

Cosumnes Groundwater Authority

Meeting of the Board of Directors

Agenda

When: 9:00 am, Monday, June 20, 2022
Where: [Via Zoom: https://us02web.zoom.us/j/82839220818](https://us02web.zoom.us/j/82839220818)
Meeting ID: 828 3922 0818
Call in Number: 1-669-900-9128

PUBLIC COMMENT – Any member of the public may address the Board concerning any matter on the agenda before or during its consideration of the matter. Public comment is limited to three (3) minutes per person. For good cause, the Board Chair may waive these limitations.

ACCESSIBILITY - If you have a disability and require a reasonable accommodation to fully participate in this event, please contact Austin Miller (CGA Secretary) before June 20, 2022 via email [info@CosumnesGroundwater.org] or telephone [916-526-5447] to discuss your accessibility needs.

Call to Order

1. Introductions
 - a. Agenda Overview
2. Determine if Quorum is Present

Public Comment on Non-Agenda Items

Comment will be received at this time for items not on the agenda, but within the jurisdiction of the agency. The Board will hear comment but may not take action on issues raised on non-agenda items. Limit of 3 minutes per speaker.

Action Items

3. Consent Items (*5 minutes*)
 - a. Agenda – June 20, 2022
 - b. Minutes – May 23, 2022
 - c. Consideration of Findings Related to Remote Meetings Pursuant to AB 361
 - d. Financial Report – June 2022
 - e. Purchase Requests – June 2022
4. Fiscal Year 2022-2023 Budget (*15 minutes*)
5. Governor's Executive Order N-7-22 Update (*20 minutes*)
6. Staff Support Agreements (*10 minutes*)
7. Outreach and Engagement (*20 minutes*)
 - a. Citizen Advisory Committee - Member Selection (2 applications)
8. Projects Committee Update (*20 minutes*)
 - a. Request for Qualifications: Groundwater Management Services (Project Scoping)
9. Long Term Funding (*20 minutes*)
 - a. Request for Qualifications: Groundwater Fee Study Development
10. City of Sacramento and Sacramento County Water Agency Transfer Determination (*10 minutes*)

Informational Items

11. Cosumnes Subbasin Watershed Coordinator Report
12. DWR North Central Regional Office Update
13. Upcoming Agenda Items
14. Director Comments

Adjourn Meeting

Agenda Item #3b

**Cosumnes Groundwater Authority
Board of Directors Meeting**

Meeting Minutes
May 23, 2022, 9:00am

Call to Order: 9:05 am

- 1) Introductions
- 2) Determine if Quorum is Present
 - a. Directors in Attendance: Rick Wohle, Mark Stretars, Don Notolli, Lindsey Liebig, Gary Thomas, Jay Vandenburg, John Mulrooney

Action Items

- 3) Consent Items
 - a. Agenda – May 23, 2022
 - b. Minutes – April 25, 2022
 - c. Consideration of Findings Related to Remote Meetings Pursuant to AB 361
 - d. Financial Report – April 2022

Director Wohle moved to approve all consent items.
Director Thomas seconded the motion.
The motion passed with all in favor.
- 4) SAFCA Involvement in the Cosumnes Subbasin
Gary Bardini, Director of Planning for the Sacramento Area Flood Control Agency (SAFCA) presented information on SAFCA's interest and involvement in groundwater planning and project implementation. Mr. Bardini indicated that SAFCA was willing to provide their experienced grant writer to support the Cosumnes Subbasin's DWR implementation grant application (anticipated to open in September 2022). CGA Staff will work with SAFCA to develop a working agreement between the two organizations for the Board to consider at a future meeting.
- 5) Projects Committee Update
Director Notlli moved to direct staff to change the draft RFP to a Request for Qualifications and solicit to interested parties.
Director Thomas seconded the motion.
The motion passed with all in favor.
- 6) Citizen Advisory Committee, Member Selection
Director Wohle moved to select Eugene Rose for the Citizen Advisory Committee.
Director Thomas seconded the motion.
The motion passed with all in favor.
- 7) Fiscal Year 2022-2023 Budget
The Board directed staff to work with Rick Ferreria (Amador County Water Agency) to change the format of the budget documents to improve readability.

Agenda Item #3b

8) Long Term Funding

Director Vandenburg moved to direct staff to change the draft RFP to a Request for Qualifications and solicit to interested parties.

Director Thomas seconded the motion.

The motion passed with all in favor (Notolli absent).

9) Governor's Executive Order N-7-22 Overview

The Board did not discuss this item due to time constraints.

Information Items

10) 2021 Cosumnes GSP Annual Report Update

CGA Staff provided an update on the outstanding questions related to the Annual Report.

11) Cosumnes Subbasin Watershed Coordinator Report

The Cosumnes Subbasin Watershed Coordinator provided an update on a variety of projects throughout the Subbasin.

12) DWR North Central Regional Office Update

DWR Staff provided a monthly update on DWR activities.

13) Upcoming Agenda Items

No additional agenda items were identified.

14) Director Comments

No Director comments.

Adjourn Meeting

Chair Liebig adjourned the meeting by consensus at 11:25.

The next regular meeting of the Cosumnes Groundwater Authority will on June 20, 2022 at 9:00.

Cosumnes Groundwater Authority

Financial Report

June 2022

<u>Expenses</u>		
Description	Source	Amount
Staff Support (SRCD, May)	Sloughhouse RCD	\$ 6,400.00
Staff Support (SSCAWA, May)	SSCAWA	\$ 6,380.00
Monitoring Services (May)	MLJ Environmental	\$ 1,520.00
Total Monthly Expenses		\$ 14,300.00

<u>Revenue</u>		
Description	Source	Amount
Invoiced: FY21/22 Member Contribution (1 of 1)	OHWD	\$ 23,420.59
Total Monthly Revenue		\$ 23,420.59

Monthly Change	\$	9,120.59
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Agenda Item #3e

**Cosumnes Groundwater Authority
Board of Directors Meeting**

Agenda Date: June 20, 2022

Agenda Item #: 3e
Agenda Item Subject: Purchase Requests

To: CGA Board of Directors
From: CGA Staff

Background

CGA Staff have identified the following needs to improve our efforts:

Description	Max Amount Requested	Budgeted?
Adobe Acrobat Pro	\$400	Yes – Misc. (\$500 of \$3,000 spent to date)
ArcGIS Online	\$500	Yes – Misc. (\$500 of \$3,000 spent to date)
Website and Microsoft Teams Improvements	\$5,000	Yes – Public Outreach (\$0 of \$20,000 spent to date)
Workshop Materials (printing, supplies, etc.)	\$5,000	Yes – Public Outreach (\$0 of \$20,000 spent to date)
TOTAL	\$10,900	

These expenses were reflected in the Fiscal Year 2021-2022 year-end estimates presented with the Fiscal Year 2022-2023 budget that was presented in the May and June 2022 CGA Board Agenda Packets.

Staff Recommendation

- Authorize CGA Staff to make the above purchases.

Agenda Item #4

Cosumnes Groundwater Authority Board of Directors Meeting

Agenda Date: June 20, 2022

Agenda Item #: 4

Agenda Item Subject: Fiscal Year 2022-2023 Budget

To: CGA Board of Directors

From: CGA Staff

Background

The CGA Board discussed the Draft Fiscal Year 2022-2023 Cosumnes Groundwater Authority Budget in April and May. At the May 2022 Board meeting Rick Ferriera (Amador County Groundwater Management Authority) offered to assist CGA Staff in formatting the Budget to improve clarity. CGA Staff was unable to connect with Mr. Ferriera prior to this meeting but Staff will follow up to improve the budget in future revisions/reports.

CGA Staff will draft an update/replacement for the [Cosumnes Subbasin GSA Initial Funding and Revenue Agreement for Implementation of a GSP](#).

Attachments

- CGA Fiscal Year 2022-2023 Budget

Staff Recommendation

- Approve the presented CGA Fiscal Year 2022-2023 Budget.

Agenda Item #4

**Cosumnes Groundwater Authority
FY 2022 – 2023 (July 2022 – June 2023)**

Budget Overview

Presented: May 23, 2022

Budget Item	FY 21-22 Budget	FY 21-22 Year End (anticipated)	FY 22-23 Budget
CGA Funded Expenses	\$444,185	\$212,419	\$496,000
Total Expenses	\$444,185	\$212,419	\$496,000
Member Contributions	\$444,185	\$444,185	\$444,185
Total Revenue	\$444,185	\$444,185	\$444,185
Gain/Loss	\$0	\$231,766	<\$51,815>
Year End Reserve*	\$0	\$231,766	\$179,951

*The Cosumnes Groundwater Authority anticipates long term expenses that have not yet been budgeted (ex: GSP 5-Year Update).

Agenda Item #4

**Cosumnes Groundwater Authority
FY 2022 – 2023 (July 2021 – June 2022) Budget**

Expenses

Expense Item	FY 21-22 Budget	FY 21-22 Year End (anticipated)	FY 22-23 Budget
Establish Organization	\$10,000	-	-
Funding Exploration	\$35,000	\$20,000	\$35,000
Monitoring	\$30,000	\$14,000	\$30,000
Data Management System	\$10,000	-	\$10,000
Public Outreach	\$20,000	\$10,000	\$1,427
Legal	\$30,000	\$20,000	\$30,000
Financial Audit	\$15,000	-	\$15,000
Personnel	\$90,000	\$90,000	\$150,000
Miscellaneous	\$3,000	\$3,000	\$3,000
Data Gaps	\$25,000	\$7,500	\$25,000
Annual Report	\$48,000	\$47,919	\$48,000
Post-GSP Fee Establishment	\$100,000	-	\$100,000
Other PMAs	\$20,000	-	\$20,000
Contingency	\$8,185	-	\$10,000
Sub Totals	\$444,185	\$212,419	\$496,000

Agenda Item #4

Expense Item Justification/Description

Establish Organization	-
Funding Exploration	Grant applications, partnership development, etc.
Monitoring	Fall and Spring Monitoring (gw elevation and quality)
Data Management System	Updates to DMS, technical assistance, server costs
Public Outreach	website, mailchimp, materials, etc.
Legal	-
Financial Audit	Audit, accounting support
Personnel	SSCAWA and SRCD agreements
Miscellaneous	Staff training, professional organization membership, project management software, etc.
Data Gaps	GDE exploration, surface water flow meters, cone of depression, etc.
Annual Report	-
Contingency	-
Post-GSP Fee Establishment	Data gathering and clean up, public outreach, and final report.
Other PMAs	Conservation, GSP PMAs, etc.

Agenda Item #4

**Cosumnes Groundwater Authority
FY 2022 – 2023 (July 2022 – June 2023) Budget**

Revenue

Funding Source	FY 21-22 Budget	FY 21-22 Year End (anticipated)	FY 22-23 Budget
City of Galt GSA	\$15,000	\$15,000	\$15,000
Amador Groundwater Authority GSA	\$5,000	\$5,000	\$5,000
Galt Irrigation District GSA	\$161,807	\$161,807	\$161,807
Clay Water District GSA	\$21,889	\$21,889	\$21,889
Omochumne-Hartnell Water District GSA	\$24,893	\$24,893	\$24,893
Sloughhouse Resource Conservation District GSA	\$150,762	\$150,762	\$150,762
County of Sacramento GSA	\$64,834	\$64,834	\$64,834
GSA Member Contributions Total	\$444,185	\$444,185	\$444,185
Total Revenue	\$444,185	\$444,185	\$444,185

Agenda Item #5

Cosumnes Groundwater Authority Board of Directors Meeting

Agenda Date: June 20, 2022

Agenda Item #: 5

Agenda Item Subject: Governor's Executive Order N-7-22 Overview

To: CGA Board of Directors

From: CGA Staff

Background

On March 28, 2022 Governor Newsom issued [Drought Executive Order N-7-22](#) that included new well permitting requirements for local agencies to prepare for and lessen the effects of drought conditions (Action 9). The California Department of Water Resources released a “[Drought Well Permitting Requirements](#)” factsheet.

A representative from the County of Sacramento Environmental Management Department (well permitting agency for Sacramento County) will share details on Sacramento County's [new procedures](#) to comply with Executive Order N-7-22 and an accompanying [Compliance Bulletin](#).

The two new requirements that applicants must meet include:

1. A report signed, by a California licensed professional, such as a Professional Geologist with a Certified Hydrogeologist specialty certification or a Professional Engineer, the concludes both that extraction of groundwater from the well is not likely to interfere with the production and functions of existing nearby wells and is not likely to cause subsidence that would adversely impact or damage nearby infrastructure. (See Action 9(b) of Executive Order N-7-22)
2. If the well's location is within the North American, South American, Cosumnes, or Solano Subbasins, written concurrence that the proposed well would not be inconsistent with any applicable Groundwater Sustainability Plan adopted by the applicable Groundwater Sustainability Agency and would not decrease the likelihood of achieving a sustainability goal for the Subbasin. (See Action 9(a) of Executive Order N-7-22)

Groundwater wells that provide less than two (2) acre-feet per year of groundwater for individual domestic users or that will exclusively provide groundwater to public water supply systems are excluded from this requirement.

Additionally, current legislation (Assembly Bill 2201, Bennett), if passed, would codify similar permitting requirements.

Staff Recommendation

1. Provide direction on CGA's role in assisting GSAs and the County of Sacramento in complying with Executive Order N-7-22.

Agenda Item #6

Cosumnes Groundwater Authority Board of Directors Meeting

Agenda Date: June 20, 2022
Agenda Item #: 6
Agenda Item Subject: Staff Support Agreements
To: CGA Board of Directors
From: CGA Staff

Background

The Sloughhouse Resource Conservation District (SRCD)/CGA Administrative Services Memorandum Of Agreement (MOA) and the Southeast Sacramento County Agriculture Water Authority (SSCAWA)/CGA Watershed Coordinator Services MOA is set to expire on June 30, 2022.

On June 8, 2022 the SRCD Board authorized extending the Administrative Services MOA through June 30, 2023. The SSCAWA Board is anticipated to consider extending the Watershed Coordinator Services MOA at their July 2022 meeting.

Attachments:

- [Sloughhouse Resource Conservation District/CGA Administrative Services MOA](#)
 - Fiscal Year 2021-2022 Overview
- [Southeast Sacramento County Agriculture Water Authority/CGA Watershed Coordinator Services MOA](#)
 - Fiscal Year 2021-2022 Overview

Staff Recommendation

1. Authorize extending the SRCD and SSCAWA MOAs through June 30, 2023.

**Cosumnes Groundwater Authority and Sloughhouse Resource Conservation District
Administrative Services Agreement**

THIS AGREEMENT is made this 12th day of January 2022 between COSUMNES GROUNDWATER AUTHORITY (“CGA”), a California Joint Powers Authority, by and through its Board of Directors, and SLOUGHHOUSE RESOURCE CONSERVATION DISTRICT (“SRCD”), a California Resource Conservation District and a signatory to the CGA Joint Powers Agreement, by and through its Board of Directors.

RECITALS

WHEREAS, CGA and SRCD are independent public agencies, each participating in water management and planning within their respective boundaries; and

WHEREAS, the Parties wish to take advantage of staffing and management efficiencies potentially available to them, while providing for effective and locally knowledgeable management services within the groundwater basin; and

WHEREAS, CGA wishes to contract with SRCD to provide it certain management and watershed coordination services as delineated herein; and

WHEREAS, the services provided herein would be performed at the direction of the CGA Board, for the benefit of CGA and its members, including SRCD; and

WHEREAS, the Parties have the authority to contract for these services under the CGA Joint Powers Agreement and applicable provisions of California law; and

WHEREAS, the Districts intend for this initial Agreement to serve as a trial period for potential future cooperation.

AGREEMENT

NOW, THEREFORE, the Parties agree as follows:

1. Recitals. The Recitals above are incorporated and adopted as if fully set out herein.

2. Term of Agreement: The initial term of this Agreement shall commence on the date of its execution by both districts noted in the opening paragraph above, and continue until June 30, 2022. The initial term of this Agreement may be extended upon approval by the governing Board of each Party.

3. Services to be Performed: SRCD will provide staffing to perform the services identified in Exhibit A, according to the rate schedule provided therein.

4. Costs: There will be no additional fee for costs or office space. The Parties will

negotiate additional costs/fee share for shared facilities, equipment and projects as the need arises.

5. Billing: For the initial term of this Agreement, SRCD shall bill CGA for services provided on an hourly basis. SRCD will send CGA a monthly statement of the fees & costs incurred under this Agreement. SRCD's statements will clearly describe the basis for all charges and will itemize costs and expenses attributed to CGA under this Agreement. In the event that CGA objects to any fee or expense item, the Parties shall immediately meet and confer in an attempt to resolve the disagreement in an amicable fashion.

6. Relationship of Staff to Board/District: For the term of the Agreement, SRCD staff will remain SRCD employees. Nothing in this Agreement shall be construed as creating an employer-employee relationship between SRCD staff and CGA. The parties recognize that management and policy determinations for each Party are carried out under the direction and control of that entity's governing boards.

7. Conflicts between Parties: The Parties recognize that CGA and SRCD are each a distinct legal entity, and from time to time, their positions on items of mutual concern may differ. In the event of a conflict between the interests of the Districts, either presently occurring or potential, the Chair of each Board shall meet and confer in order to resolve the issue and develop a plan for staffing on that issue. In no case shall staff be required or expected to prioritize competing interests of the two Districts.

8. Indemnity. Each Party agrees, to the fullest extent permitted by law, to indemnify and hold the other Party and its trustees, officers, employees, agents or authorized volunteers harmless from any and all damages, liability or costs (including attorneys' fees and costs of defense) to the extent caused by the indemnifying Party's own negligent acts, errors or omissions or the negligent acts, errors or omissions of its contractors or sub-contractors or others for whom the indemnifying Party is legally liable.

9. Early Termination of the Agreement: The Agreement may be mutually terminated by the Parties at any time. The Agreement may be terminated by either party upon 60 days written notice of the termination. In the event of an early termination of this Agreement, the parties agree to cooperate in transitioning the services provided under this Agreement back to the respective parties. Termination shall not relieve any Party of its financial obligations arising under this Agreement prior to the effective date of the termination, including but not limited to financial obligations or guarantees for loans provided by individual Parties, if applicable.

GENERAL

10. Entire Agreement. This MOA constitutes the entire agreement between the Parties and supersedes all prior agreements and understandings, written or oral. This MOA may be amended from time to time by written agreement executed by the Parties.

11. Severability. If one or more clauses, sentences, paragraphs or provisions of this MOA are held to be unlawful, invalid or unenforceable, it is hereby agreed by the Parties that the remainder of the MOA shall not be affected thereby. Such clauses, sentences, paragraphs or

provisions shall be deemed reformed so as to be lawful, valid and enforced to the maximum extent possible.

12. Headings. The paragraph headings used in this MOA are intended for convenience only and shall not be used in interpreting this MOA or in determining any of the rights or obligations of the Parties to this MOA.


13. Construction and Interpretation. This MOA has been arrived at through negotiation and each Party has had a full and fair opportunity to revise the terms of this MOA. As a result, the normal rule of construction that any ambiguities are to be resolved against the drafting Party shall not apply in the construction or interpretation of this MOA.

14. Waivers. Waiver of any breach or default hereunder shall not constitute a continuing waiver or a waiver of any subsequent breach either of the same or of another provision of this Agreement and forbearance to enforce one or more of the remedies provided in this MOA shall not be deemed to be a waiver of that remedy.

15. Third Party Beneficiaries. This MOA shall not create any right or interest in any non-Party or in any member of the public as a third party beneficiary.

16. Counterparts. This MOA may be executed by the Parties in separate counterparts, each of which when so executed and delivered shall be an original. All such counterparts shall together constitute but one and the same instrument.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement:

 <i>Herb Garms, Chair</i> <i>Sloughhouse Resource Conservation District</i>	<i>1/12/22</i> <i>Dated:</i>
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 <i>Lindsey Liebig, Chair</i> <i>Cosumnes Groundwater Authority</i>	<i>1/12/22</i> <i>Dated:</i>
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EXHIBIT A

SERVICES TO BE PROVIDED

Task 1: Serve as Cosumnes Groundwater Authority Administrator

- a. Assist the Board of Directors in carrying out their policies and procedures.
- b. Serve as the Board Clerk.

Task 2: SGMA Activities

- a. Serve as the Interim Cosumnes Subbasin Groundwater Sustainability Plan's Plan Manager and be responsible for the implementation of said Plan.
- b. Contract with consultants for SGMA related activities including, but not limited to, preparation of an Annual Report to DWR, gathering data from the Cosumnes Subbasin Monitoring Network for Water Year 2022, and maintenance of a Data Management System.

Task 3: Outreach and Engagement

- a. Serve as the Cosumnes Subbasin Public Information Officer and respond to all questions/requests from the public, media, and other stakeholders. Coordinate with GSA reps as warranted.
- b. Coordinate the creation and implementation of a Cosumnes Subbasin Citizen Advisory Committee.

Task 4: Contract and Fiscal Management

- a. Serve as the Cosumnes Groundwater Authority Treasurer.
- b. Assist Watershed Coordinator with identifying and pursuing funding opportunities.
- c. Provide oversight of Cosumnes Groundwater Authority contracts.

Task 5: Miscellaneous

- a. Work with the Board of Directors to identify staffing needs and recruit staff as needed.
- b. Work collaboratively with the Cosumnes Subbasin Watershed Coordinator to ensure adequate staffing is provided to all tasks.
- c. Other tasks and responsibilities identified by the Board of Directors and agreed to by Sloughhouse RCD.

Task	Hourly Rate	Total Monthly Hours	Total Monthly Costs
Task 1	\$80	15	\$1,200
Task 2	\$80	25	\$2,000
Task 3	\$80	15	\$1,200
Task 4	\$80	15	\$1,200
Task 5	\$80	10	\$800
Monthly Total		80	\$6,400
Agreement Total		560	\$44,800

SLOUGHHOUSE RCD

Cosumnes Groundwater Authority - MOA Hours Track

Fiscal Year: 2021-2022

Month	Task 1	Task 2	Task 3	Task 4	Task 5	Total
December	26	14	14	9	17	80
January	22	11	16	17	14	80
February	21	16	14	16	13	80
March	19	8	19	22	12	80
April	26	14	20	10	10	80
May	22	14	16	16	12	80
June	0	0	0	0	0	0
TOTALS	136	77	99	90	78	480

**Cosumnes Groundwater Authority and Southeast Sacramento County Agricultural Water
Authority
Groundwater Management Services Agreement**

THIS AGREEMENT is made this 11th day of January, 2022 between Cosumnes Groundwater Authority (“CGA”), a California Joint Powers Authority, by and through its Board of Directors, and SOUTHEAST SACRAMENTO AGRICULTURAL WATER AUTHORITY (“SSCAWA”), a California Joint Powers Authority, by and through its Board of Directors.

RECITALS

WHEREAS, CGA and SSCAWA are independent public agencies, each participating in groundwater management and planning within their respective boundaries; and

WHEREAS, the Parties wish to take advantage of staffing and management efficiencies potentially available to them, while providing for effective and locally knowledgeable management services within their groundwater basin; and

WHEREAS, CGA wishes to contract with SSCAWA to provide it certain management and watershed coordination services as delineated herein; and

WHEREAS, the services provided herein would be performed at the direction of the CGA Board, for the benefit of CGA and its members; and

WHEREAS, the Parties have the authority to contract for these services under their respective joint powers agreements, and other applicable provisions of California law; and

WHEREAS, the Parties intend for this initial Agreement to serve as a trial period for potential future staffing cooperation.

AGREEMENT

NOW, THEREFORE, the Parties agree as follows:

1. Recitals. The Recitals above are incorporated and adopted as if fully set out herein.

2. Term of Agreement: The initial term of this Agreement shall commence on the date of its execution by both parties noted in the opening paragraph above, and continue until June 30, 2021. The initial term of this Agreement may be extended upon approval by the governing Board of each Party.

3. Services to be Performed: SSCAWA will provide staffing to perform the services identified in Exhibit A, according to the rate schedule provided therein.

4. Costs: There will be no additional fee for costs or office space. The Parties will negotiate additional costs/fee share for shared facilities, equipment and projects as the need arises.

5. Billing: For the initial term of this Agreement, SSCAWA shall bill CGA for services provided on an hourly basis. SSCAWA will send CGA a monthly statement of the fees & costs incurred under this Agreement. SSCAWA's statements will clearly describe the basis for all charges and will itemize costs and expenses attributed to CGA under this Agreement. In the event that CGA objects to any fee or expense item, the Parties shall immediately meet and confer in an attempt to resolve the disagreement in an amicable fashion.

6. Relationship of Staff to Board/Authority: For the term of the Agreement, SSCAWA staff will remain SSCAWA employees and contractors. Nothing in this Agreement shall be construed as creating an employer-employee relationship between SSCAWA staff and CGA. The parties recognize that management and policy determinations for each Party are carried out under the direction and control of that entity's governing boards.

7. Conflicts between Parties: The Parties recognize that CGA and SSCAWA are each a distinct legal entity, and from time to time, their positions on items of mutual concern may differ. In the event of a conflict between the interests of the Parties, either presently occurring or potential, the President of each Board shall meet and confer in order to resolve the issue and develop a plan for staffing on that issue. In no case shall staff be required or expected to prioritize competing interests of the two Parties.

8. Indemnity. Each Party agrees, to the fullest extent permitted by law, to indemnify and hold the other Party and its trustees, officers, employees, agents or authorized volunteers harmless from any and all damages, liability or costs (including attorneys' fees and costs of defense) to the extent caused by the indemnifying Party's own negligent acts, errors or omissions or the negligent acts, errors or omissions of its contractors or sub-contractors or others for whom the indemnifying Party is legally liable.

9. Early Termination of the Agreement: The Agreement may be mutually terminated by the Parties at any time. The Agreement may be terminated by either party upon 60 days written notice of the termination. In the event of an early termination of this Agreement, the parties agree to cooperate in transitioning the services provided under this Agreement back to the respective parties.

GENERAL

10. Entire Agreement. This MOU constitutes the entire agreement between the Parties and supersedes all prior agreements and understandings, written or oral. This MOU may be amended from time to time by written agreement executed by the Parties.

11. Severability. If one or more clauses, sentences, paragraphs or provisions of this MOU are held to be unlawful, invalid or unenforceable, it is hereby agreed by the Parties that the remainder of the MOU shall not be affected thereby. Such clauses, sentences, paragraphs or provisions shall be deemed reformed so as to be lawful, valid and enforced to the maximum extent possible.

