WHEREAS, at the public hearing, the Henry Miller Water District Board of Directors considered oral and written comments to the extent provided by the public; and

WHEREAS, it would be in the best interests of the District to form a GSA and exercise the powers and authorities granted by SGMA.

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

1. That the foregoing is true and correct.

2. That Henry Miller Water District hereby decides to become or form a GSA and undertake sustainable groundwater management in the portion of the Kern County Subbasin (Subbasin5-22.14 of the San Joaquin Valley Basin as defined by DWR Bulletin 118) underlying Henry Miller Water District's boundaries.

3. That Henry Miller Water District shall develop an outreach program to include all stakeholders to ensure all beneficial users of groundwater are considered.

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5. That the Board of Directors of Henry Miller Water District is authorized to submit to DWR on behalf of Henry Miller Water District notice of its intent to undertake sustainable groundwater management in accordance with SGMA (Part 2.74 of the California Water Code).

6. That staff is directed to send to DWR the Henry Miller Water District's notification of its decision to become a GSA and such notification shall include the boundaries of the Kern County Subbasin that the Henry Miller Water District intends to manage, which shall include lands within Henry Miller Water District's boundaries as set forth in the map attached hereto as Exhibit "A," a copy of this resolution, a list of the interested parties developed pursuant to Section 10723.2 of SGMA, and an explanation of how their

of SGMA, and an explanation of how their interests will be considered in the development and operation of the GSA and in the development and implementation of the GSA's GSP.

PASSED AND ADOPTED this 15th day of March, 2017, by the following vote, to wit:

Director	Aye	Nay	Abstain	Absent
Director Hurlbutt	X			
Director Mendonca	X			
Director Riddle	X			
Director Wyrick	X			
Vacant Seat				

I HEREBY CERTIFY that the foregoing resolution is the resolution of the Henry Miller Water District as duly passed and adopted by its Board of Directors at a legally convened meeting held on the 15th day of March, 2017.

Jeof Wyrick
President of the Board of Directors
HENRY MILLER WATER DISTRICT

ATTESTED:

James A. Worth
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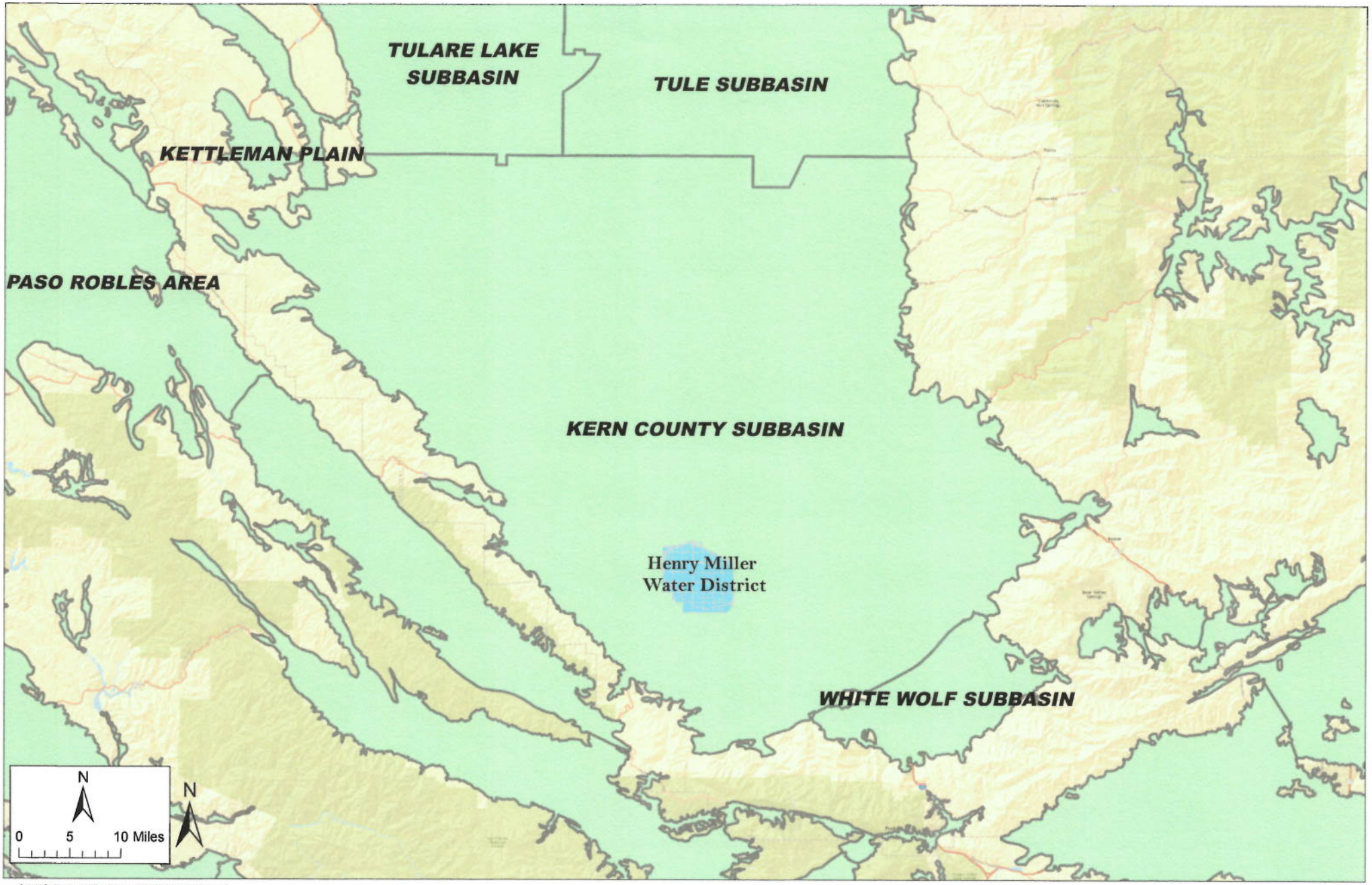
[SEAL]



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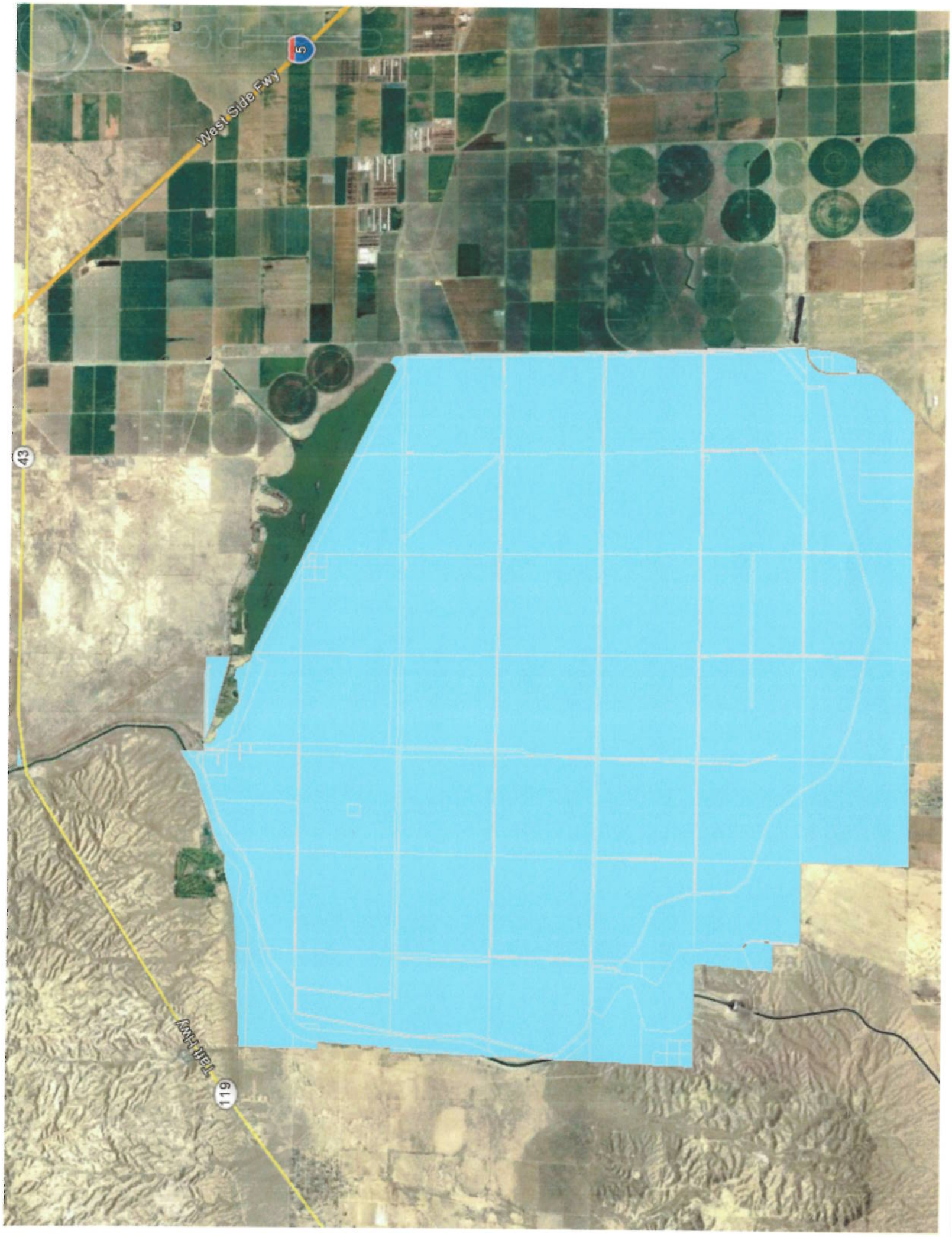
DRAFT Date: 4/7/2017


West Side Fwy
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119

Appendix D

Well Construction Documents

KERN COUNTY
Public Health Services
DEPARTMENT

MATTHEW CONSTANTINE
DIRECTOR

AGRICULTURAL WELL PERMIT INFORMATION

PERMIT EXPIRATION

The application for a permit will expire one (1) year after the date of issuance if the work has not been started and reasonable progress is not made toward completion.

Well owners will be billed at the current hourly rate for any time incurred after the permit expiration date. Inspection time includes travel time to and from your well for inspections of surface slab and surface construction features.

CONTRACTOR RESPONSIBILITIES

It is the responsibility of the Well Contractor to construct, deepen, or reconstruct an agricultural well in accordance with Kern County Ordinance Code, Section 14.08, and the State Department of Water Resources' Bulletin 74-81 and Bulletin 74-90, except as modified by subsequent revisions. Representatives of the Environmental Health Services Department conduct routine inspections during the construction phase to ensure that your well is constructed according to the regulations.

WELL OWNER RESPONSIBILITIES

Once the well has been constructed, deepened, or reconstructed by the contractor, you may obtain electrical permits from the Kern County Building Inspection Division which will allow you to energize a pump once it is installed.

Although you may wish to contract with a water well contractor or pump company to do the following work, it is the responsibility of the owner of the well to supply the following items once the well has been completed.

- Surface slab
- Watertight sanitary seal
- Approved backflow protection device (chemigation, air gap)
- Down-turned, screened casing air vent
- Disinfection access/sounding tube
- Unthreaded sample tap
- Collect water samples from the well for Water Quality Analyses:

  Irrigation Water Analysis

  Arsenic

  Fluoride

  EDB

  DBCP

  Gross Alpha

MORE ABOUT WATER TESTING

This test is to be performed by a state-certified laboratory at the well owner's expense.

The following laboratories can provide sample containers and instructions on how to collect water samples. Most laboratories will also collect water samples for you upon request.

BC Laboratories
4100 Atlas Court
Bakersfield, CA 93308
(661) 327-4911

Dellavalle Laboratory, Inc.
1910 W. McKinley, Suite 110
Fresno, CA 93728
(559) 233-6129 or (800) 228-9896

Kern County Public Health Laboratory –
1800 Mt. Vernon Avenue
Bakersfield, CA 93306-3302
(661) 868-0505

Does not collect water samples.
Performs bacterial analyses only.

Zalco Laboratories, Inc.
4309 Armour Avenue
Bakersfield, CA 93308
(661) 395-0539

FINAL CONSTRUCTION INSPECTIONS

A representative of the Environmental Health Services Department will make a final construction inspection to ensure the following surface construction features are present and properly installed.

Inspections are made by appointment only. Telephone (661) 862-8700 when you have verified that all the items listed below are present.

___ Watertight reinforced concrete surface slab - a minimum thickness of 6 inches, set a minimum of 4 inches above ground level, and extending horizontally at least 3 feet in all directions from the edge of the well casing. Must adequately drain water away from the casing.

___ Unthreaded sample spigot.

___ Down-turned, screened casing air vent.

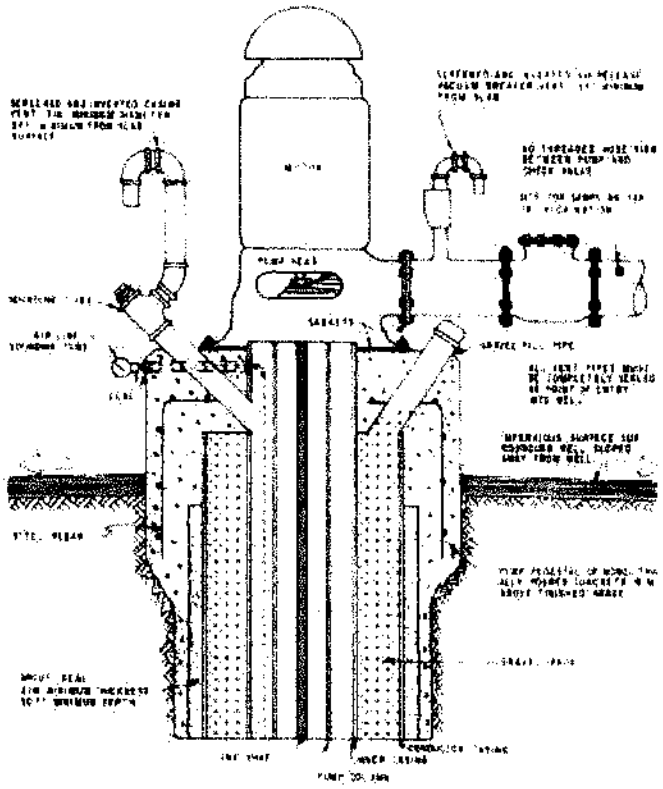
___ A backflow protection device.

___ Disinfection access/sounding tube - allows access to well for chlorination or for determining depth to water without removing pump or well plate.

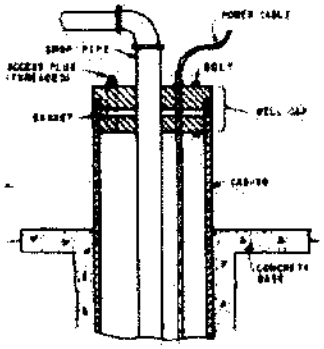
___ Watertight sanitary seal for all cracks, holes, or openings into the well.

FINAL APPROVAL

Final approval of your well cannot be issued until all water quality tests have been received and the surface construction features approved.



DEEP WELL TURBINE INSTALLATION



SUBMERSIBLE PUMP INSTALLATION

Public Health Services

MATTHEW CONSTANTINE

Permit/Well #

Starting Date

APPLICATION FOR WATER WELL PERMIT

APPLICATION MUST BE SUBMITTED AT LEAST TEN (10) WORKING DAYS PRIOR TO THE PROPOSED STARTING DATE

Mark Type of Permit: ☒ Construct New ☐ Reconstruct/Modify ☐ Deepen ☐ Destroy

Type of Well

- ☐ Domestic/Private (1) or Industrial
- ☐ Domestic (2-4 connections)
- ☐ Domestic (5 or more connections)
- ☐ Public Water System (15+ connections, 25+ people)
- ☐ Test Hole (Drill and Destroy)
- ☐ Monitoring
- ☒ Agricultural/Industrial (Must comply w/ Title 19 of K.C.O.C.) **(Must complete Intended Use form)**
- ☐ Cathodic Protection
- ☐ Vadose
- ☐ Other

MARK ONE OF THE BOXES BELOW FOR THE PARTY RESPONSIBLE FOR PAYMENT OF FEES

OWNER'S INFORMATION			PROPERTY/FACILITY INFORMATION		
☐ Name:			☐ Name: Nearest roads are Sandrini and Copus Roads		
Address:			Address:		
City: Bakersfield	State: CA	Zip: 93389	City: Bakersfield	State: CA	Zip:
Phone:	e-mail:		APN:	T: R:	Sec:
CONTRACTOR'S INFORMATION					
☐ Environmental Contractor:			☐ Driller: Layne Christensen Company	C-57: 510011	
Address:			Address: 1717 W Park Ave		
City:	State:	Zip:	City: Redlands	State: CA	Zip 92373
Contact:	Phone:		Contact: Steve Gillman	Phone: 909 390-2833	
e-mail:			e-mail: steve.gillman@layne.com		
PUMP INSTALLATION INFORMATION					
Name: Layne Christensen Company			Contact: Rigo Pereida	Phone: 909 390-2833	
Address: 1717 W Park Ave			Email: rigoberto.pereida@layne.com		
City: Redlands	State: CA	Zip: 92373	☐ Water Quality Included		

WATER SAMPLE TO BE TAKEN BY Layne Christensen Company **TOTAL ACRES** 201.83

LOCATION OF WELL GPS COORDINATES

Attach a plot plan with the exact location of water well with respect to the following items: property lines, adjoining properties, water bodies or courses, drainage pattern, roads, existing wells, structures, sewers or private disposal systems. **Include dimensions from two property lines.** For **monitoring wells** provide a description of the facility to be monitored, including: location of tanks, proposed monitoring and placement, nearest street or intersection; location of any water wells or surface water within 500' radius of facility.

Provide detailed directions to site:

EHS-6/7/17

WELL CONSTRUCTION INFORMATION

METHOD: [X] Reverse Rotary [ ] Rotary [ ] Air Rotary [ ] Hollow Stem Auger [ ] Other: _____

WELL NAME / NUMBER			
MAXIMUM WELL DEPTH	1000'		
SEALING MATERIAL	Cement		
SEAL DEPTH (HARD ROCK/UNCONSOLIDATED)	350'		
CASING MATERIAL & GAUGE	LCS/.375		
CASING - INSIDE DIAMETER	18"		
SCREEN/PERFORATION DEPTH	650'		
CONDUCTOR DEPTH	50'		
CONDUCTOR DIAMETER	30"		
DEPTH TO GROUNDWATER	Unknown		
LOCKING WELL CAP			
BOREHOLE DIAMETER	28"		
SCREEN MATERIAL & GAUGE	LCS/.375		
TYPE OF BENTONITE PLUG & DEPTH			
FILTER PACK MATERIAL & SIZE	Gravel 1/4 x 10		
SCREEN SLOT SIZE & LENGTH	.060		
SEALANT PLACEMENT METHOD	Tremmie		

WELL DESTRUCTION INFORMATION

WELL NUMBER			
WELL DEPTH			
CASING MATERIAL			
SEALANT MATERIAL			
SEALANT PLACEMENT METHOD			

GENERAL CONDITIONS FOR DESTRUCTION:

1. A well destruction application must be filed with this Division if a well is being destroyed that is not in conjunction with a test hole permit.
2. Destruction procedures must be followed as per UT-50.
3. Placement of the seal must be witnessed by a representative of this Division. Forty-eight hour advanced notice is required for an appointment.

SPECIAL CONDITIONS:

GENERAL CONDITIONS FOR ALL PERMITS:

Permit applications may be submitted to the Planning Department by county staff for zoning, access, and flood plain clearances prior to approval of the Environmental Health Division (EHD). If you are drilling within city's limits, you will have to receive approval from their Planning Department.

1. Permit applications must be submitted to EHD at least ten (10) working days prior to the proposed starting date.
2. Well site approval is required before beginning any work related to water well construction. It is unlawful to continue work past the stage at which an inspection is required unless inspection is waived or completed.
3. Other required inspections include: setting conductor casing, E-Logs, all seals, and final construction features.
4. In areas where a water well penetrates more than one aquifer, and one or more of the aquifers may contain water which is of a quality which may degrade the other aquifer(s) penetrated if allowed to commingle, an E-Log shall be required to determine the location of the confining clay layer(s) and assist in the placement of any required annular seal(s).
5. A phone call to the **Division Hotline at (661) 862-8788** is required 48 hours before the placement of any seals or plugs. **No seals shall be called for after 2:00 pm without prior approval or in case of an emergency.**
6. Construction under this permit is subject to any instructions by EHD representatives.
7. **Approval of water quality and final construction features is required before the water well is put into use.**
8. Any misrepresentation or noncompliance with required permit conditions, or regulations, will result in issuance of a 'Stop Work Order.'
9. A copy of the Department of Water Resources Driller's Report and water quality analyses must be submitted to EHD within sixty (60) days after completion of the work.
10. 'Dry' holes must be properly destroyed within two (2) weeks of drilling. A water well destruction application must be filed with EHD.
11. The permit is void one (1) year after date of issuance if work has not been started and reasonable progress toward completion made. Fees are not refundable or transferable.
12. Lead appurtenances shall not be used in construction of any private or public water supply system. The use of solders containing more than 2/10 of 1% lead is prohibited in making joints and fittings in any private or public potable water system.
13. Drilling of a water well shall be performed by a C-57 contractor licensed in accordance with the provisions of the Contractors License Law (Chapter 9, Division 3, of the Business and Professions Code) unless exempted by that act, and registered to drill within the County of Kern.
14. Permittee shall assume entire responsibility for all activities and uses under this permit and shall indemnify, defend and save the County of Kern and/or Kern County Water Agency, its officers, agents, and employees, free and harmless from any and all expense, cost or liability in connection with or resulting from the exercise of this permit, including, but not limited to, property damage, personal injury, and wrongful death.

☒ **I UNDERSTAND THAT FUTURE DEVELOPMENT PERMITS MAY NOT BE ISSUED (KCOC 17.04.120) UNLESS RECORDED LEGAL ACCESS TO THE PROPERTY CAN BE DEMONSTRATED.**

I certify that I am the owner of the above-described property, or the authorized representative of such owner, and that all the information I have furnished is current and accurate to the best of my knowledge, and I intend to construct the water well as represented above. I understand that all work is to be done in accordance with Kern County Ordinance Code Chapter 14.08, Bulletin 74-81 and all subsequent bulletins and the conditions of the Permit Application, including any conditions which may be added or changed by EHD upon review of this Application and issuance of the Permit. I further understand that any permit issued pursuant to this application is subject to such further conditions as may be deemed necessary to ensure compliance with the permit regulations.