12. Headings. The paragraph headings used in this MOU are intended for convenience only and shall not be used in interpreting this MOU or in determining any of the rights or obligations of the Parties to this MOU.

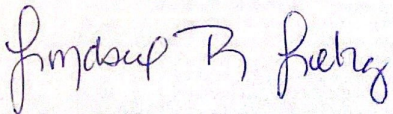
13. Construction and Interpretation. This MOU has been arrived at through negotiation and each Party has had a full and fair opportunity to revise the terms of this MOU. As a result, the normal rule of construction that any ambiguities are to be resolved against the drafting Party shall not apply in the construction or interpretation of this MOU.

14. Waivers. Waiver of any breach or default hereunder shall not constitute a continuing waiver or a waiver of any subsequent breach either of the same or of another provision of this Agreement and forbearance to enforce one or more of the remedies provided in this MOU shall not be deemed to be a waiver of that remedy.

15. Third Party Beneficiaries. This MOU shall not create any right or interest in any non-Party or in any member of the public as a third party beneficiary.

16. Counterparts. This MOU may be executed by the Parties in separate counterparts, each of which when so executed and delivered shall be an original. All such counterparts shall together constitute but one and the same instrument.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement:

<i>Leo VanWarmerdam, President Southeast Sacramento County Agricultural Water Authority</i>	<i>Dated:</i>
 <i>Lindsey Leibig, Chair Cosumnes Groundwater Authority</i>	<i>1/11/22</i> <i>Dated:</i>

Southeast Sacramento County Agricultural Water Authority

Cosumnes Groundwater Authority - MOA Hours Track

Fiscal Year:

2021-2022

Month	Task 1	Task 2	Task 3	Task 4	Total	
December	29.5	14	8.5	6	58	
January	37.5	8	1.5	11	58	
February	30	13.5	4.5	10	58	
March	33	15.5	4.5	5	58	
April	30.5	18	2	7.5	58	
May	34.5	4.5	15.5	3.5	58	
June					0	
TOTALS	195	73.5	36.5	43	348	

Agenda Item #7

Cosumnes Groundwater Authority Board of Directors Meeting

Agenda Date: June 20, 2022
Agenda Item #: 7
Agenda Item Subject: Outreach and Engagement
To: CGA Board of Directors
From: CGA Staff

Background

The first Citizen Advisory Committee (CAC) meeting was held on June 9th. The primary focus of the meeting was to establish the new committee, discuss how the group would be involved with other CGA efforts, and how to improve our Outreach & Engagement. Future CAC meetings will focus on Projects & Management Actions, Long-Term Funding, and other SGMA related topics. We have received two applications to join the Citizen Advisory Committee since the May 2022 CGA meeting: Belinda Ellis and Mark Nelson.

As part of the support we receive from the DWR Facilitation Support Services, CBI and CGA Staff will be preparing for an update to the Cosumnes Subbasin Outreach & Engagement Plan.

CGA and CBI Staff will be preparing to hold a public workshop in the late summer. As the first public workshop of the Cosumnes Groundwater Authority, the workshop will highlight our efforts to date as well as community feedback on the Priority Projects List (currently being developed by the Projects Committee).

Attachments:

- Citizen Advisory Committee Applications:
 - Belinda Ellis
 - Mark Nelson

Staff Recommendation

1. Consider interested applicants to serve on the Citizen Advisory Committee.

**Cosumnes Groundwater Authority
Citizen Advisory Committee**

Committee Member Application

**Next application
review deadline:
May 10, 2022**

The Cosumnes Groundwater Authority (CGA) is soliciting applications for membership on the CGA Citizen Advisory Committee (CAC). The CAC will serve as an advisory role to the CGA Board of Directors and provide direct feedback on implementation of the Cosumnes Subbasin Groundwater Sustainability Plan (GSP). Members will develop a mutual understanding of and provide feedback on a variety of aspects of the GSP including, but not limited to, funding mechanisms, projects and management actions, outreach, monitoring, and more. It is anticipated that the CAC will meet once quarterly.

If you are interested in serving on the CAC, please review the Cosumnes Subbasin GSP website, review the CAC overview, complete this application, and submit it to CGA Staff. The Application may be submitted in person to staff, mailed USPS, or emailed to the address below. Staff will then work with the CGA Board to put the consideration of new members on an upcoming agenda of the Board. Applicants will be invited to participant at that meeting but are not required to attend. You will be advised by the Board if you are appointed to serve as a CAC member.

Austin Miller, 8970 Elk Grove Blvd., Elk Grove, CA 95624 Phone: 916-526-5447
Email: info@CosumnesGroundwater.org

NAME: Belinda Ellis
RESIDENCE ADDRESS: 14180 Joy Dr. Galt 95632
BUSINESS OR MAILING ADDRESS: same
PHONE (DAYTIME): (209) 745-2581 PHONE (EVENING): (916) 826-9809

Please provide a brief description of your background and qualifications and any other relevant documents you believe support your eligibility and nomination, including relevant experience and/or education, with particular emphasis on factors that demonstrate an interest in groundwater conservation, an ability to serve as a information conduit to a wider community of water users, and a demonstrated commitment to productive and collaborative dialogue. (Please include additional pages as needed.)

My name is Belinda Ellis. I have been the District Manager of the Galt Arno Cemetery District since September 2016. Water is important to keep the cemetery green - The residents of Galt and those with loved ones interred here want the final resting place of their loved ones kept green and beautiful. I want to work with and help develop programs that will conserve our groundwater and continue to water where necessary. It is going to take a great deal of work to conserve with care.

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Citizen Advisory Committee**

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Austin Miller, 8970 Elk Grove Blvd., Elk Grove, CA 95624 Phone: 916-526-5447
Email: info@CosumnesGroundwater.org

.....

NAME: K. Mark Nelson
RESIDENCE ADDRESS: 12211 Pear Lane, Wilton, 95693
BUSINESS OR MAILING ADDRESS: SAME
PHONE (DAYTIME): 916 849 5558 PHONE (EVENING): SAME

Please provide a brief description of your background and qualifications and any other relevant documents you believe support your eligibility and nomination, including relevant experience and/or education, with particular emphasis on factors that demonstrate an interest in groundwater conservation, an ability to serve as a information conduit to a wider community of water users, and a demonstrated commitment to productive and collaborative dialogue. (Please include additional pages as needed.)

I am a rancher/farmer in Wilton. My ranch has a mile of frontage on the Cosumnes. We have grapes, cattle and horses. I lived here since 1976.

Please see attached Resume

K. MARK NELSON

12211 PEAR LANE
WILTON, CA 95693
(916) 849-5558 CELL

EDUCATION:

Glendale College, AA Degree
University of California, Irvine, BA Economics
Most Valuable Player-Basketball-Glendale and UCI

REAL ESTATE HISTORY:

1968 Coldwell Banker-Beverly Hills Office—Property Management for 15 months.

1969 Coldwell Banker-Sacramento Office—Industrial Salesman earning the Sales Associate award at the youngest age in the history of the company at that time. Projects included the Johnston Industrial Park, Park Executive Plaza (10th and L Streets), sold 130 acres to Don Koll Company in the Point West Area and at I-5 and Richards Blvd. (33 acres) and at Point West (97 acres).

1973 Don Koll Company- Newport Beach Office—worked with Lee Sammis and Don Koll developing a Master Plan for the 130 acres in Sacramento.

1974 Lee Sammis Company—Sacramento Office—In December of 1974, I started the Lee Sammis Company with Lee, Sam Lindsay, and John Hagestad. We did major office projects, retail projects, and residential developments in Sacramento, Walnut Creek, Diamond Bar and several other small adjoining communities. Our partners were Intereal Company (Nashville, TN), Connecticut General, New England Mutual, Aetna, Sacramento Savings, Heart Federal Savings and others.

Major projects included:

Point West Office Park, 660,000 SF of garden office buildings including the twin five story reflective glass buildings at Expo Blvd. and Interstate 80.

Rollingwood (Fair Oaks), 352-acre PUD that earned the Pacific Coast Builders Conference Most Innovative Land Plan Award 1976.

Corporate Center, 175,000 SF Class A structure located at the corner of Fifth and J Streets. The project also had a 155 space parking structure attached to it. We were the first to comply with the “Arts in Public Places” program by purchasing the George Rickey kinetic sculpture (Sixth and J Streets) and the Debbie Butterfield horse sculpture (Fifth and J Streets).

The Willows (Concord), major rehab of a specialty shopping center located on Interstate 680.

South Natomas, 500 acres of residential lots created and mapped. In some cases, the lots were improved for builders or we sold “paper lots”. We also zoned 100+ acres of office ground for our own account and other landowners.

Retail Centers, retail strip centers ranging in size from 25,000 SF to 180,000 SF.

Diamond Bar, several retail strip centers.

Pleasanton, Three-story office building and restaurant pads on I-580.

1985 Started Nelson Rodgers Company and developed several projects in and around Sacramento. Our joint venture partners were Heart Federal Savings and Loan and Sacramento Savings.

Antelope Area, Joint Venture with Sac Savings on 40+ acres of residential land that we did a paper lot subdivision and sold to major homebuilders.

Spink Building, build to suit (40,000 SF) for the Spink Corporation in South Natomas.

- Wallace Kuhl Building**, This was a build to suit for the soils engineering firm in the West Sacramento Port Center.
- South Placer Business Center**, 230,000 SF “flex” Business Park, tenants included Roseville Hospital and Kaiser Hospital amongst others.
- Sheldon Park Estates**, 36 two-acre estate lots in Elk Grove.
- Abbie Lane**, 10 two-acre estate lots in Elk Grove.
- 1986** Acquired Canyon Center, Reno, Nevada, 25,000 SF retail center anchored by Albertson’s and five pads including Bank of America, Hollywood Video, and Schlotzky’s Deli
- 1987** Founded Sacramento Commercial Bank and was Vice Chair for 10 years. We sold the bank in 1996. During our ownership we were the first and most successful bank to do real estate joint ventures. We were also the leading SBA lender in the region.
- 1994** Started the Elk Grove Auto Mall rezone and eventual development with Lee Sammis. Phase I finished in 1998, and Phase II was completed in 2004. Phase III is also sold. Our buyers include Chevrolet, Ford, GMC Pontiac and Buick, Honda, Toyota, Nissan, VW Acura, Infiniti, BMW, Saturn, Subaru and Kia, a Lincoln Mercury Volvo dealer, and a Suzuki Mitsubishi dealer. The Elk Grove Auto Mall is a 127-acre project.
- 2000** **Sheldon Hills**, 20-two acre estate lots in Elk Grove
- 2001** **Sleepy Hollow**, 20-two acre lots in Elk Grove that will was built and sold in 2004 to Morrison Homes.
- 2002** **Creekside Retail, LLC**, A 25,000 SF retail development completed in December 2005. The center is 100% leased at completion.
- 2003** **Waterman Grove, LLC**, A 48, 000 SF retail development completed in December 2005. Leasing is at 90% with the best retail pad on the main corner left for key designated tenants. This center was sold and closed in March, 2009.
- 2004** **East Crossing Pointe**, A 26,000 SF retail strip center site in Elk Grove at the corner of Bradshaw and Elk Grove Blvd. Site plan and design approvals were granted by the City of Elk Grove in May 2006. The site was sold to another developer in 2008.
- 2005** **North Natomas Retail Center**, This is a 2.1-acre site in the very active North Natomas area within a long block of Arco Arena and I-5 at Arena Boulevard. It will have 20,385 SF located on the corner of Arena Blvd. and East Commerce Drive.
- 2011** Started Five Star Land Company an agricultural real estate marketing company. We’ve marketed major grass ranches, walnut and almond properties, grape vineyards and rice farms since our inception. We’ve also specialized in marketing major equestrian properties.

PERSONAL ACTIVITIES:

California Cattleman’s Assn. President, 11/2006 through 11/2008
NCBA Membership Chairman, Budget Committee Member
NCBA PAC, Vice Chairman
NCBA Board of Directors
Western States Angus, Past President
AAU Basketball Coach and sponsor of an inner city club basketball club team
UCI Alumni Assn. Lauds and Laurels recipient 2004

UCI Hall of Fame Recipient

Sacramento Commercial Bank, Past Founder, Director, and Vice Chairman

Sacramento Country Day School, Past Board of Trustee Member

Elk Grove Rotary Club, Past Director

Pacific Coast Cutting Horse Association, Past Board Member

California Rangeland Trust, Current Emeritus Board Member

California Rangeland Trust, Past Board Chairman & Co-Chair

California Farm Bureau

California State Fair, Past Board Member and Chairman

Rancheros Visitadores

**Cosumnes Groundwater Authority
Board of Directors Meeting**

Agenda Date: June 20, 2022

Agenda Item #: 8

Agenda Item Subject: Projects Committee Update

To: CGA Board of Directors

From: CGA Staff

Background

At the May CGA Board Meeting, a Request for Qualifications (RFQ) to find a consultant for project scoping was approved. On May 27, 2022, the RFQ was posted to the CGA website and emailed to our listserv. Three Statement of Qualifications (SOQs) were received.

Attachments

- [SOQ - EKI Environment & Water, Inc](#)
 - Subconsultant: Larry Walker and Associates
 - Subconsultant: Land IQ
- [SOQ - GEI Consultants Inc.](#)
 - Subconsultant: ERA Economics
 - Subconsultant: Ramboll
- [SOQ - Cali Consulting Service Inc.](#)

Staff Recommendation

- Direct the PMA Committee to interview the interested firms and to schedule a Special Meeting in early July for consultant selection.

Statement of Qualifications

Groundwater Management Services

for the Cosumnes Subbasin



A. COVER LETTER

14 June 2022

Cosumnes Groundwater Authority
8970 Elk Grove Boulevard, Elk Grove, CA 95624
Attn: Stephen Julian sJulian@cosumnesgroundwater.org

Subject: REQUEST FOR QUALIFICATIONS – Groundwater Management Services (EKI C2-144)

Dear Mr. Julian:

EKI Environment & Water, Inc. (EKI) has assembled a broad and robust team (the “EKI Team”) of hydrogeologists, engineers, soil scientists, remote sensing specialists, agronomists, agricultural specialists, geographic information system (GIS) analysts and web application developers. The EKI Team consists of highly qualified individuals from EKI, Larry Walker Associates (LWA), and Land IQ that also includes a consortium of Agricultural Specialists. The EKI Team’s collective skill, experience, and familiarity with the Cosumnes Subbasin and Cosumnes Subbasin Groundwater Sustainability Plan (GSP) is unmatched, making us uniquely qualified to provide Groundwater Management Services to the Cosumnes Groundwater Authority (CGA).

Herein, we provide firm descriptions, example projects, and resumes for key members of the EKI Team. Owing to our decades of proven leadership and broad water resources experience (including in the Cosumnes Subbasin), EKI will serve as the Project Manager and will be responsible for the coordination of firms and individuals as necessary to successfully complete each requested task. EKI has demonstrated our competent project management skills through the development of the GSP, and our continued involvement in GSP implementation will: (1) reduce the workload for CGA, and (2) provide CGA with a single point of contact and access to the wide variety of technical skills and resources required to produce high value and reliable work products. As Project Manager, EKI has preliminarily recommended leads for the work tasks as described by the CGA. However, task assignments will be finalized in coordination with CGA and the EKI Team.

EKI understands the CGA’s desire to conduct work efforts in a cost-effective manner. We have demonstrated our ability to adhere to established budgets and schedules. Accordingly, we have submitted this response to meet the Request for Qualifications (RFQ) requirements. However, we are happy to provide supplemental information if requested by the CGA and look forward to the opportunity to continue working with the Groundwater Sustainability Agencies (GSAs) and local landowners on this important endeavor.

Very truly yours,

EKI ENVIRONMENT & WATER, INC.



Anona Dutton, PG, CHG
Vice President



John Fio
Principal in Charge

B. INTRODUCTION

The EKI Team (which consists of highly qualified individuals from EKI Environment & Water, Inc. [EKI], Larry Walker Associates [LWA], Land IQ, and a consortium of Agricultural Specialists) understands that the Cosumnes Groundwater Authority (CGA) is seeking a qualified firm or team to assist the Board of Directors develop Project and Management Actions (PMAs) to support implementation of the Cosumnes Subbasin (Basin) Groundwater Sustainability Plan (GSP). Specifically, per their Request for Qualifications develop a voluntary irrigation water conservation program and explore opportunities for implementing small scale groundwater recharge projects in suitable locations. While the exact services will be determined by the CGA Governing Board, we understand the tasks are likely to include preparation and/or review of a broad range of technical studies; analysis of historical, current, and projected future groundwater conditions; evaluation of proposed PMAs; working with individual land owners; implementation of multi-scaled groundwater recharge projects throughout the Basin; and participation in various meetings with the CGA Governing Board, sub committees, and the public. This section describes the key elements of the EKI Team's technical approach and demonstrates our understanding of the critical issues that will impact the program's implementation and effectiveness.

SGMA Implementation in the Cosumnes Subbasin

As a medium-priority groundwater basin, the Basin is subject to the Sustainable Groundwater Management Act (SGMA). To date, efforts to comply with SGMA in the Basin have included the following, much of it conducted with technical and strategic support from EKI who has been actively supporting the Basin Groundwater Sustainability Agencies (GSAs) since July 2017:

- 1) Formation of seven GSAs covering the entire Basin, including Omoichumne-Hartnell Water District (OHWD), Sloughhouse Resource Conservation District (SRCD), Galt Irrigation District, Clay Water District, City of Galt, Amador County Groundwater Management Authority, and Sacramento County;
- 2) Successful procurement and administration of Proposition 1 and 68 grant, Technical Support Services, Facilitation Support Services, and Department of Conservation Watershed Coordinator grant funds to support GSP development and administration;
- 3) Preparation, adoption, and submittal by the GSAs of a single GSP for the Basin in January 2022;
- 4) Performance of initial GSP implementation activities including migration of governance from the Cosumnes Subbasin SGMA Working Group to the CGA, passage of an irrigated acreage fee, collection of monitoring data, updates to the numerical groundwater model, and preparation and submittal of the first Annual Report which covered Water Year (WY) 2021; and,
- 5) Ongoing public and stakeholder outreach, including formation of a Citizen Advisory Committee, regarding the GSAs' efforts to achieve the Basin's Sustainability Goal.

The CGA was formed by a Joint Powers Agreement between the seven GSAs. The CGA jurisdictional area is coincident with the Basin boundaries and consists of roughly 210,300 acres in the northern region of the San Joaquin Valley Groundwater Basin, within Amador and Sacramento Counties. The land use within the Basin includes a variety of agricultural, grazing, and managed conservation areas. Municipal and domestic land and water uses include the City of Galt, City of Ione, Amador Water Agency, Jackson Valley Irrigation District, unincorporated communities and rural landowners. Water demands within the Basin

are predominantly met using groundwater, with some landowners or GSAs having access and rights to surface water.

The Cosumnes Subbasin GSP reports historical and current groundwater conditions based on the best available data at the time of preparation. Additionally, the Cosumnes Subbasin Water Year (WY) 2021 Annual Report provides an update on groundwater conditions since 2015. As described in the Cosumnes Subbasin GSP and the Annual Report and as shown in the related hydrographs, measured groundwater levels in the Basin have generally shown a long-term decline. To stabilize water levels and manage groundwater supplies within the Basin's sustainable yield, the CGA plans to utilize a combination of wet year supplies to augment recharge, new supplies to augment recharge, and land repurposing and conservation to reduce groundwater consumption, as outlined in the Cosumnes Subbasin GSP Guiding Principles for PMAs.

C. THE EKI TEAM

EKI Environment & Water, Inc. (EKI) assembled a team (the “EKI Team”) of scientists, engineers, and agricultural specialists to complete the tasks listed in the Request for Qualifications (RFQ). Each member of the EKI Team was selected based on technical skill, familiarity with the Cosumnes Subbasin (Basin), and experience with Sustainable Groundwater Management Act (SGMA) matters and the requisite hydrologic/groundwater analyses. The EKI Team specifically consists highly qualified individuals from EKI, Larry Walker Associates (LWA), Land IQ, and includes a consortium of Agricultural Specialists. As illustrated below, EKI is the proposed Project Manager and will facilitate coordination between the Cosumnes Groundwater Authority (CGA) and technical consultant activities on the four major work tasks:

1. Voluntary Land Repurposing.
2. Conservation and Water Use Efficiency.
3. Small Scale Recharge Projects.
4. Data Collection, Data Gaps, and Groundwater Monitoring to Support Refinement of Numeric Model.

EKI is also proposed to lead work efforts on *Task 1 Voluntary Land Repurposing* and *Task 4 Data Collection, Data Gaps, and Groundwater Monitoring to Support Refinement of Numeric Model*. EKI has been involved in numerous multi-benefit land repurposing projects and has developed a geographic information system (GIS)-based screening tool using ArcGIS that automatically processes multiple geospatial data sets to identify the most promising candidate locations for repurposing. The screening tool identifies candidate locations with a systematic ranking and screening of the geospatial datasets using a customized, value-based scoring framework for each dataset/criterion developed in consultation with our clients. EKI has been involved in data collection and monitoring activities in basins throughout California; additionally EKI worked with CGA members to develop the monitoring plan and representative monitoring networks within the Basin as part of our work to develop the Cosumnes Subbasin Groundwater Sustainability Plan (GSP).

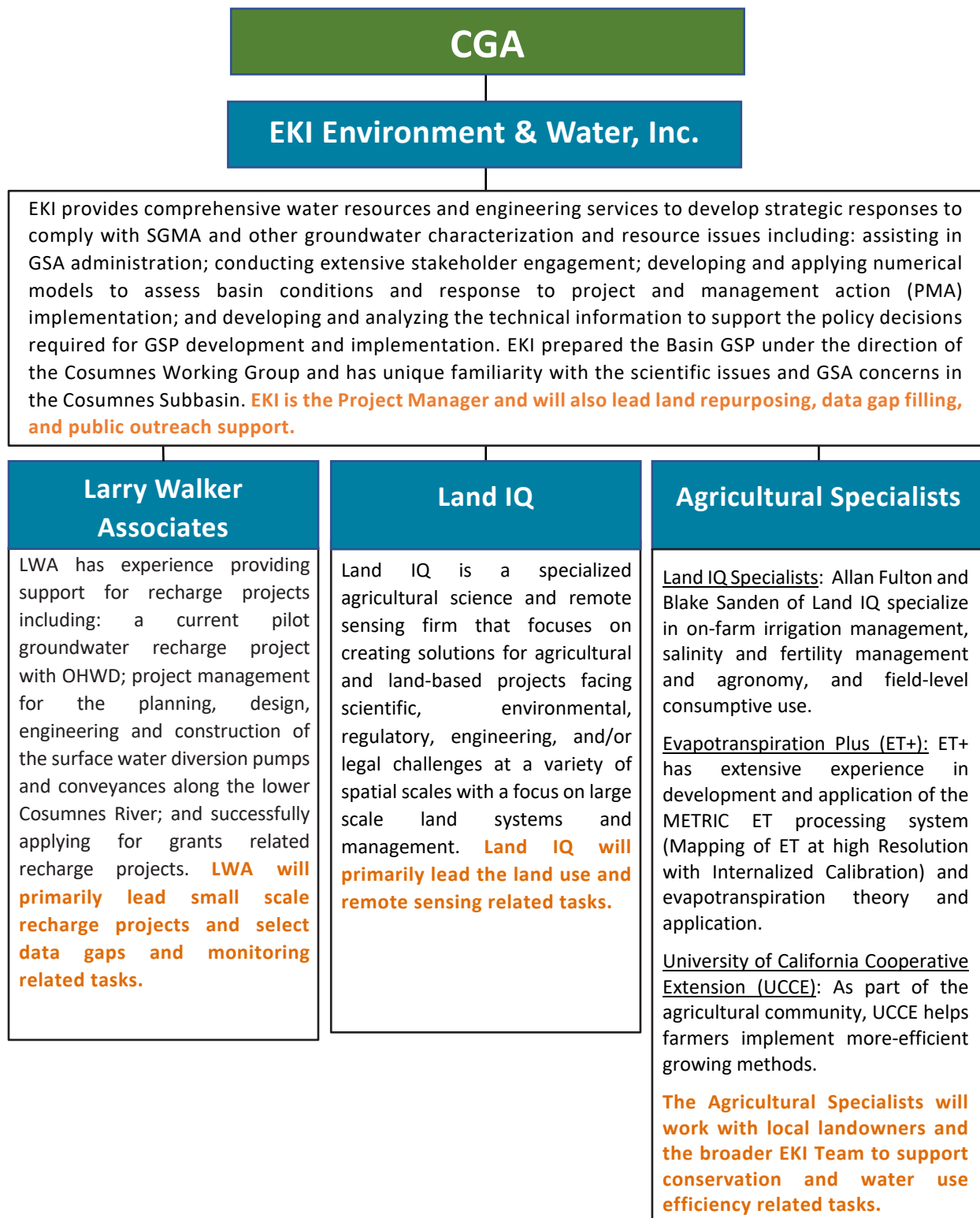
LWA is proposed to lead work efforts on *Task 3 Small Scale Recharge Projects*. LWA has experience providing support for recharge projects including the pilot groundwater recharge project with the Omoichumne-Hartnell Water District (OHWD), one of the Basin Groundwater Sustainability Agencies (GSAs). In that role, LWA is responsible for project management, preparation and submittal of annual diversion permits and reports, data monitoring and assessing benefits from the recharge. Finally, LWA can provide expertise in filling data gaps associated with surface water under *Task 4 Data Collection, Data Gaps, and Groundwater Monitoring to Support Refinement of Numeric Model* by expanding the existing Basin monitoring network, including the installation of new stream gages and multi-depth monitoring sites along the Cosumnes River and Dry Creek.

Land and water use evaluations rely on verifiable mapping information. Therefore, Land IQ is a key participant in *Tasks 1, 2, and 4*. Land IQ’s unparalleled expertise in large- and small scale land use mapping and software development in basins across the state will provide critical support to the Basin’s current land and agricultural water use estimates.

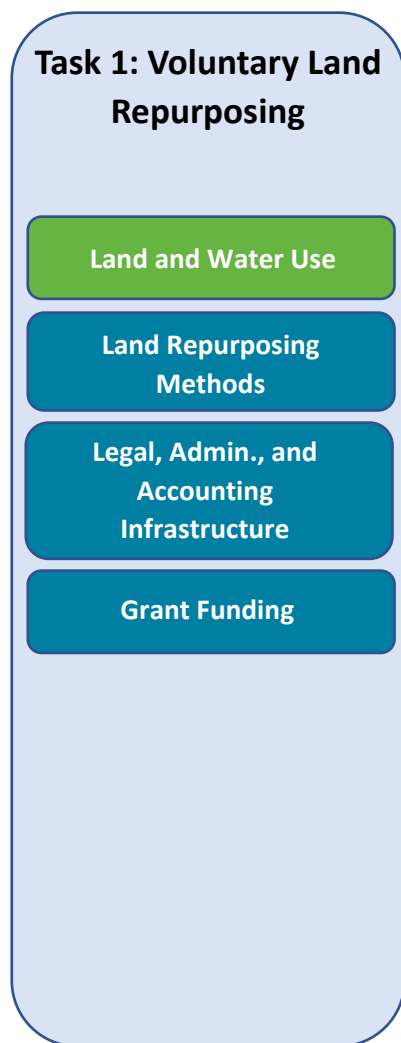
Agricultural Specialists will be relied upon to work with local landowners during *Task 2 Conservation and Water Use Efficiency*. Their extensive expertise as farm advisors and evapotranspiration (ET) specialists bring the necessary knowledge of irrigated land practices, irrigation management best practices for crops and pastures, and ability to connect with landowners to recommend land and irrigation system

improvements. Their participation will be critical in identifying specific conservation practices for implementation in the Basin.

Proposed Organization of the Project Team



As Project Manager and with our unique familiarity with the Basin's interests, concerns, and stakeholders, EKI will closely coordinate and participate in most of the work tasks identified by the CGA ensuring the CGA receives high-quality deliverables. Anticipated leads for the work tasks identified by the CGA are preliminarily proposed below, but final assignments will be determined in coordination with CGA. The flexibility afforded by this approach ultimately maximizes work product value and benefit.



LAND AND WATER USE

Under Stephanie Tillman's direction, who has specialized experience with beneficial reuse projects, Land IQ can support the Land and Water Use component of the Voluntary Land Repurposing Task

LAND REPURPOSING METHODS

EKI staff Chris Heppner, Christina Lucero and Susan Xie are available to utilize their experience supporting land repurposing efforts as part of GSP implementation.

LEGAL, ADMIN, AND ACCOUNTING INFRASTRUCTURE

EKI, under Anona Dutton's direction, can utilize our vast knowledge gained through supporting GSA's formation and coordination throughout California to assist the CGA in developing administrative infrastructure.

GRANT FUNDING

Building off the successful Proposition 1 and 68 grant application and administration in both the Cosumnes Subbasin and three other subbasins, EKI (Kristyn Lindhart and John Fio) can fully support grant funding and administration.

Legend



Task 1. Project Subtasks by Identified Consultant

Task 2: Conservation/ Water Use Efficiency

Farmer Interest and Ideas

Specific Conservation
Practices

Farm-by-Farm Water
Accounting

Feasibility of
Compensation

Financial Assistance and
Government Programs

Grant Funding

Legend

EKI

LWA

Land IQ

Agricultural Specialists

Task 2. Project Subtasks by
Identified Consultant

FARMER INTEREST AND IDEAS

With over 40 years of experience working in the agricultural community, Allan Fulton and Blake Sanden, with assistance from the University of California Cooperative (UCCE) can connect the local farming community and EKI Team to ensure local farmers' interests and ideas are identified and considered.

SPECIFIC CONSERVATION PRACTICES

UCCE, Allan Fulton, and Blake Sanden have extensive knowledge of irrigated land practices for crops and pasture, and have worked with farmers across the state. Additional technical support from Evapotranspiration Plus (ET+) can ascertain the most effective conservation practices are selected and implemented.

FARM-BY-FARM WATER ACCOUNTING

Land IQ's team of Certified Crop Advisors (Adriana Delucchi, Seth Mulder, and Stephanie Tillman), Certified Professional Agronomists (Seth Mulder and Stephanie Tillman), Agricultural Irrigation Specialist (Adriana Delucchi), and Certified Professional Soil Scientists (Joel Kimmelshue and Stephanie Tillman) with specialized background in developing water and soil management systems, are recommended for farm-by-farm water use accounting.

FEASIBILITY OF COMPENSATION

Tyler Colyer with EKI has proven experience completing cost-benefit analysis for concept screening and strategic planning and can support the EKI Team assess the feasibility of compensating farmers based on selected conservation practices.

FINANCIAL ASSISTANCE AND GOVERNMENT PROGRAMS

With their combined knowledge of federal, state, and local resources and programs, Allan Fulton, Blake Sanden, and the UCCE, can ensure the CGA, and/or farmers, efficiently and competitively apply for available assistance programs.

GRANT FUNDING

Building off the successful Proposition 1 and 68 grant application and administration in both the Cosumnes Subbasin and three other subbasins, along with other past successful grant solicitations through the Urban and Multibenefit Drought Relief grant program, EKI staff are fully committed to support grant funding and administration.

Task 3: Small Scale Recharge Projects

Recharge Project Ideas

Recharge Project Benefit Including Costs and Financing Options

Incorporate Recharge Projects into Grant Applications

Legend

EKI

LWA

Land IQ

Agricultural Specialists

Task 3. Project Subtasks by Identified Consultant

RECHARGE PROJECT IDEAS

LWA (Laura Foglia, Andrew Calderwood and Ryan Fulton) are prepared to build off recent experiences identifying potential recharge projects including an active project in OHWD.

RECHARGE PROJECT BENEFIT INCLUDING COSTS AND FINANCING OPTIONS

LWA, under the direction of Laura Foglia, can build off recent experience assessing project benefits including costs and financing options.

INCORPORATE RECHARGE PROJECTS INTO GRANT APPLICATIONS

Building off the successful grant applications through the National Fish and Wildlife Foundation and the Westside Sacramento Integrated Regional Water Management (IRWM) program, Laura Foglia and Ryan Fulton of LWA are recommended to support incorporation of recharge projects in to grant funding applications.



Legend



Task 4. Project Subtasks by Identified Consultant

DATA GAPS

Anona Dutton, John Fio and Kristyn Lindhart of EKI lead data gap identification in the Basin GSP and are most suited to develop and implement plans to fill them.

AERIAL IMAGERY ANALYSIS

Chris Stall and Seth Mulder, with assistance from Adriana Delucchi, of Land IQ can leverage their combined knowledge and experience working with remote (satellite/aerial) data to conduct the Aerial Imagery Analysis.

SURFACE WATER DEPENDENT LANDS

Laura Foglia, Andrew Calderwood and Ryan Fulton of LWA have extensive experiences working in land areas adjacent to the Cosumnes River, and can effectively support efforts to identify land areas that utilize available surface water.

LAND USE

Land IQ's Dr. Kimmelshue and Land IQ have proven success generating Statewide crop maps by integrating crop knowledge, detailed ground truth information and multiple satellite and aerial image resources.

ET AND WATER USE

Land IQ are available to utilize their extensive knowledge of crop consumptive use estimation technologies and agricultural systems to assess both ET and Water Use for the Basin.

CLAY BED MAPPING

EKI (John Fio and Kristyn Lindhart) are prepared to expand the hydrogeologic and geophysical data set to map the depth and aerial distribution of significant clay deposits and their influence on groundwater levels and storage.

INTERCONNECTED SURFACE WATER

Laura Foglia of LWA can build off past work in the Cosumnes River and experience supporting other GSAs in the state to improve quantitative descriptions of the relationships with interconnected surface water.

MONITORING NETWORK

Kristyn Lindhart and Jeff Shaw of EKI can to utilize their extensive experience in monitoring network design and monitoring well design and construction to expand the Basin's Monitoring Networks.

STREAM GAUGES

As part of the Prop 68 Grant, Laura Foglia and Jeff Walker of LWA constructed two new stream gauges on the Cosumnes River and are prepared to develop additional infrastructure on Dry Creek and other locations in the basin.

MULTI-DEPTH MONITORING

Laura Foglia and Jeff Walker of LWA can build off recent experience supporting other GSAs plan and manage installation of additional multi-depth monitoring well sites along basin boundaries.

Task 5: PUBLIC OUTREACH

Since 2017, Anona Dutton, John Fio and Kristyn Lindhart have been involved in the Basin's public outreach and have extensive experience engaging local communities with effective public workshops, informational fact sheets, stakeholder surveys, and other proven outreach tools. Under their guidance, the EKI team can ensure the public is well informed and actively engaged.

Task 6: PROJECT MANAGEMENT

EKI has proven project management skills, including experience with submittal of monthly invoices and effectively coordinating with multiple clients. EKI can ensure invoices from EKI Team members are submitted monthly by the 15th of each month with great attention to detail.

The following sections provide an overview of the EKI Team's experience and expertise, which highlights our science- and data-driven approaches and technical skills required to produce high value and reliable work products.

EKI Environment & Water, Inc.

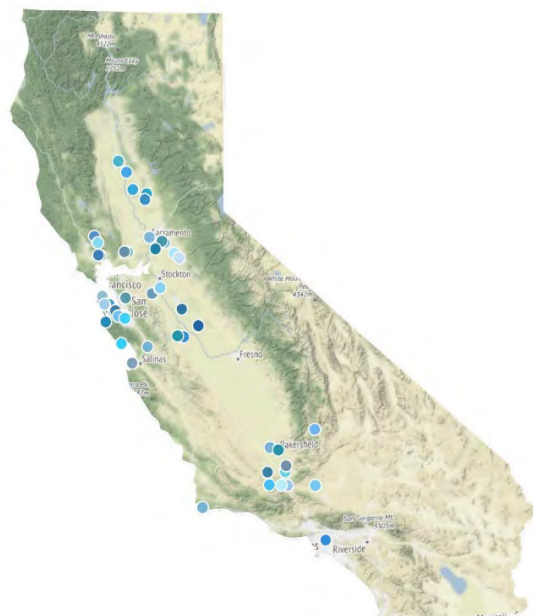
EKI is an employee-owned company that has provided comprehensive water resources and engineering services to public and private sector clients since our founding in 1989. Our staff includes over 100 engineers, geologists, hydrogeologists, environmental scientists, computer-aided designers, and GIS, database specialists and support personnel in offices throughout California and the United States. Work on this project will be staffed from our Davis, CA and Daly City, CA offices.

EKI takes a solution-oriented approach to projects that builds from a strong technical foundation and emphasizes proactive and effective communication. The size of our firm, the high level of experience and continuity of our multi-disciplinary staff, and our established credibility in our fields of expertise and with regulatory agencies allow us to effectively support our clients to meet their objectives across a variety of sectors and issues.

It's in the EKI Mix

EKI's staff comprises an effective mix of disciplines, including environmental engineers, civil engineers, chemical engineers, geologists, hydrogeologists, and environmental scientists. This complementary mix is an asset to understanding and effectively resolving a wide variety of complex technical challenges. EKI's planning, engineering, and hydrogeology services for similar projects include:

- Strategic and technical support for SGMA implementation and compliance, including GSP development and implementation;
- Numerical groundwater modeling in support of basin water budgeting, basin sustainable yield analysis, GSP implementation optimization, project evaluation, and chemical fate and transport;



EKI has broad experience in planning, engineering, and hydrogeology services for water resources projects across California.

- Water supply portfolio development and management, including water transfers, conjunctive use studies, and aquifer storage and recovery (ASR) projects;
- Evaluation of managed aquifer recharge, including with recycled water for direct or indirect potable reuse (IPR/DPR) purposes;
- Program and project management services to augment engineering and other technical staff resources for public agencies;
- Water supply system planning, design, program management, and construction management;
- Data management system (DMS) design and maintenance;
- Design, construction, and testing of large-capacity water supply wells, including municipal supply wells;
- Local and state regulatory and permit support; and
- Technical expert support for basin adjudication proceedings and litigation support services.

Client Loyalty

EKI takes pride in repeat business from satisfied clients. The low turnover of our staff permits the development of long-term working relationships with our clients and each other. Our project management team offers continuity, tenacious attention to detail, responsiveness, and quality service.

Over 90 percent of EKI's work is acquired through referrals or repeat work with existing clients.

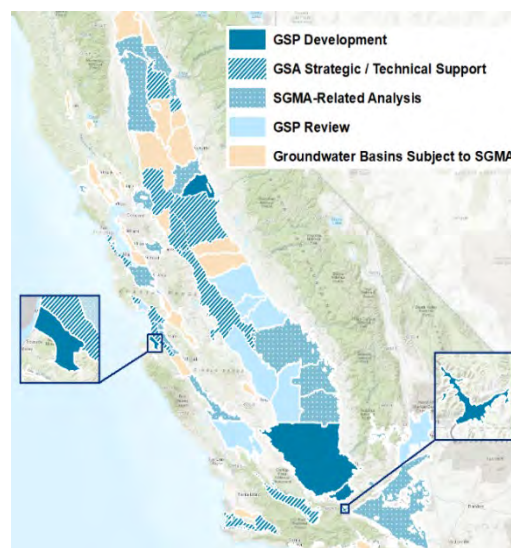
Management Philosophy

EKI has developed a reputation for effective technical project management by carefully assessing client needs, providing appropriate services led by experienced staff, and delivering products that meet or exceed client expectations. Our project managers form one-on-one relationships with clients and work hard to understand each project's technical, financial, and regulatory constraints. Communication within EKI is facilitated by the proximity of all project team members and by frequent team meetings in and between each office. Each project manager is supported by an officer of the firm and a team of top-notch technical staff.

SGMA Experience

EKI is working with entities throughout California to develop strategic responses to comply with SGMA, and on other groundwater characterization and resource issues including: supporting scientific basin boundary modification requests; assisting in the formation and administration of GSAs; conducting extensive stakeholder engagement; developing and applying numerical models to assess basin conditions and response to project and management action (PMA) implementation; and developing and analyzing the technical information to support the policy decisions required for GSP development and implementation.

EKI is actively leading the development and implementation of more than 10 GSPs in some of the most jurisdictionally and technically complex basins in California, including areas like the Salinas Basin, Delta-Mendota Subbasin,



EKI is working with entities throughout California to develop strategic responses to comply with SGMA, including developing and analyzing the technical information required for GSPs.

and the Kern County Subbasin. Our team is experienced with working with GSAs and diverse stakeholder groups on issues related to groundwater characterization and management, including comprehensive water budgeting, geospatial analysis of land and water use, and issues related to the development of groundwater allocations and other demand management measures.

EKI has conducted detailed technical review of more than 30 GSPs prepared for the 21 critically overdrafted basins, including an inventory of the planned PMAs. We have also conducted numerical modeling to understand the impacts of projected land use changes and the benefits of demand-reduction PMAs such as rotational fallowing, groundwater allocations, and pumping reduction glide paths.

EKI Staff

EKI staff have decades of experience supporting clients with project implementation, data collection, and monitoring. Please see **EKI Environment & Water Inc. resumes** for the resumes of key EKI staff. As highlighted in the attached resumes, EKI personnel have the leadership and experience to successfully implement sub-tasks associated with *Task 1 Voluntary Land Repurposing* and *Task 4 Data Collection, data gaps, and groundwater monitoring to support refinement of numeric model*:

- **Anona Dutton, PG, CHg** is deeply involved with SGMA implementation and brings strong technical and strategic support to water resources projects. Ms. Dutton's active involvement in SGMA implementation in the Cosumnes Subbasin since 2017, as well as her technical expertise from PMA implementation support in other subbasins will be crucial in leading the EKI Team.
- **John Fio** has decades of experience in water resources consulting and project leadership. Mr. Fio successfully managed the development of the Cosumnes Subbasin GSP, including design and oversight of field- and office- based data gap filling efforts and groundwater flow model development, calibration, and implementation.
- **Kristyn Lindhart** brings multiple years of experience supporting agencies and public sectors clients on water resources projects. Ms. Lindhart was an integral in development of the Cosumnes Subbasin GSP, ranging from grant management to development of multiple sections of the GSP.
- **Tyler Colyer, PE**, has over a decade of experience in water infrastructure design and planning. Mr. Colyer has played a key role in development of RFPs, scopes, budgets, and schedules.
- **Chris Heppner, PhD, PG**, provides strong technical leadership from his many years' experience supporting SGMA implementation in multiple basins across the State. Dr. Heppner has demonstrated capability with hydrogeologic investigations including groundwater supply assessment, aquifer test planning, performance, and analysis, development of hydrologic models, amongst others, and most recently has supported land repurposing PMA initiation.
- **Christina Lucero, PG**, with over twelve years of experience with gathering and evaluating hydrogeologic data and a proven expertise in groundwater flow modeling (IWFM and MODFLOW), provides highly valuable technical expertise to the EKI team. Ms. Lucero continues to support SGMA implementation across multiple subbasins including PMA initiation.
- **Jeff Shaw, PG, CHg**, has extensive experience in drilling, logging, and sampling of supply, environmental, and resource-recovery wells as well as borehole and surficial geophysical investigations and well design.
- **Susan Xie, PE**, with a strong technical background in data analysis with MATLAB, R, Excel, and ArcGIS, amongst others, has supported multiple projects such as water bank evaluation and siting, and SGMA implementation efforts.

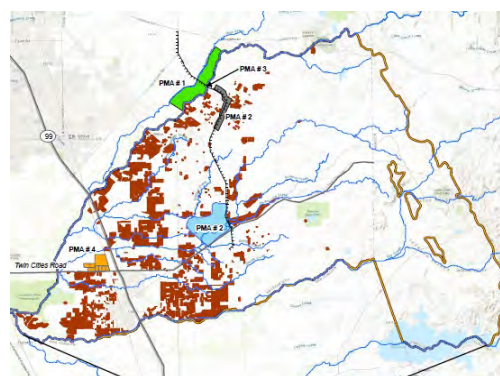
Relevant Projects

The following projects are examples of work completed that demonstrates EKI's experience within the Cosumnes Subbasin and experience from other GSP implementation efforts relevant to *Task 1 Voluntary Land Repurposing* and *Task 4 Data Collection, data gaps, and groundwater monitoring to support refinement of numeric model*.

COSUMNES SUBBASIN SGMA COMPLIANCE PROJECT, COSUMNES SUBBASIN GSAS

Client: Sacramento County Department of Water Resources
Contact: Kerry Schmitz
Address: 801 I Street, Room 301, Sacramento, CA 95814
Phone Number: (916) 874-4681
Email: schmitzk@SacCounty.net

EKI has been actively working in the Cosumnes Subbasin since 2017. In our role as strategic technical advisor and GSP consultant, EKI assisted the seven GSAs in the basin to develop and implement a comprehensive strategy for SGMA compliance, including preparation of a coordinated GSP and development of successful Proposition 1 and 68 applications. EKI's technical work (including several technical presentations, memoranda, and the GSP) is available on the basin's SGMA website: <http://cosumnes.waterforum.org/sustainable-groundwater-management-act-sgma>.



PMA locations in the Cosumnes Subbasin

EKI developed a detailed, basin-wide hydrogeological conceptual model (HCM) that is quantitatively represented in the numerical groundwater-flow model that uses the IWFM platform. EKI provided detailed input into the model mesh design to reliably simulate the interactions between groundwater and surface water in the Cosumnes River and other key streams and creeks in the basin, and to closely follow GSA boundaries and other land and water use features that potentially influence groundwater recharge and extractions. The climate, land use, surface water diversions, pumpage (residential, agricultural, and municipal), and root zone process input data sets were all constructed and are utilized by the model to simulate groundwater recharge and discharge. The model simulates and was calibrated to hydrologic conditions during the period 1999-2018; EKI utilized the model to conduct forward projections to assess impacts of climate change and various PMAs (including demand management and augmented groundwater recharge) on basin conditions. In support of PMA analysis, EKI conducted numerical modeling scenarios to support optimization of a rotational fallowing program and identify areas of the basin and crop types to target to create the largest benefit.

EKI's SGMA-related work in the Cosumnes Subbasin included: securing grants and providing grant administration support; design, construction, and on-going maintenance of a DMS; developing the basin-wide HCM (including detailed geologic interpretation and the development of multiple, detailed cross-sections based on geologic borings and geophysical logs), water budget, and assessment of groundwater conditions based on compilation and review of water level, water quality and geochemical data; assessing groundwater dependent ecosystem (GDE) occurrence and surface water / groundwater interactions in the Cosumnes River, Dry Creek, and other minor creeks and drainages; collaborative development,

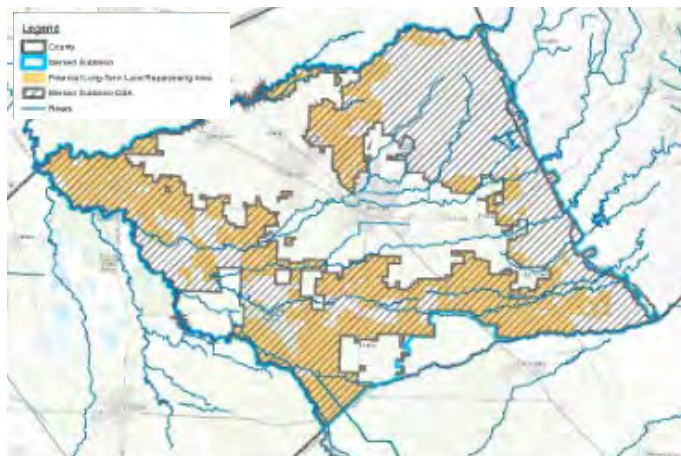
calibration, and application of a numerical model based on the IWFM platform with adjacent basins; and design of a monitoring network to identify undesirable results. EKI also helped develop the TSS grant application which resulted in the first DWR-constructed monitoring wells through the TSS program in the State, and directed and interpreted technical field investigations that included geophysical surveys (methods included Electrotelluric Sounding [ETS], Surface Nuclear Magnetic Resonance [SNMR], and Time-Domain Electromagnetic [TEM]), water quality and geochemistry (including isotopic analysis to assess recharge conditions), water level data collection, detailed mapping and field assessment of GDEs, and monitoring well installation to focus on surface water / groundwater interactions.

A key action for reaching sustainability is managed aquifer recharge (MAR) via the controlled flooding of dormant farm fields with winter runoff. EKI preliminarily determined potential MAR sites based on proximity to natural drainages and existing conveyance structures (e.g., the Cosumnes River and Folsom South Canal). Recharge potential was inferred from USDA Soil Conservation Survey (SCS) data, the Soil Agricultural Groundwater Banking Index (SAGBI), and subsurface stratigraphic conditions detected in geophysical survey results and available boring logs. EKI utilized the ETS soundings to show that the westernmost portion of the Principal Aquifer may be underlain by an inferred clay deposit at about 100 ft bgs. In this portion of the basin, the inferred clay may limit hydraulic interaction between recharge, water table level changes, and groundwater extractions from depths beneath the clay. EKI also concluded that the SNMR and TEM results revealed that shallow groundwater can occur within 30 ft bgs in some locations. However, the data also show that this shallow water is likely perched and separated from the Principal Aquifer by predominantly fine-grained sediments in the 45 to 50 ft bgs interval. The complex cause-and-effect relationships between managed recharge activities and the resulting changes in water table elevation, seepage to and leakage from interconnected surface water features, subsurface inflow and outflow across basin boundaries, and the resulting change in Basin groundwater storage were quantified by the numerical surface water groundwater model.

LAND REPURPOSING PROGRAM DEVELOPMENT IN THE MERCED SUBBASIN

Client: Merced Subbasin Groundwater Sustainability Agency
Contact: Adriel Ramirez
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Phone Number: (209) 381-1096
Email: Adriel.Ramirez@countyofmerced.com

The Merced Subbasin is a critically-overdrafted, high priority basin subject to SGMA. The Merced Subbasin Groundwater Sustainability Agency (MSGSA) is one of three GSAs in the Basin. The adopted GSP includes a basin-wide management action to allocate a portion of the Merced Subbasin's total native yield of groundwater to each of the three GSAs, and also includes a MSGSA-specific Demand Reduction Management Action to reduce pumping from current/historical levels to the allocated sustainable value. The actions include land repurposing, individual landowner allocations, water markets, and tiered pumping fees.



Target areas for the Land Repurposing Program for the Merced Subbasin

EKI provides technical and strategic guidance to MSGSA's actions to reduce groundwater consumption. As their initial step, the MSGSA has focused on developing a voluntary Land Repurposing Program (LRP), with a near-term (2025) goal of reducing consumptive use of groundwater by 15,000 acre-feet per year (AFY). The LRP is tailored to meet the needs of local landowners and beneficial users of groundwater. Over the course of a year, EKI supported the MSGSA Demand Reduction Ad-Hoc Committee and Technical Advisory Committee define their LRP goals and objectives and translate them into workable solutions. The centerpiece of the LRP is an application and associated scoring framework which allows prospective LRP participants to submit applications for their own proposed project area, repurposing type, duration, and incentive payment. The applications are then scored against various criteria using an objective framework/matrix that considers water use savings, cost, and project location relative to areas of concern (e.g., subsidence hot spots, domestic well locations, and disadvantaged communities). High scoring applications are then considered for LRP contracts, at which point land repurposing will occur and will be verified through use of remote sensing evapotranspiration data. Use of this "entrepreneurial" application-based approach allows landowners to set a price that works for them, while allowing the MSGSA to objectively rank and select projects that best fit their goals in a cost-effective manner.

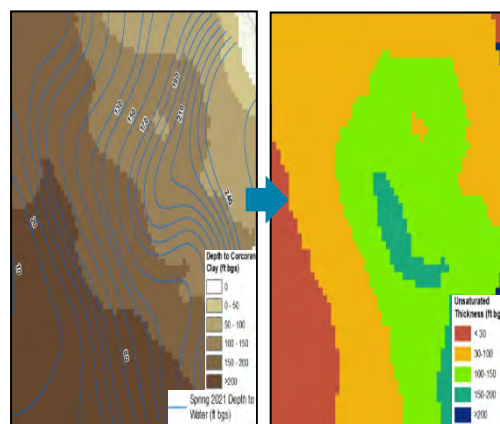
As the primary consultant to the MSGSA, EKI is centrally involved in the development of all LRP components, including the application process, scoring framework, contracting, and associated outreach materials including a Frequently Asked Questions document. EKI also assisted MSGSA bring additional partners to advise, support, and publicize the MSGSA program.

WATER BANK EVALUATION AND SITING

Client: Confidential

Since 2020, EKI has completed in-depth evaluations of existing water banks and siting studies for potential new water banks. Existing water banks are evaluated for performance and risk, including water quality, treatment cost, and groundwater level and storage trends. Siting assessments include due diligence investigations of proposed banking opportunities, and geographical screening of the San Joaquin Valley to identify potential new banking opportunities.