Owner's Signature _____ Date _____

Authorized Agent andylee@layne.com
or Agency: Layne Date 10.10.17

THIS APPLICATION BECOMES A PERMIT WHEN APPROVED

For Internal Use Only

Permit Approved By: [illegible]	Total Fee: _____ Date Paid: _____
Date: 10-19-17 Expires On: _____	Receipt #: _____ Received By: _____
Zoning: _____ Date: _____	☐ Cash ☐ Check (# _____) ☐ Credit Card
Per approved site plan, changes may be subject to review	E-Log Required ☒ Yes ☐ No
Flood Plain Approval Required: ☒ Yes ☐ No	Faxed to KCWA on _____ By: _____
Elevate Casing Above Grade: 2 [illegible]	Seal Depth: _____ By: _____

REASONS FOR DENIAL OR CONDITIONS OF PERMIT:

[illegible]

Public Health Services

MATTHEW CONSTANTINE
DIRECTOR

INTENDED USE STATEMENT

Property Owner _____ Phone No. _____

Mailing Address _____

Well Location Bakersfield, near Sandrini and Copus Roads

Assessor's Parcel Number _____ Township/Range/Section _____

FOR OFFICE USE ONLY WP _____

☒ The permit application for drilling the well listed above is for agricultural (irrigation) or industrial use only. The well does not include any domestic (potable) use.

☐ The permit application for drilling the well listed above is for agricultural (irrigation) or industrial use only. The well may include domestic (potable) use in the future.

☐ The permit application for drilling the well listed above is for agricultural (irrigation) or industrial use and domestic use.

ANY PERSON OF THIS WELL SHALL REQUIRE THE APPROVAL OF ENVIRONMENTAL HEALTH AND MEET ALL THE REQUIREMENTS OF THE NEW USE

Signature — 10.10.17 Date

Cindy Lee — ADMIN

Print Name — Title

KERN COUNTY
Public Health Services
DEPARTMENT

MATTHEW CONSTANTINE
DIRECTOR

October 20, 2017

Bakersfield, CA 93389

Ladies and Gentleman:

This is to advise you that your application for a permit to construct an agricultural well located in has been received and reviewed. Your permit number is WP 18211.

An E-Log is required for this well. Final annular seal depth will be determined upon interpretation of this E-Log. The top of the well casing and all electrical is to be elevated 2 feet above ground level as stated in the October 16, 2017 Flood Protection Report. The existing shallow perched water well is to be immediately capped with a sealed well lid.

Guidelines for obtaining final approval of your water well are outlined in the enclosure.

If you will not be able to install your pump, obtain the necessary water quality results, and receive final approval by this Division with ninety (90) days of completing drilling, please complete and return the Out of Service form to the Public Health Services Department, Environmental Health Division.

If you have any questions about your well, please contact our office at (661) 862-8758 or email ryanj@co.kern.ca.us.

Sincerely,

Jeremy Ryan, R.E.H.S.
Environmental Health Specialist III
Water Quality Program

Enclosure

cc: Layne Christensen
File WP 18211

KERN COUNTY
Public Health Services
DEPARTMENT

MATTHEW CONSTANTINE
DIRECTOR

October 20, 2017

Bakersfield, CA 93389

SUBJECT: Permit No.: WP 18211

LETTER OF INTENT

I wish to declare my water well "Out of Service"

I wish to declare my water well "out of service." I agree to maintain my water well subject to the following conditions:

1. The water well has no defects which will impair quality of water in the water well or in the water-bearing formations penetrated.
2. If the pump has been removed, the water well shall be covered with a watertight seal to prevent injury to persons and the entrance of undesirable water, rodents, or foreign matter.
3. The water well is marked so that it can be clearly seen.
4. The area surrounding the water well is kept clear of brush or debris.
5. Electrical service and water supply lines will be disconnected from the water pump.
6. Redeclaration of intent shall be made upon request of the health officer.

I understand that a representative of the Public Health Services Department, Environmental Health Division, may inspect my water well in thirty (30) days to verify that the above conditions are met.

I agree to provide the necessary water quality analyses results and to contact the Environmental Health Division in order to arrange for a final inspection of my water well prior to placing it in service.

If there are no plans to use the water well in the future, the water well will be abandoned as required and in accordance with Kern County Ordinance Code G-5006, Section 14.08.370.

_____ _____

Signature of Applicant Date

PLEASE SIGN AND DATE THIS FORM AND RETURN TO THIS DIVISION

APPLICANTS COPY

KERN COUNTY PUBLIC WORKS DEPARTMENT
BUILDING AND DEVELOPMENT DIVISION
Flood Protection Requirements for a Proposed Well

Section A – PROJECT INFORMATION

Applicant:

Type of Structure: Well Permit No: WP18211

Address: Bakersfield Ca 93313

Tract: Lot: PM: Parcel:

APN: Section: Township/Range:

FOR OFFICE USE ONLY	
Prepared by:	B Blasé
Checked by:	K Hamilton
Date Received:	10/13/2017
Date Completed:	10/16/2017
Elevation Cert Required	No
Permit Finalized:	No
Microfilm No:	
File No:	161.25

Section B – FEE and ELEVATION CERTIFICATE REQUIREMENTS

SETTING OF REQUIREMENTS AND FEE:

Flood protection requirements are hereby set and a fee of $850.00 is required.

ELEVATION CERTIFICATE:

☑ The attached Elevation Certificate **must** be completed by a licensed land surveyor or engineer and returned to the building inspector **PRIOR TO PLACING THE FOUNDATION**. The Building Inspector may complete the Elevation Certificate if the requirements involve a height above natural ground, however, the Building Inspector is **NOT REQUIRED** to complete this form.

SECTION C – GENERAL INFORMATION

The flood protection measures stated herein are based on the best available information and represent the minimum requirements necessary to promote the public health, safety, and general welfare and minimize public and private losses due to flood conditions. The flood conditions are based on the current estimated 100-year storm event, which may change as additional hydrologic data become available. If, as a result of the additional hydrologic data, the 100-year event were to increase, the degree of protection provided by these measures will be reduced.

The documents reviewed to perform this evaluation are as indicated:

☑ FEMA Flood Insurance Rate Map, Community No. 060075, Map No. 06029C 3125 E, effective 9/26/08

☐ Parcel Map/Tract Map/Approximate Study:

SECTION D – FINDINGS

The proposed structure is located in an area subject to flooding from Watershed and is:

Within FEMA FIRM Zone: A

Within Parcel Map/Tract Map/Approximate Study Limits: ☐

Therefore, the 100-year storm event flood conditions are as follows:

☐ Base flood elevation of feet NAVD88

☑ Flow depth of 1 feet

☐ Average flow velocity of feet per second

Source of Base Flood Elevation or Base Flood Depth: ☐ FIRM ☑ Community Determined

SECTION E – FLOOD PROTECTION REQUIREMENTS

All structures shall be elevated one foot above the 100-year flow depth or the base flood elevation.

The **top of casing and all electrical** shall be elevated to a minimum height of:

2.0 ☑ feet above the prevailing ground level (see note).

☐ NAVD88. This elevation is to be certified as being true and correct by a Registered Civil Engineer or a Licensed Land Surveyor on the elevation certificate form provided by Kern County

☐ feet above the prevailing ground level (see note) at the location of the well or one feet above the possible backwater condition, whichever is higher. A possible backwater condition exists behind the:

Note: Prevailing ground is the highest natural elevation of the ground surface prior to construction, upstream and next to the proposed walls of the structure.

U.S. DEPARTMENT OF HOMELAND SECURITY
Federal Emergency Management Agency
National Flood Insurance Program

OMB No. 1660-0008
Expiration Date: November 30, 2018

ELEVATION CERTIFICATE

Important: Follow the instructions on pages 1-9.

Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

SECTION A – PROPERTY INFORMATION	FOR INSURANCE COMPANY USE
A1. Building Owner's Name	Policy Number:
A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. Bakersfield Ca 93313	Company NAIC Number:
City State Zip Code	
APN: Permit #: WP18211	
A3. Property Description (Lot and Block Numbers, Tax Parcel Number, Legal Description, etc.) Township/Range: Section: Parcel Map/Parcel Tract Map/Lot	

A4. Building Use (e.g., Residential, Non-Residential, Addition, Accessory, etc.) Well

A5. Latitude/Longitude: Lat. _____ Long. _____ Horizontal Datum: ☐ NAD 1927 ☐ NAD 1983

A6. Attach at least 2 photographs of the building if the Certificate is being used to obtain flood insurance.

A7. Building Diagram Number _____

A8. For a building with a crawlspace or enclosure(s):

a) Square footage of crawlspace or enclosure(s) _____ sq ft

b) Number of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade _____

c) Total net area of flood openings in A8. b _____ sq in

d) Engineered flood openings? ☐ Yes ☐ No

A9. For a building with an attached garage:

a) Square footage of attached garage _____ sq ft

b) Number of permanent flood openings in the attached garage within 1.0 foot above adjacent grade _____

c) Total net area of flood openings in A9. b _____ sq in

d) Engineered flood openings? ☐ Yes ☐ No

SECTION B – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

B1. NFIP Community Name & Community Number	B2. County Name	B3. State
Kern 060075	Kern	CA

B4. Map/Panel Number	B5. Suffix	B6. FIRM Index Date	B7. FIRM Panel Effective/ Revised Date	B8. Flood Zone(s)	B9. Base Flood Elevation(s) (Zone AO, use Base Flood Depth)
06029C 3125	E	9/26/08	9/26/08	A	

B10. Indicate the source of the Base Flood Elevation (BFE) data or base flood depth entered in Item B9: Finished Floor: 2.0

☐ FIS Profile ☐ FIRM ☑ Community Determined ☐ Other/Source:

B11. Indicate elevation datum used for BFE in Item B9: ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____

B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? ☐ Yes ☒ No

Designation Date: _____ ☐ CBRS ☐ OPA

ELEVATION CERTIFICATE

OMB No. 1660-0008
Expiration Date: November 30, 2018

IMPORTANT: In these spaces, copy the corresponding information from Section A.	FOR INSURANCE COMPANY USE
Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. Wible Rd Bakersfield Ca 93313	Policy Number:
City State Zip Code	Company NAIC Number

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

C1. Building elevation are based on: ☐ Construction Drawings* ☐ Building Under Construction* ☐ Finished Construction
*A new Elevation Certificate will be required when construction of the building is complete.

C2. Elevations – Zone A1–A30, AE, AH, A (with BFE), VE, V1–V30, V (with BFE), AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO. Complete Items C2.a–h below according to the building diagram specified in Item A7. In Puerto Rico only, enter meters.

Benchmark Utilized: _____ Vertical Datum: _____

Indicate elevation datum used for the elevations in items a) through h) below.
☐ NGVD 1929 ☐ NAVD 1988 ☐ Other/Source: _____
Datum used for building elevations must be the same as that used for the BFE.

		Check the measurement used.
a)	Top of bottom floor (including basement, crawlspace, or enclosure floor)	_____ . _____ ☐ feet ☐ meters
b)	Top of the next higher floor	_____ . _____ ☐ feet ☐ meters
c)	Bottom of the lowest horizontal structural member (V Zones only)	_____ . _____ ☐ feet ☐ meters
d)	Attached garage (top of slab)	_____ . _____ ☐ feet ☐ meters
e)	Lowest elevation of machinery or equipment servicing the building (Describe type of equipment and location in Comments)	_____ . _____ ☐ feet ☐ meters
f)	Lowest adjacent (finished) grade next to building (LAG)	_____ . _____ ☐ feet ☐ meters
g)	Highest adjacent (finished) grade next to building (HAG)	_____ . _____ ☐ feet ☐ meters
h)	Lowest adjacent grade at lowest elevation of deck or stairs, including structural support	_____ . _____ ☐ feet ☐ meters

SECTION D – SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION

This certification is to be signed and sealed by a land surveyor, engineer, or architect authorized by law to certify elevation information. *I certify that the information on this Certificate represents my best efforts to interpret the data available. I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.*

Were latitude and longitude in Section A provided by a licensed land surveyor? ☐ Yes ☐ No ☐ Check here if attachments.

Certifier's Name	License Number	Place Seal Here
Title		
Company Name		
Address		
City	State Zip Code	
Signature	Date Telephone	

Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.

Comments (including type of equipment and location, per C2(e), if applicable)

ELEVATION CERTIFICATE

OMB No. 1660-0008
Expiration Date: November 30, 2018

IMPORTANT: In these spaces, copy the corresponding information from Section A.			FOR INSURANCE COMPANY USE
Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. Wible Rd Bakersfield Ca 93313			Policy Number:
City	State	Zip Code	Company NAIC Number

SECTION E – BUILDING ELEVATION INFORMATION (SURVEY NOT REQUIRED) FOR ZONE AO AND ZONE A (WITHOUT BFE)

For Zones AO and A (without BFE), complete Items E1–E5. If the Certificate is intended to support a LOMA or LOMR-F request, complete Sections A, B, and C. For Items E1–E4, use natural grade, if available. Check the measurement used. In Puerto Rico only, enter meters.

E1. Provide elevation information for the following and check the appropriate boxes to show whether the elevation is above or below the highest adjacent grade (HAG) and the lowest adjacent grade (LAG).

a) Top of bottom floor (including basement, crawlspace, or enclosure) is _____ . _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

b) Top of bottom floor (including basement, crawlspace, or enclosure) is _____ . _____ ☐ feet ☐ meters ☐ above or ☐ below the LAG.

E2. For Building Diagrams 6–9 with permanent flood openings provided in Section A Items 8 and/or 9 (see pages 1–2 of Instructions), the next higher floor (elevation C2.b in the diagrams) of the building is _____ . _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E3. Attached garage (top of slab) is _____ . _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E4. Top of platform of machinery and/or equipment servicing the building is _____ . _____ ☐ feet ☐ meters ☐ above or ☐ below the HAG.

E5. Zone AO only: If no flood depth number is available, is the top of the bottom floor elevated in accordance with the community's floodplain management ordinance? ☐ Yes ☐ No ☐ Unknown. The local official must certify this information in Section G.

SECTION F – PROPERTY OWNER (OR OWNER'S REPRESENTATIVE) CERTIFICATION

The property owner or owner's authorized representative who completes Sections A, B, and E for Zone A (without a FEMA-issued or community-issued BFE) or Zone AO must sign here. The statements in Sections A, B, and E are correct to the best of my knowledge.

Property Owner or Owner's Authorized Representative's Name			
Address	City	State	ZIP Code
Signature	Date	Telephone	

Comments

☐ Check here if attachments.

ELEVATION CERTIFICATE

OMB No. 1660-0008
Expiration Date: November 30, 2018

IMPORTANT: In these spaces, copy the corresponding information from Section A.	FOR INSURANCE COMPANY USE
Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No. Wible Rd Bakersfield Ca 93313	Policy Number:
City State Zip Code	Company NAIC Number

SECTION G – COMMUNITY INFORMATION (OPTIONAL)

The local official who is authorized by law or ordinance to administer the community's floodplain management ordinance can complete Sections A, B, C (or E), and G of this Elevation Certificate. Complete the applicable item(s) and sign below. Check the measurement used in Items G8–G10. In Puerto Rico only, enter meters.

G1. ☐ The information in Section C was taken from other documentation that has been signed and sealed by a licensed surveyor, engineer, or architect who is authorized by law to certify elevation information. (Indicate the source and date of the elevation data in the Comments area below.)

G2. ☐ A community official completed Section E for a building located in Zone A (without a FEMA-issued or community-issued BFE) or Zone AO.

G3. ☐ The following information (Items G4–G10) is provided for community floodplain management purposes.

G4. Permit Number	G5. Date Permit Issued	G6. Date of Certificate of Compliance/Occupancy Issued
WP18211		

G7. This permit has been issued for: ☐ New Construction ☐ Substantial Improvement

G8. Elevation of as-built lowest floor (including basement) of the building: _____ . _____ ☐ feet ☐ meters Datum _____

G9. BFE or (in Zone AO) depth of flooding at the building site: _____ . _____ ☐ feet ☐ meters Datum _____

G10. Community's design flood elevation: _____ . _____ ☐ feet ☐ meters Datum _____

Local Official's Name	Title
Community Name	Telephone
Signature	Date

Comments (including type of equipment and location, per C2(e), if applicable)

☐ Check here if attachments

Appendix E

Well Destruction Documents

KERN COUNTY
Public Health Services
DEPARTMENT

MATTHEW CONSTANTINE
DIRECTOR

2700 M STREET, SUITE 300 BAKERSFIELD, CALIFORNIA 93301-2370 (661) 862-8740 FAX (661) 862-8701 KERNPUBLICHEALTH.COM

August 24, 2016

Henry Miller Water District
PO Box 9759
Bakersfield, CA 93389

Ladies and Gentleman:

This is to advise you that your application for a permit to destroy an agricultural well located in T 31S, R 25E, Section 25, APN 184-050-27, has been received and reviewed. Your permit number is WP 17319.

No additional conditions will be required at this time.

If you have any questions about your well, please contact our office at (661) 862-8740.

Sincerely,

Jeremy Ryan, R.E.H.S.
Environmental Health Specialist I
Water Quality Program

Enclosure
cc: Layne Christensen
File WP 17319

Public Health Services

MATTHEW CONSTANTINE
DIRECTOR

Permit/Well # WP17319

Starting Date_____

APPLICATION FOR WATER WELL PERMIT

APPLICATION MUST BE SUBMITTED AT LEAST TEN (10) WORKING DAYS PRIOR TO THE PROPOSED STARTING DATE

Mark Type of Permit: ☐ Construct New ☐ Reconstruct/Modify ☐ Deepen ☒ Destroy

Type of Well

☐ Domestic/Private (1) Domestic (2-4 connections) Domestic (5 or more connections)
☒ Agricultural (must comply w/ Title 19 of K.C.O.C.)
☐ Test Hole
☐ Monitoring
☐ Cathodic Protection
☐ Vadose
☐ Other _____

MARK ONE OF THE BOXES BELOW FOR THE PARTY RESPONSIBLE FOR PAYMENT OF FEES

OWNER'S INFORMATION			PROPERTY/FACILITY INFORMATION		
☐ Name: Henry Miller Water District			☐ Name: HM 22 S		
Address: PO Box 9759			Address: Bear Mountain Blvd, & Coles Levee Rd		
City: Bakersfield	State: CA Zip: 93389		City: Bakersfield	State: CA Zip: 93311	
Phone: 661 327-3551	e-mail:		APN: 184-050-27	T: 31S R: 25E Sec: 25	
CONTRACTOR'S INFORMATION					
☐ Environmental Contractor:			☒ Driller: Layne Christensen	C-57: 510011	
Address:			Address: 1717 W Park Ave		
City:	State:	Zip:	City: Redlands	State: CA	Zip 92373
Contact :	Phone:		Contact: Freddy Ramirez	Phone: 909 390-2833	
e-mail:			e-mail: jesus.ramirez@layne.com		

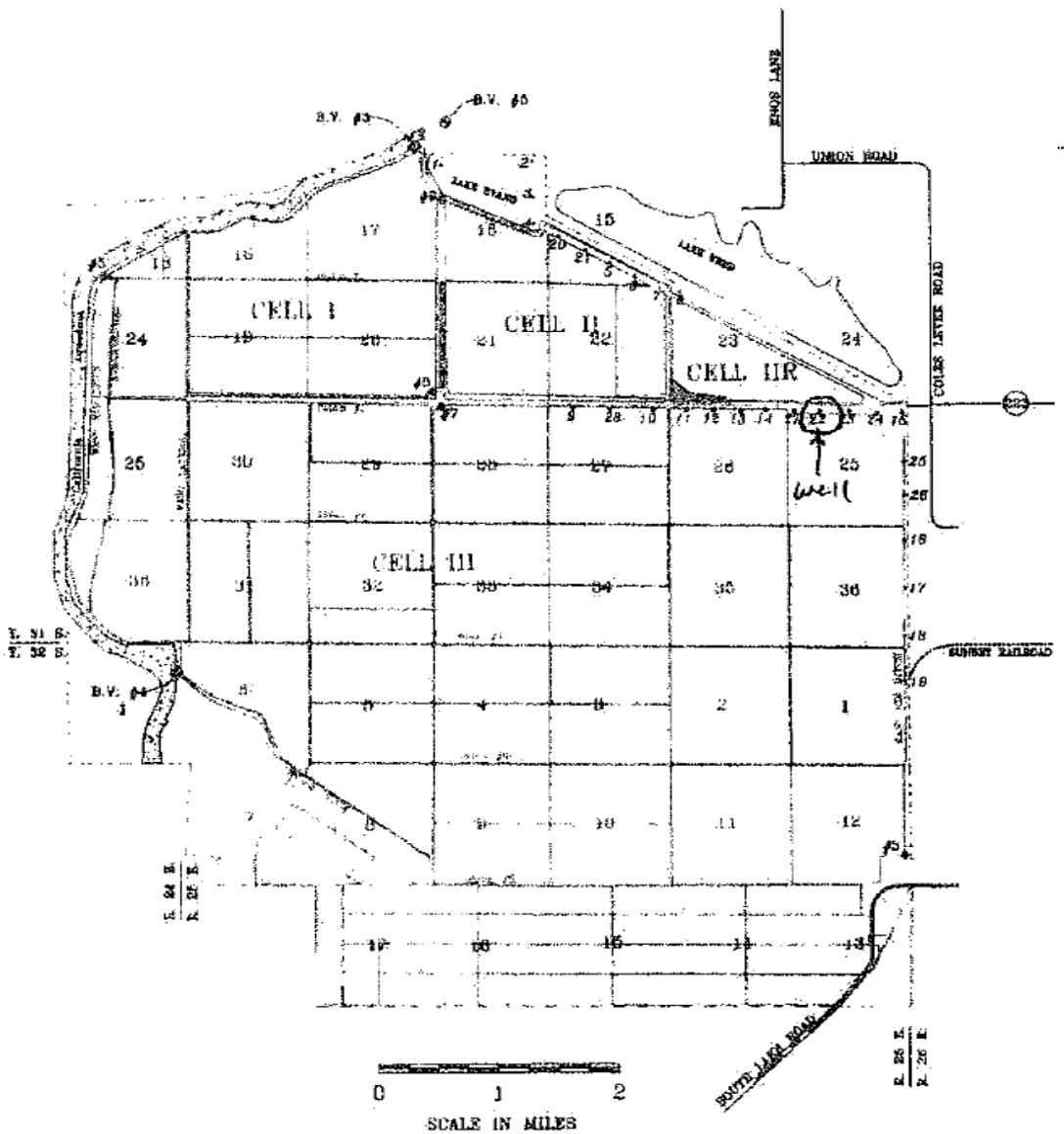
LOCATION OF WELL:

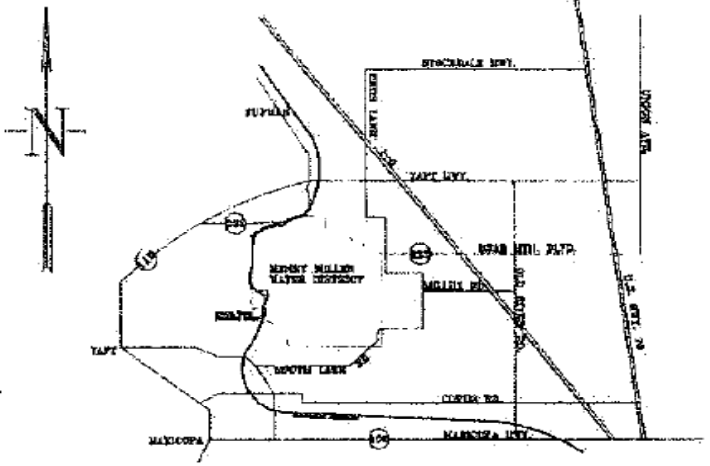
TOTAL ACRES 25.07

Attach a plot plan with the exact location of water well with respect to the following items: property lines, adjoining properties, water bodies or courses, drainage pattern, roads, existing wells, structures, sewers or private disposal systems. **Include dimensions. Draw a 200' radius circle from well site location.** For **monitoring wells** provide a description of the facility to be monitored, including: location of tanks, proposed monitoring and placement, nearest street or intersection, location of any water wells or surface water within 500' radius of facility.

Provide detailed directions to site:

See attached map





LOCATION MAP

SCALE IN MILES

LEGEND

- HMWD BOUNDARY
- STATE WATER PROJECT TURNOUTS
- ●17 HMWD WELLS
- ⊕#9 HMWD LIFT PUMPS
- HMWD CANALS AND DITCHES

HENRY MILLER WATER DISTRICT
KERN COUNTY, CALIFORNIA
LOCATION AND PROJECT MAP
SCALE AS SHOWN | REVISED 01/20/15 | DRAWN BY: JOE LUTCH

WELL CONSTRUCTION INFORMATION

METHOD: ☐ Reverse Rotary ☐ Rotary ☐ Air Rotary ☐ Hollow Stem Auger ☐ Other: _____

WELL NAME / NUMBER			
MAXIMUM WELL DEPTH			
SEALING MATERIAL			
SEAL DEPTH (HARD ROCK/UNCONSOLIDATED)			
CASING MATERIAL & GAUGE			
CASING - INSIDE DIAMETER			
SCREEN/PERFORATION DEPTH			
CONDUCTOR DEPTH			
CONDUCTOR DIAMETER			
DEPTH TO GROUNDWATER			
LOCKING WELL CAP			
BOREHOLE DIAMETER			
SCREEN MATERIAL & GAUGE			
TYPE OF BENTONITE PLUG & DEPTH			
FILTER PACK MATERIAL & SIZE			
SCREEN SLOT SIZE & LENGTH			
SEALANT PLACEMENT METHOD			

WELL DESTRUCTION INFORMATION

WELL NUMBER			
WELL DEPTH	800'		
CASING MATERIAL	Steel		
SEALANT MATERIAL	Cement		
SEALANT PLACEMENT METHOD	Tremie / Pump		

GENERAL CONDITIONS FOR DESTRUCTION:

1. A well destruction application must be filed with this Division if a well is being destroyed that is not in conjunction with a test hole permit.
2. Destruction procedures must be followed as per UT-50.
3. Placement of the seal must be witnessed by a representative of this Division. Forty-eight hour advanced notice is required for an appointment.

SPECIAL CONDITIONS:

Pump is stuck, well will be filled with cement through pump column and will allow 1 day curing. Pad will be destroyed, then excavate 5' BGS to form mushroom cap with cement and backfill hole with native soil.

GENERAL CONDITIONS FOR ALL PERMITS:

Permit applications may be submitted to the Planning Department by county staff for zoning, access, and flood plain clearances prior to approval of the Environmental Health Division (EHD). If you are drilling within city's limits, you will have to receive approval from their Planning Department.

1. Permit applications must be submitted to EHD at least ten (10) working days prior to the proposed starting date.
2. Well site approval is required before beginning any work related to water well construction. It is unlawful to continue work past the stage at which an inspection is required unless inspection is waived or completed.
3. Other required inspections include: setting conductor casing, E-Logs, all seals, and final construction features.
4. In areas where a water well penetrates more than one aquifer, and one or more of the aquifers may contain water which is of a quality which may degrade the other aquifer(s) penetrated if allowed to commingle, an E-Log shall be required to determine the location of the confining clay layer(s) and assist in the placement of any required annular seal(s).
5. A phone call to the **Division Hotline at (661) 862-8788** is required 48 hours before the placement of any seals or plugs. **No seals shall be called for after 3:00 pm without prior approval or in case of an emergency.**
6. Approval of water quality and final construction features is required before the water well is put into use.
7. Construction under this permit is subject to any instructions by EHD representatives.
8. Any misrepresentation or noncompliance with required permit conditions, or regulations, will result in issuance of a "Stop Work Order."
9. A copy of the Department of Water Resources Driller's Report and water quality analyses must be submitted to EHD within sixty (60) days after completion of the work.
10. "Dry" holes must be properly destroyed within two (2) weeks of drilling. A water well destruction application must be filed with EHD.
11. The permit is void one (1) year after date of issuance if work has not been started and reasonable progress toward completion made. Fees are not refundable or transferable.
12. Lead appurtenances shall not be used in construction of any private or public water supply system. The use of solders containing more than 2/10 of 1% lead is prohibited in making joints and fittings in any private or public potable water system.
13. Drilling of a water well shall be performed by a C-57 contractor licensed in accordance with the provisions of the Contractors License Law (Chapter 9, Division 3, of the Business and Professions Code) unless exempted by that act, and registered to drill within the County of Kern.
14. Permittee shall assume entire responsibility for all activities and uses under this permit and shall indemnify, defend, and save the County of Kern and/or Kern County Water Agency, its officers, agents, and employees, free and harmless from any and all expense, cost or liability in connection with or resulting from the exercise of this permit, including, but not limited to, property damage, personal injury, and wrongful death.

☐ **I UNDERSTAND THAT FUTURE DEVELOPMENT PERMITS MAY NOT BE ISSUED (KCOC 17.04.120) UNLESS RECORDED LEGAL ACCESS TO THE PROPERTY CAN BE DEMONSTRATED.**

I certify that I am the owner of the above-described property, or the authorized representative of such owner, and that all the information I have furnished is current and accurate to the best of my knowledge, and I intend to construct the water well as represented above. I understand that all work is to be done in accordance with Kern County Ordinance Code Chapter 14.08, Bulletin 74-81 and all subsequent bulletins and the conditions of the Permit Application, including any conditions which may be added or changed by EHD upon review of this Application and issuance of the Permit. I further understand that any permit issued pursuant to this application is subject to such further conditions as may be deemed necessary to ensure compliance with the permit regulations.

Owner's Signature _____ Date _____

Authorized Agent or Agency _____ Date 8/19/2016

THIS APPLICATION BECOMES A PERMIT WHEN APPROVED

For Internal Use Only

Permit Approved By: JR	Total Fee: _____ Date Paid: _____
Date: 9-23-16 Expires On: _____	Receipt #: _____ Received By: _____
Zoning: _____ Date: _____	☐ Cash ☐ Check # _____ ☐ Credit Card
Per approved site plan, changes may be subject to review	E-Log Required: ☐ Yes ☒ No
Flood Plain Approval Required: ☐ Yes ☒ No	Faxed to KCWA on: 9-23 By: JR
Elevate Casing Above Grade: _____	Seal Depth: _____ By: _____

REASONS FOR DENIAL OR CONDITIONS OF PERMIT

Method of destruction is acceptable. - JR

KERN COUNTY
Public Health Services
DEPARTMENT

MATTHEW CONSTANTINE
DIRECTOR

1800 MT. VERNON AVENUE BAKERSFIELD, CALIFORNIA, 93306-3302 661-321-3000 WWW.KERNPUBLICHEALTH.COM

WATER WELL DESTRUCTIONS

Water wells that are no longer in use (abandoned) or are no longer producing adequate supplies of water are required by state law and county ordinance to be destroyed according to established procedures.

Abandoned water wells can act as conduits for surface and subsurface pollution to enter groundwater supplies. Once polluted, groundwater is no longer drinkable.

Abandoned wells can also be illegally used for the disposal of liquid and solid wastes, causing further degradation of the groundwater quality.

The following guidelines will enable you to destroy your well in compliance with those regulations:

1. An application for a permit to destroy the well must be submitted to the Kern County Public Health Services Department, Environmental Health Division, for review prior to the well destruction.

2. The contractor submitting an application must have a C-57 license and be registered with the Department.

3. A fee at the rate of $100 per hour will be charged for the travel and inspection time.

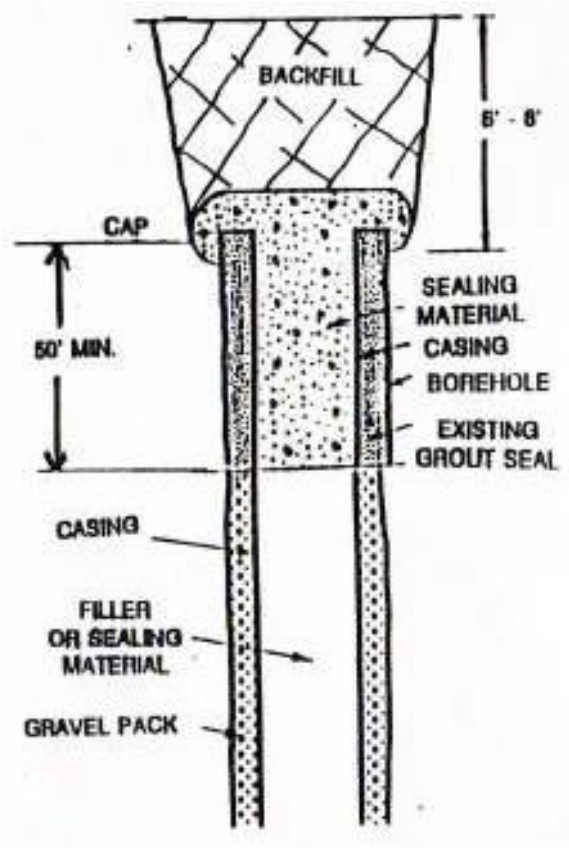
4. Cut off casing six to eight feet (6'-8') below grade if in an urban area.

5. Sealing material shall consist of neat cement, sand cement, concrete, bentonite or other approved material. Cuttings from drilling, or drilling mud, shall not be used for any part of the sealing material.

6. With an aid of a tremie pipe, cement, concrete, or sand-cement grout in top 50 feet, spilling over to form a mushroom cap.

7. Placement of the 50-foot cement seal must be witnessed by a representative of this Division.

WELL DESTRUCTION



KERN COUNTY
Public Health Services
DEPARTMENT

MATTHEW CONSTANTINE
DIRECTOR

1800 MT. VERNON AVENUE BAKERSFIELD, CALIFORNIA, 93306-3302 661-321-3000 WWW.KERNPUBLICHEALTH.COM

DESTRUCTION OF WELL WITH REGIONAL CONFINING CLAY

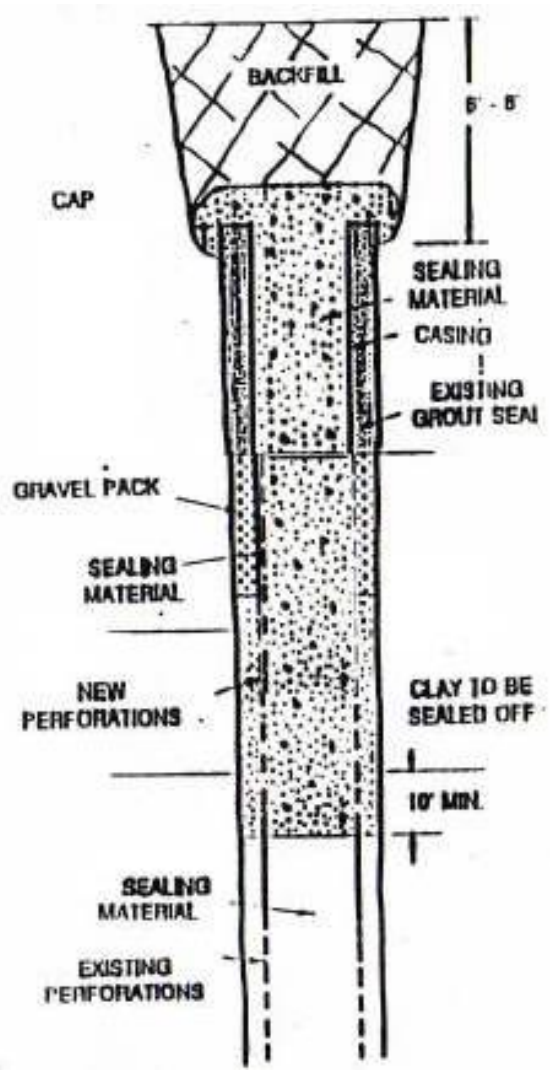
For wells that penetrate a regional confining clay, additional requirements are as follows:

1. Depth of the annular seal will be determined at the time the application is submitted or after the application is submitted to the Kern County Water Agency for review.

2. Casing may be required to be perforated across the regional confining clay with a mills knife or wire line casing shot.

3. The casing is to be immediately pumped full of approved sealing material with the aid of a tremie pipe from 10' below the regional confining clay to the top of the well casing.

4. The destruction procedures for the upper seal are the same as for the shallow well destruction.



WELL DESTRUCTION

PROCEDURES

DEPARTMENT OF PUBLIC HEALTH SERVICES,
ENVIRONMENTAL HEALTH DIVISION
2700 M STREET, SUITE 300
BAKERSFIELD, CA 93301

(661) 862-8700

October 2006

Appendix F

TODD Groundwater: SGMA Water Budget Development using C2VSimFG-Kern in support of the Kern County Subbasin Groundwater Sustainability Plan

TODD GROUNDWATER

January 7, 2020

MEMORANDUM

To: Mark Mulkay, Kern River GSA
Patty Poire, Kern Groundwater Authority GSA

From: Michael Maley, Todd Groundwater
Charles Brush, Hydrolytics LLC

Re: **SGMA Water Budget Development using C2VSimFG-Kern in support of the Kern County Subbasin Groundwater Sustainability Plans (GSPs)**

1. INTRODUCTION

In compliance with the Sustainable Groundwater Management Act (SGMA), the multiple Groundwater Sustainability Agencies (GSAs) of the Kern County Subbasin (**Figure 1**) have successfully coordinated on the development of Groundwater Sustainability Plans (GSPs). The Kern County Subbasin, the largest in the State, was designated as critically-overdrafted by the California Department of Water Resources (DWR). Water management in the Kern County Subbasin is complex. It involves more than 30 water districts/systems, contains large groundwater banking projects of State-wide importance, and provides large quantities of groundwater to support both large urban centers and one of the top agricultural-producing areas in the country. In addition, most agencies are involved in conjunctive management of local surface water, imported state and federal water, and groundwater.

Within this complex water management setting, GSAs recognized that a numerical modeling tool would be needed to meet GSP regulations for assessment of historical, current, and future projected water budgets that are developed on a Subbasin-wide basis (§357.4(b)(3)). The California Central Valley Groundwater-Surface Water Simulation Model (C2VSim) is anticipated to be DWR's primary tool for evaluating water management in the Central Valley and is specifically referenced in the GSP regulations for application to GSP water budgets (§354.18(f)); therefore, C2VSim was selected by the GSAs for GSP compliance.

This technical memorandum describes the process and approach for selection, revisions, and application of the C2VSim to the Kern County Subbasin. The memorandum documents the development of Subbasin water budgets and presents the results. This document is being prepared as an attachment to Subbasin GSPs and as an attachment to the Kern County Subbasin GSAs' coordination agreement.

1.1 Background

During late 2016 and 2017, Subbasin GSAs held a series of meetings and workshops to evaluate potential modeling tools for GSP application. Although numerous existing models had been developed by various entities in the Subbasin over time, none of those models covered the entire Subbasin or incorporated all of the local water budget components necessary to meet GSP requirements.

During the time that the Subbasin was evaluating various modeling alternatives, DWR was in the process of updating the regional C2VSim model through water year (WY) 2015. In particular, the GSP regulations stated that DWR would provide the C2VSim model "for use by Agencies in developing the water budget." Todd Groundwater developed an approach for review, revisions, and application of the C2VSim model to the Kern County Subbasin. In March 2017, the Kern River GSA (KRGSA), on behalf of the Subbasin GSAs, entered into a contract with Todd Groundwater to conduct the proposed scope of work. The Kern Groundwater Authority (KGA), on behalf of the Subbasin GSAs, also retained Woodard & Curran to conduct a peer review of the Todd Groundwater C2VSim model revisions and application for the Kern County Subbasin.

DWR released the C2VSim Fine Grid Public Beta model (C2VSimFG-Beta) on May 18, 2018 (CNRA, 2018). An initial model review indicated that the C2VSimFG-Beta generally had good historical precipitation, streamflow, land use and crop acreage for the entire Central Valley. Historical water supply and demand data were also generally good in the Sacramento Valley and San Joaquin River hydrologic regions; however, data were considered less reliable in the Tulare Lake hydrologic region including Kern County. To address this concern, Todd Groundwater – working with all Subbasin GSAs –revised the Kern County portion of C2VSimFG-Beta for WY1985 to WY2015. This revised version of C2VSim for the Kern County Subbasin, referred to herein as the C2VSimFG-Kern model, was used to develop historical, current and projected-future water budgets in accordance with the requirements in the GSP regulations.

The Central Valley portion of Kern County contains two groundwater subbasins, the Kern County Subbasin (5-022.14) and the White Wolf Subbasin (5-22.18) based on DWR Bulletin 118 (DWR, 2016A). All of the agencies that deliver water in White Wolf Subbasin also deliver water in the Kern County Subbasin and participated in the C2VSim revision. The White Wolf Subbasin portion of C2VSimFG-Beta model was included in this update to ensure coordination of groundwater conditions between the two subbasins. These are considered separate groundwater basins under SGMA with the Kern County Subbasin listed by DWR as critically-overdrafted with a GSP deadline of January 30, 2020, whereas the White Wolf Subbasin is listed as medium priority with a GSP deadline of January 30, 2022. Therefore, only the model results for the Kern County Subbasin are evaluated and reported here.

1.2 General Approach

The current C2VSim model has a detailed finite element mesh that closely follows local hydrologic features. As a regional model, the C2VSimFG-Beta may over-generalize local conditions within the Kern County Subbasin so as to be inconsistent with local site-specific data and knowledge. To address this concern, the managed water supply and demand inputs were updated to better represent the local water balance. To do this, the more general assumptions in C2VSimFG-Beta were replaced with local data and knowledge that are regionally or locally significant over the WY1995 to WY2015 Hydrology Period. Local managed water supply input data (e.g., surface water deliveries, land use, irrigation demand, return flows, and groundwater banking) were collected and applied to C2VSim. Improvement of Kern County data focused on incorporating:

- Surface water delivery volumes, application areas and use by water district,
- Groundwater banking recharge, recovery and application of recovered water,
- Irrigation demand from recent analyses of remote sensing data of evapotranspiration in the Kern County Subbasin based (ITRC, 2017),
- Urban demand for the Subbasin focusing on Metropolitan Bakersfield, and
- Data on other water sources and demands of local significance to individual districts/GSAs.

Compiling the data needed for the model revision required a coordinated effort from the Subbasin GSAs (**Figure 1**) to provide locally derived data on managed water supply and demand that was used to revise the C2VSimFG-Beta for the Kern County Subbasin. The Subbasin GSAs also coordinated on selection of consistent study periods for the C2VSimFG-Kern water budget analyses. Based on technical considerations and a review of regional data, the following study periods were selected:

- Historical Water Budget - WY1995 through WY2014 (Section 3.2), and
- Current Water Budget - WY2015 (Section 3.2),
- Projected Water Budget - WY2021 through WY2070 using 50 years of hydrologic data based on historical data (Section 6.1).

Todd Groundwater also coordinated data collection and model revision efforts with a Technical Peer Review Team and local agencies to ensure input data were accurately represented in the model. Tabulated input data, model files and model-derived water budgets were provided to the Technical Peer Review Team for review of accuracy and appropriateness. Model input data and results were also provided to Kern County Subbasin water districts and local water purveyors for their review. Comments and data issues were reconciled and incorporated into the revised C2VSimFG-Kern model.

1.3 Acknowledgements

These regional model revisions were enhanced by the participation of the many agencies that provided local water budget input data. Todd Groundwater worked with the member agencies, and their consultants, including the Kern River GSA, Kern Groundwater Authority GSA, Henry Miller Water District GSA, Olcese Water District GSA, and Buena Vista GSA to coordinate acquisition of input data from other agencies in formats that could be easily incorporated into the C2VSim model. On-going review of interim model results by these agencies, including local zonal water budgets, groundwater hydrographs and other model results, helped ensure that the revised model reproduced local mass balance estimates across the Subbasin.

Woodard & Curran conducted an on-going peer review of model input files at the request of the GSAs in the Kern County Subbasin. Todd Groundwater worked with Woodard & Curran throughout the historical model revision process. The C2VSimFG-Kern input files for the Kern County Subbasin revised historical simulation were provided to DWR for incorporation into future C2VSim public releases.

Dr. Charles Brush of Hydrolytics LLC was added to the Todd Groundwater modeling team. As an early developer of C2VSim for DWR, he provided his experience and expertise with the C2VSim. This collaborative effort provided further assurance that the significant model revisions could be managed in an efficient manner to meet the expedited schedule for water budget development.

2. C2VSIM

C2VSim uses DWR's modeling code *Integrated Water Flow Model* (IWFM) and covers the entire California Central Valley. Kern County is located at the far southern end of the Central Valley (**Figure 2**). C2VSim simulates the full hydrologic cycle, calculating water demands and tracking water movement through surface water and groundwater systems, and is therefore well suited to support GSP development.

2.1 C2VSim Background

DWR developed C2VSim to simulate water demands and supplies in the Central Valley. C2VSim is an application of DWR's IWFM software. IWFM is an integrated hydrologic model that simulates water flows on the linked land surface, unsaturated zone, groundwater, and surface water flow systems. A key feature of IWFM is DWR's agricultural and urban water supply and demand management module that dynamically simulates the delivery of both surface water and groundwater supplies based on both water availability and calculated water demands, as affected by usage and climatic conditions.

The C2VSim is derived from a series of Central Valley hydrologic models developed by DWR and other agencies beginning in the early 1990s. Each model in this series has incorporated significant improvements over the previous version (Brush, Dogrul and Kadir, 2013). The groundwater flow system is modeled in IWFM using the finite element method and uses a highly efficient solver developed at UC Davis. The IWFM Demand Calculator (IDC) and land surface simulation process were developed with input from California irrigation management professionals. Given DWR's emphasis on water management, detailed water budgets produced by C2VSim provide strong representations of the surface water and groundwater flow systems and make it a preferred platform for developing water budgets.

2.2 C2VSImFG-Beta Model

DWR's 2018 release of C2VSimFG-Beta includes historical input data for WY1922 to WY2015. C2VSimFG-Beta includes historical precipitation, stream inflow, land use and crop acreage for the entire Central Valley. These data include monthly precipitation and annual land use for each model element and estimated monthly evapotranspiration for each modeled land use type and agricultural crop. Historical surface water data include monthly surface water inflow for each river entering the model boundary and monthly surface water diversions and deliveries.