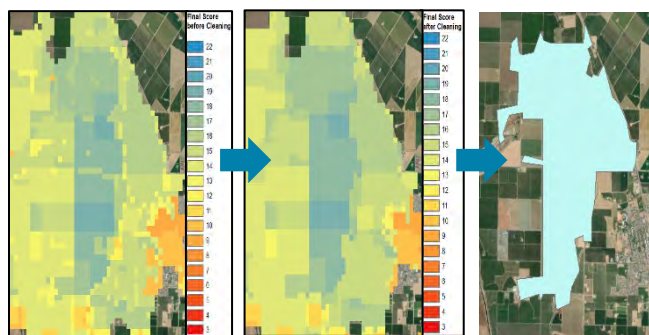
To identify the most suitable area for potential water bank development, EKI developed initial screening criteria and compiled three categories of geospatial datasets that represent these criteria: hydrogeologic, institutional, and excluded areas. Some criteria used multiple datasets as surrogate. For example, EKI developed an unsaturated thickness criterion that used the shallower values between depth to water and depth to Corcoran Clay as surrogate.



Depth to Corcoran Clay and Unsaturated Thickness for Evaluation of Water Banking Facility

The unsaturated thickness screening criterion is combined with similar data sets that represent the spatial distribution of sediment texture (fractions of sand and gravel) and aquifer storage properties (specific yield) to quantify the capacity to store recharge.

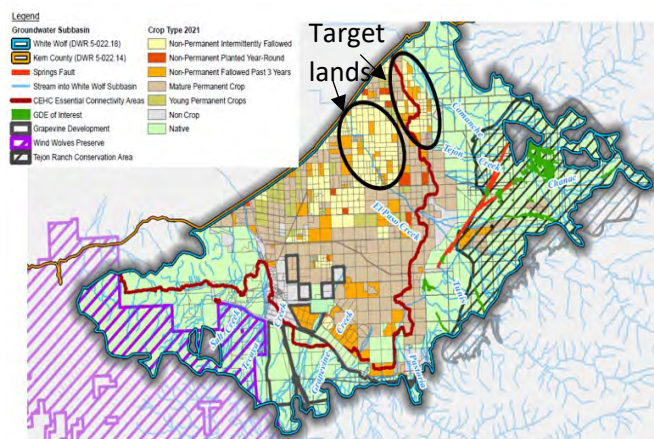
To systemize the screening process, EKI developed a GIS-based screening tool that automatically processes these multiple geospatial data sets to identify the most promising candidate water bank locations. The candidate sites are identified with a systematic ranking and screening of the geospatial datasets using a customized, value-based scoring framework for each dataset/criterion developed in consultation with the client. The screening tool assigns scores for each criterion, creates a geospatial representation of the scoring based on the geographic datasets, and overlays the datasets to isolate areas with the highest scores and that meet predetermined objectives. Identified candidate locations are then subjected to detailed feasibility assessments that include technical constraints, property values, contractual or partnership issues, political and stakeholder perspectives, water rights, supply reliability and infrastructure needs.



Combined Scoring Criteria and Final Selection for Water Bank Site

WHITE WOLF GSA GSP PMA IMPLEMENTATION

Client: White Wolf GSA /
Tejon-Castac Water District
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Tejon Ranch, CA 93243
Phone Number: (661) 663-4262
Email: amartin@tejonranch.com

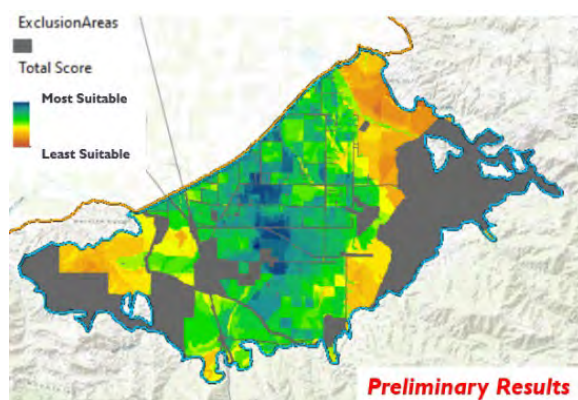


Target lands for Repurposing

EKI provides technical and strategic support to the White Wolf Groundwater Sustainability Agency (WWGSA) for GSP PMAs implementation. The White Wolf GSP includes 24 PMAs, eight of which focus on water demand reduction to reduce overall groundwater consumption by 9,500 AFY by 2042. EKI assisted the WWGSA with coordinating Project Partners (including Wind Wolves Preserve and Tejon Ranch) to establish a land repurposing vision for the White Wolf Subbasin. As part of this effort, EKI identified land parcels best suited for multi-benefit land repurposing. Multi-benefit land repurposing could include repurposing irrigated agricultural lands into alternative uses, such as recharge basins, solar farms, floodplain restoration, or land fallowing/rewilding. Our preliminary screening of parcels considered land use, habitat potential, and proximity to surface water features.

EKI identified candidate lands for multi-benefit land repurposing as non-permanent crop fields within the essential habitat connectivity area or adjacent to El Paso Creek. Using the seasonal crop land use surveys conducted and recorded by the WWGSA member districts, we identified fields which have been planted as either non-permanent crops, permanent crops, or fallowed for the last three years. We overlaid the crop type with essential habitat connectivity corridors, endangered and threatened species known habitats, conservation lands and easement areas, and creeks.

EKI is screening land areas for potential recharge sites based on feasibility for direct recharge, floodplain recharge, and in-lieu recharge projects. To do this, EKI created an automated feasibility screening tool that utilizes the spatial distribution of hydrogeologic, multi-beneficial, and infrastructure data and criteria to systematically score and rank parcel feasibility for potential recharge projects. Working with the WWGSA, we assigned weighting factors to the screening criteria and ranked basin land areas. Once the most suitable land areas have been identified, EKI will conduct additional evaluations based on quantifiable benefits, timeline, cost, and complexity so that the WWGSA can prioritize the PMAs for implementation and funding.



Most suitable lands for direct recharge based on preliminary technical screening criteria

Larry Walker Associates

LWA is an environmental engineering and consulting firm specializing in water quality management. LWA integrates environmental stewardship, sound science, effective public policy and collaborative problem solving, delivering practical and constructive solutions for today's environmental challenges. LWA works with public agencies and private businesses throughout the West, partnering to best use all of our resources to protect and improve the environment.

LWA is a privately owned firm headquartered in Davis, California with regional offices in Berkeley, San Diego, Santa Monica, Ventura and Seattle. Since 1979, LWA has been a partner, innovator, and industry leader, assisting municipalities and private businesses in navigating and solving complex and important environmental and public policy challenges.

LWA consulting services range from traditional water and wastewater engineering to highly specialized water quality, stormwater, groundwater and watershed management activities. LWA's technical expertise and services include ambient water quality monitoring, wastewater, stormwater, groundwater, watershed management/total maximum daily loads (TMDLs), regulatory assistance, agricultural water quality monitoring, and data management.

LWA has proven experience with and knowledge of the federal Clean Water Act (CWA) and the California Porter-Cologne Water Quality Control Act, as well as the federal and state regulations and policies influencing these landmark water quality laws. Specifically, LWA is an expert on the permit requirements for Phase I and Phase II Municipal NPDES Stormwater Programs, NPDES permits for wastewater agencies, and other related requirements. LWA has assisted numerous clients in the development and implementation of strategies to achieve compliance with NPDES permit requirements.

LWA is about collaboration as much as it is about engineering. It's about solutions, as well as science. Most of all, it's about working together to improve California's water quality, preserving our environment for future generations.

Management Philosophy

LWA Corporate Values include the following:

- **Passion For Excellence:** We are Driven to Achieve Exceptional Results in All We Do;
- **Building Meaningful Relationships:** We Cultivate and Sustain Productive, Respectful and Professional Relationships;
- **Forward Thinking:** We Look Ahead to Create Enduring and Effective Strategies for Our Clients and Our Company;
- **Caring:** We Support Our Staff, Our Clients, Our Company, and Our Community;
- **Serving the Public Good:** We Pursue Environmental Solutions in Balance with Economic and Social Values

LWA Staff

LWA staff have decades of experience supporting clients with project implementation, data collection, and monitoring. Please see **Larry Walker Associates resumes** for resumes of key LWA staff. As highlighted in the attached resumes, LWA personnel have the leadership and experience to successfully implement

sub-tasks associated with *Task 3 Small Scale Recharge Projects* and *Task 4 Data Gaps, Monitoring, and Modeling*:

- **Laura Foglia, PhD**, has extensive experiences working in land areas adjacent to the Cosumnes River and has the technical background to identify and help implement small scale recharge projects and improve data collection and groundwater monitoring efforts to support refinement of the numeric model. Dr. Foglia was involved in the development of the pilot groundwater recharge project for the OHWD and she helped develop a continuous monitoring network for groundwater levels in the South American Subbasin, north of the Basin.
- **Ryan Fulton, PE**, also has extensive experiences working in areas near the Basin and in collaboration with Evapotranspiration Plus (ET+) and the University of California Cooperative Extension (UCCE), can estimate agronomic and environmental/riparian water use and help identify, implement, and monitor on-farm conservation and water use efficiency improvements
- **Thomas Grovhoug, PE**, is available to serve as a project advisor and help coordinate and engage with stakeholders. Mr. Grovhoug is a registered civil engineer with broad experience in the planning, permitting and development of a variety of water management projects, including work with numerous stakeholder groups in the development of Basin Plan amendments, water quality objectives, modeling studies and water quality monitoring programs.
- **Andrew Calderwood, EIT**, has experience in the monitoring and assessment of groundwater conditions relevant to recharge site implementation and regional groundwater planning and can identify and help implement small scale recharge projects and improve data collection and groundwater monitoring efforts to support refinement of the numeric model. Mr. Calderwood is familiar with some of the Basin's monitoring wells as he was part of the sampling team during the Basin's Isotopic Recharge Characterization Study.
- **Jeff Walker, PhD**, will utilize his extensive experience deploying versatile remote sensing technology paired with data loggers, to support installation of continuous monitoring equipment at selected environmental sites (e.g., groundwater monitoring wells and stream monitoring locations) and post real-time data to a website for the project team to access.
- **LWA Support Staff**: Dr. Mani, Ms. McNeill, and Mr. Applegate are available to provide project technical support including with integrated water resources management, hydrology, groundwater management and modeling, climate change adaptation and mitigation strategies, and water quality assessments

Relevant Projects

The following projects are examples of work completed that demonstrates LWA's experience in developing and supporting recharge projects and knowledge of the groundwater and surface water interactions within the Cosumnes Subbasin, and highlights LWA's experience in undertaking efforts similar to *Task 3 Small Scale Recharge Projects* and *Task 4 Data Collection, data gaps, and groundwater monitoring to support refinement of numeric model*.

RECHARGE PROJECT SUPPORT

Client: GEI Consultants on behalf of
South American Subbasin GSAs

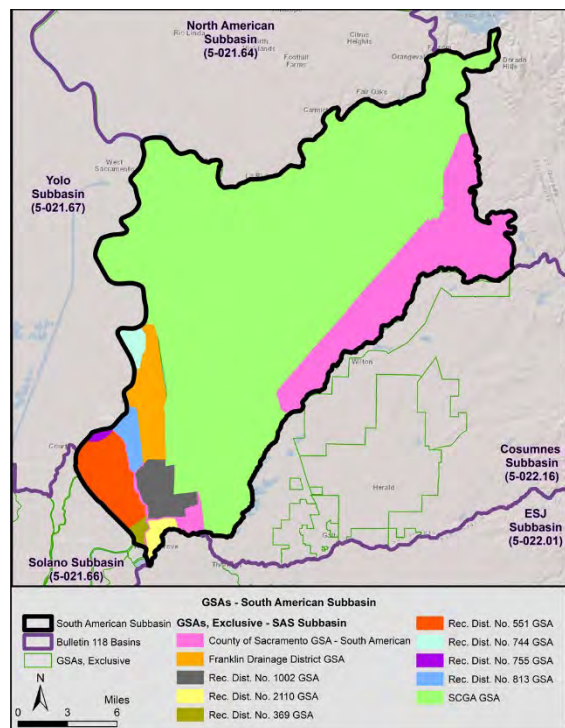
Contact: John Woodling

Address: 2868 Prospect Park Dr #400
Rancho Cordova, CA 95670

Phone Number: (916) 631-4563

Email: jwoodling@geiconsultants.com

In January of 2020, LWA began leading a consultant team to work with the Sacramento Central Groundwater Authority (SCGA) in developing a GSP for the South American Subbasin (Subbasin). The LWA Team assisted SCGA in completing the most cost- and resource-effective plan toward groundwater sustainability, in compliance with SGMA. Local knowledge, public outreach, and extensive experience with the implementation of new regulatory policies will help ensure that groundwater management remains at the local level, while simultaneously ensuring the sustainable management of groundwater resources.



LWA served as the lead consultant for implementation of the South American Subbasin GSP

LWA Work Included:

Project Management and Administration: As outlined in the Proposition 1 Grant proposal for the Subbasin's GSP development, the LWA Team is preparing quarterly progress and accountability reports, Project and Grant Completion Reports, QA/QC Plan for conducting the work, and assisting SCGA and the Department of Water Resources (DWR) in clarifying and resolving issues that may arise during implementation of the project. LWA drafted the template for annual reporting. The template will be used to link data management tools and reporting responsibilities of the member agencies.

Stakeholder Communication and Engagement: The LWA Team has worked with local agencies to develop a strategy for Stakeholder Engagement and Outreach that ensures efficient and effective communication between stakeholders in the basin, and between adjacent basins. This included refining the Communication and Engagement Plan to ensure the public's notification of GSP development activities, public outreach meetings, and GSP planning workshops.

In addition, LWA assisted with the development of the GSP elements, including:

- **Develop Sustainable Management Criteria:** LWA provided direction and technical support to establish sustainable management criteria (SMC) for water quality, subsidence, groundwater levels, groundwater storage, and surface water depletions. LWA's work to address these SGMA requirements hinged on the novel assessment of impacts to beneficial uses and users.
- **Projects and Management Actions:** The LWA Team has worked with SCGA and local stakeholders to update and enhance existing management actions for compliance with SGMA – notably around interbasin strategies for recharge and conjunctive use. Multiple steps have been taken to ensure

efficient management outcomes, including consideration of alternative management scenarios with stakeholder input, and identification of existing groundwater remediation projects and actions. Additionally, due to the high degree of hydraulic connection with adjacent subbasins, LWA has successfully coordinated with interbasin parties to ensure accurate representation of cross-boundary issues.

- **Improvements to the Monitoring Network:** Monitoring well networks play a critical role in SGMA as they provide the data used to characterize and understand current groundwater dynamics within the basin. Using local knowledge and time-honored experience, LWA has compiled information regarding existing monitoring wells and stream gages and developed a representative monitoring network at which to measure SMCs that avoid undesirable results in the Subbasin.
- **Cost Analysis and Rate Study:** LWA has provided cost estimates for management action scenarios, as well as long-term cost estimates for monitoring.
- **Development of the GSP:** Successful GSP development requires effective collaboration and transparent decision-making by consultants, GSAs, and other involved parties. Throughout GSP development, LWA has provided guidance to, and worked closely with, the broader basin and interbasin consultant team, GSA members, regulators, and the public. Notably, as part of the development process and in preparation of the GSP, LWA has worked with SCGA and DWR to address public comments and concerns.
- **Development of Annual Report Template:** LWA drafted the template for annual reporting. The template will be used to link data management tools and reporting responsibilities of the member agencies.
- **Model Development Assistance:** Leveraging LWA's extensive experience developing and implementing cutting-edge integrated hydrologic models, the LWA Team provided multiple technical reviews of the Regional Water Authority's model for the North American, South American, and Cosumnes Subbasins (CoSANA) and supported model and scenario development efforts on behalf of SCGA and Subbasin GSAs.
- **Evaluation of groundwater dependent ecosystems (GDEs) and Surface Water Depletion:** The careful consideration of GDEs is an integral part of GSP development that is commonly overlooked. The LWA Team has leverage their vast expertise of surface water and groundwater interactions to develop SMCs that protect GDEs. This includes the development of surface water depletion and GDE technical studies that address GDEs in the Subbasin, as well as identifying and developing management scenarios and model runs needed to evaluate actions for protection of GDEs and surface water depletions.

GROUNDWATER RECHARGE PROJECT OMOCHUMNE-HARTNELL WATER DISTRICT

Client: Omochumne-Hartnell Water District
Contact: Mike Wackman
Address: 7513 Sloughhouse Road
Elk Grove, CA 95624
Phone Number: (916) 682-5958
Email: info@ohwd.org

OHWD received funding in 2011 to implement a groundwater banking project through a Proposition 84 Integrated Regional Water Management (IRWM) grant submitted by the Regional Water Authority (RWA). As part of an on-call contract, LWA assisted OHWD in repurposing the existing grant into an off-season irrigation project to enhance aquifer recharge to the underlying groundwater aquifer and the South American and Cosumnes groundwater basins.

LWA has worked on or is currently working on the following activities on behalf of the Water District:

- Ongoing stakeholder coordination
- Putting together RFPs to irrigation system design and monitoring well installation
- Mapping and GIS shapefiles creation
- Site selection and characterization of the recharge site locations
- Regulatory permitting assistance
- Calculations for water application rates
- Overseeing groundwater monitoring network installation and ongoing monitoring implementation

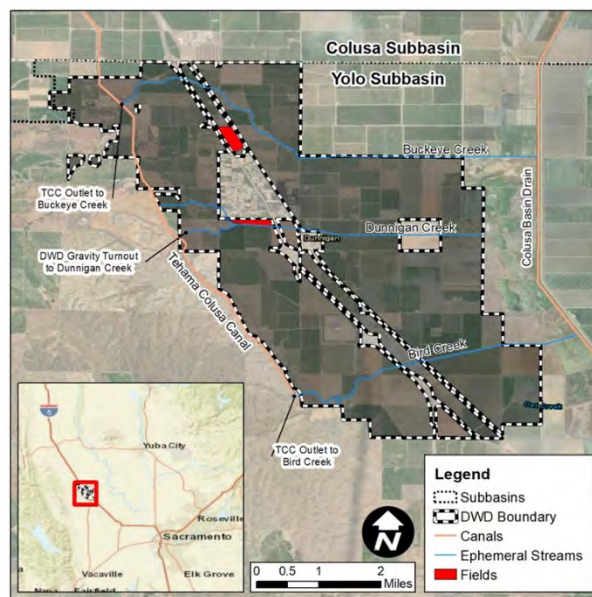
LWA provides overall project management for the planning, design, engineering, and construction of surface water diversion pumps and conveyances along the lower Cosumnes River and any irrigation design modifications that would allow groundwater recharge on the identified land parcels.

LWA assisted with installing new or identifying existing monitoring well(s) or monitoring well network(s) in the vicinity of the irrigation flooding to provide a means to assess and quantify groundwater impacts. Every year, LWA applies to SWRCB for the environmental permit needed for water diversion and provides the environmental documentation, reports, and compliance with all federal and state environmental regulations necessary to accomplish the work.

DUNNIGAN AREA GROUNDWATER RECHARGE DEMONSTRATION AND PILOT PROJECT

Client: Dunnigan Water District
Contact: William Vanderwaal, Manager
Address: 3817 1st Street
Dunnigan, CA 95937
Phone Number: (530) 812-6276
Email: wvanderwaal@rd108.org

The Dunnigan Area Groundwater Recharge Demonstration and Pilot Project seeks to immediately address the unprecedented drought conditions impacting the disadvantaged community of Dunnigan and will build drought resiliency through groundwater recharge according to the state's prioritization of groundwater recharge projects. Groundwater levels continue to decline threatening water supply for both agricultural and domestic users and causing land subsidence. The subsidence is damaging nearby infrastructure, including to the Tehama-Colusa Canal (TCC) and Interstate 5, both of which provide critical support for the agricultural industry and residents on the westside of the Sacramento Valley. Residents in the Dunnigan area rely on private domestic and public wells. Public water supply is provided by California American Water. There are approximately 207 domestic/public wells in which approximately 19 wells (or 9%) have gone dry in the recent drought. As of Fall 2021, groundwater levels in the Dunnigan area have reached historical lows. Groundwater levels between the Fall of 2010 and the Fall of 2020 have declined by over 30 feet in areas. It is estimated that an additional 37 wells (or 18%) will go dry in the next decade if groundwater levels continue to decline at the current rate. Total subsidence between June of 2015 and October of 2021 was



Location of the Dunnigan Area Groundwater Recharge Pilot Project

measured at approximately -0.2 feet according to DWR. A pilot project was performed in February 2022 when the Tehama-Colusa Canal was emptied to complete repairs. This Project augments the amount of recharged water, continues over the next few years, and helps demonstrate that groundwater recharge is a viable tool to alleviate critical drought conditions across the State. Additionally, this Project aims to provide habitat for migratory waterfowl supporting the region's objective to implement multi-benefit projects.

The Westside Sacramento IWRM program selected the Project to receive the IWRM Funding Area set-aside funds from the Department of Water Resources through the Urban and Multibenefit Drought Relief Program. The Project utilizes Section 215 water when it is available, excess contract water from Dunnigan Water District (DWD) and purchased surface water from senior water right holders until a permanent winter water right is obtained. Areas with a Soil Agricultural Groundwater Banking Index (SAGBI) rating of "excellent," "Good," or "Moderately Good" will be targeted for recharge sites. Surface water will be diverted from the TCC into Buckeye, Dunnigan, and Bird Creeks and on to two fields as shown in Figure 1. Buckeye Creek is located about 2 miles north of Dunnigan and flows from west of Interstate 5 to the south and east. It is about 6.0 miles long and empties into the Colusa Basin Drain (CBD). Dunnigan Creek flows from west of Dunnigan to the east through the community. It is about 3.4 miles long and empties into a wetland complex and eventually the CBD. Bird Creek is located about 3 miles south of Dunnigan and flows from the west of Interstate 5 to the north and east. It is about 4.4 miles long and empties into the CBD. The fields were selected because the upper soil layer was removed during the construction of Interstate 5 leaving behind coarser soils with higher permeability. Based on diverting water 30 days per year, the estimated recharge benefit is approximately 1,800 AF per year. The annual recharge amount will vary from year-to-year ranging from 200 AF to 2000 AF per year depending on future hydrology and available surface water supply. The recharge area will provide freshwater habitat for migratory waterfowl in the Fall, which is estimated at approximately 90 acres.

LWA has worked on or is currently supporting DWD on the following activities:

- Seeking grant funds and other financial support through local, state, and federal agencies
- Stakeholder coordination including with the Yolo Subbasin Groundwater Agency, private landowners, non-governmental organizations, Westside Sacramento IWRM, and funding agencies
- Implementing a groundwater recharge project that can be implemented long-term and expanded into other areas to stabilize groundwater levels and storage volumes, prevent stream depletions, and protect groundwater dependent ecosystems.
- Technical assistance includes refining water budgets and hydrologic conceptual model, assessing water quality impacts and habit enhancements, and expanding monitoring network.
- Quantifying all water budget inflows and outflows including applied water, precipitation, evapotranspiration, tailwater, and deep percolation
- Mapping and GIS shapefiles creation
- Site selection and characterization of the recharge site locations
- Regulatory permitting assistance
- Overseeing groundwater monitoring network installation and ongoing monitoring implementation
- Identifying infrastructure upgrades or retrofits to improve recharge capacity utilizing DWD's conveyance and drainage systems.

Land IQ

Land IQ is a specialized agricultural science and remote sensing firm that maintains a staff of approximately 35 skilled soil scientists, agronomists, remote sensing specialists, GIS analysts and web application developers. Our professionals include Certified Professional Soil Scientists, Certified Crop Advisors, Certified Professional Agronomists, Certified Professionals in Erosion and Sediment Control and ESRI Certified Web Application Developers. Our work centers on solutions for agricultural and land-based projects facing scientific, environmental, regulatory, engineering, and/or legal challenges at a variety of spatial scales with a focus on large scale land systems and management.

Providing Solutions to Agricultural Problems

Land IQ has extensive expertise in agricultural systems, soil science, salinity and nutrient management, crop consumptive use estimation technologies, irrigation and drainage management, water quality, remote sensing, geospatial analysis, geostatistics, and web application development. Land IQ blends rigorous scientific approaches with practical experience; many of our staff have roots in agriculture and bring first-hand and irreplaceable understanding of agricultural production systems to projects. The results are practical, applicable, and accurate work products including traditional formats as well as online interactive maps allowing our clients to make objective, informed, and strategic decisions.

In addition to technical expertise, the Land IQ Team also has expansive experience working in the California's Central Valley, both from a project standpoint and from working with growers, irrigation district managers and government officials.

Specific experience and qualifications include:

- Soil, surface, near-surface, and vegetation investigations and assessments
- Detailed agronomic assessments, including yield impacts caused by various factors
- Soil reclamation and irrigation/drainage strategies and management
- Salinity and nutrient management
- Development and of remotely sensed crop evapotranspiration calculations
- Water quality and supply analysis and modeling
- Integration of GIS and remote sensing technologies to inform and enhance site evaluation approaches
- Research design and implementation of pilot projects and studies
- Regulatory and permitting support
- Grower and stakeholder relations

Land IQ Staff

Land IQ staff with specialized experience in soil science, agronomy, and land use identification will produce a spatial land use coverage for the Cosumnes Subbasin and provide input on CGA's voluntary land repurposing program, water use estimates, and on-farm conservation and water use efficiency strategies. Please see **Land IQ resumes** for resumes of key Land IQ staff. As highlighted in the attached resumes, Land IQ personnel have the experience to support sub-tasks associated with *Task 1 Voluntary Land Repurposing*, *Task 2 Conservation/Water Use Efficiency* and *Task 4 Data Gaps, Monitoring, and Modeling*:

- **Adriana Delucchi, CCA, CAIS**, brings technical experience in soil survey and characterization and crop production systems. As a Certified Crop Advisor and an Agricultural Irrigation Specialist, combined with her expertise in utilizing crop photo (aerial imagery) interpretation and GIS, Ms. Delucchi has supported a variety of projects ranging from crop mapping to urban landscape mapping and dust mitigation and management of salt effected soils.
- **Chris Stall**, has over 14 years of experience as a soil scientist and provides expertise in soil and land classification, remote (satellite/aerial) land evaluation, and land use evaluation and planning.
- **Joel Kimmelshue, PhD, CPSS**, serves as the Principal Soil and Agricultural Scientist for the Land IQ team. In addition to multiple years of project leadership experience, Dr. Kimmelshue brings a strong technical background developing practical and applied solutions for development of water/soil management systems, crop and soil classification, regulatory support, and land reclamation.
- **Seth Mulder, CPAg, CCA** has valuable experience in the collection, development, and leveraging of spatial and non-spatial agricultural and environmental datasets. Mr. Mulder additionally possess substantial knowledge and experience in GPS/GIS technologies, database software and statistical analysis.
- **Stephanie Tillman, CPSS, CPAg, CCA** brings over 20 year experience in the consulting and agri-business industries with a focus on various aspects of agronomy and soil quality management in agricultural systems. Specifically, Ms. Tillman has extensive experience working with growers and grower representatives on various projects such as nutrient and water management, fertilizer co-product development, regulatory compliance, and beneficial reuse irrigation projects.

Relevant Projects

The following projects are examples of work completed within the last five years that demonstrates Land IQ's experience in knowledge of irrigated lands practices in the Cosumnes Subbasin and the California Central Valley; experience in devising and testing irrigation management best practices for a variety of crop types; familiarity with land repurposing opportunities that result either in reduced water use or increased groundwater infiltration; and our ability to connect with land managers and incorporate local conditions and experience into recommended land and irrigations system improvements

STATEWIDE LAND USE MAPPING

Client: Department of Water Resources
Contact: Bekele Temesgen
Address: 901 P Street, Sacramento, CA 95814
Phone Number: (916) 651-9679
Email: Bekele.Temesgen@water.ca.gov

Land use data is critically important to the work of the Department of Water Resources (DWR) and other California agencies. Understanding the impacts of land use, crop location, acreage, and management practices on environmental attributes and resource management is an integral step in the ability of Groundwater Sustainability Agencies (GSAs) to execute Groundwater Sustainability Plans (GSPs) and implement projects to attain sustainability. As a result, Land IQ was contracted by DWR to develop a comprehensive and accurate spatial land use database beginning with the 2014 crop year, covering over 9.4 million acres of irrigated agriculture on a field scale and additional areas of urban extent.



Land IQ Crop Map

The primary objective of this effort was to produce a spatial land use database with accuracies exceeding 95% using remote sensing, statistical, and temporal analysis methods. Over the past five years, Land IQ has conducted statewide land use mapping for 2014, 2016, 2018, 2019 and 2020, which classified over 14 million acres of land into irrigated agriculture and urban area. Unlike the 2014 and 2016 datasets, the WY 2018, 2019 and 2020 datasets include multi-cropping. WY 2021 is currently being analyzed.

Land IQ integrated crop production knowledge with detailed ground truth information and multiple satellite and aerial image resources to conduct remote sensing land use analysis at the field scale. Land IQ provides the following:



Field Scale Crop Map
Deliverable

- Individual field boundaries of homogeneous crop types representing true irrigated area, rather than legal parcel boundaries.
- Individual fields are classified using a supervised classification algorithm. Fields are classified into two legends, a crop category legend (DWR) and a more specific crop type legend (Land IQ).
- To determine frequency and seasonality of multiple-cropped fields, peak growth dates and percentage of the field cropped are determined for annual crops. Time-series statistics are also provided to assist DWR with internal review.
- After crop classification, a separate algorithm is performed to determine planting date of perennial crops.

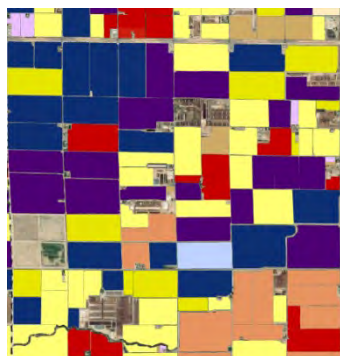
FIELD-SCALE CONSUMPTIVE USE FOR GROUNDWATER SUSTAINABILITY AGENCIES

Client: Semitropic Water Storage District
Contact: Jason Gianquinto
Address: 1101 Central Avenue, Wasco, CA 93280
Phone Number: (661) 758-5113
Email: jgianquinto@semitropic.com

In 2016 the Semitropic Water Storage District (SWSD) initiated a project to determine the actual evapotranspiration (ETa) of crops at the field level for the entire district. For the District, it was important to understand ETa for a series of reasons. These reasons included the regulatory requirements associated with the implementation of and compliance with the Sustainable Groundwater Management Act (SGMA), understanding the annual consumptive use in relation to annual water supply allocations, and for determining a baseline consumptive use for billing purposes. At the grower level, it was important for the District's water users to understand ETa at their individual field level in order to facilitate water management practices and water use efficiency, for improving irrigation scheduling and to assist with crop selection.



**Weather Station for
Capturing Eta Data**



**Ground truthing remotely
sensed data driven model**

It was while working with SWSD for nearly 3 years that Land IQ developed and refined their remotely sensed Data Driven Model. Satellite data are ideally suited for deriving spatially continuous ET surfaces that can be pared down to the field scale because of their temporal and spatial characteristics. However, the most accurate use of RS models require calibration to surface measurements, first at the field level. For these reasons, Land IQ used a combined approach to calculating ETa by implementing comprehensive "ground truthing" for calibration and validation, a spatial approach to recognize field by field differences, the integration of crop type for improved results and knowledge of agronomic systems.

Analysis is conducted every 5 to 16 days every month to characterize ETa and calibrate daily, time-resolved analysis for the year. Currently, Land IQ is incorporating the use of Sentinel-2/SAR image resources to enhance the consumptive use estimates with more frequent image resources coupled with Landsat. The resulting analyses are overlaid with Land IQ derived cropping information to determine field-by-field and crop-by-crop ET results. This allows SWSD to integrate the data into groundwater models and charge their water users based upon actual water use rather than delivered or applied water.

With the implementation of SGMA and development of GSPs more irrigation districts and GSAs are looking for ways to quantify the amount of water used for irrigated agriculture. Over the past three years in addition to SWSD, a total of 21 GSAs or irrigation districts, covering over 2 million acres are using Land IQ ET.



Land IQ ET Parcel Data

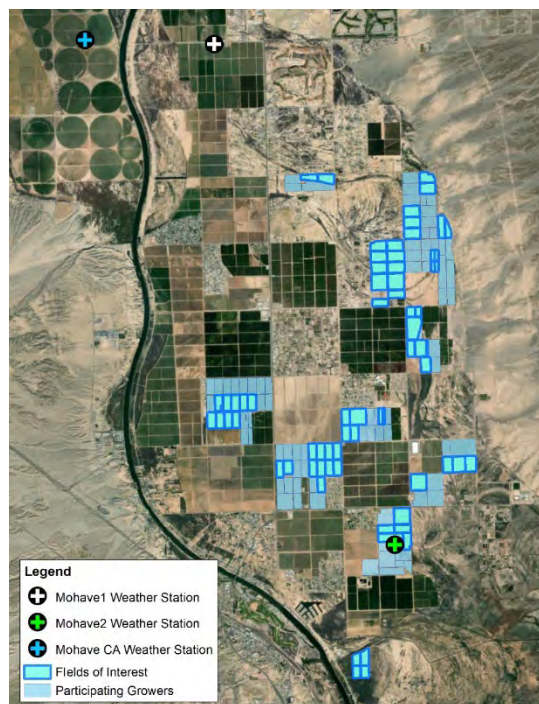
CONSUMPTIVE USE CALCULATIONS FOR FALLOWING PROGRAMS

Client: Water Asset Management
Contact: Vince Vasquez
Address: 220 Montgomery Street, Penthouse 3 San Francisco, CA 94104
Phone Number: (415) 529-4832
Email: v.vasquez@waterinv.com

Mohave Valley Irrigation & Drainage District (MVIDD) asked Land IQ, LLC to perform a temporal and average consumptive use analysis for a proposed fallowing program in Mohave County, Arizona. The fields of interest comprise approximately 3,000 acres of irrigable ground.

The water savings for fallowing the fields of interest were based on the previous five-year crop history and the calculated consumptive use. Crops typically grown in this area are alfalfa, Bermuda grass/other hay, cotton, and Sudan grass, with alfalfa dominating the planted acreage. Land IQ performed a remote sensing analysis to identify crop types from 2015 through 2019 for the MVIDD fields and then performed a consumptive use analysis.

For the consumptive use analysis, reference evapotranspiration was calculated and put through a quality control (QC) process by Dr. Paul Brown, the Associate Director for Extension Programs in Agriculture and Natural Resources who currently oversees the operation of the Arizona Meteorological Network (AZMET), at the request of MVIDD.



Fields of Interest for Fallowing Program

The average consumptive use was calculated for each landowner by using an area weighted average for the consumptive use of all the fields of interest. For these purposes, an average of total consumptive use and consumptive use from applied water was used for calculations, due to the intensity and variability of precipitation within the Mohave Valley. The average consumptive use was then applied to the fallowed acreage to determine a water savings for the District.



Determination of Consumptive Use for the Mohave Valley Irrigation & Drainage District by Land IQ

Agricultural Specialists

The Agricultural Specialists have strong ties with the local agricultural community and will serve as the connection between the local farming community and the Project Team to ensure local farmers' interests and ideas are both identified and considered. The Agricultural Specialists will primarily support conservation and water use efficiency tasks.

Land IQ Specialists:

Allan Fulton and Blake Sanden of Land IQ specialize in on-farm irrigation management, salinity and fertility management and agronomy, and field-level consumptive use.

Mr. Fulton has nearly 40 years of experience working in the agricultural community, including 20 years as a UC Cooperative Extension Irrigation and Water Resources Farm Advisor in Tehama, Glenn, Colusa, and Shasta Counties. Mr. Fulton's professional career focused on applied research and extension programs in on-farm irrigation management has led to a positive change in on-farm water use, efficiency, and sustainable production in the Northern Sacramento Valley. Extended his knowledge and practical experience to water users in the northern Sacramento Valley concerning water measurement, groundwater aquifer systems, groundwater management approaches, and conjunctive water management concepts. He also educated water users of water measurement and non-point source water quality regulations facing irrigated agriculture and the role of watershed management approaches to respond. Currently, Mr. Fulton provides senior review on Land IQ's field-level consumptive use (ET) estimates for over 2 million acres in the Southern San Joaquin Valley.

Mr. Sanden has over 40 years of experience working in the agricultural community, including 26 years as a UC Cooperative Extension Irrigation and Agronomy Farm Advisor in Kern County. Mr. Sanden's professional career focused on applied research and extension programs in irrigation management, salinity and fertility management and agronomy, including the development of field salt tolerance thresholds for California pistachios, crop water use coefficients (Kc) and fertility for high yield almond production. Mr. Sanden provides senior review to Land IQ on their field-level consumptive use (ET) estimates for over 2 million acres in the Southern San Joaquin Valley.

Please see **Land IQ Specialist resumes** for Mr. Fulton and Mr. Sanden's resumes.

Evapotranspiration Plus (ET+):

ET+ has extensive experience in development and application of the METRIC ET processing system (Mapping of Evapotranspiration at high Resolution with Internalized Calibration) and evapotranspiration theory and application. The owner and proprietor of ET+ is Dr. Richard G. Allen. Allen is professor of water resources engineering at the University of Idaho, and has 30+ years experience in evapotranspiration (ET) measurement and calculation including surface energy balance determination by satellite. Allen holds primary responsibility for the development of the METRIC ET processing system (Mapping of Evapotranspiration at high Resolution with Internalized Calibration). In addition to Allen, ET+ is supported by a team of current/former professors, engineers, and GIS specialists. This team of professionals have extensive experience in applying METRIC and in evapotranspiration theory and application, with more than 30 refereed journal papers published on METRIC and related processes.

ET+ has considerable and unique experience in procuring and preparing information needed to support the surface energy balance estimations utilized in the METRIC process, including acquisition and quality control of ground-based meteorological information, and has specialized ability in identifying needs and solutions for specific component computations in METRIC.

Please see **Evapotranspiration Plus resumes** for resumes of key ET+ staff.

University of California Cooperative Extension (UCCE):

UCCE are problem solving centers that create a bridge between local issues and the power of University of California (UC) research. As part of the agricultural community, UCCE helps farmers implement more-efficient growing methods and solve pest management problems. UCCE helps land owners develop smart water-use strategies and help preserve natural areas and farmland. UCCE will help support the EKI Team wherever possible.

D. REFERENCES

The EKI Team has provided similar Sustainable Groundwater Management Act (SGMA) implementation support to those described in the Request for Qualifications (RFQ) to multiple clients in California. We are proud of our work and the compliments we get from our clients regarding the high quality of our work, our attention to detail, and our responsiveness. The references below can attest to the team's relevant experience providing a full range of environmental technical services in support of Groundwater Sustainability Plan (GSP) implementation activities.

EKI Environment & Water, Inc.

COSUMNES SUBBASIN SGMA COMPLIANCE PROJECT, COSUMNES SUBBASIN GSAS

Client: Sacramento County Department of Water Resources
Contact: Kerry Schmitz
Address: 801 I Street, Room 301, Sacramento, CA 95814
Phone Number: (916) 874-4681
Email: schmitzk@SacCounty.net

LAND REPURPOSING PROGRAM DEVELOPMENT IN THE MERCED SUBBASIN

Client: Merced Subbasin Groundwater Sustainability Agency
Contact: Adriel Ramirez
Address: 2222 M Street, Merced, CA 95340
Phone Number: (209) 381-1096
Email: Adriel.Ramirez@countyofmerced.com

WHITE WOLF GSA GSP PMA IMPLEMENTATION

Client: White Wolf GSA /Tejon-Castac Water District
Contact: Angelica Martin
Address: P.O. Box 1000, Tejon Ranch, CA 93243
Phone Number: (661) 663-4262
Email: amartin@tejonranch.com

Larry Walker Associates

RECHARGE PROJECT SUPPORT

Client: GEI Consultants on behalf of South American Subbasin GSAs
Contact: John Woodling
Address: 2868 Prospect Park Drive #400, Rancho Cordova, CA 95670
Phone Number: (916) 631-4563
Email: jwoodling@geiconsultants.com

GROUNDWATER RECHARGE PROJECT OMOCHUMNE-HARTNELL WATER DISTRICT

Client: Omochumne-Hartnell Water District
Contact: Mike Wackman
Address: 7513 Sloughhouse Road, Elk Grove, CA 95624
Phone Number: (916) 682-5958
Email: info@ohwd.org

DUNNIGAN AREA GROUNDWATER RECHARGE DEMONSTRATION AND PILOT PROJECT

Client: Dunnigan Water District
Contact: William Vanderwaal, Manager
Address: 3817 1st Street, Dunnigan, CA 95937
Phone Number: (530) 812-6276
Email: wvanderwaal@rd108.org

Land IQ

STATEWIDE LAND USE MAPPING

Client: Department of Water Resources
Contact: Bekele Temesgen
Address: 901 P Street, Sacramento, CA 95814
Phone Number: (916) 651-9679
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FIELD-SCALE CONSUMPTIVE USE FOR GROUNDWATER SUSTAINABILITY AGENCIES

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CONSUMPTIVE USE CALCULATIONS FOR FOLLOWING PROGRAMS

Client: Water Asset Management
Contact: Vince Vasquez
Address: 220 Montgomery Street, Penthouse 3 San Francisco, CA 94104
Phone Number: (415) 529-4832
Email: v.vasquez@waterinv.com

E. RESUMES

EKI Environment & Water Inc. Resumes

Anona L. Dutton, PG, CHg

Vice President / Principal-in-Charge/ Project Manager

Ms. Dutton has over twenty years of professional experience managing water resources projects. She has managed multi-million dollar efforts to secure reliable water supplies for water agencies and developers, including leading the technical efforts to minimize the water footprint of new and existing development, assessing groundwater and surface water supply yields, supporting development of groundwater allocations within and outside of basin adjudications, securing water transfer options, and evaluating the feasibility and cost of developing new water supply sources such as recycled water, desalination water, and other non-potable sources.

Ms. Dutton is deeply involved in implementation of the Sustainable Groundwater Management Act (SGMA) throughout the State, including provision of strategic and technical support for Groundwater Sustainability Agency (GSA) formation and administration, basin boundary adjustments, Groundwater Sustainability Plan (GSP) development and implementation, and securing grant funding. She has been actively involved in SGMA implementation in the Cosumnes Subbasin since 2017.



Education

- M.S., Hydrogeology, Stanford University, 2000
- B.S., Environmental Sciences, Stanford University, 1998

Registrations/Certifications

- Professional Geologist in California (#7683)
- Certified Hydrogeologist in California (#841)
- LEED Green Associate
- Water Use Efficiency Practitioner - Grade 1

Relevant Experience

- **Sustainable Groundwater Management Act (SGMA).** *Multiple Clients.* Ms. Dutton's recent SGMA work includes supporting GSA coordination, securing grant funding, and GSP preparation and implementation. She oversees stakeholder engagement efforts, numerical groundwater modeling, application of water budgets, and the development of projects and management actions (P/MAs), including frameworks for groundwater reduction and allocation programs and supply augmentation projects. Her SGMA-related projects span California including: White Wolf Subbasin GSP development and implementation, Castac Basin GSP development and implementation, Cosumnes Subbasin GSP development and implementation, Cuyama Basin strategic support for GSP development and implementation, Cal Water strategic support in many basins, Cordua Irrigation District strategic support for GSP development and implementation, City of Lathrop strategic support for SGMA compliance, GSP development and implementation for Kern County Subbasin entities, GSP implementation in the Delta-Mendota Subbasin, Alternative GSP development in the Livermore Valley Basin, and technical support for GSP development in the East Bay Plain Subbasin.
- **Technical and Strategic Support For Land Repurposing Program.** *Merced Subbasin GSA.* Ms. Dutton is overseeing EKI's work to provide technical and strategic support for the land repurposing program (LRP) in the Merced Subbasin. The program objective is to reduce

consumptive groundwater demand by 15,000 AFY by 2025. EKI is centrally involved in the development of all LRP components, including the landowner application process, scoring framework, contracting, support for the basin's Proposition 218 process and associated cost estimation and outreach materials including a FAQ document. EKI also assisted MSGSA bring additional partners to advise, support, and publicize the LRP program.

- **Technical and Strategic Water Resources Support.** *South of Kern River GSAs.* Since 2016 Ms. Dutton has provided strategic technical support to Arvin-Edison Water Storage District, Tejon-Castac Water District, Wheeler Ridge-Maricopa Water Storage District in groundwater sustainability matters. She is leading efforts to comply with SGMA in the White Wolf and Kern County Subbasins, including GSP preparation and implementation. She is supporting efforts to develop conjunctive use projects and to maintain water quality in the Friant-Kern Canal, including conducting in-depth investigations of surface and groundwater quality trends and developing a salinity mitigation policy. She is supporting the costing, prioritization and implementation of P/MAs related to procuring grant funds and developing land-repurposing and other demand reduction programs, in addition to supply augmentation projects. She developed a water rights based water budget and groundwater allocation method that considered native safe yield, the surface water imports and water banking operations, and historical water use information for the GSAs and local landowners.
- **Technical Support for Analysis of Demand Management.** *Cosumnes Subbasin GSAs.* As part of GSP development in the Cosumnes Subbasin Ms. Dutton oversaw the evaluation of the various P/MAs that are being contemplated to bring the basin into sustainability by 2042. A key management action being contemplated by the GSAs is demand management through voluntary or mandatory fallowing. EKI applied the numerical model we developed to assess which crops and areas of the basin create the most benefit (in terms of increased groundwater storage) as a result of fallowing. This analysis is supporting the GSAs to minimize the amount of acres that will need to be fallowed, while achieving the savings objectives.
- **Conjunctive Use Study.** *Zone 7 Water Agency.* Ms. Dutton is leading the development of a Conjunctive Use (CU) Study to support Zone 7 to identify the preferred integration of known and potential future sources and new infrastructure to increase yield, operations, and reliability. The CU Study is considering a variety of sources and options, including optimization of the groundwater basin, recharge of imported and reclaimed water, investments in LVE and Sites reservoir, and water bank operation, among other things.
- **Valley Water.** *Multiple water banking related analysis.* Ms. Dutton leads EKI's efforts to support Valley Water in the assessment of multiple water banking opportunities. Work efforts have included in-depth analysis of existing water bank performance and risk factors, including those related to water quality and declining groundwater levels, and systemizing the process to support Valley Water's on-going assessment of water bank performance and identification of new water banking sites.
- **IPR/DPR Feasibility Assessment.** *Marina Coast Water District (MCWD).* Ms. Dutton conducted a technical assessment of the feasibility to develop an indirect or direct potable reuse (IPR/DPR) project in Monterey Subbasin. As part of this assessment, she developed a hydrogeologic conceptual model of the local groundwater system and conceived of and priced out options to augment potable water supplies with Salinas River storm flows or highly treated municipal wastewater. This project is now being pursued as part of GSP implementation.
- **Water Strategy.** *City of East Palo Alto.* Ms. Dutton managed the development and implementation of a comprehensive water strategy to address the water shortage crisis within the City of East Palo Alto, which is a Disadvantaged Community (DAC). She supported the City in negotiating a water transfer agreement for the first-ever transfers of Individual Supply Guarantee (ISG) within the San Francisco Regional Water System and in the development of their groundwater program, including feasibility assessment, design and cost-estimation.

John L. Fio

Principal Hydrogeologist

Mr. Fio has almost 40 years of experience in water resources consulting and project leadership. His professional experience includes ten years of research and project leadership with the U.S. Geological Survey, and more than 25 years of experience in private consulting (20 of those years as a co-founder of his own consulting firm located in Davis, CA). John has developed water management plans; evaluated the performance of planned and operating conjunctive use projects (e.g., in the Cosumnes, Westside, Madera, and Pajaro Valley basins); evaluated groundwater quality effects of wastewater and recycled water disposal to land and surface water bodies; and determined water sources using chemical and age-dating techniques. Much of his work has involved numerical groundwater-flow and solute transport modeling where he has employed models to quantify water budgets and their sensitivity to changes in land- and water-use practices, groundwater-flow paths and time-of travel, migration of dissolved constituents, saltwater intrusion, groundwater surface-water interactions, and the effects of climate change and sea level rise. His work is published in 16 peer-reviewed journal articles and government reports.



Education

- M.S., Civil Engineering, University of California, Davis, 1987
- B.S., Soil and Water Science, University of California, Davis, 1984

Relevant Experience

- **Groundwater Sustainability Plan Development.** Cosumnes Subbasin, CA. Mr. Fio managed GSP development for the Cosumnes Subbasin, which includes the Cosumnes River. The Cosumnes River is the last, undammed drainage originating in the Sierra Nevada, and supports Salmon and Steelhead populations. The basin is managed by seven newly formed Groundwater Sustainability Agencies, and no coordinated data collection, compilation, or evaluation programs existed within the basin. The more than \$2.5 million effort required design, construction and population of a comprehensive, basin-wide Data Management System; the Hydrogeological Conceptual Model of the basin and quantitative evaluation of Groundwater Conditions; development of the basin numerical model which employs DWR's Integrated Water Flow Model (IWFM); and, data gap filling efforts that included geophysical investigations, sampling and evaluation of stable isotope data, biological surveys related to the identification of groundwater dependent ecosystems, and design and construction of monitoring infrastructure (stream gauges, well meters, and monitoring wells).
- **San Mateo Plain Subbasin Groundwater Assessment.** *San Mateo County.* Mr. Fio developed a groundwater-flow model to quantify groundwater conditions beneath San Francisco Bay and cross-boundary flows between adjacent basins located in San Francisco, San Mateo, Santa Clara and Alameda counties. The model was utilized to estimate expected yields and likely hydraulic effects from aquifer pumping on existing groundwater users and assist future basin management and

compliance with SGMA. Data sets were developed to represent projected changes in groundwater recharge because of climate change on rainfall, temperature, and run-off.

- **Optimization of Groundwater Recharge and Recovery Operations. Santa Cruz and Monterey Counties, CA.** The Pajaro Valley Water Management Agency (Agency) is actively working to prevent further increases in long-term overdraft. One of the Agency's water supply projects diverts surface water runoff from Harkins Slough to an open recharge basin, and the infiltrated surface water is extracted by recovery wells located around its periphery. Past project performance has captured only 36% of the total volume of slough water diverted to the recharge basin. John evaluated measured water levels and water quality time-series data and numerical groundwater-flow and transport modeling results to show that project performance can be improved by: (1) increasing the pumping rates from select recovery wells, and (2) construct additional wells downgradient of the recharge basin. John is currently overseeing tests to maximize pumping rates and evaluate potential well interferences to recommend locations and construction details for additional recovery wells near the basin. On a parallel track, the information is guiding decisions on the number and locations of additional extraction wells to optimize recovery from additional recharge basins planned north and south of the existing basin. The numerical model is being deployed to optimize project operations to meet the timing and magnitude of the irrigation requirements of agriculture.
- **San Francisquito Creek Alluvial Fan Groundwater. Menlo Park, CA.** Mr. Fio constructed a groundwater-flow model that quantified the hydraulic relationships in Bayland aquifers and beneath South San Francisco Bay – relationships that were not widely recognized by the hydrologic community. Results showed that pumping in both the Menlo Park area and western Alameda County can affect groundwater flow and constituent movement in shallow aquifers on either side of San Francisco Bay. He then utilized local geohydrologic, geochemical, and stable isotope data to develop a focused, site-specific groundwater-flow model for the shallowest water bearing zones and constituent transport model to project the movement of chlorobenzene, 1,1-DCE, and PCBs. These models evaluated the potential for off-site constituent migration under a variety of possible alternative future land use and hydrologic conditions.
- **Westside Groundwater Basin, City of Daly City.** San Francisco and San Mateo Counties, CA. Since 1998, as a consultant to Daly City, Mr. Fio has provided key technical analyses and consensus building efforts toward improved management of the Westside Groundwater Basin located in San Francisco and San Mateo Counties. The basin is a source of drinking water for the City of San Francisco, City of Daly City, Town of Colma, City of South San Francisco (Cal Water), and City of San Bruno. John was a key contributor toward development of the basin management plan and directed development and technical acceptance of the groundwater-flow model utilized to quantify basin hydrogeology. The effort to achieve model consensus required extensive coordination and effective communication with multiple basin stakeholders and their technical representatives. The model has since been employed to design and analyze proposed groundwater development projects in the City of San Francisco and an in-lieu conjunctive use project in San Mateo County to increase drinking water supply reliability for the greater San Francisco Bay area.