The C2VSimFG-Beta finite element grid divides the Central Valley into 32,537 model elements (**Figure 2**). Element areas are small near streams and in developed areas and expand to larger sizes in undeveloped areas. Element sizes average 407 acres and range from 4 to 1,770 acres. Central Valley rivers and streams are represented with a network of 110 stream reaches. Surface water and groundwater inflows from uplands along the model boundary are simulated with 1,033 small watersheds. Within the Kern County Subbasin, the land surface elevation varies from 208 feet above mean sea level (msl) in the north to 3,922 feet above msl in the foothills.

The groundwater aquifer system is represented with four aquifer layers and one regional confining layer. The aquifer thickness in the Kern County Subbasin varies from 857 to 9,054 feet and the deepest aquifer location is 8,752 feet below msl. The Central Valley aquifer is simulated with the following hydrostratigraphic layers, listed from top to bottom:

- Shallow, unconfined aquifer,
- Regional confining layer,
- Active confined aquifer (contains high level of pumping),
- Inactive confined aquifer (contains limited pumping), and
- Saline confined aquifer.

C2VSimFG-Beta includes annual land use and crop acreages and monthly precipitation, evapotranspiration, stream inflows, surface water deliveries and specified groundwater pumping rates for WY1922 to WY2015. C2VSimFG-Beta uses IDC to dynamically calculate distributed monthly water demands, allocate available water supplies to meet these demands, and calculate unmetered groundwater pumping necessary to satisfy unmet demands. C2VSimFG-Beta produces detailed monthly water budgets for arbitrary sets of elements grouped into zones.

Water demands are calculated dynamically for each model element using the IWFM Demand Calculator (IDC) for agricultural, urban, native and riparian land use types. Agricultural demand is calculated based on annual crop type distribution mapping and user-specified evapotranspiration rates for 20 irrigated crop types and managed seasonal wetlands at the Kern National Wildlife Refuge. Agricultural water demand is determined based on a soil moisture balance that uses local soil properties to assess the amount of applied water (precipitation and specified surface water applications) available to meet the crop demand. If water demands in an element are not satisfied from these sources, the C2VSim model calculates the groundwater pumping needed to eliminate any deficit.

Urban demands are calculated based on population and per-capita water demands. Water demands for native, undeveloped, fallow or riparian settings are calculated from monthly evapotranspiration rates and the amount of precipitation. If water demands in an element are not satisfied, no applied water is provided to these areas, and the vegetation is assumed to be in a stressed state. Runoff of precipitation in developed and undeveloped areas within the Subbasin and surrounding small watersheds is calculated using methodology included in IWFM that is based on the Soil Conservation Service Curve Method (NRCS, 2004).

C2VSimFG-Beta was released after a preliminary model calibration. The distribution of aquifer parameters was based on a texture analysis of lithologic well logs compiled by the US Geological Survey (USGS, 2009) from Well Completion Reports submitted to DWR by well drillers. The texture analysis interpolated the percentage of coarse-grained material at each well location and depth of the C2VSimFG-Beta mesh. Aquifer parameters were then calculated for the model mesh based on the percentage of coarse-grained material and estimated properties for pure coarse- and fine-grained materials. Transmissivities were estimated using specific capacity tests, where available. Soil properties for each model element were derived from digitized soil maps published by the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS, 2018).

3. KERN COUNTY REVISIONS

C2VSimFG-Beta input files were revised to incorporate locally-derived managed water supply and demand data to better represent the local water budgets for the Kern County Subbasin. Additional revisions were made to C2VSimFG-Beta model to address issues that were identified with the physical representation of the Kern County Subbasin. The result of these Kern County specific modifications is a local version of C2VSimFG-Beta that is referred to here as C2VSimFG-Kern. The following provides a summary of the model modifications.

3.1 C2VSimFG-Kern Model

C2VSimFG-Kern input files incorporate locally-derived historical data for the Kern County and White Wolf subbasins to better represent local water conditions. These are two separate groundwater subbasins in the Kern County portion of the San Joaquin Groundwater Basin. The Kern County Subbasin is listed as critically-overdrafted by DWR with a GSP deadline of January 30, 2020, whereas the White Wolf Subbasin is listed as medium priority by DWR with a GSP deadline of January 30, 2022. C2VSimFG-Kern was not changed for areas outside of the Kern County Subbasin.

Historical surface water diversion, water bank recharge and water bank withdrawal information were collected from local GSAs, management areas, water agencies and purveyors. Urban land use was restricted to developed areas, and urban populations and per-capita water demands were updated. Model structure (elements, streams, stratigraphy, etc.) was not modified. Model parameters were not calibrated, although some model parameters were adjusted to improve model performance in specific geographic areas.

3.2 Simulation Time Period

GSP requirements indicate a need to identify an average hydrologic study period for purposes of the groundwater analyses in the basin-wide water budgets. In order to select a consistent study period, the Kern County Subbasin GSAs agreed upon an historical hydrologic study period covering WY1995 through WY2014 (October 1, 1994 through September 30, 2014). The selection of the historical hydrologic study period was based on a variety of technical criteria including:

- Covers at least 10 years consistent with GSP regulations (§354.18(c)(2)(B)),
- Contains 10 years characterized as above normal or wet years based on precipitation; also contains 10 years of below normal or dry years, including four critically dry years,
- 100 percent of the long-term average streamflow conditions on the Kern River, as indicated by an average annual Kern River Index of 100 percent (**Figure 4**),
- About 104 percent of long-term average precipitation (NOAA Bakersfield Meadows Field Airport Station),
- Widely-available high-quality data available across the Subbasin,
- Time period with current water management practices, intensive groundwater banking operations, and more recent land use patterns,
- Begins in a time of relatively stable water levels (October 1994), and
- Overlaps a time period with consistently developed basin-wide contour maps by Kern County Water Agency (KCWA).

For the historical water budget, it is desirable to define a base period when natural hydrology represents average conditions. C2VSimFG-Kern incorporates this 20-year base period of WY1995 through WY2014 with a 10-year spin-up period (WY1985 to WY1994).

Kern County water agencies provided locally-derived water budget data for WY1993 to WY2015 for this study so that data input extended beyond the historical base period. Additional water budget data prior to WY1993 were also collected where available and input into the model.

The simulation period for C2VSimFG-Kern was set to WY1986 to WY2015 (October 1, 1985 through September 30, 2015), allowing a 10-year spin-before the start of the historical base period. The C2VSimFG-Beta simulation period ran from October 1973 through September 2015 (WY1974 to WY2015). The period from October 1973 to September 1985 was not included in the simulation due to concerns about lack of comparable data from these earlier periods.

3.3 Data Compilation

Participating agencies compiled water budget input data sets (using their staff, consultants or other resources) and provided them to Todd Groundwater. Where appropriate, Todd Groundwater developed data templates that conformed to IWFM model data needs and used them to facilitate obtaining input data from local agencies. This included monthly data for the following:

- Surface water imports and diversions (inflows and outflows) by source, conveyance and application area,
- Groundwater banking and managed aquifer recharge by water district or agency,
- Groundwater recovery pumping of groundwater bank recharge for export from the basin,
- Groundwater recovery pumping of managed aquifer recharge for local use,
- Urban area population and per capita water use, and
- Crop evapotranspiration (ET) rates based an analysis of satellite data (ITRC, 2017).

In addition, groundwater banking data were compiled for the large Kern Fan banking projects. Recently developed crop ET rates derived from remote sensing data were used to develop monthly crop ET rates for agricultural crops. Urban land use was restricted to developed areas, urban populations and per-capita water demands were updated, and urban wastewater recharge operations were added.

3.4 Surface Water

Kern County surface water diversions in C2VSimFG-Beta were grouped by project or water source, and some surface water deliveries were applied to large regions rather than to individual districts. In addition, some local surface water deliveries were missing from C2VSimFG-Beta. For C2VSimFG-Kern, the 43 Kern County surface water diversions from C2VSimFG-Beta were replaced with 113 surface water diversions developed with data provided by local agencies.

The Arvin-Edison WSD, Wheeler Ridge-Maricopa WSD and Tejon-Castaic WD overlie both the Kern County and White Wolf subbasins. Surface water deliveries for these districts were apportioned to either the Kern County and White Wolf subbasins, based on data provided by Arvin-Edison WSD and Wheeler Ridge-Maricopa WSD, so that surface water deliveries to those areas could be tracked separately for the water budgets.

3.4.1 River and Stream Inflow

Inflows to the Kern River and Poso Creek at the Subbasin boundary are based on historical gauge data. Kern River inflows at the First Point gauge and downstream gauges were verified and updated based on the annual Kern River Hydrographic Reports produced by the City of Bakersfield (COB, 1985-2015). C2VSimFG-Beta contained Poso Creek inflows for WY1961 to WY1986. Poso Creek inflows for WY1987 to WY2015, based from flow records for the Coffee Canyon and Trenton stream gauges, were added to C2VSimFG-Kern based on data provided by the local agencies.

3.4.2 Surface Water Diversions

Monthly surface water diversion data for WY1995 to WY2015 were collected for 21 agencies and recharge projects in Kern County. The data from each water district or agency included monthly surface water inflow by source and monthly surface water outflow by destination.

The monthly surface water inflow and outflow data collected for this study did not have sufficient detail to track this water and create an accurate historical water budget for each canal for each month. The data did provide sufficient information to identify monthly surface water diversions from each source and deliveries to each end use. Therefore,

- All diversions from the Kern River were exported from the model and treated as imports at delivery locations,
- Diversions from Poso Creek and the Kern River Flood Channel (or Main Drain) were diverted from the appropriate stream nodes, and
- All other surface water deliveries (State Water Project (SWP), Central Valley Project (CVP), oil field recovery water, etc.) were treated as imports.

Each C2VSim surface water diversion is linked to two groups of model elements: the elements of the end use and the elements receiving the recoverable losses. A single set of elements was used for both purposes in C2VSimFG-Kern. Model elements for agricultural, urban and refuge deliveries were selected by overlaying the model grid on delivery areas maps. Model elements for recharge diversions were selected by overlaying the model grid on recharge basin maps.

Monthly water delivery data for the SWP, CVP and Kern River were also provided by the agencies. Monthly turnout-level deliveries for the SWP were also compiled from the monthly SWP Report of Operations published by DWR. Monthly CVP deliveries were compiled from the USBR Report of Operations. Monthly Kern River flow and diversions were compiled from Kern River Hydrographic Reports. Water agencies in the Kern County Subbasin trade and wheel water in real time to maximize water utilization, minimize waste and energy consumption, and meet immediate water needs. Water delivery reports from water suppliers (such as the CVP and SWP) generally identify the owner of delivered water, not where it was actually delivered.

Some surface water conveyances discharge water into stream or river channels for re-diversion downstream. A key part of the surface water system in Kern County is the Kern River. Kern River operations data were reviewed for calendar years 1970 to 2015. While **Table 1** summarizes surface water deliveries, **Table 2** summarizes Kern River diversions by turnout location as applied in C2VSimFG-Kern.

3.4.3 Surface Water Deliveries

Water flow through the Kern River and its associated canal system is very complex. Water is diverted from the Kern River into a parallel canal system at several locations, with some diverted water flowing

back to the river. Some water from the CVP and SWP are discharged into the Kern River for diversion downstream. Some water agencies are served from multiple diversion points along the Kern River. Several canals that receive water diverted from the Kern River also exchange water with other canals and receive some water from groundwater pump-in, so deliveries from many canals cannot be attributed to a single source. **Figure 5** shows the locations of the primary streams, regional surface water canals, and groundwater recharge locations in the Kern County Subbasin.

Each surface water diversion in C2VSim is allocated to a specified destination and water use. Five water use types are simulated in C2VSimFG-Kern: agricultural, urban, refuge, recharge and export. Agricultural and refuge diversions are applied to a group of model elements that corresponds to a surface water service area within a specific water agency or refuge. Urban diversions are allocated to an urban service area. Groundwater recharge diversions are allocated to the model element or elements where the receiving recharge basin is located. Three delivery fractions apportion each surface water diversion to application, loss to groundwater (recoverable loss), and loss to evaporation (non-recoverable loss). **Table 1** summarizes the annual surface water deliveries for agricultural use by water district in Kern County. **Table 3** summarizes surface water diversions for urban use, wastewater land disposal and wildlife refuge management in Kern County.

3.5 Groundwater Banking and Managed Aquifer Recharge Operations

In our preliminary discussions with the C2VSim developers at DWR, it was revealed that significant model uncertainty was related to incomplete data regarding groundwater banking and other managed aquifer recharge (MAR) operations in the Kern County Subbasin. Recognizing the importance of these groundwater banking projects for simulating groundwater conditions, the groundwater banking and MAR operations data was updated using the earliest available records.

3.5.1 Recharge and Recovery Data

A monthly time-series of recharge rates was determined for each recharge project. Recharge rates were allocated to individual recharge basins using the initial data whenever possible or were shared proportionally between basins based on historical rates. All Kern County recharge basin surface water deliveries were simulated as imports.

Recharge basin locations and recovery well locations were provided by each agency or project (**Figure 6**). The C2VSim finite element grid was overlaid onto a map of recharge basins to determine the model elements for each recharge location. Well location coordinates were added to C2VSimFG-Kern.

Monthly volumes for recharge at groundwater banking and managed aquifer recharge facilities were compiled for 16 agencies and projects (**Table 4**). This information originated from multiple sources, and included data provided by agencies, compiled from agency reports, and compiled from Kern River Hydrographic Reports. The data includes monthly recharge for years prior to 1995 for many projects. Several agencies and projects provided data for multiple recharge basins. Some groundwater wells used for recovery of banked water are also used for other purposes such as supplementing agricultural or urban surface water deliveries.

Recognizing that several of the large groundwater banking projects (especially those on the Kern Fan) pre-date the 20-year base period, and that future studies might simulate periods prior to 1985, all available historical data for groundwater banking operations was reviewed and updated. This included incorporating pre-1985 data for banking operations at

- Arvin-Edison WSD (1966-2015),
- Berrenda Mesa Project (1977-2015),
- Buena Vista WSD (1963-2015),
- City of Bakersfield 2800 Recharge Facilities (1973-2015),
- North Kern WSD (1956-2017), and
- Rosedale-Rio Bravo WSD (1980-2015).

3.5.2 Groundwater Recovery

Two types of recovery wells were added to the C2VSimFG-Kern. These include district-operated water wells that were used for out-of-district transfers or out-of-basin exports of groundwater, and wells used for recovering banked groundwater and distributing the pumped groundwater via the district's water conveyance system to provide water supply, typically for agricultural use, within the district. The locations of the specified groundwater recovery wells are shown on **Figure 6**. The specified groundwater recovery pumping input into C2VSimFG-Kern is summarized as follows:

- 229 time series for Kern County groundwater banking withdrawals were added,
- 313 simulated pumping wells and 225 pumping time series for local groundwater pumping by district-operated recovery wells were added, and
- Elemental agricultural, refuge and urban pumping was eliminated in areas where it has not historically occurred.

Recharge and withdrawal data for the Kern Fan banking projects, including the Kern Water Bank, Berrenda Mesa Project, Pioneer Project, and the City of Bakersfield 2800 Recharge Facilities were shared with the local banking authorities for verification. Banking data for district-specific groundwater banking projects were provided by these districts. A summary of the data input for groundwater recovery pumpage added to C2VSimFG-Kern is provided in **Table 5**.

3.5.3 Model Application

A separate diversion was created to deliver surface water to each recharge basin or set of geographically close jointly managed basins. A diversion time series of monthly application rates was then created for each recharge diversion from the available data. Each recharge diversion delivers water to the model elements coinciding with the receiving recharge basin(s). Recharge basins were simulated in C2VSimFG-Kern by setting the application delivery fraction to zero, the recoverable loss fraction to 94% and the evaporation loss to 6%.

Monthly groundwater recovery was generally provided by well field and destination (e.g., agriculture, urban, canal pump-in, or export). This information was used to develop a pumping time series for each well field and destination. Groundwater pumped for export from the Kern County Subbasin is summarized in **Table 6**. Recovery well locations and screen intervals were used to enter each recovery well into C2VSimFG-Kern. Recovery pumping time series were then allocated equally to all of the wells in each field.

Some well fields supply water to two different end uses, for example supplementing surface water deliveries within the district in some months and exporting water from the district in other months. This is handled in C2VSimFG-Kern by entering the well two times. Each entry is associated with a separate time series of pumping rates and delivery destination.

3.5.4 Groundwater Banking Obligations

The general operation of groundwater banking facilities is to recharge excess available surface water supplies during wet years by recharging to the groundwater and recovering this water by pumping in dry years when surface water supplies are limited. Groundwater banking programs store water in the Kern County Subbasin for use by local agencies and for export to out-of-basin entities.

For evaluating the groundwater sustainability, any water stored in the Kern County Subbasin that is contractually obligated to an out-of-basin entity does not contribute to the long-term groundwater sustainability because the owner of that water could call for its return at any time. However, this can be difficult to track because a common practice is to recover groundwater for local use to replace imported surface water that was sent to the out-of-basin entity.

C2VSimFG-Kern does not have a mechanism to track these complex contractual exchanges, so the tracking is done as a post processing step by assigning the portion of the groundwater recharge as an out-of-basin banking obligation.

The Kern County Subbasin GSAs provided the total out-of-basin banking obligation for their operations as of September 2014 for the historical assessment. As of September 2014, the out-of-basin banking obligation for the Kern County Subbasin totaled of 1,719,307 acre-feet, which, when averaged over the 20-year period, was 85,965 acre-feet per year (AFY). The 85,965 AFY is applied during post-processing of C2VSimFG-Kern historical water budget results.

3.6 Urban Water Demand

C2VSim calculates urban water demands for specified urban delivery zones, allocates specified surface water and groundwater supplies to meet these demands, and can optionally pump additional groundwater to satisfy unmet urban demands in each zone. Urban demands were represented with nine urban zones in C2VSimFG-Beta. These zones were reconfigured, and a tenth urban zone was added representing Metropolitan Bakersfield in C2VSimFG-Kern. Historical urban populations and per capita water use rates were reviewed and updated.

3.6.1 Urban Zones

C2VSimFG-Kern dynamically calculates urban water demands for urban zones using time-series data of urban populations and monthly per capita water use. The urban delivery zones of C2VSimFG-Beta were modified to better represent Kern County population centers, jurisdictional boundaries and urban water sources. Although Kern County urban water delivery systems are operated by many diverse entities, their water generally comes from two sources: surface water deliveries and agency-operated groundwater wells.

The nine Kern County urban zones in C2VSimFG-Beta for Kern County were numbered 97-105. The Urban Zone boundaries were adjusted, as shown on **Figure 7**, as follows:

- Portions of Urban Zones 97, 99, 100, and 102 in C2VSimFG-Beta were used to create Urban Zone 106 representing the Metropolitan Bakersfield area,
- Urban Zone 98 was extended southeast to near the Stockdale Highway to include unincorporated urban areas,
- The boundary of Urban Zone 99 was extended eastward to California State Route 65 to include small communities in this area, removing them from Urban Zone 100, and

- The northern boundary of Urban Zone 104 was moved north to correspond to the West Kern WD service area.

3.6.2 Urban Population and Per Capita Use

Historical annual urban populations for the urban zones were estimated using United States Census total population data from 1990, 2000 and 2010 (US Department of Commerce, 2018). Tabular historical census data and census block shapefiles were obtained from the IPUMS National Historical Geographic Information System Database (IPUMS 2018). These data were combined to produce maps of the geographic distributions of populations within Kern County. The historical populations for each Urban Zone were estimated by mapping census block centroids to the ten Urban Zones using ArcGIS. The 1990, 2000 and 2010 populations of each Urban Zone were then estimated as the sum of the populations of the associated census blocks. Populations for other years were estimated using interpolation and extrapolation. The population values by Urban Zone used for C2VSimFG-Kern are listed in **Table 7**.

3.6.3 Urban Water Use Specifications

Monthly historical urban water demands for Urban Zone 106 were calculated using water delivery data from the water purveyors in the Metropolitan Bakersfield area. Monthly historical urban water demands for the other urban zones in the Kern County Subbasin were estimated using available water use data from published urban water management plans for the communities served in those zones. The historical monthly water use in each zone was then divided by the historical population to obtain the monthly per capita urban water demand. Monthly historical per capita water demands for zones without urban water management data were estimated using the per capita water demand from zones with similar demographics.

The urban water use specifications indicate the portion of total urban water that is used indoors. In C2VSimFG-Kern, the portion used indoors becomes urban return flow, and the remainder is added to the urban root zone where it contributes to evapotranspiration and deep percolation. C2VSimFG-Beta included monthly urban water use specifications for each model subregion. The urban per capita water use was based on local water supply data and urban water management plans. **Table 8** lists the per capita water use data used for C2VSimFG-Kern.

3.6.4 Urban Wastewater

Urban wastewater for the Metropolitan Bakersfield area is treated at local wastewater treatment plants; however, wastewater disposal is primarily evaporation ponds or land disposal at locations outside of the Metropolitan Bakersfield area. C2VSimFG-Beta does not have a direct means to redirect wastewater to an outside location. Urban wastewater, based as the indoor use, is applied uniformly within the urban zone. To get around this limitation, application of wastewater for the Metropolitan Bakersfield area was turned off in C2VSimFG-Kern. The wastewater deliveries to evaporation ponds and land disposal areas from the wastewater treatment plants was assigned to the appropriate location using data provided by the plants. This conserved the water balance by not double counting wastewater, and it was applied at the appropriate locations for evaluating groundwater levels.

3.6.5 Model Application

Historical annual urban population estimates were placed in the C2VSimFG-Kern urban population input file. Historical monthly urban per capita water demand estimates for each urban zone were placed in the C2VSimFG-Kern urban per capita water use file. Urban demand was calculated by C2VSimFG-Kern and the water supply to meet these demands was met first by specified surface water and groundwater

pumping deliveries for urban use. The remaining water demand in each model element was met with groundwater pumped from the aquifer portion of that element.

3.7 Agricultural Crop Water Demand

C2VSim dynamically calculates agricultural crop water demands and allocates supplies to meet these demands for each model element. Agricultural demands are calculated for 20 crops using historical crop acreage data and crop evapotranspiration (ETc) rates. Crop water demands in each model element are first met with stored soil moisture, surface water deliveries and specified groundwater deliveries. If the agricultural demands are not satisfied, the model can optionally calculate the additional groundwater pumping required to satisfy the unmet demands and extract that water from the groundwater component of the model element.

C2VSimFG-Beta contained one set of monthly ETc rates for each model subregion that were applied to all years despite climatic variation. New monthly ETc rates for three model subregions (northeast, northwest, south) in Kern County were calculated for 1993-2015 using monthly remote sensing imagery and detailed annual crop maps. ETc for 1974-1992 were estimated from 1993-2015 values by using the values for similar water year types based on the San Joaquin Index. Satellite data were not available for 2012, so ITRC was unable to provide METRIC data for 2012. In C2VSimFG-Kern, 2013 was applied as an appropriate proxy for ETc data in 2012 because of their hydrologic similarity.