Kristyn Lindhart

Hydrogeologist

Ms. Lindhart has over eight years of professional experience supporting agencies and public sector clients with water resources projects including groundwater resource evaluations, Urban Water Management Plans (UWMPs), and water supply and quality assessments of groundwater basins. Her Sustainable Groundwater Management Act (SGMA) implementation and compliance experience includes annual reports and Groundwater Sustainability Plan (GSP) development. Ms. Lindhart conducts hydrogeology-related field-work and excels in evaluating and analyzing hydrogeologic data.



Relevant Experience

- Sacramento County, Cosumnes Subbasin GSP Development.** Sacramento County, CA. Ms. Lindhart is currently aiding in the Proposition 1 and Proposition 68 Grant Management and GSP development for the Cosumnes Subbasin SGMA Working Group. As part of Grant Management, she drafts the quarterly Progress Reports and invoices for submittal to DWR for grant re-imbursement. Ms. Lindhart had an integral part in the GSP development, as she supported project management tasks and drafted many sections of the GSP. She developed monthly presentations, summarizing the GSP development as it progressed throughout the duration of the project, and participated in the monthly Working Group meetings.
- Sacramento County, Cosumnes Subbasin Proposition 68.** Ms. Lindhart managed the application development process of the successful Cosumnes Subbasin's Prop 68 SGM Planning Grant Application, which secured the Subbasin \$750,000 of grant money and \$250,000 of cost share funds to support the GSP development and well installation project. She helped manage the various projects that were funded by this grant, including coordinating with subcontractors, contracting, and invoicing.
- City of Galt, City of Galt 2020 UWMP.** City of Galt, CA. Ms. Lindhart managed and drafted the City of Galt 2020 UWMP. As part of that effort, she compiled historical water use information, projected future demands based on population growth and water conservation assumptions, and assessed the City's development of recycled water and groundwater supplies. Ms. Lindhart evaluated their progress on reaching their targeted reductions as per Senate Bill X7-7, as well as demand management measures as they relate to supply reliability and demographic projections going forward.
- San Joaquin County Resource Conservation District, Irrigated Lands Regulatory Program Groundwater Quality Reporting.** San Joaquin Valley, CA. Ms. Lindhart assisted in drafting the Groundwater Quality Trend Monitoring (GQTM) program and the Quality Assurance Project Plan (QAPP) for the irrigated lands regulatory program groundwater quality reporting in San Joaquin County. She created a sampling network for the trend monitoring program this consisted of matching well logs to coalition members, choosing the best fitted wells, reaching out to the coalition member to volunteer their wells, coordinating with volunteers to canvass the wells. After canvassing the wells,

Education

- B.S., Hydrology, University of California, Davis, 2014

she created a list of ideal candidate wells, created maps showing the distribution of the wells, created tables and excel files of the wells information.

- **Somach, Simmons & Dunn.** *Potential Effects of Mixing Sacramento River Water and Groundwater for Aquifer Storage and Recovery*. Yolo County. Ms. Lindhart assisted in analyzing potential effects of mixing Sacramento River water and groundwater for aquifer storage and recovery. She collected water quality data from numerous wells, researched the hydrogeology and geology of the study area and created a geochemical model to assess clogging of the well screens due to mixing treated river water with groundwater. Additionally, she analyzed isotopic data from the well sampling and found surface water isotopic data from previous studies to estimate the river influence throughout the study area. Using the isotopic data, water quality data and model results she was able to determine which wells would be most ideal for aquifer storage via injection of the treated surface water.
- **RMC Water and Environment,** *Groundwater Recharge Sources Study*. Sacramento Valley, CA. Ms. Lindhart helped assess groundwater recharge sources within the Central basin in the Sacramento Valley. She collected and assessed chemical and isotopic analysis of rain, groundwater and surface-water samples. She coordinated with multiple agencies to gain access to wells to create network of wells for sampling. She performed the sampling of thirty municipal wells and one surface water site. She analyzed the laboratory results and created multiple water quality plots and maps. Using the combined isotopic dataset, she helped determine which wells were most influenced by different recharge sources. She created figures, tables and draft write-ups for the report.
- **RMC Water and Environment,** *South Westside Basin Shallow Groundwater Study*. San Mateo County, CA. Ms. Lindhart assisted with the South Westside Basin Shallow Groundwater Study. She coordinated sampling events and collected groundwater samples, including age-dating and isotopic samples, from monitoring wells with bladder pumps throughout the Westside Basin. She analyzed the laboratory results and performed quality assurance and quality control to make sure the analytical results were up to the correct standards. She performed statistical analysis on the water quality by creating piper plots and box plots. She provided ArcGIS support for modeling outputs. Additionally, she helped draft text, figures, and tables of the Technical Memorandum.
- **City of Lathrop,** *Groundwater Monitoring Program*. Lathrop, CA. Ms. Lindhart performs groundwater quality monitoring and analysis related to land application of wastewater. She analyzes and summarizes water quality results and water level measurements. She creates water level contours using the water the level measurements and performs quality assurance tests on the water quality results. She drafts text, tables and figures for the quarterly groundwater monitoring report. Additionally, she has collected soil samples, overseen monitoring well installations, overseen monitoring well abandonments, collected groundwater samples from nearby monitoring wells and performs a well condition survey every year.

Tyler F. Colyer, PE

Civil and Environmental Engineer

Mr. Colyer has over eleven years of project experience in water and wastewater infrastructure design and planning, water quality engineering, and environmental engineering. He has prepared and managed water supply studies, water treatment system designs, pipeline designs, infrastructure feasibility studies, and development water use reports, and provided construction management and construction observation. Mr. Colyer has played a key role in development of RFPs, scopes, budgets, and schedules. Additionally, he has experience in wastewater plant operations, maintenance, and engineering technical support.



Relevant Experience

- **Marina Coast Water District, Groundwater Augmentation Planning and Recycled Water Grant Application.** Marina, CA. Project Engineer and Manager. Mr. Colyer served as Project Engineer for preparation of a feasibility study evaluating technical viability of groundwater augmentation through percolation and/or injection of Salinas River winter storm flows and/or tertiary treated wastewater, including preparation of preliminary cost estimates for construction of each groundwater augmentation scenario. As a follow up to the study, Mr. Colyer prepared a successful application on behalf of MCWD for a State Water Resources Control Board (SWRCB), Clean Water State Revolving Fund recycled water planning grant. This \$150,000 study is 50% funded by a grant from the Clean Water State Revolving Fund program and is being written to adhere to the SWRCB's Water Recycling Funding Program Guidelines. The recycled water feasibility study will identify preferred locations for indirect potable reuse injection wells and will include construction of a groundwater-flow model and conceptual design of a recommended project alternative.
- **Marina Coast Water District, Monterey One Water, and Fort Ord Reuse Authority, Fort Ord Reuse Authority Water Augmentation Study.** Marina, CA. Project Engineer. Mr. Colyer prepared a series of four technical memoranda for Marina Coast Water District, Monterey One Water, and the Fort Ord Reuse Authority to identify approximately 1,000 acre feet per year of water supply that will augment MCWD's existing supply portfolio, in order to serve the redevelopment of the Fort Ord Community. Mr. Colyer worked with the three parties to establish strategic goals and selection criteria to screen a variety of water source alternatives. Mr. Colyer developed conceptual cost estimates for the top three alternatives (two indirect potable reuse alternative and one desalination alternative) and evaluated these alternative through a costs/benefit analyses to identify a recommended project. Location options for the

Education

- M.S., Civil and Environmental Engineering, University of California, Berkeley, 2010
- B.S., Environmental Engineering, University of California, Riverside, 2009

Registrations/Certifications

- Professional Civil Engineer in California (C #80141) and Arizona (#64179)
- Forty-hour HAZWOPER Training Course

recommended indirect potable reuse project have been evaluated and future work needs were identified, which MCWD plans to implement prior to further project development.

- **Diablo Water District and Ironhouse Sanitary District, *Recycled Water Feasibility Study*.** Oakley, CA. Project Engineer. Mr. Colyer prepared a recycled water feasibility study to identify recycled water projects that will benefit the mutual customer base shared by Diablo Water District (DWD) and Ironhouse Sanitary District (ISD). Ironhouse Sanitary District currently produces recycled water that is appropriate for unrestricted reuse but primarily discharges this effluent to the San Joaquin River. The feasibility study developed and evaluated numerous recycled water projects including recycled water distribution alternatives, potable reuse alternatives, and groundwater augmentation alternatives. Project cost and energy use estimates were prepared for each alternative, as well as an evaluation of qualitative criteria such as constructability, ease of maintenance, and community benefits. A conceptual design and financing plan were prepared for the recommended project alternative and a series of next steps were included as part of the study.
- **City of East Palo Alto, *Gloria Way Well*.** East Palo Alto, CA. Project Engineer. Mr. Colyer prepared engineering plans and specifications for the construction of a groundwater treatment system for potable water use at the City of East Palo Alto's Gloria Way Well. The system includes a submersible well pump, iron and manganese treatment system, chemical amendments, Hetch-Hetchy blending system with booster pump station, and a surge tank. Mr. Colyer also assisted the City with the reactivation and permitting of the existing Gloria Way Well, as well as provided engineering services during construction for the Project. In addition, Mr. Colyer worked closely with the City to secure \$3 million of Proposition 84 grant funding to support the City's groundwater development efforts.
- **City of East Palo Alto, *Pad D Well*.** East Palo Alto, CA. Project Engineer. Mr. Colyer prepared engineering plans and specifications for the construction of a new well and groundwater treatment system for potable water use at the future Pad D Well site. The system is anticipated to be used primarily for emergency purposes and will include a submersible well pump, chemical amendments, and a hydropneumatic tank. The footprint for the system was optimized due to the very small parcel and room must be reserved for potential future treatment units.
- **City of East Palo Alto, *Water System Master Plan*.** East Palo Alto, CA. Project Manager. Mr. Colyer is overseeing the preparation of the City of East Palo Alto's Water System Master Plan Update. The project includes construction of a new hydraulic model, water demand projections, a risk-based capital improvement plan and a recycled water feasibility evaluation. Cost estimates and schedules will be prepared for each recommended capital improvement project.
- **Valley of the Moon Water District, *Well 5A Municipal Supply Well*.** El Verano, CA. Project Engineer. Mr. Colyer served as Project Engineer for the mechanical design of the project which includes a new submersible well pump, piping, and appurtenances; and rehabilitation of the existing iron and manganese filtration system. Mr. Colyer also served as Project Manager for the project's construction management services.
- **North Coast County Water District, *Recycled Water Planning Study*.** Pacifica, CA. Project Manager. Mr. Colyer oversaw the preparation of a recycled water planning study to identify recycled water users within the North Coast County Water Districts service area and to develop conceptual distribution projects that will serve these users. Project cost and energy use estimates were prepared for each alternative, as well as a recommendation for a project to pursue further. Findings were presented to the District's Board of Directors and Mr. Colyer is continuing to advise the District on their recycled water operations and planning efforts.

Christopher S. Heppner, PhD, P.G. Supervising Hydrogeologist

Dr. Heppner has 21 years of experience conducting hydrogeologic investigations in both applied and research settings. His water resources work, much of which was done in support of the Sustainable Groundwater Management Act (SGMA), has included basin safe yield analysis; groundwater supply assessments; aquifer test planning, performance, and analysis; municipal well design; development of materials to support grant funding applications; groundwater monitoring program development and implementation; groundwater flow and solute transport analytical and numerical modeling in support of water resources and contaminant remediation evaluations; development of water budget and soil moisture budget models; modeling of integrated groundwater/surface water flow and sediment transport; research into unsaturated zone recharge processes in fractured rock; development of hydrologic models and data analysis tools; and collection of hydrologic field data in multiple environments.

Dr. Heppner has published articles in peer-reviewed journals related to recharge in fractured rock settings, watershed-scale hydrologic response simulation, and sediment transport modeling, and has presented at conferences on topics including basin sustainable yield estimation, salinity in shallow groundwater, numerical modeling methods, equitable groundwater pumping allocation strategies, and water rights-based water budgets.



Education

- PhD, Hydrogeology, Stanford University, 2007
- B.S., Geology/Biology, Brown University, 1998

Registrations/Certifications

- Professional Geologist, CA (#9188)
- 40-hour OSHA HAZWOPER Training Course
- 8-hour Health and Safety Training

Affiliations

- National Ground Water Association
- Groundwater Resources Association of California

Relevant Experience

• Merced Subbasin Groundwater Sustainability Agency (MSGSA),

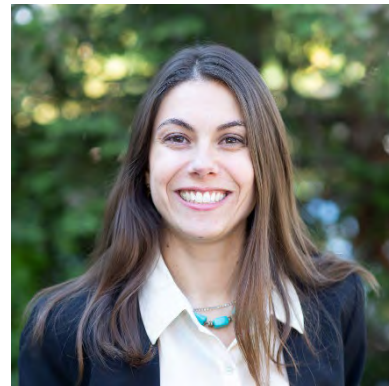
Land Repurposing Program Development for SGMA Compliance. Merced County, California. EKI is assisting the MSGSA with development of a land repurposing program (LRP) that will serve as a centerpiece of the MSGSA's demand reduction management action. Facing significant critical overdraft within its jurisdictional area, the MSGSA recognizes the need to reduce consumptive use of groundwater to achieve its sustainability goals. Dr. Heppner has led EKI's efforts to provide technical and strategic support for the LRP development including: designing and disseminating a stakeholder survey; working with technical advisory committee and ad-hoc MSGSA Board committees to identify and refine program objectives; designing a LRP financing structure that encourages voluntary participation through incentive payments; and developing key materials including an application, scoring framework, contract terms, an FAQ document, and stakeholder outreach materials. Successful implementation of the LRP will allow the MSGSA to achieve its near-term (2025) demand reduction

goal, while establishing administrative frameworks for further demand management activities (e.g., an allocation system).

- **Tejon-Castac Water District, Arvin-Edison Water Storage District, Wheeler Ridge-Maricopa Water Storage District, and Olcese Water District, *Hydrogeologic Conceptual Models and Water Budgets for SGMA Compliance*.** Kern County, California. Project Hydrogeologist. EKI is currently providing technical and strategic SGMA compliance support services to four separate public agencies in Kern County. Each agency faces their own unique set of SGMA compliance challenges, due to differences in size, location, water sources and demands, and local political factors. EKI has worked closely with each entity to tailor our services to meet their particular needs. Dr. Heppner has played a central role in the technical analyses and hydrogeologic evaluations that form the core of EKI's services. His work has focused on development of integrated hydrogeologic conceptual models (HCMs) and water budgets, involving interpretation of various geologic and groundwater data sets and information; compilation and analysis of groundwater conditions data; development and calibration of transient water budget tools and soil moisture balance models; and peer review of related numerical groundwater modeling work. These HCMs and water budget models are key required elements of Groundwater Sustainability Plans (GSPs) and EKI's work prepares our clients for meaningful participation in their respective GSAs.
- **Cordua Irrigation District, *Basin Yield, Groundwater Substitution Transfer Evaluation, and SGMA Support*.** Sacramento Valley, California. Project Manager/Hydrogeologist. EKI is providing water resources consulting services to an Irrigation District in the Sacramento Valley area, including assisting with planning for groundwater substitution water transfers, evaluation of potential impacts of such transfers, and development and review of technical materials for inclusion in the Yuba Subbasin GSP. In support of these goals, Dr. Heppner has conducted temporal analysis of groundwater level data to understand the impacts of previous transfers, developed a novel transfer allocation method, evaluated potential alternative conveyance pathways for surface water during transfers, provided peer review of a basin groundwater model, and helped prepare reports, presentations, and proposals to the county water agency and the California Department of Water Resources (DWR). The Yuba Basin GSP to which Dr. Heppner contributed was submitted ahead of schedule and approved by DWR.
- **Marina Coast Water District, *Groundwater Augmentation Feasibility Study and SGMA Support*.** Central Coast, California. Project Hydrogeologist. EKI has conducted a feasibility study of potential groundwater supply augmentation alternatives on behalf of the Marina Coast Water District (MCWD). The study evaluated the physical, hydrogeologic, permitting, cost-related and regulatory factors for a range of potential alternatives to augment local groundwater supplies. Dr. Heppner provided oversight of efforts to form the hydrogeologic conceptual model underpinning the evaluation, as well as supported the permitting evaluation. EKI also provides SGMA support to MCWD, including preparing a highly ranked Proposition 1 grant proposal to obtain funding support for GSP preparation, development of a SGMA "Road Map", and a preliminary data-gap analysis. Dr. Heppner has been involved in all EKI's SGMA support efforts.

Christina E. Lucero, P.G. Hydrogeologist

Ms. Lucero has twelve years of experience in hydrogeologic data gathering, collection and evaluation; groundwater flow modeling and Geographic Information Systems (GIS). She develops and implements numerical models, researches the geology and hydrology of project areas, conducts spatial analyses and creates maps using ArcGIS, and summarizes results in hydrologic and water quality reports. She is actively engaged in Sustainable Groundwater Management Act (SGMA)-related activities in four groundwater basins. Furthermore, she has experience utilizing both IWFM and MODFLOW platforms, and has successfully implemented regional and site-specific models.



Relevant Experience

- Cosumnes Subbasin Groundwater Sustainability Plan (GSP) Development.** *Sacramento County, CA.* Hydrogeologist. Ms. Lucero aided in GSP development for the Cosumnes Subbasin. She developed cross-sections located through the middle of- and along the boundaries of the Subbasin to aid with numerical model grid mesh and layering refinements and for integration into the Hydrogeological Conceptual Model (HCM). She refined and calibrated the IWFM numerical model to better represent the Cosumnes Subbasin HCM and groundwater conditions. She then integrated specific Project and/or Management Actions (P/MAs), including winter flooding of fields and Flood-MAR, into the numerical model projected scenarios to quantify benefits to the basin.
- Tejon-Castac Water District, White Wolf Subbasin Groundwater Sustainability Agency (GSA) GSP Development and Implementation.** *White Wolf Subbasin, CA.* Hydrogeologist. Ms. Lucero aided in Proposition 1 and Proposition 68 Grant Management and GSP development for the White Wolf GSA. Ms. Lucero developed a Basin-specific numerical groundwater flow model using MODFLOW-NWT. The model represents the HCM of the Basin, was calibrated to historical data, and was verified against current data. Ms. Lucero developed projected model scenarios that were used to assess impacts of climate change and projected land use and water availability conditions on sustainable management criteria and facilitate P/MAs planning, including site-specific analyses using particle tracking beneath a recharge facility. Model results played a critical role in guiding the GSA's future GSP implementation efforts. As part of GSP development, Ms. Lucero also aided in developing cross sections, conducted a current groundwater conditions analysis, summarized historical, current, and projected water budgets to

Education

- B.S., Geology, University of California, Davis, 2010

Registrations/Certifications

- Professional Geologist in California (#9262)

support long-term planning, coordinated with the GSA entities to develop a SGMA monitoring network for each relevant sustainability indicator, and oversaw a field investigation on shallow water-bearing zone conditions and connectivity to the Principal Aquifer. As part of the field investigation, Ms. Lucero helped conduct monitoring well siting to optimize placement of the well to monitor shallow water levels adjacent to groundwater dependent ecosystems. Ms. Lucero continues to support the GSA with ongoing GSP implementation, including annual model extension, ongoing data collection and processing, annual reporting, and P/MA planning support using the model. Most recently, Ms. Lucero has worked with the GSA to conduct spatial analyses to identify (1) target lands in which the GSA may consider conducting multi-benefit land repurposing and (2) most suitable lands for recharge based on screening criteria. Finally, she continues to support the GSA with quarterly Board meetings and stakeholder outreach.

- **Arvin-Edison Water Storage District Coupled Groundwater Flow Model and Operational Decision Support Tool.** *Kern County, CA.* Project Manager. Ms. Lucero is currently overseeing development of a coupled groundwater flow model and operational decision support tool for the Arvin-Edison Water Storage District. The tool will support both the District's well siting, operational, and water quality decisions, and ongoing SGMA implementation and compliance efforts. While the model is currently in development, Ms. Lucero has worked with the EKI team to compile all relevant data, draft a model design work plan, and begin model construction.
- **Tejon-Castac Water District, Castac Lake Groundwater Basin GSA GSP Development.** *Lebec, CA.* Hydrogeologist. Ms. Lucero aided in GSP development for the Castac Basin GSA and is currently aiding in ongoing GSP implementation. During GSP development, she updated an analytical spreadsheet model for the Basin to quantify historical and current groundwater inflows, outflows, and storage which was then used to inform recharge inputs to a numerical flow model. She aided in development of a numerical flow model used to quantify the future projected water budget under numerous climate change, land use, and management scenarios. One such scenario included modeled particle tracking beneath a proposed P/MA in which lake levels would be maintained to facilitate groundwater recharge. Particle tracking model results indicated there would be minimal to no impact to public water system wells. As part of GSP implementation, Ms. Lucero oversees annual updates to the numerical model, which is used to quantify the Basin's change in groundwater storage. Finally, Ms. Lucero supported the GSA in applying for a monitoring well installation Technical Support Services Grant to fill critical data gaps identified throughout the GSP and model development process.
- **Westside Basin Numerical Groundwater Flow Model Update.** *Daly City, CA.* Groundwater modeler. Between 2010 and 2017, Ms. Lucero assisted with two updates to the Westside Basin numerical groundwater flow model, which is utilized to quantify basin hydrogeology and has been employed to design and analyze an in-lieu conjunctive use project in San Mateo County to increase drinking water supply reliability for the greater San Francisco Bay area. Additionally, in 2015 Ms. Lucero conducted particle tracking to estimate recharge areas for monitoring and supply wells. Finally, most recently in 2020, Ms. Lucero utilized the Westside Basin model to developed scenarios to support planning of a regional aquifer storage and recovery groundwater recharge project.
- **Confidential Client, Model Review, Update and Implementation for Estimating Future Response to Project Pumping.** *Monterey County, CA.* Hydrogeologist and groundwater modeler. Ms. Lucero conducted a model review, update, and implementation for estimating future response to project pumping. She updated and employed an existing MODFLOW groundwater-flow model to calculate the cone of depression caused by proposed coastal slant wells for a proposed desalination project. Additionally, she used MODPATH to determine the areal extent of ocean water that would be captured and to identify areas where seawater intrusion would be affected due to future project pumping. The modeling analysis was used in preparation of the Draft EIR/EIS for determining potential project impacts on groundwater resources.

Jeff R. Shaw, PG, CHg

Senior Hydrogeologist

Mr. Shaw has thirty-five years of experience conducting hydrogeologic investigations and resource development in the fields of water resources, environmental remediation, and mineral exploration and development. His work has included municipal well and test well drilling, design, construction, development, testing, and sampling; aquifer test planning, execution, and analysis; groundwater supply assessment; planning and execution of environmental investigations; analytical and numerical groundwater flow and geochemical modeling; and statistical analysis and data quality control.



Relevant Experience

- **Extensive Drilling, Logging, and Sampling.** *California, Arizona, Iowa, and Kentucky.* Hydrogeologist. Mr. Shaw has planned and executed drilling and construction of supply, environmental, and resource-recovery wells at commercial, industrial, and mining sites in California, Arizona, Iowa, and Kentucky. Mr. Shaw also conducted mineral-resource drilling for precious and base-metals exploration and development in Montana and Arizona. Mr. Shaw has been responsible for all phases of work, including writing proposals, budgeting and cost estimation, permitting from various state and local agencies, contracting, conducting field operations including supervision of junior employees, health and safety, geologic logging, sampling, and interpretation, sampling of sediment, groundwater, soil vapor, and rock cores, well construction and development, and underground mapping in historical mine workings.
- **Borehole and Surficial Geophysical Investigations.** *Multiple Locations.* Hydrogeologist. Mr. Shaw has planned, executed, and analyzed subsurface geophysical investigations, using borehole geophysical tools and techniques such as natural gamma, resistivity, spontaneous potential, fluid temperature and conductivity, spinner flowmeter and heat-pulse flowmeter logs. Mr. Shaw also has planned, supervised, and executed shallow-subsurface geophysical investigations using magnetometers, ground-penetrating radar, gravity, and very-low frequency radio receivers.
- **Environmental Groundwater Investigations.** *Multiple Locations.* Hydrogeologist. Mr. Shaw has conducted analysis of geologic controls on chemical distribution at numerous industrial sites in

Education

- M.S., Hydrology, University of Arizona, 1997
- B.S., Geology, University of Idaho, 1986

Registrations/Certifications

- Professional Geologist, CA (#7759)
- Certified Hydrogeologist, CA (#1021)
- 40-hour OSHA HAZWOPER Certification
- 8-hour Refresher Courses

the Bay Area and elsewhere. Responsibilities have included interpretation of geologic, geophysical, and other subsurface data to map hydrogeologic features and evaluate groundwater flow in complex heterogeneous media, and research of historical records for information on chemical usage and construction details that influence the spatial distribution and transport of chemicals of concern.

- **Hydraulic Pumping and Slug Tests. *San Francisco Bay Area.*** Hydrogeologist. Mr. Shaw has planned, executed, and analyzed hydraulic pumping tests and slug tests at industrial and commercial sites in the Bay Area, elsewhere in California, and in other states. He has been responsible for all phases of hydraulic testing, including planning, budgeting and specifications; equipment procurement, calibration and troubleshooting, test execution and data collection; field staff supervision, data reduction and evaluation, analytical model selection and implementation, and reporting and presentation.
- **City of Marysville, *Water Supply Reliability Construction Project, Gavin Park.*** Marysville, CA. Mr. Shaw provides hydrogeological services for a new well construction project with the goal of improving water system capacity, water system reliability, and sustainability at the Park, while reducing the potable water flow requirements. Mr. Shaw's responsibilities included drafting of bid specifications for drilling, sampling, well construction, geophysical testing, and zone testing; as well as review of data obtained; and well design.
- **City of East Palo Alto, *Pad D Production Well Project.*** East Palo Alto, CA. Hydrogeologist. Mr. Shaw provides hydrogeological support for design and construction of a new well and treatment system for the City of East Palo Alto. Mr. Shaw's responsibilities include contracting, test well design, supervision of drilling and geophysical services, and review of hydraulic testing plans and implementation.
- **Valley of the Moon Water District, *Well 5A Production Municipal Water Project.*** Hydrogeologist. Mr. Shaw provided hydrogeological support for the design and construction of a replacement municipal water well with an option for future use as an Aquifer Storage and Recovery ("ASR") well for the Valley of the Moon Water District. Mr. Shaw's responsibilities include supply well design, contracting, supervision of drilling and geophysical services, and planning, execution, and analysis of hydraulic testing.
- **Groundwater Study for a Planned Community. *Southern California.*** Hydrogeologist. Mr. Shaw planned, supervised, and executed a drilling program for a network of 400-ft deep monitoring wells which proved instrumental for evaluation of project water resources of a large rural development project in southern California. Mr. Shaw was responsible for scoping, contracting and management of subcontractors, drilling and geophysical services supervision, monitoring well design, supervision of well construction, planning, execution, and analysis of hydraulic testing, and development of the site hydrogeological model based on the data collected.