A remote sensing study of historical ETc rates across the entire Kern County Subbasin by the Irrigation and Training Research Center (ITRC, 2017) provided detailed basin-wide agricultural demands that corresponded to the WY1995 to WY2014 base period. These data were used to develop monthly ETc rates for the Kern County portion of the model.

3.7.1 ET Rates

The Irrigation Training and Research Center (ITRC) at California Polytechnic State University, San Luis Obispo, has developed a procedure to use remote sensing imagery from Landsat satellites to calculate historic ETc rates (ITRC, 2017). The Mapping of Evapotranspiration with Internal Calibration (METRIC) method was originally developed by Richard Allen of the University of Idaho. ITRC made several modifications to the original METRIC method to better match California data and conditions (named the ITRC-METRIC method). These modifications include using grass for reference evapotranspiration (ETo), incorporating a semi-automated calibration procedure and spatially interpolating ETo rates. An example of the METRIC ET data for the total annual ET in 2013 is provided in **Figure 8**.

ITRC used Landsat imagery for 1994-2015 (except 2012 when no imagery was available) and the ITRC-METRIC method to develop monthly raster maps of ETc at 30 x 30-meter resolution for the Kern County portion of the Central Valley (ITRC, 2017). The monthly ETc raster maps were used with annual DWR crop maps to calculate the average ETc by crop type for the three Kern County C2VSim subregions. ITRC-METRIC raster data were used to determine the exact areas of applied irrigation and total annual ETc. A raster pixel was assumed to be irrigated if the total annual ETc was greater than 20 inches.

The following data processing steps were used to determine monthly ETc rates for each crop and C2VSim subregion:

- Create irrigation coverages – ITRC-METRIC monthly ETc raster data were summed to calculate total annual ETc for each year for each raster location. The ArcGIS Reclassify tool was then used on each annual ETc raster to create a binary polygon coverage for each year for 1994-2015

(except 2012), setting the attribute "IRR" to 1 if total annual ETc was over 20 in/year, and to 0 if total annual ETc was equal to or less than 20 in/year.

- Create land use coverages – Annual DWR land use rasters were converted to polygon coverages with the attribute "Crop" set to the corresponding integer crop value used in C2VSimFG-Kern. The land use rasters were checked against GIS maps produced by the Kern County Agricultural Commissioner and errors in the DWR land use rasters were corrected. DWR land use maps for 1994-1997 were missing large areas of data, so the 1998 land use map was used to approximate the land use for 1994-1997.
- Create monthly zone maps – One zone shapefile was created for each month by using the ArcGIS Union tool to combine a shapefile of the three C2VSim subregions with the irrigation coverage (produced in step 1) and the land use coverage (produced in step 2). Each monthly zone polygon shapefile has three attributes: C2VSim subregion, binary irrigation indicator, and a land use crop value. The dissolve function was used to combine zones with identical parameters.
- Calculate average monthly ETc for each zone – The ArcGIS Zonal Statistics by Table tool was used to calculate the average ETc value for each zone for each month. The individual pixels in each monthly ETc raster were averaged within each zone (produced in step 3). ITRC-METRIC data for 2013 were used in place of missing data for 2012.
- Combine tables – The MS Access Append function was used to combine the monthly ETc tables into a master table of monthly ETc by crop and C2VSim subregion.
- Output data – Data from the Access database was exported in a form consistent with the C2VSimFG-Kern input files. The output was also summarized to show the average monthly ETc for the irrigated area of each crop type in each model subregion.

The monthly ETc rates for the three Kern County subregions for WY 1993-2015 were then replaced with the monthly ETc rates calculated using ITRC-METRIC data. The annual ETc rates applied to C2VSimFG-Kern by crop are listed in **Table 9**.

3.7.2 Irrigation Periods

The C2VSim Irrigation Periods file contains monthly parameters for each crop and subregion that indicate whether or not the crop is irrigated in that month. C2VSimFG-Beta irrigation periods for the three Kern County subregions were adjusted to match crop irrigation practices from ITRC-METRIC water usage. Refuge irrigation periods for the three Kern County subregions were also adjusted to match Kern NWR practices. Simulated irrigation water usage for the C2VSimFG-Kern better reflects observed irrigation practices.

3.8 Model Modifications

In general, the scope of work was to revise the managed water supply and demand for the Kern County Subbasin. During the course of this revision, several issues were identified with the hydrogeological conceptual model and simulation parameters that affected the historical water budget. The following summarizes modifications made in C2VSimFG-Kern to improve the model performance. Other issues identified regarding the hydrogeological conceptual model, model setup and simulation parameters that were not addressed in C2VSimFG-Kern but are recommended to be modified for future model updates, are listed in Section 8.5. A summary of the changes that were made in C2VSimFG-Kern are provided below.

3.8.1 Streambed Parameters

In the Kern County Subbasin, the Kern River and Poso Creek are the two largest streams. Both have multiple stream gauges along their courses including ones near where they enter the Kern County Subbasin from the Sierra Nevada. These are the only two streams that are simulated in the model using the IWFM stream module. Both are predominantly losing streams where surface water recharges groundwater, except during limited periods near the major groundwater banking operations west of Bakersfield when multi-year periods of recharge operations produce high groundwater levels.

As a part of the C2VSimFG-Kern update, the simulated recharge from the Kern River and Poso Creek were compared to changes in stream gauge measurements and estimated streambed losses to evaluate how well the model was simulating streambed seepage. For much of the Kern River, the amount of streambed seepage is estimated based on daily weir information and is documented in the annual Kern River Hydrographic Reports. The streambed parameters used in C2VSimFG-Beta were not providing a comparable volume and distribution of seepage along the Kern River streambed. In dry years, streamflow as not getting far enough downstream whereas in wet years the seepage was too low. Similarly, the Poso Creek streambed seepage showed similar issues based on comparisons to differences in stream gauge data along its course.

To address this, the Kern River and Poso Creek streambed parameters were manually modified until a reasonable approximation of the measured streambed seepage was achieved by C2VSimFG-Kern. In general, the streambed conductance was lowered whereas the stream wetted perimeter was increased. This provided the best balance in matching the measured dry, average and wet years flows in both streams.

Part of this issue is that C2VSimFG-Beta uses a simple form of the stream module in the simulation. This approach appears to work sufficiently well for the continuously flowing streams in the northern parts of the Central Valley but is not sufficient for simulating the highly variable flows that occur on the Kern River and Poso Creek. It is recommended that future revisions to C2VSimFG-Kern further evaluate issues in simulating streamflow and seepage in the Kern River and Poso Creek (see Section 8.5). This may include incorporating more advanced streamflow simulation features that are available in IWFM but that have not been utilized in C2VSimFG.

3.8.2 Small Watershed Runoff

In reviewing the small watershed contributions, it was determined that the runoff was not representing the variable nature of runoff in an arid region. Although this was not part of the originally planned model revisions, it affected the model results. Todd Groundwater revised the corresponding model parameters to be more representative of the local arid conditions in Kern County.

Runoff of precipitation from the surrounding small watersheds was calculated within C2VSimFG-Kern using methodology included in IWFM that is based on the SCS Curve Method (NRCS, 2004). The C2VSimFG-Beta results showed a steady baseflow that contributed water to the Kern County Subbasin continuously and did not show the appropriate variation in runoff expected between wet, average and dry years in the arid environment.

Two major issues were identified and revised. First, the SCS curve number was changed to allow a higher percentage of runoff in wet years to capture the flashy nature of runoff from these watersheds during differing climatic conditions. Second, IWFM uses a localized soil moisture water budget; however, soil, ET and other parameters were set that allowed for the continuous outflow from the

basins. These were changed to more appropriate values that limited baseflow from the very small watersheds while allowing baseflow from the larger watersheds. Parameters were varied to better match estimated watershed runoff from a local USGS study (Nady and Larragueta, 1983).

3.8.3 Root Zone Parameters

Areas of overly high root zone hydraulic parameters led to high volumes of deep percolation that required additional groundwater pumping to meet the overall water demand for irrigation. This issue was noted by local water district staff who recognized that the groundwater pumping and deep percolation from preliminary model results were significantly higher than what was found in practice. A review found areas of overlying hydraulic conductivity and other hydraulic parameters that caused this high percolation rate. Two types of issues were found. First, very high parameters were found in parts of the basin that were not consistent with local soil data. Second, the root zone parameters for lakebed and other heavy clay soil areas were too high. These areas were manually adjusted to be more in line with observed conditions. A more rigorous development of root zone parameters should be considered in the future as this issue demonstrates that it is a sensitive parameter.

3.8.4 Land Use Modifications

The agricultural land use and crop type distribution in the model for early period (1974-1990 and 1992-1996) from C2VSimFG-Beta used a regional distribution and did not accurately represent historical practices. This resulted in agricultural water use being distributed across the entire Kern County Subbasin including areas that did not have irrigated agriculture. To correct for this, land use and crop type data were modified to conform with irrigated agricultural areas in the early 1990s. The crop types were adjusted to be consistent with the Kern County Agricultural Commissioner reports for these years. This included capturing the appropriate crop types present in the Kern County Subbasin in the periods from 1974 through 1996. For example, there was a higher percentage of cotton produced during that period and a lower percentage of nut trees, which became one of the major crop types in the 2010s.

3.8.5 Westside Pumping Limits

Western Kern County contains large areas with poor groundwater quality. As a result, little or no agricultural or urban groundwater pumping occurs in this area. To simulate this, groundwater pumping was turned off in C2VSim-Kern in most of the area with poor groundwater quality. However, in the Westside District Water Authority Management Area, limited groundwater pumping does occur. The poor-quality water is mixed with surface water to supplement the imported water supply. To simulate this condition, the groundwater pumping rate in the Westside District Water Authority Management Area was estimated to be 10% of the surface water deliveries, and the automated groundwater pumping adjustment in C2VSimFG-Kern was turned off for these areas.

Subsequent to the completion of the historical model, GSP developers in the Westside area refined their estimate of pumping used to mix with delivered surface water to about 3,000 AFY, which is considerably lower than that used in the historical model. The Westside GSP developers included a management action to further refine the estimated groundwater use in the Westside GSP water districts. Therefore, the original assumption was left in this version of the historical model. The Westside District Water Authority Management Area GSP identifies a management action to further evaluate the groundwater pumping in their area. The results of their evaluation will be included in in future model updates.

3.8.6 Kern Wildlife Refuge pumping

C2VSimFG-Beta enabled groundwater pumping in the model elements representing the Kern National Wildlife Refuge. The Kern National Wildlife Refuge Water Management Plan (USBR, 2011) indicates that

during the simulation time period, the refuge was sustained entirely on imported surface water and occasional diversions of Poso Creek flood waters. No groundwater was pumped at the refuge during the simulation period 1985-2015. Groundwater pumping was used at some time in the past. Groundwater pumping and automated groundwater pumping adjustment were turned off for all model elements in the Kern National Wildlife Refuge.

In addition to the Kern National Wildlife Refuge, former rice fields and other areas are currently used for sustaining ponds at private duck hunting clubs in the northwestern portion of the Kern County Subbasin. Water use data for these operations were not available during the development of the historical model. This water includes a combination of surface water and groundwater, and this volume is considered to be very small relative to the overall basin water use. GSP developers included a management action to further refine the estimated water use for these facilities that will be addressed in future updates.

3.9 C2VSimFG-Beta Modifications

Minor changes were made to the C2VSimFG-Kern hydrogeological conceptual model and natural water budget components and are listed in **Table 10**. The architecture of the model including layering, discretization, boundary conditions, and aquifer properties was not revised. Aquifer parameters were adjusted in several areas to better match observed historical conditions, especially in areas with high historic recharge volumes such as the Kern Fan. Extremely high soil hydraulic conductivities in a small set of elements were reduced to more reasonable values. Stream-bed conductance values were modified in some stream reaches to better match simulated stream gains and losses to observed values. Minor adjustments to small watershed parameters were also made to match surface runoff to observed values.

Due to the number of modifications that were identified with the hydrogeological conceptual model and aquifer parameters during the C2VSimFG-Kern update, it is recommended that a more rigorous model update be conducted that will update the hydrogeological conceptual model and aquifer parameters to be consistent with that presented in the Kern County Subbasin GSPs. In addition, further calibration of C2VSimFG-Kern is recommended to update aquifer parameters in the Kern County Subbasin. Future calibration is further discussed in Section 8.5.

4. HISTORICAL AND CURRENT WATER BUDGETS FROM C2VSIMFG-KERN

C2VSimFG-Kern was used to develop historical (WY1995 to WY2014) and current (WY2015) water budgets for the Kern County Subbasin. The following summarizes the simulated water budgets from C2VSimFG-Kern. A summary of these results is provided below.

4.1 Historical and Current Water Budget

The simulated historical and current water budgets based on C2VSimFG-Kern are presented in **Tables 11A** and **11B** and are presented graphically on **Figures 9**. **Figure 10** presents the average annual historical water budget for the Kern County Subbasin. The results for the historical water budget are summarized under the following categories that are defined as:

- **Deep Percolation** – Precipitation and applied water that reaches the groundwater after simulated transport across the unsaturated zone. The simulated historical 20-year average is a net inflow of 669,398 AFY.
- **Managed Recharge and Canal Seepage**- Combined groundwater recharge from managed aquifer recharge operations, groundwater banking, and seepage from canals and other conveyance. The simulated historical 20-year average for Managed Recharge and Canal Seepage is a net inflow of 583,598 AFY. On Figure 10, this total is subdivided between out-of-basin groundwater banking obligations (85,965 AFY) and the remaining local recharge of 497,633 AFY.
- **Net Groundwater-Surface Water (GW/SW) Interactions** - Net volumetric exchange of surface water and groundwater between the aquifer and streams: Positive represents a net groundwater recharge, and negative represents a net groundwater discharge to the stream. The simulated historical 20-year average is a net inflow of 98,606 AFY.
- **Small Watershed Inflow** – Runoff, small stream inflow and subsurface inflow from the small watersheds and areas surrounding the groundwater basin. The simulated historical 20-year average is a net inflow of 48,760 AFY.
- **Groundwater (GW) Pumping** - Total groundwater pumping by wells. Groundwater banking recovery pumping is specified as fixed input values and agricultural and municipal pumping is calculated by C2VSimFG-Kern based on demand minus surface water diversions. The simulated historical 20-year average is a net outflow of 1,590,373 AFY.
- **Subsurface Flow with Adjacent Groundwater (GW) Basins** - Net subsurface groundwater flow to and from the Kern County Subbasin with adjoining groundwater basins: negative is a net flow out of the Subbasin and positive is a net flow into the Subbasin. The simulated historical 20-year average is a net outflow of 87,102 AFY.
- **Change in Groundwater Storage** - Sum of the inflow components (positive numbers) plus the outflow components (negative numbers): positive is an increase in storage typified by a rise in groundwater levels whereas a negative is a decrease in storage typified by a decline in groundwater levels. The simulated historical 20-year average is a decline in groundwater storage of 277,114 AFY.

The simulated change in groundwater storage varies over the 20-year historical period and is closely related to climatic conditions and surface water supply availability (**Figure 11**). During the periods

WY1995 to WY1999, WY2005 to WY2006 and WY2011, the groundwater storage volume was stable to increasing and correlates to the above average rainfall and surface water availability during these times. During the periods WY2000 to WY2004, WY2007 to WY2010 and Y2012 to WY2015, groundwater storage volume decreased, correlated to periods of drought and low surface water availability. The simulated historical groundwater recharge also reflects this climatic pattern with high deep percolation to groundwater and steep increases in managed aquifer recharge and canal seepage during the above average rainfall periods and lower groundwater recharge during the drought years (**Figure 12**).

Groundwater pumping for agriculture shows a general increasing trend from WY1995 to WY2014; however, groundwater pumping is lower in above average rainfall years and higher during droughts (**Figure 13)**. This general increasing trend follows a comparable decreasing trend in surface water deliveries over this same period. As shown on **Figure 14**, surface water deliveries show a general decreasing trend from WY1995 to WY2014; however, the surface water deliveries are higher in the above average rainfall years and lower during the droughts.

4.2 Sustainable Yield

Section 354.18(b)(7) of the GSP Regulations requires that an estimate of the basin's sustainable yield be provided in the GSP (or in the coordination agreement for basins with multiple GSPs). SGMA defines "sustainable yield" as:

> "the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result."

SGMA does not incorporate sustainable yield estimates directly into sustainable management criteria. Sustainable yield is referenced in SGMA as part of the estimated basinwide water budget and as the outcome of avoiding undesirable results. Basinwide pumping within the sustainable yield estimate is neither a measure of, nor proof of, sustainability. Sustainability under SGMA is only demonstrated by avoiding undesirable results for the six sustainability indicators.

4.2.1 Determination of Sustainable Yield

To determine the sustainable yield for the Kern County Subbasin, the results of the C2VSimFG-Kern model were used with two methods to estimate the amount of groundwater pumping that would avoid the undesirable result of a reduction in groundwater storage over the historical base period 1995 to 2014. The results are shown in **Table 12** and are summarized below:

- **Sustainable Yield from Groundwater Pumping –** The model results produced an average annual groundwater pumping in the Kern County Subbasin of 1,590,373 AFY with a decline in groundwater storage of 277,114 AFY. Subtracting the groundwater storage decline from groundwater pumping produced a sustainable yield of approximately 1,313,000 AFY.

- **Sustainable Yield from Groundwater Recharge –** The model results produced an average annual groundwater recharge in the Kern County Subbasin of 1,400,362 AFY. The subsurface outflow from the GSA was estimated to be 87,102 AFY. Subtracting these outflow losses from the groundwater recharge produced a sustainable yield of approximately 1,313,000 AFY.

Sustainable yield estimates are part of SGMA's required basinwide water budget. In general, the sustainable yield of a basin is the amount of groundwater that can be withdrawn annually without causing undesirable results. This sustainable yield estimate can be helpful for evaluating the projects and programs needed to achieve sustainability. Although the SGMA regulations require a single value of sustainable yield calculated basinwide, it should be noted that the sustainable yield can be changed by implementation of recharge projects, variations in climate, or changes in stream flow conditions.

Using WY1995 to WY2014 as the base period, C2VSimFG-Kern results show declining groundwater levels and long-term reduction of groundwater storage. During this period, average annual inflow to the aquifer is 1,400,362 AFY, and outflow is 1,677,476 AFY (**Table 11A**). This yields an average annual deficit of 277,114 AFY. Based on these historical C2VSimFG-Kern results, the sustainable yield of the basin is approximately 1,313,000 AFY, with an estimated level of uncertainty on the order of plus or minus 10% to 20%.

4.2.2 Native Yield

Although not a SGMA requirement, the native yield is being used by Kern County GSAs for determining a portion of the groundwater allocation within the basin. The native yield is comparable to the sustainable yield except that the only recharge that is included in the calculation is the natural, unallocated portion of the groundwater recharge. For the Kern County Subbasin, this includes the groundwater recharge derived from precipitation and runoff from unallocated streams. The Kern River and Poso Creek, however, are allocated streams where specific agencies or parties have rights to specific volumes of flow.

The C2VSimFG-Kern model results over the historical base period WY1995 to WY2014 was again used for estimation of native yield. The model results were used to determine the amount of precipitation recharge over irrigated agricultural areas and the native/urban/undeveloped areas. The total and average annual volume of precipitation that percolates to groundwater during the WY1995 to WY2014 base period are listed in **Table 13**. The basinwide contribution is the relative proportion of the runoff along the basin margins from small, unallocated watersheds and inflow from the surrounding basin margin (from areas not defined as DWR groundwater basins). The results of this assessment based on the C2VSimFG-Kern results are shown in **Table 13** and are summarized below:

- The volume of precipitation that recharges the groundwater in the irrigated agricultural areas is 77,780 AFY.
- The volume of precipitation that recharges groundwater in the other areas is 132,981 AFY.
- The volume of inflow from unallocated small watersheds that recharges the groundwater in the irrigated agricultural areas is 48,760 AFY.

Totaling these inputs results in a native yield for the Kern County Subbasin of 259,520 AFY. The annual contribution per acre of approximately 0.144 acre-feet per acre is estimated by dividing the average annual contribution by the total area of the Kern County Subbasin (**Table 13**).

Similar to the sustainable yield, the native yield at this time is based on the available data. However, as data gaps are eliminated and management actions/plans are implemented, the native yield could change, and any changes to native yield will be included in future GSP amendments.

4.2.3 Application of Sustainable and Native Yield

In general, the sustainable yield of a basin is the amount of groundwater that can be withdrawn annually without causing undesirable results. The native yield is comparable to the sustainable yield except that the only recharge that is included in the calculation is the natural, unallocated portion of the groundwater recharge. The following estimates of the Kern County Subbasin sustainable and native yields are derived from the C2VSimFG-Kern historical model results for the purpose of supporting GSP assessment of the types and magnitude of projects and programs needed to achieve sustainability.

The C2VSimFG-Kern estimates of sustainable and native yield presented here are based on available data and the current level of model calibration. Therefore, these estimates are considered appropriate as guides to SGMA planning. However, the C2VSimFG-Kern sustainable and native yield estimates are initial water budget estimates that are not intended for determination of individual landowner allocations or groundwater rights. Additional technical and legal analysis, along with stakeholder involvement, is necessary to fully quantify the sustainable and native yields.

5. APPROACH FOR PROJECTED FUTURE WATER BUDGETS

Projected future Baseline water budgets for the Kern County Subbasin were developed using the C2VSimFG-Kern. These projected water budgets establish expected Baseline conditions to evaluate the impacts of GSP implementation. Three predictive scenarios were developed for the Kern County Subbasin, each representing a different expected future hydrologic condition, by adapting C2VSimFG-Kern as follows:

- Future Baseline Conditions: Repeat historical hydrology with expected future water supply,
- 2030 Climate Conditions: Adjust historical hydrology for 2030 climatic conditions and expected water supply, and
- 2070 Climate Conditions: Adjust historical hydrology for 2070 climatic conditions and expected water supply.

Projected future water budgets were developed for Baseline conditions and expected 2030 Climate Conditions and 2070 Climate Conditions over a 50-year planning and implementation horizon. These scenario models provide a basis of comparison for evaluating proposed sustainability management actions and projects over the SGMA planning and implementation horizon.

5.1 Assumptions

C2VSimFG-Kern was modified to incorporate projected future hydrology and land use using analog data from the historical C2VSimFG-Kern model. This approach meets GSP requirements using:

- A 50-year time-series of historical precipitation, evapotranspiration and stream flow information as the future Baseline hydrology conditions,
- The most recent land use, METRIC-based evapotranspiration, crop coefficient and urban population growth information as the Baseline condition for estimating future water demands,
- The most recent water supply projections as the Baseline condition for estimating future surface water supply,

- DWR Climate Change Guidance and Data Sets to incorporate estimated climate change conditions for the Kern County Subbasin,
- Specialized analysis of the Kern River watershed and estimated runoff volumes under climate change conditions,
- Specialized analysis of CVP deliveries to Kern County under climate change conditions incorporating implementation of the San Joaquin River Restoration Program, and
- Specialized analysis of SWP deliveries to Kern County under climate change conditions incorporating implementation of the OCAP Biological Opinion and recent changes in Table A and Article 21 allocations.