Presentations and Publications

Meixner, T, J.R. Shaw, and R.C. Bales, (2004) Temporal and spatial variability of cation and silica export in an alpine watershed, Emerald Lake, California. *Hydrological Processes*, 18, 1759–1776 (2004). DOI: 10.1002/hyp.1416.

Susan Xie, P.E. Water Resources Engineer

Ms. Xie has several years of experience in environmental engineering with a focus on water resources. She has experience in supporting public and private clients in developing strategic responses to the Sustainable Groundwater Management Act (SGMA) and providing other technical and management services related to groundwater supply and quality. She also provides technical support for other water resource projects that involve groundwater data processing and numerical modeling. Her comprehensive skills base in several areas, including data analysis with MATLAB, R, and Excel VBA, civil design with AutoCAD, data management with Access, data visualization with ArcGIS. She has been involved in several projects with Valley Water in recent years. Her educational background in civil and environmental engineering combined with her analytical skills make her a strong asset on this project.



Relevant Experience

- Confidential Client, Water Bank Evaluation and Siting.** Water Resources Engineer. Ms. Xie has provided technical support on in-depth evaluations of existing water banks and siting studies for potential new water banks. Ms. Xie has evaluated the existing water banks for their performance and risk, including water quality, treatment cost, and groundwater level and storage trends. Ms. Xie has also provided due diligence investigations of proposed banking opportunities, and geographical screening of the San Joaquin Valley to identify potential new banking opportunities. Ms. Xie estimated projected groundwater storage change within the water bank locations through application of the numerical groundwater model and water level volumetric calculation, analyzed groundwater elevation and water quality data through development of analytical tool (in R Studio) to perform statistical analyses, developed conceptual cost-estimates for different treatment scenarios, and developed a geographic information system-based screening tool using ArcGIS that automatically processes multiple geospatial data sets to identify the most promising candidate water bank locations.
- Private Equity Fund. Water Asset Evaluation.** Water Resources Engineer. Ms. Xie has provided due diligence support on 25 separate water banking assets located in California for a major confidential transaction. The evaluation included an assessment of the physical aspects of the facility; the water rights associated with the water supply, conveyance, storage and return; potential risk factors related

Education

- M.S., Environmental Engineering, Water Resources Engineering, University of California, Berkeley, 2018
- B.S., Civil and Environmental Engineering, University of California, Los Angeles, 2017

Registrations/Certifications

- Professional Engineer, CA (#93254)
- 40-hour OSHA HAZWOPER Training Course

Affiliations

- Active member, Chinese American Environmental Professionals Association

to issues such as permitting, water quality, declining water levels, and subsidence; and issues related to climate change and market competition on asset performance and yield.

- **Shafter-Wasco Irrigation District, *Groundwater Sustainability Plan Development*.** Kern County, CA. Water Resources Engineer. Ms. Xie helped develop a Management Area Plan (MA Plan) for a formerly undistricted area (“white lands”) in the Kern County Subbasin, that was recently annexed into the Shafter-Wasco Irrigation District service area. This work has included, among other things, stakeholder outreach and coordination between other entities in the GSA and Basin; development of a conceptual water budgets as a means of estimating historical, current, and projected future water resource availability within the Management Area; defining “Undesirable Results” related to groundwater overdraft conditions to develop “Sustainability Criteria” that to protect from negative impacts of groundwater withdrawals; and identification of projects and management actions to support sustainability in an area that has historically utilized only groundwater and recycled water supplies to support primary agricultural and industrial activities.
- **Tejon-Castac Water District, *Castac Lake Groundwater Basin GSA Groundwater Sustainability Plan (GSP) Development*.** Lebec, CA. Water Resources Engineer. Ms. Xie has aided in GSP development for the Castac Basin GSA. She has helped to develop the Sustainable Management Criteria section of the GSP, including Interim Milestones, Measurable Objectives, and Minimum Thresholds. Ms. Xie developed a numerical model of groundwater elevation to calculate SMCs within the Management Area. She also built a MATLAB program to calculate trends in groundwater quality data, test whether the trends are statistically significant, and plot groundwater elevation data with groundwater quality data to examine their correlation.
- **Adjudication Support in the Las Posas Valley, Ventura County.** Ms. Xie has provided technical support for the comprehensive basin adjudication effort in the Las Posas Valley Groundwater Basin, located in Ventura County. The Las Posas Valley Groundwater Basin contains both urban and agricultural water users, as well as both groundwater and imported surface water use. Ms. Xie provided support in demonstrating our client’s prescriptive rights to groundwater pumping within the available sustainable yield, including managed large datasets and performed statistical data analysis on water level measurements, water quality data, and well construction information. Ms. Xie developed a regression model on native safe yield in the basin, and detailed a history of documented overdraft conditions in the Basin and compared various estimates of reported sustainable yield.

Larry Walker Associates Resumes

Laura Foglia, Ph.D.

Associate Engineer

EDUCATION

Ph.D. in Environmental
Engineering, 2006, ETH Zurich
Switzerland

M.S., Physics, 1999,
University of Milan, Italy

YEARS OF EXPERIENCE

With LWA: 8 years
With UC Davis: 10 years
With Technical University
Darmstadt: 3 years

PROFESSIONAL AFFILIATIONS

American Geophysical Union
European Geophysical Union
IAHS, International Association
of Hydrological Sciences
Secretary of International
Commission of Groundwater,
IAHS

Dr. Foglia is a Senior Engineer with Larry Walker Associates (LWA) where she assists with projects in the areas of hydrological modelling, groundwater management assistance, and TMDL development. At LWA, she is leading the groundwater services for the Ukiah basin Groundwater Sustainability Agency and for Siskiyou County for the development of their Groundwater Sustainability Plans. She is also involved in the development of the pilot groundwater recharge project for the Omochumne-Hartnell Water districts, and she collaborated on a project with SCGA to develop a continuous monitoring network for groundwater levels in the South American Subbasin. Dr. Foglia worked with Prof. Steffen Mehl on behalf of Sacramento County Water Agency for the development of the testimony regarding the potential impact of the California WaterFix project on the groundwater resources in the South American Basin. She was involved in the first Pilot Project in 2009 that promoted by the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) coalition, a collaborative basin planning effort aimed at protecting vulnerable and essential water resources. Since January 2016, Dr. Foglia is also an Adjunct Faculty Staff in the Land, Air, and Water Resources (LAWR) Department at University of California, Davis where she teaches a graduate class on model calibration.

Ukiah Valley Basin Groundwater Sustainability Plan

Dr. Foglia is engaged with the Ukiah Valley Groundwater Sustainability Agency for the development and implementation of their GSP. The plan for the Ukiah valley was submitted in January 2022 and it focuses on river/aquifer interactions, groundwater dependent ecosystems, and decrease in water levels as possibly most important undesirable results. Dr. Foglia is managing the project and playing an active role in the development of the numerical model.

Siskiyou County Groundwater Sustainability Plan

Dr. Foglia is working with Siskiyou county staff and with UC Davis for the development and implementation of the GSPs for three basins: Scott valley, Shasta valley and Butte Basin. All the basins are defined as medium priority and their plans has been submitted in January 2022. As in Ukiah, the main focus is on understanding river/aquifer interactions, and groundwater dependent ecosystems. Dr. Foglia is managing the project and playing an active role in the stakeholders' engagement process as well as in the development of the numerical model.

Omochumne-Hartnell Water District: On-Call Engineering Services

Dr. Foglia is managing the in-call engineering services contract with OHWD. Work includes the repurpose of an existing Proposition 84 grant Integrated Regional Water Management to design an off-season irrigation project to enhance aquifer recharge to the underlying groundwater aquifer and the South American and Cosumnes groundwater basins. The project includes repurpose of the grant, development of the RFPs for the construction services, groundwater monitoring design, stakeholder coordination.



Omoichumne-Hartnell Water District and Sloughhouse Resource Conservation District Basin Boundary Adjustment

Dr. Foglia, together with the LWA team, assisted Omoichumne-Hartnell Water District (OHWD) and Sloughhouse conservation district (SRCD), in putting together and submitting a jurisdictional and scientific basin boundary adjustment request for the Cosumnes Subbasin's northern boundary, located along the Cosumnes River, to DWR in 2016. The project involved the development of technical material as well as the preparation of stakeholders meetings to support the boundary adjustment request.

Scott Valley Groundwater Study, Scott Valley, CA

As part of the LAWR Department at UC Davis, Dr. Foglia provided research services for the Scott Valley groundwater/surface water management project, funded by the North Coast Regional Water Quality Board. The aim of the project is to assist the Scott Valley community with the development of a groundwater management plan that can lead to better streamflow conditions mainly during the summer months, preserving the water needed for agriculture activity. Dr. Foglia assisted with the development of a new GIS-based, irrigation driven, conceptual model for the analysis of the soil and water balance in the Scott Valley watershed. She worked closely with the stakeholders, communities, and landowners.

Sacramento County Water Agency California WaterFix Groundwater Modeling Impact Assessment Support

Dr. Foglia teamed with Prof. Steffen Mehl to support the Sacramento County Water Agency in the Evaluation of the potential impact of the California WaterFix project on the groundwater system in South American Subbasin. Existing models for the entire Central Valley (CVHM) and for the Delta region (CVHM-D) have been extensively used and results analyzed to demonstrate whether the potential impact of the project on water resources (mostly river/aquifer interactions) has been properly considered by the Petitioners. A testimony and a surrebuttal testimony have been submitted as results of this study.

CV-SALTS Salt & Nitrate Sources Pilot Implementation Study, Central Valley, CA

Dr. Foglia managed and performed analysis of salt loads in the Central Valley aquifers for the completion of a Salt and Nitrate Sources Pilot Implementation Study on behalf of the Central Valley Salinity Coalition (CVSC) to help develop a Basin Plan Amendment (BPA) to address the issue of salt and nutrient management in California's Central Valley. The resulting methodology provided a defensible means to relate downstream impacts to upstream sources in watersheds. The objectives were to develop and document procedures and methodologies to quantify the significant salt and nitrate sources in the Central Valley and to pilot test them by applying them in three areas to validate the region-wide applicability.

Work History

Larry Walker Associates, Inc., Senior Engineer. 2007-present

Adjunct Professor, Land Air and Water Resources, UC Davis. Jan. 2016 - present

Technical University of Darmstadt, Germany, Assistant Professor w/o tenure track, research group of Prof. Christoph Schueth. March 2013-Dec. 2015

Department of Land, Air and Water Resources Davis, Post-Doctoral associate, Prof. Tim Ginn. 2007-2009, Prof. Thomas Harter. Aug. 2011-June 2013



**LARRY WALKER
ASSOCIATES**
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Ryan Fulton, P.E.

Project Engineer

EDUCATION

M.Eng., Civil & Environmental
Engineering, 2014, Utah State
University,
Logan, UT

B.S., BioResource and
Agricultural Engineering, 2013,
California Polytechnic State
University,
San Luis Obispo, CA

REGISTRATIONS

Professional Engineer, CA,
No. C87403

YEARS OF EXPERIENCE

With LWA: <1 year
With other Firms: 9 years

PROFESSIONAL AFFILIATIONS

United States Committee on
Irrigation & Drainage
California Irrigation Institute

SPECIALIZED TOOLS

ArcGIS
Surveying

Mr. Fulton serves as a Project Engineer for LWA since joining the company in September 2021, performing specialized work in the groundwater, regulatory, and agricultural market sectors. He has experience working with counties, groundwater sustainability agencies, and irrigation districts throughout California's major agricultural regions, including in the Sacramento and San Joaquin Valleys, Shasta Valley, Imperial Valley, and along the Central Coast. Mr. Fulton has performed groundwater and agricultural data analyses pertaining to water supply quality and quantity, performed risk and alternative water supply assessments, developed grant applications for agencies seeking state and federal funds, developed conceptual hydrologic models, and prepared agricultural water management plans identifying and prioritizing efficient water management practices.

Groundwater Sustainability Plan Development, Sierra Valley Groundwater Sustainability Agencies. September 2021 – Present. Sierra and Plumas Counties, CA.

Mr. Fulton contributed to the development of the Sierra Valley Subbasin Groundwater Sustainability Plan (Plan) through developing sustainable management criteria, identifying and prioritizing project and management actions, updating Plan content summarizing hydrologic model development, and preparing annual report template and workflow process. Additionally, he worked with the Sierra Valley Groundwater Management District to seek state funding to develop basis of design reports, including conceptual level designs, to implement projects and management actions listed in their Plan.

Work History

Dauids Engineering, Inc., Associate Engineer, 2014-2021

California Polytechnic State University Irrigation Training & Research Center, Irrigation Support Engineer, 2012-2014

Delivery Infrastructure Modernization and Canal Operations Decision Support System Implementation, Biggs-West Gridley Water District. March 2016 – April 2021. Gridley, CA.

Prepared CALFED Water Use Efficiency and DWR Proposition 1 grant applications to complete infrastructure modernization and canal operations decision support system upgrades. Estimated total project costs, quantified expected water savings and other project benefits, and summarized scope of work for the purpose of seeking implementation funds and initiating the CEQA and NEPA process. Worked with the client to review grant agreements and suggested edits to funding agencies to properly define scope of services. Worked on the basis of design report to detail the site-specific conditions, technical adequacy of the proposed design, relevant assessments, data gaps, how the proposed project will deliver the benefits claimed, and ongoing maintenance and operational expectations. Supervised engineering staff conducting site visits to inventory existing turnout and operational spills; conducted topographic site surveys; and prepared designs, plans, and specifications. Reviewed AutoCAD drawings and design



details and prepared estimates of materials and quantities during the development of plans, maps, and project costs. Communicated project scope and permanent and temporary impacts to environmental and cultural resources consultants. Reviewed environmental studies (e.g., Mitigated Negative Declaration, Cultural Resources Inventory and Evaluation, etc.). Participated in grant funding administration internal meetings to track project budget and schedule implications and facilitated project coordination among District staff, technical team, funding agencies, landowners, and other stakeholders.

Agricultural Water Management Plans, Western Canal Water District/Feather River Joint Districts and Corning Water District. January 2020 – April 2021. Sacramento Valley, CA

Completed water budgets quantifying inflows and outflows within the supplier service areas. Identified and developed reconnaissance-level plans and cost estimates of water conveyance and water management improvement projects. Project types include canal system modernization using automated water level control, improved water measurement and remote monitoring via SCADA, and system interties to capture and re-route canal spills. Met with District staff to review Plan sections and current and planned efficient water management practices. Reviewed AWMP requirements; ensured plans meet legislative requirements. Coordinated with DWR and USBR staff as necessary.

Lateral Headgate Flow Rating Verification and Calibration, Reclamation District No. 108. April 2020 – October 2020. Grimes, CA

Developed rating tables for large headgates (e.g., 30", 36", and 48") based on published rating tables by the Irrigation Training and Research Center. Supervised engineering staff with the collection, analysis and refinement of field data. Compared verification measurements taken using a Sontek RiverSurveyor and FlowTracker to the predicted flows from the published rating tables. Developed a calibrated discharge coefficient regression based on percent gate opening. Created custom rating tables; documented results in a brief technical memorandum. Worked with District staff and SCADA integrator to incorporate lateral heading flow equations into the District's SCADA system.

Mapping EvapoTranspiration at high Resolution with Internalized Calibration (METRIC) Applications. January 2015 – February 2021. CA.

In consultation with Dr. Rick Allen, professor at the University of Idaho, applied METRIC to estimate actual evapotranspiration for agricultural and natural landscapes in the San Joaquin Valley near Oakdale, California and within the Napa Valley, and for managed wetlands located in the Sacramento Valley. Processing steps included downloading and preparing satellite imagery obtained through the USGS, developing spatial land use coverages using available datasets from the DWR and USDA, quality controlling and assessing weather parameters available through CIMIS and calculating reference evapotranspiration using standardized Penman-Monteith equation, processing ERDAS Imagine and Python code, and performing image calibration selecting 'hot' and 'cold' pixels critical for accurate actual evapotranspiration estimates. Documented results in METRIC processing reports and disseminated results to stakeholders.

Integrated Water Flow Model (IWFM) Development and Refinement for SGMA Compliance. January 2017 – April 2021. CA.

Modeled land surface hydrologic processes using the IWFM and other models. Compared inputs/outputs from DWR model releases (e.g., C2VSim) to local, quality-controlled data collected from agricultural water suppliers, state and federal agencies, and NGOs. Supported development of the surface layer model input files for IWFM groundwater models, developing spatially and temporally distributed model inputs including quantifying land use acreages and trends, crop consumptive use using remote sensed evapotranspiration estimates, root zone soil characteristics, and weather parameters. Projected future conditions using DWR 2030 and 2070 central tendencies with and without climate change. Supported model development in Madera, Chowchilla, Solano, Napa, Sutter, Colusa, Yuba, Butte, Vina, Los Molinos, Antelope, Bowman, and Corning Subbasins for development of Groundwater Sustainability Plans. Evaluated proposed projects and management actions by incorporating into hydrologic models.



Thomas R. Grovhoug, P.E.

Senior Executive

EDUCATION

M.S., Civil Engineering, 1975,
University of California, Davis

B.S., Civil Engineering, 1973,
University of California, Davis

REFERENCE

GEI Consultants on behalf of
South American Subbasin GSAs

John Woodling
(916) 631-4563

REGISTRATIONS

Civil Engineering, State of
California, No. 27901

YEARS OF EXPERIENCE

With LWA: 38 years
With other Firms: 7 years

PROFESSIONAL AFFILIATIONS

Member, Water Environment
Federation

Member, California Water
Environment Association

Associate Member, California
Association of Sanitation
Agencies

Member, National Association
of Clean Water Agencies

Member, Association of
California Water Agencies

Member, Groundwater
Resources Association

Member, Northern California
Society of Environmental
Toxicologists and Chemists

Member, SWRCB Nutrient
Policy Stakeholder Advisory
Committee

As a Senior Executive and Past President of LWA, Mr. Grovhoug supports the leadership of the company and the overall quality of technical work performed by the firm. His work for numerous municipal and private clients over the past 40 years at LWA has focused on water quality and water resource issues: watershed and groundwater management and planning, engineering analysis, permitting, monitoring, and policy development. In his frequent role as either a project manager or project advisor, he is responsible for project team leadership and management, client communications, budgeting, scheduling, regulatory agency communications, public presentations, and product quality.

Mr. Grovhoug is a registered civil engineer with broad experience in the planning, permitting and development of a variety of water management projects, including work with numerous stakeholder groups in the development of Basin Plan amendments, water quality objectives, modeling studies and water quality monitoring programs. He is an expert in the federal Clean Water Act, California Porter Cologne Act, Basin Planning, NPDES permitting and waste discharge requirements.

He has worked on a wide range of projects over the past 40 plus years on behalf of California clients, including antidegradation analyses, economic analyses, water quality impact assessments, and numerous special studies. His expertise includes collaborative policy and management plan development working with regulators, municipal, agricultural and non-governmental organizations on a variety of projects.

Wastewater

Sacramento Regional County Sanitation District, Development of Delta Drinking Water Policy and Basin Plan amendment (2002-2013)

NPDES permit renewal assistance, Sacramento Regional County Sanitation District, project manager and/or strategic advisor. Led team to address NPDES permit Compliance issues, develop and implement negotiation strategies, and perform a wide range of regulatory policy services (1990 to 2022)

Permitting and Regulatory Advocacy Special Project, Central Valley Clean Water Association, project manager. Led team working on NPDES permit issues, compliance strategies and regulatory policy development (2004-2022)

NPDES permit renewal assistance, for the cities of Manteca, Grass Valley, Tracy, Yuba City, Roseville, Vacaville and numerous other California Central Valley and Bay Area municipalities, project manager or advisor. (1990-2022)

Harvest Water Program Technical and Permitting Services, Sacramento Regional County Sanitation District, project manager. Led assessment of water quality benefits of Harvest Water



effort to provide recycled water to agricultural users in Southern Sacramento County, supported application for Proposition 1 Water Storage Investment Program funding, assisted in development of permitting strategy for program. (2017-2022)

Nutrient Policy Development for the Sacramento-San Joaquin Delta Sacramento County Regional Sanitation District, project manager. Provided Technical and Policy support, collaborated with stakeholders and Central Valley Water Board staff. Participated in Technical Advisory Group (2013-2022)

Biostimulatory and Biointegrity Policy Development, Central Valley Clean Water Association (CVCWA), project manager. Provided technical and policy support for policy development for Wadeable Streams, Inland Surface Waters of California. Member of Stakeholder Advisory Group (2012-2022)

Biostimulatory and Biointegrity Policy Development, California Association of Sanitation Agencies (CASA), project manager. Provided technical and policy assistance to support the policy development effort for wadeable Inland Surface Waters of California (2013-2015)

Freshwater Mussels Special Project, Central Valley Clean Water Association, project manager. Worked with regulators, stakeholders and consultant team to develop NPDES permitting and policy strategies for implementation of USEPA 2013 ammonia criteria, including development of site-specific ammonia criteria for the Central Valley (2014-2019)

Variance Policy and Streamlined Salinity Variance for Central Valley, Central Valley Clean Water Association (CVCWA), project manager. Led effort to perform technical analyses to support the development of a Basin Plan amendment to adopt the Variance Policy and Streamlined Salinity Variance. Assessed management scenarios for control of salinity in Sacramento-San Joaquin Delta to meet water quality objectives (2012-2013)

Regulatory Strategy to support implementation of the Nutrient Management Strategy for San Francisco Bay, Bay Area Clean Water Agencies (BACWA), project manager. Led development of policy analyses, prepared memoranda, and coordinated with BACWA representatives and staff of the San Francisco Bay Water Board. (2013)

Delta Drinking Water Policy, Sacramento Regional County Sanitation District, project manager. Provided technical and policy support for the development of the policy and an associated successful Basin Plan amendment. Worked with regulators and stakeholders to assess need for new water quality objectives for total organic carbon and pathogens using water quality modeling tools and evaluation of management scenarios (2002-2013)

Groundwater

Groundwater Sustainability Plan (GSP) for the South American Subbasin, project administered by Sacramento Central Groundwater Authority (SCGA), project manager. Led consultant team to develop a GSP to fulfill requirements of Sustainable Groundwater Management Act (SGMA). Used modeling tools to evaluate future project scenarios to determine effectiveness in achieving sustainability of groundwater subbasin. (2020-2021)

EDUCATION

Ph.D., Physical Hydrology,
Expected 2023,
University of California Davis,
Davis, CA

B.S., Civil and Environmental
Engineering, 2019,
University of California Davis,
Davis, CA

REGISTRATIONS

EIT, CA,
No. 171128

YEARS OF EXPERIENCE

With LWA: 1 year
With other Firms: 4 years

PROFESSIONAL AFFILIATIONS

GRAC, Member
ASCE, Member

SPECIALIZED TOOLS

Primary: Python, R, QGIS,
Secondary: ArcGIS, AutoCAD

Mr. Calderwood is a Project Engineer in the groundwater and water resources fields at LWA. He has almost 4 years of experience in the monitoring and assessment of groundwater conditions relevant to recharge site implementation and regional groundwater planning. He is the Task Lead for the development and continued update of integrated hydrologic models in the support of Groundwater Sustainability Plan Implementation, along with the application of integrated hydrologic modeling to facilitate project management action scenario testing. He facilitates recharge project permit renewal and reporting, including field monitoring for the duration of the project.

Groundwater

Groundwater Basin GSP, Butte Valley. 2021 - Present. Siskiyou County, CA.

Technical task lead for Chapter 2 of the GSP, including developing the MODFLOW model for the basin and basin water budget. Engaged in developing the GSP for the medium-priority Butte Valley Groundwater Basin due in January 2022. The plan deals mainly with groundwater recharge and pumping dynamics and subsurface outflow to an adjacent basin while providing sustainable criteria for the other five undesirable results.

Groundwater Basin GSP, Shasta Valley. 2021 - Present. Siskiyou County, CA.

Technical task lead for Chapter 2 of the GSP, including the continued development of the loosely coupled MODFLOW - PRMS model for the basin and basin water budget. Engaged in developing the GSP for the medium-priority Shasta Valley Groundwater Basin due in January 2022. The plan deals mainly with surface water and groundwater interaction and streamflow depletion while providing sustainable criteria for the other five undesirable results.

Water Resources

Groundwater Recharge Projects, Omochumne-Hartnell Water District. 2020 – Present. Wilton, CA.

Task lead for the Omochumne-Hartnell Water District (OHWD) Groundwater Recharge project maintaining recharge monitoring equipment and preparing measured data for board review. The project includes monitoring soil moisture, temperature and EC, groundwater elevation, evapotranspiration and applied water. He manages the temporary diversion permit reporting to the State Board to quantify and justify water diverted for groundwater recharge, along with aiding the renewal of the temporary diversion permit.



Andrew Calderwood, EIT

Project Engineer I-A

Publications

Calderwood, A. J., Pauloo, R. A., Yoder, A. M., & Fogg, G. E. (2020). "Low-cost, open source wireless sensor network for real-time, scalable groundwater monitoring." *Water*, 12(4), 1066.
<https://doi.org/10.3390/w12041066>

Presentations & Workshops

American Geophysical Union, Fall Conference 2021, New Orleans, LA, December 14, 2021, *Influence of hydrogeologic structure on long-term sustainable groundwater elevations for a moderate-altitude rain-fed groundwater basin under climate change*, Andrew Calderwood, Bill Rice, Bradley Simms, Cab Esposito, Thomas Harter and Laura Foglia.

Groundwater Resources Association of California, Western Groundwater Conference Fall 2021, Burbank, CA, September 14, 2021, *Using groundwater-surface water modeling to compare groundwater recharge design alternatives to improve stakeholder decision making on multi-benefit projects*, Andrew Calderwood, Maribeth Kniffin and Laura Foglia.