5.2 Projected Future SGMA Projects

Projected water budgets for the Kern County Subbasin were developed using the C2VSimFG-Kern to evaluate the performance of proposed management actions with respect to achieving groundwater sustainability. Participating agencies provided a list of projected future management actions to be implemented between WY2021 and WY2040. These projects were simulated under Baseline conditions, 2030 Climate Conditions and 2070 Climate Conditions through WY2070 using the C2VSimFG-Kern.

Proposed future projects and management actions were provided by GSAs. The types of proposed SGMA projects and management actions are summarized as follows:

- Demand Reduction is the volume of water reduced by changing the land use; these include:
    - Agricultural demand reduction projects through incentives or actions to reduce crop water use,
    - Fallowing of agricultural land and conversion of agricultural land to recharge basins, and
    - Conversion of agricultural land to urban land.
- New Supply groups together planned increases in imported water supplies; these include:
    - Increased surface water imports generally resulting from projected water purchases,
    - New water conveyance facilities including pipelines and reservoirs to increase flexibility, and
    - Expansion of surface water delivery areas to reduce groundwater usage.
- Other Supply groups together proposed projects to increase local water supplies; these include:
    - Recharging treated waste waters derived from both urban areas and oil production operations; increased recharge occurs in both existing and new locations,
    - Increased stream flow diversions; these include exercising riparian water rights and diverting flood flows,
    - Reallocation of water; generally reducing sales of surface water and banked groundwater and using this water within the agency, and
    - Brackish groundwater in areas not currently overdrafted will be treated and mixed with surface water to augment surface water supplies.

Some management actions are implemented gradually over many years, with savings increasing each year over the implementation period. Some management actions are implemented only in certain years (wet years, for example). The anticipated average-annual water supply benefit of the proposed SGMA projects and management actions steadily increases over the 20-year period from WY2021 to WY2040 to represent the implementation of the Kern County Subbasin GSPs. This increasing trend, as shown as

the average-annual water supply benefit over five-year increments on **Figure 15**, is summarized as follows:

- about 116,000 AFY over the first five-year period (WY2021-WY2025),
- about 216,000 AFY over the second five-year period (WY2026-WY2030),
- about 343,000 AFY over the third five-year period (WY2031-WY2035), and
- about 361,000 AFY over the fourth five-year period (WY2036-WY2040).

The anticipated water supply benefit of the proposed SGMA projects and management actions included in the C2VSimFG-Kern projected future simulations is 422,000 AFY over the period from WY2041 to WY2070. Benefits of implementing these projects and management actions over the 20-year implementation period are summarized in **Figure 15**.

6. PROJECTED FUTURE BASELINE DEVELOPMENT

Projected water budgets are required by GSP regulations to represent future conditions over a 50-year GSP planning and implementation horizon. A Baseline condition was developed that projects water supply, demand and operations based on current land use and expected water supply availability over 50 years. The Baseline then serves as a basis of comparison for evaluating proposed sustainability management actions and projects for achieving sustainability over the planning and implementation horizon. Each predictive scenario model simulates the 50-year planning and implementation period WY2021 to WY2070. Development of the projected future Baseline conditions is summarized below.

6.1 Projected Future Time Period Development

WY1995 to WY2014 was chosen as a historical hydrology period because detailed demand and supply data are available for this period, and most Subbasin water delivery infrastructure was fully developed by the middle of this period. The average Kern River inflow for this period is also very close to the long-term average Kern River inflow.

The projected future simulation period is based on repeating the WY1995 to WY2014 historical study period. This period is only 20 years long, so a 50-year sequence of historical hydrology was developed by repeating data from this period in the sequence as shown in **Table 14**. The development of this sequence is summarized as follows:

- Simulation period WY2021 to WY2032 used the historical period WY2003 to WY2014,
- Simulation period WY2033 to WY2052 used the historical period WY1995 to WY2014, and
- Simulation period WY2053 to WY2070 used the historical period WY1995 to WY2012.

This sequence was developed to match long-term average flows on the Kern River, and to ensure that the Baseline does not end in an extreme drought or extreme wet year. By starting the projected future simulation time sequence with WY2003, the 50-year hydrology period has approximately 100 percent of the long-term average streamflow conditions on the Kern River, as indicated by an average annual Kern River Index of 100 percent. The sequence includes the appropriate range of hydrologic conditions including extremely wet years and extended periods of drought.

C2VSimFG-Kern simulation results for the last timestep of the historical simulation (September 30, 2015) were used as initial conditions for all projected future simulations, including initial conditions for the root zone, saturated and unsaturated aquifer zones, and small watersheds. Since the historical C2VSimFG-Kern simulation period ends with WY2015, all projected future scenarios also include estimated hydrology for WY2016 to WY2020. Model input data for WY2016 to WY2020 was developed by repeating model input data for recent years based on correlation with the San Joaquin Index (DWR, 2019).

6.2 Development of Key Baseline Data Sets

Key required components for the Projected Future Baseline, as summarized in the DWR *Water Budget Best Management Practices* guidance document (DWR, 2016B) include the following:

- The projected Baseline hydrology conditions were developed using 50-years of historical precipitation and streamflow following the sequence outlined in Section 6.1.
- Surface water supplies are based on available information from DWR and others to project future water imports from the SWP, CVC - Friant-Kern Canal (FKC) and Kern River diversions. For the Kern River, recent diversion practices based on entitlements were used to develop water use consistent with the Baseline hydrology.
- WY2013 land use was used as current land use for all scenarios as drought conditions likely reduced agricultural production in WY2014 and WY2015.
- Consumptive use for agriculture and undeveloped lands was based on the recent land use and METRIC-based evapotranspiration. Following DWR guidance, METRIC data over the Baseline period was varied according to varying hydrologic conditions (e.g., water year type).
- Urban water demand was based on projections from recent urban water management plans to meet regulations for future water use. Urban demand was estimated in the model based on projected urban population growth and per capita water demand information (including recent regulatory guidance).
- Small watershed inflows used the same parameters as the historical C2VSimFG-Kern model; however, volumes varied based on changes in the precipitation and ET under the 2030 and 2070 climate change conditions.

Time-series input data were first developed for the Baseline scenario model for WY2021 to WY2070. Development of this time-series input data generally involved repeating time-series data from the historical C2VSimFG-Kern in the appropriate sequence. The following time-series data were developed for each scenario:

- Precipitation rates,
- Evapotranspiration rates,
- Surface water inflow rates,
- Surface water diversion and delivery rates, and
- Specified groundwater pumping rates.

Baseline scenario model time-series data files were then modified following DWR guidelines to produce time-series input data for the 2030 Climate Conditions and 2070 Climate Conditions scenario models. C2VSim input data were modified only in Kern County. C2VSim input data for areas outside of Kern County were not modified.

The baseline data sets were incorporated into the model files to develop the projected future water demand and supply under Baseline, 2030 Climate and 2070 Climate conditions. A summary of the development of the projected future water demand and supply is discussed below.

6.3 Projected Future Water Demand

The projected future water demand was developed using fixed WY2013 land use areas with historical evapotranspiration rates for the Baseline and modified evapotranspiration rates for the 2030 and 2070 climate scenarios and increasing urban populations.

6.3.1 Agricultural Water Demand

Evapotranspiration rates for the Baseline scenario model were developed by repeating input evapotranspiration rates from C2VSimFG-Kern in the appropriate sequence. DWR provided monthly change factors for ETo values under 2030 and 2070 central tendency climatic conditions on a 6 km x 6 km VIC grid for calendar years 1915 through 2011. The VIC grid IDs for each C2VSim subregion in the Kern County Subbasin Zone of Interest were identified and area weighted monthly ETo change factors were calculated for each subregion. Baseline scenario ETc rates for each subregion were then multiplied by the appropriate area-weighted ETo change factors to produce time-series ETc rates for the 2030 Climate Conditions and 2070 Climate Conditions scenarios. Factors for calendar years 1959-1961 were used as analogs for calendar years 2012-2014.

6.3.2 Urban Water Demand

Urban water demand calculations include an indoor component and an outdoor component. Indoor urban water demands are based on the urban population and monthly per capita water demand. Future urban populations for Kern County urban areas were estimated using California Department of Finance population projections. Future per capita urban water demands were estimated using projections from urban water management plans and California urban water conservation regulations, including SB 606 and AB 1668. Future outdoor urban water demands are based on ETc rates, which were modified as described in the Agricultural Water Demand section above.

6.3.3 Groundwater Banking Recovery

Future groundwater banking recovery rates were developed by repeating historical recovery rates in the appropriate sequence. No adjustments were made to Baseline rates or to rates for 2030 and 2070 climatic conditions.

6.4 Projected Future Water Supply

Projected future precipitation, stream inflow and surface water import time series were developed following DWR guidelines. Baseline future water supplies were developed by repeating historical values in the appropriate sequence. Surface water diversions were then adjusted to account for operational changes. Baseline water supplies were then modified to simulate 2030 and 2070 central tendency climatic conditions.

6.4.1 Precipitation Rates

Precipitation rates for the Baseline scenario model were developed by repeating input precipitation rates from C2VSimFG-Kern in the appropriate sequence. DWR provided monthly change factors for precipitation under 2030 and 2070 central tendency climatic conditions on a 6 km x 6 km VIC grid for calendar years 1915 through 2011. The VIC grid ID for each C2VSim element in the Kern County Subbasin Zone of Interest was identified and the Baseline scenario precipitation rates were multiplied by

the appropriate factors to produce time-series precipitation rates for the 2030 Climate Conditions and 2070 Climate Conditions scenarios. Factors for calendar years 1959-1961 were used as analogs for calendar years 2012-2014.

6.4.2 Surface Water Inflow Rates

Surface water inflow rates for Poso Creek and White River for the Baseline scenario model were developed by repeating input inflow rates from C2VSimFG-Kern in the appropriate sequence. DWR provided unimpaired streamflow change factor datasets for Central Valley streams, and an Excel spreadsheet tool to modify basin unimpaired streamflow using these change factors. The unimpaired streamflow change factors and spreadsheet were used to modify Baseline inflows to produce 2030 Climate Conditions and 2070 Climate Conditions scenario time series inflows for Poso Creek and White River.

Surface water inflow rates for Kern River at First Point for the Baseline scenario model were developed by repeating historical inflow rates from C2VSimFG-Kern in the appropriate sequence. Flows on the Kern River are regulated, so the unimpaired streamflow method was not appropriate for estimating future flows under 2030 and 2070 climatic conditions. Projected Kern River flows at First Point under 2030 and 2070 central tendency conditions were estimated by GEI (2018) for calendar years 1956-2010 hydrology. This analysis considered the impacts of changed runoff in each sub-watershed contributing to the Kern River to develop revised streamflow estimates for Kern River at First Point. Future scenario Kern River at First Point flows for calendar years 2011-2014 were estimated using flows for analog years with similar annual flows and monthly flow pattern. Analog years 1986, 1991, 1990 and 1961 respectively were used for 2011-2014 in the future scenarios.

6.4.3 Surface Water Deliveries

Surface water delivery rates for the Baseline scenario model were developed by first repeating input surface water delivery rates from the C2VSimFG-Kern in the appropriate sequence, and then modifying selected data sets. Surface water deliveries from in-basin sources such as Oil Field Recovery were held constant at WY2015 rates for all future scenarios.

The Kern County Subbasin is served by both the CVP and the SWP. Recent changes in CVP and SWP operations and their impacts on future surface water supplies are reflected in surface water diversion rates for the three scenarios. Future CVP deliveries will be affected by implementation of the San Joaquin River Restoration Program (SJRRP) that included the 2008 U.S. Fish & Wildlife Service biological opinion (BO) on the Long-Term Operational Criteria and Plan (OCAP) for coordination of the CVP and SWP. Future SWP deliveries will be affected by operational changes implemented between 2004 and 2008 including the OCAP BO, reduced Table A contract amounts and reduced Article 21 deliveries. DWR provided projected future deliveries from the CVP and SWP for WY1922 to WY2003, derived from CalSim-II modeling conducted for the Water Supply Investment Program (WSIP) (California Water Commission, 2016). DWR's CVP projections as provided do not fully incorporate these SJRRP operational changes. DWR's SWP delivery projections do not include the OCAP BO operational constraints, the reduced Table A amounts and reduced Article 21 water.

Future CVP delivery projections developed by the Friant Water Authority (FWUA) were used in place of DWR's CVP projections. FWUA (2018) used CalSim-II to develop projected surface water deliveries with SJRRP implementation under hydrological conditions representing the Current Baseline, 2030 and 2070 climate conditions by delivery class for WY1922 to WY2003, and estimated allocations to each CVP contractor. The 2015.c data set was used for Baseline scenario CVP deliveries, the 2030.c data set was

used for 2030 Climate Conditions scenario CVP deliveries, and the 2070.c data set was used for the 2070 Climate Conditions scenario CVP deliveries. CVP deliveries for WY2004 to WY2014 were estimated using deliveries for analog years WY1951 to WY1961; these analog years have a similar distribution of water availability.

The SWP projections provided by DWR for WY1995 to WY2003 and historical deliveries for WY2004 to WY2014 were modified to incorporate the impacts of SWP operational changes in the three scenarios. 2019 SWP Table A contract amounts were used to allocate these SWP deliveries to individual districts. In summary:

- Baseline Hydrologic Conditions
  - WY1995 to WY2003 conditions are based on 2030-Level CALSIM increased by 3.03 %,
  - WY2004 to WY2007 conditions are based on historical data adjusted for OCAP BO, and
  - WY2008 to WY2014 conditions are based on historical data with the assumption that OCAP BO adjustments are already factored into the data.
- 2030 Climate Change Hydrologic Conditions
  - WY1995 to WY2003 conditions are based on the 2030-Level CALSIM Projection,
  - WY2004 to WY2007 conditions are based on OCAP BO adjustment reduced by 3.03 %, and
  - WY2008 to WY2014 conditions are based on historical data reduced by 3.03%.
- 2070 Climate Change Hydrologic Conditions
  - WY1995 to WY2003 conditions are based on the 2070-Level CALSIM Projection,
  - WY2004 to WY2007 conditions are based on OCAP BO adjustment reduced by 8.09%, and
  - WY2008 to WY2014 conditions are based on historical data reduced by 8.09%.

Within the Kern County Subbasin, water users engage in complex real-time water trading and wheeling activities to maximize water utilization, minimize waste and energy consumption, and meet immediate water needs. It would be difficult to project future surface water deliveries in the Kern County Subbasin without the use of a surface water allocation model that simulates these water trading and wheeling activities. Therefore, for this modeling effort, monthly future scenario agricultural, urban and recharge deliveries from sources originating outside the basin were estimated by adjusting historical deliveries by the ratio of (total scenario inflows)/(total historical inflows) for each month, where total inflows are the sum of CVP deliveries, SWP deliveries and Kern River at First Point. In addition, Kern River at First Point flows above historical flows under the 2030 Climate Conditions and 2070 Climate Conditions scenarios were proportionally added to selected recharge deliveries. This method is deemed adequate for subbasin-level future scenario analyses.

Some future scenario data sets did not cover the entire period from October 1994 through September 2014. In these cases, data from an analog historical period with similar water availability was used to fill in the missing data. The analog years for each data type are summarized as:

- For CVP deliveries (CalSim-II data), WY1951 to WY1961 were used as analogs for missing WY2004 to WY2014 data; these analog years have a similar distribution of water availability.
- Projected future Kern River at First Point flows for calendar years 1986, 1991, 1990 and 1961 were used as analogs to missing calendar years 2011 through 2014; each of these analog years had a similar historical annual flow volume and monthly distribution.

- For climatic data adjustment factors, calendar years 1959-1961 were used as analogs to missing calendar years 2012-2014.

6.5 Development of Climate Change Conditions

Input data for the C2VSimFG-Kern were modified to simulate three future climatic scenarios. Historical precipitation, evapotranspiration, land use, population, surface water inflow and surface water delivery rates were replaced with projected future values for WY2016 to WY2070 for Future Baseline Conditions. The Future Baseline Conditions for WY2021 to WY2070 were then modified to simulate 2030 Climate Conditions and 2070 Climate Conditions. Water management agencies in the Kern County Subbasin provided a broad suite of proposed water management and conservation projects to increase water supplies and reduce water management demands. These projects are added to the C2VSimFG-Kern to assess the long-term impacts of these projects under the Baseline, 2030 Climate Conditions and 2070 Climate Conditions scenarios.

Projected water budgets under Future Baseline Conditions, 2030 and 2070 Climate conditions are used to evaluate the potential effects of future Baseline and extended dry conditions with respect to achieving sustainability. DWR published a *Modeling Best Management Practices* Guidance Document (DWR, 2016B) that outlines DWR recommendations for developing and running predictive scenarios. The C2VSimFG-Kern was modified following these recommendations to develop the Baseline scenario model. DWR also issued the *Guidance for Climate Change Data Use During Sustainability Plan Development* Guidance Document (DWR 2018A) that outlines how DWR recommends that climate change be addressed under SGMA. Baseline scenario data sets were modified using DWR climate change data sets for Kern County following procedures outlined in the guidance documents to develop the 2030 Climate Conditions and 2070 Climate Conditions scenario models. The adjustment factors for Baseline, 2030 Climate Change and 2070 Climate Change for SWP deliveries were developed based on consistent CalSim operations studies at current, 2030 and 2070 climate levels developed for Bay Delta Conservation Plan evaluation and provided by DWR Bay Delta Office staff. The WSIP studies provided on DWR's SGMA web site were not used due to the unavailability of a Baseline study with assumptions consistent with the 2030 and 2070 climate change studies.

6.6 Groundwater Banking Assumptions

Groundwater banking operations are simulated in the C2VSimFG-Kern with surface water diversions to recharge basins and specified pumping rates for groundwater extractions. All surface water deliveries were adjusted under the Baseline, 2030 Climate Conditions and 2070 Climate Conditions scenarios. Surface water deliveries to recharge basins were first adjusted by the same ratio as other surface water deliveries, then increased if Kern River flows were greater than historical flows. Specified pumping rates for groundwater extraction were not modified.

The out-of-basin banking obligations were assumed to follow a similar pattern where groundwater banking recharge would be affected by the limitation on surface water deliveries, but that banking recovery would remain similar to historical volumes. Therefore, the historical groundwater banking obligations were adjusted under the Baseline, 2030 Climate Conditions and 2070 Climate Conditions scenarios by the same percentage as the surface water deliveries; however, the groundwater banking recovery was assumed to remain the same. Based on the historical banking obligations and using that as a foundation going forward, no banking partner has ever requested the full amount of the water banked at any particular time even in the most recent drought years. All the banking obligation

agreements require limitations on amounts to be requested and delivered as well as "leave in" amounts that remain in the Kern County Subbasin. This historical management of banking obligations provides the Kern County Subbasin more flexibility for use of water as well as delivery of the obligations. For the projected future scenarios, the out-of-basin banking obligations were calculated as follows:

- For the Baseline scenarios, the out-of-basin banking obligations were calculated as 69,632 AFY based on surface water deliveries of about 81% of historical deliveries.
- For the 2030 Climate scenarios, the out-of-basin banking obligations were calculated as 67,913 AFY based on surface water deliveries of about 79% of historical deliveries.
- For the 2070 Climate scenarios, the out-of-basin banking obligations were calculated as 64,474 AFY based on surface water deliveries of about 75% of historical deliveries.

Tracking of banked groundwater obligations was done using the same post processing process as applied to the historical groundwater assessment by assigning the portion of the groundwater recharge as an out-of-basin banking obligation.

7. PROJECTED FUTURE C2VSIMFG-KERN SIMULATION RESULTS

The C2VSimFG-Kern was run for three scenarios that estimate hydrologic conditions of Baseline, 2030 Climate Conditions and 2070 Climate Conditions scenarios both with and without the proposed SGMA projects and management actions for a total of six projected future scenarios.

7.1 Projected Future Water Budgets

C2VSimFG-Kern calculates water budget components each month of the simulation period for each future scenario. Projected future water budgets developed based on the C2VSImFG-Kern simulation results with the proposed SGMA management actions were then compared to results for the future scenarios without the management actions to assess how these changes enhance groundwater sustainability within the Kern County Subbasin.

The average annual value of each water budget component summarizes the impacts over 50 years with current water demands. The water budget results for the six Projected Future Scenarios are presented in **Tables 16 through 21**, and include averages over three different periods, which include:

- **WY2021 to WY2040** – Implementation Period representing the 20-year period required by the SGMA regulations to implement projects and management actions to achieve sustainability.
- **WY2041 to WY2070** – Sustainability Period representing the 30-year hydrologic period following the Implementation Period to assess the long-term sustainability of the proposed projects and management actions with variable climatic conditions including periods with above average rainfall and extended droughts.
- **WY2021 to WY2070** – Simulation Period representing the entire 50-year projected future hydrologic conditions.

Changes to surface water diversions under the proposed projects and management actions included monthly increases or reductions to 37 model diversions and the addition of 7 new diversions. Ten new groundwater pumping wells were added to simulate a new groundwater pumping program. Agricultural

land use was converted to native vegetation in ten management areas, and to urban land use in three management areas. The projects and management actions included in the C2VSimFG-Kern scenarios with SGMA projects are described in the individual GSPs and management area plans. These changes were applied to a series of six C2VSimFG-Kern scenarios for Baseline, 2030 Climate Conditions and 2070 Climate Conditions both with and without SGMA projects. The results of these simulations are summarized in **Table 15** below.

Baseline simulation results indicate that the Kern County Subbasin has an average annual overdraft of 324,326 AFY. By implementing the proposed projects and management actions, the Subbasin is forecasted to achieve sustainability by 2040 with an estimated 42,144 AFY of annual surplus. With adjustments to account for limitations in the simulation (discussed in Section 7.2.1), the adjusted change in storage increases to 85,578 AFY.

Collectively, the C2VSimFG-Kern simulation results indicate that the currently proposed SGMA projects and management actions, once fully implemented, provide a reasonable approach to achieve sustainable management of the groundwater basin and can be adaptively managed to meet future challenges as necessary. A brief summary of each of the six projected future water budgets from C2VSimFG-Kern is provided below.

Table 15: Summary of Simulated Change in Groundwater Storage Results over the 2041 to 2070 Sustainability Period

C2VSimFG-Kern Model Scenario	Change in Groundwater Storage (AFY)	
	C2VSimFG-Kern Model Results	Adjusted Model Results
Historic	-277,114	-277,114
Baseline	-324,326	-324,326
Baseline with Projects	42,144	85,578
2030 Climate Change	-380,900	-372,120
2030 Climate with Projects	-12,861	46,829
2070 Climate Change	-489,828	-472,336
2070 Climate with Projects	-118,273	-45,969

7.1.1 Baseline Condition Water Budgets

The Baseline Scenarios simulate how the Kern County Subbasin aquifer would respond if the recent hydrology were repeated with current expected surface water availability and current land use. The Baseline Scenarios were run both with and without SGMA projects.

For the Baseline Scenario without SGMA Projects, the groundwater budget for WY2021 to WY2040 (**Table 16**) repeats the 20-year historical hydrologic period so it provides a direct comparison of the differences between the projected future Baseline without SGMA Projects and the historical condition. The primary difference between historical conditions and the projected future Baseline is a nearly 20% decrease in imported surface water deliveries primarily from the SWP due to the OCAP Biological

Opinion. This is replaced with additional groundwater pumping. As a result, total net aquifer outflows increase by about 20,200 AFY and total net aquifer inflows decrease by about 76,500 AFY. This is mostly because of increased groundwater pumping and decreased managed aquifer recharge due to a decline in imported SWP water. Over this period, the average groundwater pumping is 1,581,000 AFY, which includes agricultural pumping, urban pumping and exported water. This results in an additional loss of groundwater storage of about 56,300 AFY over the 50-year projected future Baseline period.

The Baseline Scenario with SGMA Projects simulates the proposed SGMA projects and management actions (Section 5.2) applied to the Baseline Scenario. No other changes were made except for the addition of the SGMA projects to provide a direct comparison of the relative benefits of about 422,000 AFY of proposed SGMA projects and management actions. The groundwater budget for the Baseline Scenario with SGMA Projects is provided in **Table 17**. Comparing the groundwater budget for WY2041 to WY2070 (**Table 17**) with the same period from the Baseline Scenario (**Table 16**) provides an evaluation of groundwater conditions after the SGMA projects and management actions have been fully implemented. As a result, total net aquifer inflows increase about 135,400 AFY due to increased managed aquifer recharge and deep percolation. The total net aquifer outflows decrease about 231,100 AFY due mostly to decreased groundwater pumping with agricultural demand reduction management actions.

The change in groundwater storage for the Baseline Scenario with SGMA Projects improves by about 366,500 AFY compared to the Baseline Scenario without SGMA Projects. This change results in a net gain in groundwater in aquifer storage over the WY2041 to WY2070 sustainability period of about 42,100 AFY. A comparison of the annual change in groundwater storage over the 50-year hydrologic period is presented in **Figure 16**. The time series shows that change in groundwater storage has stabilized to slightly increasing over the period from WY2041 to WY2070.

A comparison of the average annual water budget components for the two different Baseline Scenarios is presented in **Figure 17**. Over the WY2041 to WY2070 period, the average groundwater pumping of 1,354,000 AFY for the Baseline Scenario with SGMA Projects (which includes agricultural pumping, urban pumping and exported water) is over 270,000 AFY less than in the Baseline Scenario.

7.1.2 2030 Climate Change Water Budgets

The 2030 Scenarios simulate how the Kern County Subbasin aquifer would respond assuming hydrologic conditions representing a potentially drier climate and are based on the DWR Climate Change Guidance and Resource Guide (DWR, 2018A and 2018B). The 2030 DWR climate change factors were applied to the Baseline Scenario conditions. Additional adjustments were made to the imported surface water supplies from the SWP, CVP and Kern River, accounting for about an additional 2% decrease from the Baseline Conditions. The 2030 Climate Change Scenarios were run both with and without SGMA projects. Results for climate change budgets are illustrated in **Figures 18, 19, and 20**.

The groundwater budget for the 2030 Climate Scenario without SGMA Projects for WY2041 to WY2070 (**Table 18**) is compared the same period for the Baseline Scenario without SGMA Projects to assess the relative change due to the climate change assumptions. The results show a net increase in aquifer inflows of about 44,700 AFY, however, the aquifer net outflows increase by about 101,200 AFY. This is mostly attributed to the climate shift to earlier rainfall making more surface water available for managed aquifer recharge during the winter but less available for irrigation in the summer, resulting in higher groundwater pumping. The net change in groundwater storage is an additional decline of about 56,600 AFY due to the climate change impacts.

The 2030 Climate Scenario with SGMA Projects simulates the proposed SGMA projects and management actions (Section 5.2) applied to the 2030 climate change conditions. No other changes were made to this scenario. The groundwater budget for the 2030 Climate Scenario with SGMA Projects is provided in **Table 19**. Comparing the groundwater budget for WY2041 to WY2070 (**Table 18**) between the two 2030 Climate Scenarios, the total net aquifer inflows increase about 118,700 AFY due to increased managed aquifer recharge and deep percolation. The total net aquifer outflows decrease about 249,300 AFY due mostly to decreased groundwater pumping with agricultural demand reduction management actions.

The change in groundwater storage for the 2030 Climate Scenario with SGMA Projects improves by about 368,000 AFY. This change results in a net decline in groundwater in aquifer storage over WY2041 to WY2070 of about 12,900 AFY. A comparison of the annual change in groundwater storage over the 50-year hydrologic period is presented in **Figure 20**. The time series shows that change in groundwater storage has stabilized to slightly increasing over the period from WY2041 to WY2070, but at a level below the results for the Baseline Scenario with SGMA Projects.

A comparison of the average annual water budget components for the two 2030 Climate Scenarios is presented in **Figure 18**. Over this period, the average groundwater pumping of 1,444,000 AFY for the 2030 Climate Scenario with SGMA Projects, which includes agricultural pumping, urban pumping and exported water, is over 290,000 AFY less than in the 2030 Climate Scenario without SGMA Projects.

7.1.3 2070 Climate Change Water Budgets

The 2070 Scenarios simulate how the Kern County Subbasin aquifer would respond assuming hydrologic conditions representing a potentially very dry climate and are based on the DWR Climate Change Guidance (DWR, 2018A and 2018B). The 2070 DWR climate change factors were applied to the Baseline Scenario Conditions. Additional adjustments were made to the imported surface water supplies from the SWP, CVP and Kern River, and these accounted for an additional 6% decrease from the Baseline Conditions. The 2070 Climate Change Scenarios were run both with and without SGMA Projects.

The groundwater budget for the 2070 Climate Scenario without SGMA Projects over WY2041 to WY2070 (**Table 20**) is compared the same period for the Baseline Scenario without SGMA Projects to assess the relative change due to the climate change assumptions. The results show a net increase in aquifer inflows of about 66,100 AFY, however, the net aquifer outflows increase by about 231,600 AFY. This is mostly attributed to an even greater climate shift to earlier rainfall making more surface water available for managed aquifer recharge during the winter but less available for irrigation in the summer resulting in higher groundwater pumping. The net change in groundwater storage is an additional decline of about 165,500 AFY due to the climate change assumptions.

The 2070 Climate Scenario with SGMA Projects simulates the proposed SGMA projects and management actions (Section 5.2) applied to the 2070 climate change conditions. No other changes were made to this scenario. The groundwater budget for the 2070 Climate Scenario with SGMA Projects is provided in **Table 21**. Comparing the groundwater budget for WY2041 to WY2070 (**Table 20**) between the two 2070 Climate Scenarios, the total net aquifer inflows increase about 106,300 AFY due to increased managed aquifer recharge and deep percolation. The total net aquifer outflows decrease about 265,300 AFY due mostly to decreased groundwater pumping due to agricultural demand reduction management actions.

The change in groundwater storage for 2070 Climate Scenario with SGMA Projects improves by about 371,600 AFY. This change results in a net decline of groundwater in aquifer storage over WY2041 to WY2070 of about 118,300 AFY. A comparison of the annual change in groundwater storage over the 50-year hydrologic period is presented in **Figure 20**. The time series shows that change in groundwater storage has stabilized to slightly increasing over the period from WY2041 to WY2070, but at a level below the results for the Baseline and 2030 Scenarios with SGMA Projects.

A comparison of the average annual water budget components for the two different 2070 Climate Scenarios is presented in **Figure 19**. Over this period, the average groundwater pumping of 1,559,000 AFY for the 2070 Climate Scenario with SGMA Projects, which includes agricultural pumping, urban pumping and exported water, is over 307,000 AFY less than in the 2070 Climate Scenario without SGMA Projects.

7.2 Projected Future Sustainability Assessment

To assess the sustainability of the proposed GSP plans, the C2VSimFG-Kern model future scenario input files were modified to incorporate all the proposed SGMA projects and management actions.

7.2.1 Change in groundwater storage

Groundwater sustainability for the Kern County Subbasin was assessed using annual changes in groundwater storage. As discussed in Section 7.1, the decline in groundwater storage of the three future Baseline scenarios is significantly mitigated by the implementation of the proposed SGMA projects and management actions. An assessment of the projected future groundwater storage change for the six projected future scenarios is summarized in **Table 22**.

The Change in Groundwater Storage presented in **Table 22** provides the net difference in aquifer inflows and outflows without consideration of subsurface flow to and from adjacent groundwater basins. This provides a measure of the natural and managed water supply within the groundwater basin without being influenced either positively or negatively by the subsurface flow. For the Kern County Subbasin, the net operational flow differs from the change in groundwater storage by about 50,000 to 75,000 AFY for the scenarios without SGMA projects, indicating that most of the groundwater storage change is due to conditions within the basin.

The Adjustments to Groundwater (GW) Storage Change are made to account for limitations in either the underlying conceptual model of C2VSimFG-Kern or the setup of the projected future scenarios. The two adjustments made to the projected future water budgets include:

- **Adjustment for Excess Basin Outflows** is the difference in simulated basin outflow that is attributed to addition of SGMA projects in Kern County without comparable SGMA projects added to adjacent basins. Adjustment assumes that this difference is due to limitation of the simulation, and that this difference would remain in Kern County Subbasin when SGMA projects from adjacent basins are included in the simulation.
- **Adjustment for Excess Kern River Outflow** is the increase in simulated groundwater outflows to the Kern River relative to Baseline condition that are attributed to SGMA projects and climate change. The model is not optimized for river management. Because the Kern River is a highly managed system, the assumption is that in practice this water would be recovered for beneficial use and not allowed to flow from the basin.

These adjustments resulted in an overall improvement in the change in groundwater storage for the projected future water budgets. For the scenarios that include the SGMA Projects, the change in groundwater storage improves by 43,400 AFY (Baseline), 59,700 AFY (2030 Climate Change), and 72,300 AFY (2070 Climate Change). As a result of these adjustments, the adjusted change in groundwater storage for the three scenarios with SGMA Projects varied as follows:

- the Baseline Scenario with SGMA Projects changes from an increase of 42,100 AFY to an increase of 85,600 AFY.
- the 2030 Climate Scenario with SGMA Projects changes from a decline of 12,900 AFY to an increase of 46,800 AFY.
- the 2070 Climate Scenario with SGMA Projects changes from a decline of 118,000 AFY to a decline of 46,000 AFY.

These adjustments indicate areas of improvement for C2VSimFG-Kern. Future updates to the model will address how to better simulate these conditions directly to limit the use of post-simulation adjustments.

7.2.2 Sustainability Assessment

As defined by SGMA, the sustainable yield of a basin is the amount of groundwater that can be withdrawn annually without causing undesirable results. Although the SGMA regulations require that a single value of sustainable yield must be calculated basinwide, it should be noted that the sustainable yield can be changed with implementation of recharge projects, variations in climate, or changes in stream flow conditions. For the projected future scenarios, both the climate and the managed water supply operations are significantly affected which would lead to a change in the sustainable yield for the basin.

For the sustainability assessment, the sustainable yield was recalculated using the method described in Section 4.2, and the results are presented in **Table 23**. Without the SGMA projects and management actions, the percentage of the Average Annual Difference to the total groundwater pumping provides context to compare the significance of the level of groundwater pumping for the basin. For the scenarios without SGMA projects and management actions, the groundwater pumping exceeds the sustainable yield on the order of 25% to 34% (**Table 23**). However, with the proposed SGMA projects and management actions, the groundwater pumping is less than the sustainable yield of the Subbasin for the Baseline and 2030 climate scenarios and is within 3% of the sustainable yield for the 2070 climate scenario (**Table 23**). This assessment indicates that the proposed SGMA projects and management actions for the Kern County Subbasin are of sufficient magnitude that, if fully implemented, would lead to groundwater sustainability for the Kern County Subbasin after WY2040.

7.2.3 Minimum Thresholds and Measurable Objectives

Another requirement of SGMA is for groundwater levels not to cross their minimum thresholds to the extent that undesirable results would occur in the basin, and moreover, that proposed SGMA projects and management actions would lead to meeting the measurable objectives. The Kern County Subbasin GSAs have defined 186 representative monitoring well (RMW) locations spread across the Kern County Subbasin. A minimum threshold and measurable objective have been assigned each of the 186 locations, and the hydrographs for all 186 locations are provided in **Attachment A**. The RMW locations are shown on **Figure 21**.

The C2VSimFG-Kern results were used to assess whether the simulated groundwater levels would meet the minimum threshold and measurable objective for each monitoring well. Because C2VSimFG-Kern is

not fully calibrated, the results are presented as relative change (which does not require calibration) instead of simulated groundwater levels using the superposition method. Future change in groundwater level was determined for each of the 186 locations for each of the six projected future simulations. The change was calculated from the simulated March 2015 groundwater levels from the model. The change in groundwater level was then applied to the measured March 2015 groundwater level at the monitoring location. The result was to superimpose the simulated change in groundwater levels from the projected future C2VSimFG-Kern scenarios relative to the measured March 2015 groundwater level.

Figure 22 provides four representative examples of the simulated hydrographs using this method. Hydrographs of the simulated groundwater levels relative to the minimum thresholds and measurable objectives for all 186 locations were provided to the various GSAs and water districts for inclusion in their respective GSPs. In general, across most areas of the basin, groundwater levels fall near or below the minimum thresholds without the SGMA projects but are typically above the minimum threshold for the simulations that include the SGMA projects.

The groundwater hydrographs for some locations, especially along the eastern and western basin margins, show an unusual pattern that is likely influenced by issues with the hydrogeological conceptual model incorporated into C2VSimFG-Kern for these locations. The hydrographs for these areas are not considered to be representative of actual conditions that would physically occur. This is a limitation to the model. It is recommended that a more rigorous model update be conducted to revise the hydrogeological conceptual model to be consistent with that presented in the Kern County Subbasin GSPs. In addition, further calibration of C2VSimFG-Kern is recommended to update aquifer parameters in the Kern County Subbasin. The recommendations for revisions to the hydrogeological conceptual model and additional calibration are further discussed in Section 8.5.

8. VALIDATION OF C2VSIMFG-KERN PERFORMANCE

The C2VSimFG-Kern performs well within the central part the Kern County Subbasin. The model does not perform as well east of the Friant-Kern Canal or west of the California Aqueduct. The geologic and hydrogeologic conceptual models within the central part of the Kern County Subbasin appear to be generally realistic. The geologic and hydrogeologic conceptual models appear to be very poor in the areas where the model does not perform well.

8.1 C2VSimFG-Kern Validation

One of the concerns for the modeling is the overall calibration of C2VSimFG-Beta in Kern County. As discussed above, the assumption is that C2VSimFG-Beta was developed using reasonable care in developing the geologic framework and developing a consistent regional methodology for determining aquifer properties. An identified weakness of the C2VSimFG-Beta is the quality of data used in developing the overall water balance such as the extent of the groundwater banking operations in Kern County. The issues with the water balance are considered the primary contributing factor affecting the calibration of the C2VSimFG-Beta; the hydrogeologic conceptualization is reasonably accurate for a regional planning analysis.

To address these concerns, a validation analysis was performed for C2VSimFG-Kern by comparing simulations results to field measured groundwater level data collected during the Study Period and comparing those to a similar set of residuals from the C2VSimFG-Beta model. The statistical results of

this analysis should be comparable, if not better, for C2VSimFG-Kern compared to the C2VSimFG-Beta results.

The analysis used 42,058 groundwater levels measurements collected from 558 monitoring wells in the Kern County Subbasin. The data were collected by Kern County Water Agency, the Kern Fan Monitoring Committee, the DWR Water Data Library, and local agencies. For each location, the residual was calculated as the simulated groundwater level minus the measured groundwater level based on the well measurement data. A brief summary of the statistical measures used to evaluate the calibration results (shown on **Table 24**) is provided below:

- The residual mean is computed by dividing the sum of the residuals by the number of residual data values. The closer this value is to zero, the better the calibration especially as related to the water balance and estimating the change in aquifer storage. The residual mean of 17.3 feet for C2VSimFG-Kern is an improvement of 47% over the 32.6 feet from C2VSimFG-Beta.
- The absolute residual mean is the arithmetic average for the absolute value of the residual, so it provides a measure of the overall error in the model. The absolute residual mean of 37.4 feet for C2VSimFG-Kern is an improvement of 34% over the 56.8 feet from C2VSimFG-Beta.
- The residual standard deviation evaluates the scatter of the data. A lower standard deviation indicates a closer fit between the simulated and observed data. The standard deviation is 45.5 feet for C2VSimFG-Kern, which is an improvement of 16% over the 54.0 feet from C2VSimFG-Beta.
- The Root Mean Square (RMS) Error is the square root of the arithmetic mean of the squares of the residuals and provides another measure of the overall error in the model. The RMS Error is 50.0 feet for C2VSimFG-Kern, which is an improvement of 32% over the 73.5 feet from C2VSimFG-Beta.
- The correlation coefficient ranges from 0 to 1 and is a measure of the closeness of fit of the data to a 1 to 1 correlation. A correlation of 1 is a perfect correlation. The correlation coefficient of 0.76 for C2VSimFG-Kern is an improvement of 47% over the 0.52 from C2VSimFG-Beta.
- Another statistical measure is the ratio of the standard deviation of the mean error divided by the range of observed groundwater elevations. This ratio shows how the model error relates to the overall hydraulic gradient across the model. The ratio for C2VSimFG-Kern is 0.061 feet, which is an improvement of 34% over the 0.092 from C2VSimFG-Beta.

Considering these results in context with the overall range of measurements of 616 feet, the residual mean of 17.3 feet represents a relative percentage difference of less than 3%. For the absolute residual mean of 37.4 feet, the relative percentage difference is about 6%. Despite this improvement in model performance, the model is not considered fully calibrated. However, C2VSimFG-Kern is reasonably validated for assessing groundwater level changes on the subbasin scale for the purposes of SGMA planning.

8.2 Sensitivity Analysis

The C2VSimFG-Kern model was not formally calibrated. Some physical parameters were adjusted to improve model performance in specific areas. A sensitivity analysis was conducted on the adjusted model to understand how variations in model parameters affect model results. Eight physical parameter sets were systematically varied, and model results compared to the base model for a

selected group of groundwater hydrographs. C2VSimFG-Kern parameter sensitivities evaluated for Kern County Subbasin include:

- Horizontal hydraulic conductivity of aquifer (Kh)
- Vertical hydraulic conductivity of aquifer (Kv)
- Vertical hydraulic conductivity of Corcoran Clay aquitard (Kcorc)
- Streambed conductance of Kern River (Cstm)
- Specific storage of aquifer (Ss)
- Specific yield of aquifer (Sy)
- Soil hydraulic conductivity in root zone (Ksoil)
- Soil pore size distribution index in root zone (λ)

The Root Mean Squared Error between observed and simulated values was calculated for the original parameter set and after varying each parameter set upward and downward by a set factor. Results are presented in **Figure 23**. This sensitivity analysis shows that the hydrologic parameter values in the C2VSimFG-Kern model are generally within an acceptable range. A full model calibration would likely improve model performance.

8.3 Peer Review Process

Todd Groundwater worked with Woodard and Curran (W&C) throughout the model development process as W&C conducted an on-going peer review of model input files. W&C staff have developed several IWFM-based models and worked with DWR to develop C2VSimFG-Beta. Their reviews helped ensure that the model update used best practices when incorporating new data. The peer review process was documented in a series of meeting summaries to the KGA and KRGSA. The updated C2VSimFG-Kern input files for the Kern County Subbasin were shared with DWR for incorporation into future C2VSim public releases.

The more general assumptions in C2VSimFG-Beta were replaced with local data and knowledge that are regionally or locally significant for WY1995 to WY2015. This update employed a phased approach with regular peer reviews.

1) Phase 1 revisions address components of Regional Significance that require significant changes to the overall model input file structure. These include:
   a) Surface water delivery volumes, application areas and use by water district,
   b) Groundwater banking recharge, recovery and application of recovered water,
   c) Evapotranspiration rates and irrigation demand based on ITRC METRIC data (ITRC 2017),
   d) Urban population and per capita demand, including addition of an urban zone for Metropolitan Bakersfield, and
   e) Addition of groundwater extraction wells for groundwater banking projects.
2) Interim Review
   a) The Woodard & Curran Peer Review Team
   b) Kern County Subbasin water districts and purveyor's local data review
   c) Stakeholder input
3) Phase 2 revisions address components of Local Significance that generally require modifications of input data and parameters within the existing C2VSim model input file structure. These include:

a) Local water sources and demands of significance to individual Districts/GSAs,
b) District pumping for in-district delivery via surface water canals where significant,
c) District recharge operations utilizing canals, stream channels, and basins,
d) Wastewater disposal and land application, and
e) Review and limited adjustment of model parameters.

4) Interim Review by same reviewers listed in item 2

5) Phase 3 revisions include addressing comments and incorporating new data from the Interim Reviews

6) Interim Review by same reviewers listed in item 2

7) Tabulate model-derived water budgets for Peer-Review and GSP Use

In each update phase, historical and current water budgets for zones representing water agency service areas were produced with the revised C2VSimFG-Kern model incorporating corrected local data. These water budgets were shared with participating agencies for review, to ensure that C2VSimFG-Kern correctly represented local water balances. Where necessary, participating agencies provided additional data which was incorporated into C2VSimFG-Kern.

8.4 Internal Review Process

Todd Groundwater and Hydrolytics LLC worked collaboratively on this model revision, water budget development and the projected future scenarios. Throughout this work, efforts were applied to improve data management to develop a systematic process for generating model input files. Using this approach, internal review could be conducted with each firm reviewing the contributions from the other. The goal was to accurately represent the data provided by the Kern County agencies in the model.

Due to schedule constraints, a thorough internal review of the projected future model scenarios was not completed prior to the submission of the Public Review Draft of the model results in August 30, 2019. A thorough review of all input for the projected future scenarios was conducted in September and October 2019. During this review, several issues were identified and corrected. As a result, the results in this report vary from those provided in the August 2019 Public Review Draft. Although the numbers changed, the overall conclusions from the C2VSimFG-Kern simulations remained essentially the same.

8.5 Recommendations for Future Improvements to C2VSimFG-Kern

The C2VSimFG-Kern performs well in the Kern County Subbasin, producing simulated water budget components that generally match historical values compiled by local agencies. C2VSimFG-Kern simulated groundwater levels provide a reasonable approximation of observed groundwater levels in the central part of the Kern County Subbasin. The model is well suited for estimating the impacts of management actions on the Subbasin groundwater storage and is also well suited as a planning tool in meeting compliance of SGMA.

During the model update, several outstanding issues were identified that should be addressed in future updates to C2VSimFG-Kern. The following actions and model improvements are recommended:

- **Improve streamflow simulations of the Kern River and Poso Creek.** Flows in the Kern River channel, including local stream-groundwater interactions, are not well replicated and surface water diversions are not dynamically simulated. Some rejected recharge occurs in the Kern Fan

area in very wet years, with significant outflow of groundwater to the Kern River especially in the Kern Fan banking area (i.e., rejected recharge). This has been an ongoing issue and needs to be addressed for the projected future water budgets so that banking recharge volumes can be better matched in the model. It is recommended that future revisions to C2VSimFG-Kern further evaluate issues in simulating streamflow and seepage in the Kern River and Poso Creek (see Section 8.5). This may include incorporating more advanced streamflow simulation features that are available in IWFM but that have not been previously utilized in developing C2VSim models by DWR. Changing the stream simulation feature may require development of a local Kern County Subbasin model.

- **Improve the geologic and hydrogeologic conceptual model of the Kern County portion of the Central Valley.** A hydrogeologic conceptual model is a framework for understanding where groundwater exists, where it flows, and how groundwater interacts with surface water bodies and the land surface. A geologic conceptual model provides a framework for understanding the geologic features that control groundwater movement. Quantitative analysis of Kern County Subbasin groundwater flow is severely hampered by the lack of detailed geologic and hydrogeologic conceptual models of the areas outside the central alluvial basin. Geologic and hydrogeologic conceptual models will provide a foundation for the quantitative analysis of the groundwater flow system, and the framework for modeling the system. Key steps are:
    - Develop detailed geologic and hydrogeologic conceptual models of the Kern County Subbasin.
    - Differentiate the four Principal Aquifers that have been identified in the Kern County Subbasin based on definitions from local management area GSPs.
    - Identify the locations and characteristics of natural features that affect groundwater recharge and movement (faults, ridges, clays).
    - Understand water occurrence and movement in areas outside the central Kern County Subbasin.
    - Develop water quality maps (natural constituents and anthropogenic constituents).
    - Modify the Kern County Subbasin model to conform to the updated conceptual models.
- **Simulation of deep percolation and small watersheds.** Unreasonably high deep percolation (return flows) of the applied water in some areas has led to unreasonably elevated pumping rates to compensate. One problem is high root zone hydraulic parameter values in certain areas that were identified and corrected to better reflect local soil conditions. Because the excess pumping was returning to groundwater, the change has little effect on the basin change in storage, but the pumping and deep percolation are now more in line with local estimates. Root zone hydraulic parameters should be redeveloped throughout the subbasin to assure model values are representative of actual values.
- **Root Zone Parameters,** Areas of overly high root zone hydraulic parameters led to high volumes of deep percolation that required additional groundwater pumping to meet the overall water demand for irrigation. A review found areas of overlying high soil hydraulic conductivity and other soil parameters produced percolation rate that were too high. These areas were manually adjusted to be more in line with observed conditions. A more rigorous development of root zone parameters should be considered in the future as this issue demonstrates that it is a sensitive parameter.

- **Investigate development of a stand-alone Kern County Subbasin model.** The C2VSim model provided by DWR and updated with local data is adequate for GSP preparation. However, this model may not meet all of the groundwater modeling needs of Kern County Subbasin stakeholders. In addition, running a full Central Valley simulation model imposes longer model run times and reduces model flexibility. Stakeholders should undertake a comprehensive study to develop a list of their integrated (groundwater and surface water) modeling needs, and then decide whether further improving C2VSimFG-Kern or developing a new integrated hydrologic model is the best way to address the Subbasin modeling needs. This decision should be made before the end of 2020 to allow sufficient time to develop a new model or improve C2VSimFG-Kern in time for use in development of the 2025 GSP.
- **Adjust the finite element grid to honor water management boundaries.** The C2VSimFG-Kern model grid is a randomly generated grid that does not conform to any local features other than natural surface water channels. This limits the spatial accuracy of model inputs and the precision and flexibility of water budget outputs. Adjusting the grid to match district and agency boundaries, historical delivery areas, water management units within districts, and geologic and hydrologic features would greatly enhance model capabilities.
- **Quantify boundary flows.** Significant uncertainty exists regarding the rates and timing of groundwater flows into the Kern County Subbasin from surrounding watersheds, and groundwater flows from the Kern County Subbasin to Kings and Tulare counties to the north. Reliable estimates of boundary flows will improve model performance in boundary areas.
- **Kern County Subbasin Boundary.** The GSAs in the basin should consider when DWR updates the Bulletin 118 in 2020 to investigate the "actual" Kern County Subbasin and to remove those peripheral lands where aquifer connectivity does not exist.
- **Utilize more complex water management features of IWFM.** The Kern Update process modified information within the existing C2VSimFG-Beta model structure to improve model performance within the Kern County Subbasin. The IWFM application has several features that could be further utilized to improve model performance.
    - Adjust the agricultural crops to better match the Kern County crop mix (for example, create separate crop categories for carrots, young and mature almonds, young and mature pistachios, etc.).
    - Implement multi-cropping with semiannual or quarterly land use.
    - Some C2VSim data are organized by DWR subregions, which represent heterogeneous areas with homogeneous data. Developing Kern County Subbasin subregions and organizing model input data by these subregions may provide a better representation of local hydrologic conditions.
- **Calibrate the improved model for the Kern County Subbasin**. DWR did not fully calibrate the Kern County portion of the C2VSim model, owing to both poor historical input data and a lack of calibration data sets. The Kern Update process significantly improved the historical data in the model, developed some calibration data sets, and included limited adjustment of model parameters. The updated model performs adequately in the central part of the Kern County Subbasin and poorly in areas outside the central part of the basin. Once the above improvements are completed, the Kern County portion of the resulting model should be fully calibrated to ensure that it performs well throughout the Kern County Subbasin.

9. CONCLUSIONS

This brief summary provides an overview of the findings and conclusions of the modeling results for the Kern County Subbasin using C2VSimFG-Kern.

9.1 Findings of the C2VSimFG-Kern Application and Results

The subbasin-wide update of C2VSimFG-Kern incorporated data from many local agencies. Each participating agency provided data for their jurisdiction for use in improving the model. This included managed water supply data (e.g., surface water deliveries, land use, irrigation demand, return flows, and groundwater banking), stream and groundwater monitoring data, geologic data, and other relevant data. This information was compiled and used to improve C2VSimFG-Kern performance in the Kern County Subbasin.

The historical water budget analysis indicates that the Kern County Subbasin was in a state of overdraft equivalent to the long-term decline in groundwater storage from WY1995 to WY2014 of 277,144 AFY. Projected Future simulations indicate that the proposed SGMA projects and management actions in the Kern County GSPs are sufficient for the Kern County Subbasin to achieve sustainability under Baseline and 2030 Climate Change conditions.

C2VSimFG-Kern was used to evaluate the change in groundwater in storage for projected future conditions using a baseline condition that projects current water supply, water demand and land use over a 50-year period based on historical hydrology. The baseline was adapted following DWR climate change guidance to develop 2030 and 2070 climate change simulations. The proposed SGMA projects and management actions were compiled from all of the Kern County Subbasin GSAs and management areas. The total projects total about 421,000 AFY after implementation. This assessment indicates that the proposed SGMA projects and management actions for the Kern County Subbasin are of sufficient magnitude that, if fully implemented, would lead to groundwater sustainability for the Kern County Subbasin after WY2040.

The historical C2VSimFG-Kern performs well in the Kern County Subbasin, producing simulated water budget components and groundwater levels that generally match historical values compiled by local agencies. C2VSimFG-Kern simulated groundwater levels provide a reasonable statistical approximation of observed groundwater levels in the Kern County Subbasin that show significant improvement relative to C2VSimFG-Beta. Therefore, C2VSimFG-Kern is well suited as a planning tool to estimate the impacts of the proposed SGMA projects and management actions on groundwater conditions in the Kern County Subbasin.

The C2VSimFG-Kern model development and the water budget analysis were designed to fulfill the GSP requirement for a coordinated subbasin-wide water budget analysis, while also providing information required to fulfill other GSP requirements. The C2VSimFG-Kern was provided to DWR so the Kern County Subbasin revisions can be incorporated into their master version of the C2VSim model.

9.2 C2VSimFG-Kern Compliance with Coordination Agreement Requirements

Subbasin GSAs coordinated on the development and application of the C2VSimFG-Kern to ensure that the model was incorporating comparable data sets and the best available information; as such, the model meets numerous technical requirements for Subbasin-wide coordination, including for

Coordination Agreements in §357.4. As demonstrated throughout this memorandum, the C2VSimFG-Kern model documents the use of "the same data and methodologies" for water budget development.

Specifically, groundwater extraction data were coordinated through the use of ET METRIC data for all irrigated lands over the entire Subbasin to estimate private irrigation pumping. Monthly metered data from District, municipal, and banking pumping were incorporated as available. Surface water supply data were provided in similar units and formats using consistent templates for data collection and management in the model. Total water use and change in groundwater in storage were developed through consistent methodologies as applied in the C2VSimFG-Kern model. Calibration targets also incorporated consistent data sets for groundwater elevation data throughout the Subbasin as compiled in the DWR Water Data Library, KCWA water level database, and supplemented with local data, as needed. This memorandum documents coordination efforts in subsequent sections that demonstrates compliance with GSP requirements in §354.18, §357.4, and other portions of the regulations.

9.3 Limitations and Uncertainty of C2VSimFG-Kern

The C2VSimFG-Kern performs well in the Kern County Subbasin, producing simulated water budget components that generally match historical values compiled by local agencies. C2VSimFG-Kern simulated groundwater levels provide a reasonable approximation of observed groundwater levels in the central part of the Kern County Subbasin. The model is well suited to estimating the impacts of management actions on subbasin groundwater storage.

The C2VSimFG-Kern update was limited in scope, and some model components do not perform well. These components do not reduce model capabilities with respect to GSP development but limit the usefulness of the model for other types of studies. Flows in the Kern River channel, including local stream-groundwater interactions, are not well replicated and surface water diversions are not dynamically simulated. The Kern County Subbasin portion of the C2VSimFG-Kern is not calibrated, and although the land surface water budget components are generally accurate, groundwater conditions and stream flows are poorly simulated in much of the Subbasin. Some rejected recharge occurs in the Kern Fan area in very wet years, but this is not significant as it is a very small volume.

The C2VSimFG-Kern is a reliable and defensible tool to support planning future groundwater conditions and estimating the potential hydrological impacts of future climate conditions and management actions at the subbasin level. It is currently the best available quantitative tool for assessing projected future groundwater conditions under SGMA. DWR recommends updating and refining models used in GSPs to incorporate new data including that in annual GSP updates. Refining Kern County Subbasin hydrologic modelling tools to replicate district-level historical conditions will provide a reliable means of assessing future effects of management actions at the district level for future GSP development.

9.4 Applicability of C2VSimFG-Kern Simulation Results

Based on the model validation, C2VSimFG-Kern provides a useful planning tool to evaluate potential future trends in groundwater in the Kern County Subbasin. The model validation demonstrated the capability of C2VSimFG-Kern to reasonably simulate the groundwater elevations and trends during the period from WY1995 through WY2015 based on the comparison to measured data.

The ability to reasonably simulate historical conditions provides confidence that C2VSimFG-Kern can be used to simulate potential future conditions. The model has the capability to simulate the most beneficial application of water projects that would provide the long-term benefit to the area. For the

future case scenarios, the general practice is to evaluate model results with respect to long-term trends. Therefore, as a planning tool, it is most beneficial to run the model in relation to a base case and to evaluate the relative difference between the model scenario and the base case. The base case would assume a selected set of climatic, hydrologic and pumping conditions. Commonly, the calibration base period is assumed to repeat; however, any number of variations can be constructed.

It is important to note that in some cases the model results may vary from those measured in individual wells due to the geologic complexity of the Kern County Subbasin. However, the model is capable of evaluating the impacts of changes in pumping and water use practices in the Kern County Subbasin that are useful for SMGA planning purposes.

The conclusions and recommendations presented herein are professional opinions based on the C2VSimFG-Kern revisions and simulations as described herein. The findings and professional opinions presented in this letter are presented within the limits prescribed by the client contract, in accordance with generally accepted professional engineering, geologic and modeling practices, to support development of GSPs within the Kern County Subbasin. There is no other warranty, either expressed or implied, regarding the conclusions, recommendations, and opinions presented in this report.

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TABLES

TABLE 1 - Summary of data input for surface water diversion to agriculture by water district applied to C2VSimFG-Kern Historical Simulation

Water Year	Arvin-Edison WSD	Belridge WSD	Berrenda Mesa WSD	Buena Vista WSD	Cawelo WD	Kern River Canal Co.	Henry Miller WD	Kern Delta WD	Kern-Tulare WD	Lost Hills WD	North Kern WSD	Rosedale Rio Brave WSD	Semi-tropic WSD	Shafter-Wasco ID	So. San Joaquin MUD	Wheeler Ridge - Maricopa WSD	Olcese WD	TOTAL
	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft
1986	144,722	106,293	90,909	162,444	78,084	14,994	43,242	183,471	27,131	103,268	198,865	0	74,487	149,252	112,888	177,348	1,493	1,668,891
1987	127,333	106,293	90,909	142,274	89,117	12,113	43,242	137,458	27,131	123,981	112,432	0	53,753	172,161	76,193	161,949	1,493	1,477,832
1988	114,321	106,293	90,909	141,152	77,106	4,203	43,242	135,078	27,131	111,872	81,580	0	47,071	164,192	71,243	154,030	1,417	1,370,840
1989	114,591	106,293	90,909	150,341	85,190	11,096	43,242	140,360	27,131	122,044	61,797	0	50,495	190,990	94,729	178,129	1,480	1,468,817
1990	70,816	106,293	90,909	124,845	67,867	14,757	43,242	114,531	27,131	88,963	51,926	0	34,381	49,992	73,000	170,693	1,480	1,130,826
1991	40,698	106,293	90,909	100,517	50,621	10,416	43,242	117,287	27,131	9,553	28,931	0	40,595	7,926	11,683	31,030	1,480	718,312
1992	52,839	106,293	90,909	108,874	54,406	9,909	43,242	118,190	27,131	52,853	34,291	0	45,851	94,467	65,310	96,514	1,480	1,002,559
1993	137,479	93,344	85,549	151,653	75,490	11,596	43,973	174,003	26,034	77,793	181,920	5,040	72,120	226,462	108,767	137,221	1,425	1,609,869
1994	171,856	110,017	93,092	125,084	62,968	13,862	53,471	132,865	28,017	87,636	117,580	2,362	47,111	110,951	83,680	151,368	1,685	1,393,606
1995	134,559	110,993	78,521	189,797	73,155	6,600	29,047	159,595	27,333	85,963	174,020	5,591	62,105	235,347	108,778	153,783	1,425	1,636,611
1996	166,288	112,412	115,132	184,597	90,229	11,591	39,539	179,052	28,749	145,349	202,199	5,722	72,231	313,420	128,865	189,454	1,987	1,986,816
1997	185,820	143,146	97,233	197,871	88,202	11,134	50,584	179,388	29,998	122,140	191,871	4,563	67,407	313,717	124,456	188,455	1,778	1,997,763
1998	120,808	79,387	85,885	152,455	69,758	4,959	30,260	124,464	24,422	80,845	153,662	4,756	53,064	240,072	89,373	148,174	849	1,463,194
1999	152,909	101,786	93,199	142,271	86,667	10,085	53,858	141,626	28,093	108,563	146,395	4,679	57,625	307,686	110,686	166,018	1,248	1,713,394
2000	158,008	111,057	87,200	135,689	87,894	12,833	44,302	152,338	29,948	119,828	133,872	3,920	61,358	315,833	119,597	179,278	1,382	1,754,337
2001	158,432	91,642	65,734	76,718	70,873	10,048	31,379	113,044	30,109	68,302	74,725	0	48,772	70,879	98,104	136,390	1,588	1,146,739
2002	158,197	107,617	63,705	78,735	75,042	9,058	31,724	116,181	25,443	67,574	62,006	0	55,121	165,448	103,849	133,652	1,702	1,255,054
2003	139,412	103,724	64,267	96,601	75,749	8,371	33,941	161,162	24,120	62,007	106,436	1,000	55,511	265,110	106,779	120,733	2,041	1,426,964
2004	155,531	118,543	68,902	86,119	78,558	9,383	39,101	138,664	25,541	67,607	99,610	1,739	58,351	174,605	106,537	138,771	1,637	1,369,199
2005	136,887	105,523	69,372	125,522	78,101	6,037	39,248	169,747	21,445	60,844	207,612	2,784	58,711	294,595	109,716	127,846	1,939	1,615,929
2006	140,411	115,146	84,869	149,851	96,249	5,317	46,538	172,882	22,525	73,422	199,626	0	68,468	332,115	120,106	150,416	2,048	1,779,988
2007	158,526	118,036	102,971	91,196	70,811	4,574	48,482	112,341	23,348	83,116	89,195	552	37,391	146,826	75,642	164,924	1,496	1,329,426
2008	157,604	114,525	86,217	70,032	62,437	4,380	18,156	145,633	22,788	74,554	86,051	0	47,623	29,675	87,776	168,211	1,700	1,177,361
2009	145,184	113,385	86,439	73,530	67,340	4,340	12,129	126,039	21,803	83,740	84,727	0	44,265	30,808	116,967	159,502	1,781	1,171,979
2010	132,462	117,589	88,556	102,109	76,351	3,604	29,694	166,787	19,272	88,191	171,744	1,543	65,238	168,870	120,394	159,162	1,756	1,513,322
2011	130,306	121,808	87,344	121,329	88,617	4,617	39,642	192,069	20,213	92,149	173,305	4,466	74,413	337,724	124,678	156,216	1,530	1,770,425
2012	148,146	130,559	87,953	96,407	89,745	3,988	41,553	195,763	21,682	91,720	81,584	1,329	35,369	227,901	81,602	168,753	1,783	1,505,837
2013	159,887	138,131	93,311	33,558	49,978	3,585	18,533	94,682	22,252	93,322	23,343	0	26,194	81,279	58,923	170,033	1,966	1,068,977
2014	144,605	123,390	82,731	410	41,223	2,645	2,246	70,367	14,067	82,546	11,290	0	8,303	5,748	14,249	152,372	1,238	757,429
2015	114,350	117,357	81,535	134	38,195	2,663	0	68,228	10,274	80,631	9,901	0	0	12,226	3,020	145,842	1,462	685,817

TABLE 2 - Summary of data input for surface water diversion from Kern River at different diversion and turnouts applied to C2VSimFG-Kern Historical Simulation

Water Year	Kern River to Beardsley Canal	Kern River to Carrier Canal at Rocky Point	Kern River to Carrier Canal at Calloway Weir	Kern River to CVC at Turnout #4	Kern River to River Canal	Kern River to Rio Vista at River Walk	Kern River to Rosedale Channel	Kern River to North Lake	Kern River to Pioneer Canal	Kern River to Berrenda Mesa WSD	Kern River to Pioneer Project	Kern River to Kern Water Bank	Kern River to Kern Water Bank Canal	Kern River to 2800 Acre Facility	Kern River to Buena Vista WSD BSA	Kern River to Aqueduct at Intertie	TOTAL
	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft	Acre-ft
1986	291,715	199,035	238,877	181,392	0	0	65,684	0	63,232	0	0	0	0	97,866	86,736	0	1,224,537
1987	190,539	76,888	179,876	58,811	0	0	19,893	0	756	0	0	0	0	21,592	86,736	0	635,091
1988	111,679	25,813	163,938	21,851	0	0	345	0	0	0	0	0	0	0	86,736	0	410,362
1989	98,796	28,696	168,926	23,291	0	0	0	0	0	0	0	0	0	0	86,736	0	406,445
1990	77,389	5,373	128,753	6,577	0	0	0	0	0	0	0	0	0	0	86,736	0	304,828
1991	69,736	180,189	56,331	13,944	0	0	5,869	0	0	0	0	0	0	0	86,736	0	412,805
1992	71,521	194,315	690	11,008	0	0	3,598	0	0	0	0	0	0	0	86,736	0	367,868
1993	213,099	241,104	43,555	59,099	50,897	0	54,936	0	27,803	0	0	0	0	64,852	64,488	0	819,833
1994	187,380	213,631	18,103	26,829	67	0	0	0	0	9,882	0	0	0	28,046	38,745	0	522,683
1995	256,234	248,113	65,360	144,230	136,516	0	91,721	0	40,366	23,822	45,284	0	0	60,476	103,429	11,850	1,227,401
1996	315,988	255,792	105,845	108,405	119,999	0	78,824	0	14,286	17,382	55,074	0	0	24,037	92,768	0	1,188,400
1997	288,746	280,471	123,771	130,336	123,333	0	62,841	0	23,271	14,977	45,600	0	0	27,212	134,320	52,848	1,307,726
1998	312,857	244,337	143,422	131,398	23,346	0	95,706	0	51,802	18,483	69,637	0	0	95,160	115,019	188,048	1,489,215
1999	214,847	180,856	71,974	46,274	58,082	0	33,938	0	839	6,915	21,343	0	0	17,891	77,220	0	730,179
2000	175,718	169,844	38,793	31,596	38,147	0	20,213	0	0	1,396	15,929	0	0	30,660	47,882	0	570,178
2001	130,052	188,404	23,762	14,050	4,631	0	3,177	0	2,179	0	0	0	0	0	32,686	0	398,941
2002	91,980	203,010	4,149	23,609	7,878	0	581	0	199	431	871	0	0	0	29,404	0	362,112
2003	164,112	206,448	15,893	14,088	31,451	0	12,306	0	0	1,045	0	0	0	0	38,307	0	483,650
2004	153,148	198,769	29,338	18,247	2,301	589	1,503	165	0	2,545	2,005	0	0	0	39,412	0	448,022
2005	236,776	228,885	73,215	62,146	60,019	0	141,022	1,442	1,942	39,702	102,111	21,548	23,125	77,127	72,865	0	1,141,925
2006	257,590	247,806	53,872	122,931	33,872	3,942	87,318	1,442	9,962	24,636	116,108	25,165	34,358	42,587	97,955	0	1,159,544
2007	135,525	189,169	1,049	10,483	7,752	2,746	0	0	0	13,099	17,809	7,507	0	4,568	47,914	0	437,621
2008	137,813	229,304	53,824	22,700	0	544	0	0	0	0	0	0	0	0	34,549	0	478,734
2009	139,246	238,103	31,342	28,635	115	712	109	0	0	0	0	0	0	0	18,418	0	456,680
2010	196,135	241,876	70,315	68,944	60,087	820	10,816	776	1,775	1,165	0	0	0	13,748	66,441	0	732,898
2011	298,003	266,684	75,784	160,243	90,048	1,752	101,209	787	20,479	26,223	121,857	23,951	47,187	84,876	98,416	0	1,417,499
2012	148,513	241,953	20,495	55,303	409	1,001	10,998	0	0	7,594	20,162	582	0	7,871	45,173	0	560,054
2013	45,141	153,474	706	25,758	0	247	0	0	0	3,529	0	0	0	155	0	0	229,010
2014	26,041	122,044	0	8,356	0	283	0	0	0	0	0	0	0	0	0	0	156,724
2015	16,883	104,841	0	0	0	195	0	0	0	0	0	0	0	0	0	0	121,919