Work History

University of California Davis, Graduate Student Researcher, 2019-present

Worked with python and R to acquire, clean and prepare large hydrologic datasets to develop a groundwater-surface water model using MODFLOW. Installed in-channel pressure transducers to capture stream stage and stream wave arrival times and managed various soil sensors to monitor on-farm groundwater recharge

University of California Davis, Research Assistant, 2017-2019

Managed pressure transducers in a variety of groundwater wells and installed telemetry equipment to support a near real-time groundwater monitoring dashboard. Updated and organized continuous groundwater level data while analyzing seasonal and long-term trends to understand the impact of evapotranspiration on shallow groundwater.

EDUCATION

Ph.D., Electrical Engineering &
Computer Sciences, 1993,
University of California,
Berkeley

M.S., Electrical Engineering &
Computer Sciences, 1990,
University of California,
Berkeley

B.S., Materials Science &
Mineral Engineering, 1987,
University of California,
Berkeley

YEARS OF EXPERIENCE

With LWA: 13 years
With other Firms: 20 years

PROFESSIONAL AFFILIATIONS

Member, Institute of Electrical
and Electronic Engineers

Dr. Walker focuses on environmental real-time continuous remote sensing technology and applications. He has developed a versatile sensor platform based on data loggers, cellular modem telemetry, and various sensors including both discrete sensor elements, and multi-parameter data sondes. The systems are designed for rapid deployment at surface or groundwater sites, or paired with a GPS receiver for mixing zone studies or other mapping applications. Real time data is typically posted to an internal web site for use by the project team.

The platform enables cost effective deployment of sophisticated web-enabled real-time remote sensor equipment even for many small or short term projects. This sensor technology has proven valuable in complementing traditional monitoring methods, enabling efficient and rapid understanding of parameters of interest within a watershed.

Wastewater

Mixing zone and spatial mapping studies

Completed a number of mixing zone studies using continuous sensors equipment including GPS mapping. Typical projects use Rhodamine dye to map downstream of wastewater treatment plant outfall. For Sacramento Regional County Sanitation District, to avoid use of Rhodamine dye a mixing zone study was completed successfully taking advantage of a slight change in specific conductivity induced by the effluent. A second Regional San project mapped ammonium to 20 miles downstream as part of a fate and transport study.

Watershed Management/TMDLs

Calleguas Creek Watershed real-time Salts TMDL monitoring

Installation and operation of a long-term continuous sensor network for monitoring salts load at key sub watershed boundaries within the watershed. The network includes five creek sites with primary and redundant backup sensors for water level, electrical conductivity, and water temperature. The systems post real time data to an internal web site for use by the project team, enabling reduced labor cost and higher data quality through rapid detection of sensor fouling or drift in the coastal watershed with significant moving silt, sand, and algae. The project includes monthly surface water flow measurement for maintenance of rating curves, and bimonthly salts grabs for maintenance of EC surrogate relationships. The projects combined continuous and grab data set enable generation of accurate continuous flow hydrographs, concentration, and loading for chloride, sulfate, boron, and total dissolved solids (TDS).

Groundwater

Continuous sensors in support of Groundwater Sustainability Plans.

Designed and deployed real-time remote monitoring stations to collect data in support



First Last

Staff Title

of groundwater modeling efforts. To date, the network includes instrumentation of 50 groundwater wells and 4 surface water flow stations, spread over 5 groundwater basins. The stations are designed for long-term low-cost operation. Data is automatically reported to a central server by cellular telemetry, and available on the web for use by the project team.

Work History

Dr. Walker joined LWA following a distinguished 20-year career in telecommunications equipment research and development. His prior career included co-founding Genoa Corporation [acquired by Finisar], where he served in various capacities including Founding CEO, VP Engineering, VP Advanced Development, and Chief Technology Officer. Genoa was recognized on various industry lists including Fortune Magazine's 20 cool companies, Red Herring Magazine's 100 companies most likely to change the world, and Light Readings top 10 private telecom companies. He has 25 issued patents and numerous publications.

At Larry Walker Associates, Dr. Walker applies his broad experience in equipment development and engineering data analysis toward design and implementation of continuous remote sensor systems for various monitoring projects.

Larry Walker Associates, Inc., 2007-present

Independent Consulting Engineer, 2004-2006.

Genoa Corporation, 1998-2003.

Lawrence Livermore National Laboratory, 1995-1998.

AT&T Bell Laboratories, 1994-1995.

UC Berkeley, 1987-1993

EDUCATION

Ph.D. Civil and Environmental Engineering, 2016, Louisiana State University, Baton Rouge

M.S., Civil and Environmental Engineering, 2011, University of Tehran

B.S., Civil Engineering, 2009, University of Tehran

REGISTRATIONS

Professional Engineer, State of California, Certificate No. C89426

YEARS OF EXPERIENCE

With LWA: 4 years
With other Firms: 3 years

PROFESSIONAL AFFILIATIONS

Member, American Society of Civil Engineers

Member, WaterReuse Association of California

Member, Groundwater Resources Association of California

SPECIALIZED TOOLS

IWFM, MODFLOW, MODFLOW-OWHM, GSFLOW, C2VSIM, CVHM

MATLAB, GNU-Octave, C++, Python, VBA, R

HSPF, LSPC, HEC-HMS, PRMS

HEC-RAS, VIC, HELP3

ESRI ArcGIS, QGIS

Dr. Amir Mani is a Professional Civil Engineer with LWA and has expertise in a wide array of water resources engineering services including integrated water resources management, hydrology, groundwater management and modeling, climate change adaptation and mitigation strategies, water distribution networks, and urban supply. Since joining LWA, he has been involved in groundwater management and modeling, surface and groundwater quality data analysis, TMDL compliance analysis, watershed modeling, and development of groundwater sustainability plans (GSPs).

During his work as a research assistant at Louisiana State University, Dr. Mani expanded a large high-resolution regional groundwater model and proposed a 25-year sustainable plan to restore the aquifer by developing a high-performance computing conjunctive use model. He has been responsible for multiple large-scale hydrogeological modeling projects, runoff and recharge estimation and projections, and climate change impact assessment and mitigation. He is currently involved in LWA's groundwater market sector working on developing a GSP for the Ukiah Valley Groundwater Basin.

Groundwater

Ukiah Valley Groundwater Basin GSP, Mendocino County, CA. 2018 – Present

Engaged in the development of the GSP for the medium priority Ukiah Valley Groundwater Basin that is due in January 2022. Dr. Mani is the assistant project manager and the technical task lead for multiple chapters of the GSP including the development of the GSFLOW model for the basin and basin water budget. The plan deals mainly with surface water and groundwater interaction and streamflow depletion while providing sustainable criteria for the other five undesirable results.

City of St. Helena Groundwater Modelling, Napa County, CA. 2017-2018

Performed groundwater fate and transport modeling using USGS MODFLOW and MODPATH to assess the effects of recycled water recharge through storage basins and irrigation on the underlying aquifer and Napa River.

Waterfix Ground Water Impact Assessment Support, Sacramento County, CA. 2016-2018

Assisted in preparing testimonies with respect to aquifer response time estimation using CVHM model and assessed the response of the aquifers to the changes in the river elevations and its impacts on the South American Subbasin.

Salt and Nutrient Management Plan, Ventura County, CA. 2017-Present

Assisted in the development of the initial SNMP that included evaluation of basin conditions, basin settings, and preferable fate and transport framework. Performed analytical evaluation of the water quality in the groundwater wells of the county to estimate existing trends and assess causes and contributing sources.



Amir Mani, Ph.D., P.E.

Senior Engineer

Salts Compliance Strategy, Ventura County, CA. 2017

Proposed Groundwater Monitoring Workplan for Piru Wastewater Treatment Plant and prepared the related memorandum to address the Los Angeles Regional Water Quality Board's requirements.

Northeast Pleasant Valley Groundwater Desalter SEP, Camarillo Sanitary District, CA. 2017

Completed a special study for the Septic to Sewer Conversion Project for the City of Victorville as part of the Groundwater Desalter SEP proposed by the district.

Wastewater

NPDES Permit Renewal: Report of Waste Discharge, Multiple Clients, CA. 2017 - Present

Preparation of NPDES permit renewal application and associated technical reports including the No Feasible Alternative Analysis (required for approval of wet-weather blending events). This includes compiling appropriate datasets for wastewater and biosolids, calculating and formatting statistics, organizing pretreatment program information, developing narratives and schematics of the wastewater processes, and updating location maps. The list of clients includes:

- Sewerage Agency of Southern Marin (SASM)
- City of Ukiah
- City of Pinole
- Sonoma County
- City of Grass Valley

Recycled Water Program Implementation, Multiple Clients, CA. 2017

Prepared program guidelines for regulatory and permitting procedure, conducting mandatory inspections, and reporting. Developed engineering reports and notices of intent for compliance under General Order. Assisted in compliance activities with NPDES permits, including conducting special studies, assisting with monitoring and reporting requirements, and responding to compliance and enforcement issues.

The list of clients includes:

- Monterey One Water
- City of Hesperia
- Town of Apple Valley
- Sonoma County
- City of Healdsburg
- City of Ukiah

Watershed & TMDLS

City of Los Angeles CIMP, City of Los Angeles, CA. 2016-Present

Developed and conducted the trend analysis and exceedance analysis of water quality data for the Upper Los Angeles River, Ballona Creek, Dominguez Channel, and Santa Monica Bay watersheds as part of the MS4 permit requirement for effectiveness assessment of non-storm water control measures.

EDUCATION

MSc. Civil and Environmental
Engineering, 2018,
University of California,
Berkeley
Berkeley, CA

B.S. Geological Engineering,
2016,
Queen's University, Kingston
Ontario, Canada

YEARS OF EXPERIENCE

With LWA: 3.5 years
With other Firms: <1 years

PROFESSIONAL AFFILIATIONS

Member, Groundwater
Resources Association

Ms. McNeill is a Project Engineer with Larry Walker Associates (LWA). She is involved in projects related to stormwater, wastewater, groundwater and agriculture. She has participated in multiple monitoring, data analysis and reporting efforts. Ms. McNeill joined LWA following completion of her graduate studies at UC Berkeley. Descriptions for her project work at LWA are provided below.

Groundwater

County of Siskiyou Groundwater Sustainability Plans, Siskiyou County Flood Control and Water Conservation District, 2019-2022. CA.

Supported development of the groundwater sustainability plan (GSP) for the Scott Valley Groundwater Basin, due in January 2022. Responsible for contributing to chapter content and compiling relevant information previously completed studies, legislative documents and other relevant sources. Also supported efforts on the Butte and Shasta Valley GSPs.

City of St. Helena Groundwater Monitoring Support, City of St. Helena. 2018. St. Helena, CA.

Conducted groundwater monitoring activities for the City of St. Helena. Responsibilities included water sample collection, field data collection and field meter and sensor operation. Groundwater monitoring was conducted proximal to the land application area where treated effluent is discharged to support characterization of groundwater quality and elevation.

Wastewater

Combined Sewer System, City of Sacramento. 2018-2019. Sacramento, CA.

Supported and led sampling events for Sacramento's Combined Sewer System. Conducted sample collection and maintained and calibrated monitoring equipment. Conducted data formatting and QA/ QC prior to submittal through CIWQs.

El Dorado Irrigation District Local Limits Evaluations, El Dorado Irrigation District. 2021-2022. CA.

Conducted local limits evaluations for El Dorado Hills Wastewater Treatment Plant and Deer Creek Wastewater Treatment Plant and developed associated sampling plans.

City of Simi Valley Local Limits Evaluation, City of Simi Valley. 2020. Simi Valley, CA.

Assisted in conducting a local limits evaluation for Simi Valley through compilation and analysis of wastewater data.



Pretreatment Administrative Procedures Manual, City of Palm Springs. 2019. Palm Springs, CA.

Assisted development of an updated Pretreatment Administrative Procedures Manual for the City of Palm Springs, which included the procedures and minimum requirements for the Industrial Pretreatment Program.

Local Limits Sampling Plan, City of Thousand Oaks. 2019. Thousand Oaks, CA.

Developed a sampling plan for the City of Thousand Oaks, including sampling locations, frequencies and field controls.

Local Limits Evaluation, City of Burlingame. 2018-2019. Burlingame, CA.

Supported a local limits evaluation for Burlingame through data analysis tasks including load calculations and statistics.

TMDLs, Stormwater and Watershed Programs

Monitoring, City of Stockton and County of San Joaquin. 2003–Present. Stockton, CA.

Supported monitoring through coordination of monitoring events, tracking of compliance with monitoring requirements and receipt of results of monitoring events. Work under this project also includes analysis and compilation of monitoring data in reports.

Stormwater Annual Reports, Multiple Clients. 2019-Present. CA.

Assisted in the development of annual reports and effectiveness assessments for stormwater clients. Project work has included compilation and analysis of data for stormwater program metrics recommendations for stormwater program improvements.

Butte County Stormwater Support, County of Butte. 2021. County of Butte, CA.

Supported development of a Field Operation and Maintenance Plan, a Landscape Maintenance Design Guide, and an Illicit Discharge and Spill Response Plan for the Butte County stormwater program.

Adaptive Management Plan Development, Multiple Clients. 2020. CA.

Supported development of adaptive management plans for Ballona Creek, Dominguez Channel and Santa Monica Bay Jurisdictional Group 2 and 3 for the 2019-2020 Reporting Year. This involved review and analysis of sampling data, and associated discussion, for inclusion in annual reports.

Elk Grove Corporation Yard SWPP Monitoring, City of Elk Grove. 2019-Present. Elk Grove, CA.

Conducted monitoring at the Elk Grove Corporation Yard to collect field data and samples to satisfy requirements in the National Pollutant Discharge Elimination System (NPDES) Industrial General Permit. This involved field sample collection and data summary.

Sacramento Stormwater Quality Partnership, City of Sacramento. Sacramento, CA

Supported development of the Sacramento Stormwater Quality Partnership's (SSQP) Pyrethroid Management Plan and Baseline Monitoring Report including summary of applicable regulations, previous monitoring activities and results and summary of relevant studies. Assisted in developing the trash section for the SSQP Reasonable Assurance Analysis (RAA) report. Responsibilities included integrating results from individual trash implementation plans within the RAA framework.

Olin Applegate

Project Scientist II

EDUCATION

M.S., Hydrologic Science, 2014,
University of California Davis

B.S., Environmental Policy
Analysis and Planning, 2010,
University of California Davis

REFERENCE

GEI Consultants on behalf of
South American Subbasin GSAs

John Woodling

(916) 631-4563

YEARS OF EXPERIENCE

With LWA: 7 years
With other Firms: 2 years

SPECIALIZED TOOLS

ArcGIS, Spatial Analyst

PROFESSIONAL AFFILIATIONS

Member, Groundwater
Resources Association of
California

Mr. Applegate is a Project Scientist and hydrologist with work experience at LWA in the groundwater, agriculture, watershed, and stormwater service areas. Mr. Applegate's experience at LWA includes assisting clients with SGMA compliance, Regional Water Board negotiation during Waste Discharge Requirements renewals, stormwater permit compliance, TMDL compliance assessment, NPDES permit assistance, completion of groundwater technical reports, monitoring and reporting programs, and water quality assessments. Mr. Applegate provides a range of services including data management and analysis, participation in monitoring and special studies, compliance and communication with Regional Waterboards, and regulatory analysis. Prior to LWA, Mr. Applegate modeled impacts to groundwater quality from agricultural production in the Central Valley.

Groundwater and Agriculture

South American Subbasin GSP Development, 2020 - Present

Assisted with GSP development for the South American Subbasin. Work included adapting the previously submitted Alternative Plan into a successful GSP that meets DWR SGMA requirements. Served as the task manager for technical work including water quality analysis and monitoring well network development. Additional technical work was performed to identify groundwater dependent ecosystems via satellite imagery analysis, and to monitor the dynamics of interconnected surface-water depletion.

Sierra Valley Subbasin GSP Development, 2020 - Present

Assisted with GSP development for the Sierra Valley Subbasin to satisfy DWR SGMA requirements. Work included subbasin groundwater quality analysis, subsidence characterization, development of Sustainable Management Criteria (SMC), and design and expansion of the groundwater monitoring network. Extensive technical work was conducted by Mr. Applegate to understand groundwater quality dynamics in the subbasin and to put forth robust SMCs that ensure significant and unreasonable effects do not degrade the subbasin. Mr. Applegate coordinated work efforts between multiple firms during the project, and acted as liaison to communicate with DWR staff regarding regulatory requirements and planning efforts.

City of Palm Springs, WDR Technical Studies 2017- Present

In response to Colorado Regional Board requirements Mr. Applegate is completing a series of technical reports that examine the impact to groundwater from the City's WWTP percolation ponds. Work includes completion of a groundwater technical report that characterizes groundwater quality in the region of the WWTP, as well as a fate and transport investigation of nitrogen. Mr. Applegate analyzed groundwater dynamics



monitored from wells surrounding the WWTP to determine if the network accurately monitors the impacts from recharge. Further assessments included a non-parametric analysis of groundwater quality data, and multiple effluent loading scenarios to determine if the percolation ponds cause impairments in the receiving groundwater.

Ventura County Agricultural Irrigated Lands Group, 2015 – Present

Assisted the Ventura County Agricultural Irrigated Lands Group in responding to Waste Discharge Requirements pertaining to monitoring and reporting of discharges from irrigated agricultural lands. Mr. Applegate assisted in updating the Monitoring and Reporting Plan, aided in the production of the Annual Monitoring Report, and completed GIS work required for analysis and reports. Completion of the Annual Monitoring Report included the analysis of 10 TMDLs.

City of Santa Paula, 2017-2018

In response to LA Regional Board requirements Mr. Applegate developed the Groundwater Monitoring and Reporting Program for the City of Santa Paula's Wastewater Recycling Facility. Work included evaluation of existing subbasin assimilative capacity and baseline groundwater quality, identification of existing regional monitoring programs and data, assessment of land use, and the identification of existing wells to satisfy groundwater monitoring requirements.

Wastewater

Western Riverside County Regional Wastewater Authority, Local Limits Analysis 2020

Mr. Applegate served as the assistant project manager for industrial local limits sampling from the WRCRWA facility. Mr. Applegate conducted the sampling of water quality and biosolids, and coordinated with laboratories to ensure the project's analytical and reporting requirements were met.

Stormwater

Coordinated Integrated Monitoring Program, Upper San Gabriel River, Los Angeles County, 2019 – Present

Served as the assistant project manager providing MS4 permit support to the USGR Enhanced Watershed Management Program Group. Responsibilities include organizing and leading TMDL and stormwater monitoring efforts, analysis of water quality results, reporting of monitoring efforts, coordinating with subconsultants, laboratories, and field crews, oversight of semi-annual and annual data reports

Sacramento Stormwater Quality Partnership, Sacramento, 2014 – 2016

Preparation of monitoring stations including the installation of in-situ continuous water quality field probes, weirs, and auto-samplers. Compiled and managed water quality and flow data, and compiled channel geometry data.

Relevant Experience Prior To Larry Walker Associates

Papers

Applegate, O., Harter, T. 2014. Impact of Dairy Farming on Groundwater Salinity in California's Central Valley - A Mass Balance Approach. M.S. Thesis. University of California Davis. 2014.

Land IQ Resumes

Adriana Delucchi, CCA, CAIS
Soil & Irrigation Scientist



Education

B.S., Environmental Soil Science, California Polytechnic University, San Luis Obispo, CA, 2017

Minor: Water Science, specializing in irrigation

Professional Registrations and Affiliations

- Certified Agricultural Irrigation Specialist (CAIS)
- Certified Crop Advisor (CCA #490209) with Nitrogen Management Certification
- Land Use and Water Committee Representative, California Farm Bureau, San Joaquin County
- Secretary, California Young Farmers & Ranchers
- Member, California Farm Bureau, San Joaquin County
- Member, California Women for Agriculture

Distinguishing Qualifications

Expert/Specialist in the following areas:

- Irrigation systems, scheduling and maintenance
- Irrigation water supply reliability and quality
- Crop production systems
- Soil fertility and plant relationships
- Soil survey and characterization
- Crop photo (aerial imagery) interpretation
- Geographic Information Systems (GIS) analysis

Relevant Experience

Ms. Delucchi is a soil and irrigation scientist with Land IQ. She has over five years of experience in agricultural systems and land use. Her work at Land IQ is focused in several directions ranging from environmental regulation to crop production systems to irrigation water supply and quality. She has been heavily involved in crop mapping, urban landscape mapping and dust mitigation and management of salt effected soils.

Representative Project Experience

CROP MAPPING

Staff Scientist – 20-Year Land and Water Use Change in Butte County and the Vina Subbasin (1999-2019); Agricultural Groundwater Users of Butte County; Butte County, California. Performed GIS analysis to identify and quantify specific areas of agricultural expansion and reduction within Butte County over a 20 year time frame.

Staff Scientist – 2018 to Present California State-wide Land Use Mapping; California Department of Water Resources; Sacramento, California. Works on a team responsible for photointerpretation and identification of peak NDVI of for each crop produced on over 9.4 million acres of total cropped area.

Staff Scientist – 2020 to Present Palo Verde Irrigation District – Crop Classification; Metropolitan Water District of Southern California, Blythe, California. Assist in the classification and data collection required for quarterly crop mapping of approximately 2,600 agricultural fields totaling 90,000 acres by identifying

Adriana Delucchi, CCA, CAIS
Soil & Irrigation Scientist



crop sequence trends. The crop mix in this irrigation district is comprised of alfalfa, cotton, wheat, and miscellaneous specialty crops.

URBAN WATER RESOURCES

Project Lead - Urban Landscape Classification and Demand Analysis; City of Sacramento, City of West Sacramento, San Juan Water District, City of Yuba City, Sacramento County Water Agency, City of Folsom and Regional Water Authority; Sacramento, California. Lead multiple projects to map urban landscapes in residential, commercial, industrial, and institutional land use areas. Creation of water budget tools based on mapped landscape area and draft state-wide water use regulations. Agency training on urban landscape water use demand and budgeting.

Project Lead - Urban Landscape Regulatory Review and Demand Analysis; California American Water; San Diego, California. Lead technical review of urban landscape mapping performed by the California Department of Water Resources for California American Water's service areas to verify that there were no data gaps and identify the magnitude of any data gaps identified. Creation of water budget tools based on mapped landscape area and draft state-wide water use regulations.

AGRICULTURAL WATER RESOURCES

Project Lead - Water Supply Reliability Evaluation for California Walnuts; California Walnut Commission; Folsom, California. Lead the characterization of California water districts to identifying the source, strength of water rights, state of their groundwater basin, reliability on surface water, use of recycled water, and water storage capacity. This allowed water districts with large walnut acreages to be compared to one another given a relative score of water reliability. In turn this data could be used to identify areas of large walnut acreage where the California Walnut Commission could focus efforts to increase the water supply reliability the most efficiently.

Project Lead – Irrigated Acreage Mapping and Water Use Estimation; Las Posas Groundwater Basin Litigation Mediating Parties; Moorpark, California. Provides technical analysis and support to clients and mediator regarding quantification of irrigated acres and applied water use in the context of the mediation of trial issues in the Las Posas Groundwater Basin comprehensive adjudication.

Project Lead – Water Supply Reliability and Orchard Assessment of California, USA Almond Production Regions; Select Harvests; Victoria, Australia. Performed water supply reliability analysis on California water/irrigation districts with the largest almond acreage in the state, making up approximately 800,000 out of the total 1.15 million acres of almonds at the time, to investigate reliability of water, potential yield, proximity to processors and relative age of orchards.

Project Lead – Modeling of California Almond Acreage and Production as Impacted by Water Reliability and Constraints; Almond Board of California; Modesto, California. Compilation of almond mapping, water supply reliability analysis (at the orchard level), Land IQ's Almond Yield Forecasting Tool, and state-wide land use mapping datasets to identify potential almond production scenarios 20 years from now given the impact of the Sustainable Groundwater Management Act (SGMA) and numerous other water related regulations. This model uses variable user inputs to forecast future production, location and acreage changes on the currently existing 1.5 million acres of almonds in the state.

Project Lead - Enhanced Groundwater Recharge Suitability Index; Sustainable Conservation; Modesto, California. Utilized geographic information systems to perform a recharge suitability index of potential for groundwater recharge to assist in SGMA induced water supply reliability constraints. This process utilized several spatial data resources covering a large span of California farmland including multiple publicly available datasets pertaining to soil and sediment characteristics, groundwater transmissivity, and soil storage capacity to assess potential groundwater recharge suitability across the entire Central Valley.

Education

M.S., Soil Science/Agricultural Engineering, North Carolina State University, Raleigh, Graduated 2008

B.S., Environmental Science/Chemistry, State University of New York- Plattsburgh, Graduated 2006

A.A.S., Ecological and Environmental Technology, Paul Smith's College of the Adirondacks, Paul Smith's, NY, 2004

Distinguishing Qualifications

Expert/Specialist in the following areas:

- Soil physics and soil chemistry
- Soil and plant nutrient interactions and management
- Erosion and dust control systems
- Soil salinity/sodicity management
- Root zone water balance
- Soil and land classification
- Transport of contaminants in soils
- Remote (satellite/aerial) land evaluation
- Environmental sampling and analysis
- Land use evaluation and planning

Relevant Experience

Mr. Stall is a project scientist with land IQ. He has over 14 years of experience as a soil scientist. He has performed large scale, specialized surface and soil investigations across the Owens Lake Playa and associated data analysis and reporting. Mr. Stall has also developed and implemented vegetation and dust control effectiveness monitoring plans and supported data analysis for a variety of dust control effectiveness studies. Mr. Stall has assisted with the design and implemented of several pilot study efforts on the Owens Playa including tillage, soil binders and multiple vegetation management studies. Mr. Stall has worked on many projects evaluating the amount and fate of water in a closed agricultural system, including estimates of evapotranspiration, runoff, and groundwater recharge. His technical expertise includes study design, soil and vegetation monitoring, soil investigations and sampling, soil hydraulic conductivity testing, dust control evaluation, erosion monitoring and modeling support, and data analysis. Mr. Stall is also proficient with geographic information systems (GIS) and efficiently integrates GIS and geospatial analysis into projects and mapping efforts. He has a deep understanding of soil physics, soil moisture modeling, and soil chemistry and soil-plant relationships.

Representative Project Experience

CROP MAPPING

Statewide Rice Mapping; Central Valley, California. Assesses acreage of rice during the growing season via satellite data. NASS estimates are accurate after the rice harvest season is complete and statistics are gathered. The remote sensing method has proven to be very accurate (>99% accuracy) from 2014 to present. The remote sensing method of rice identification is usually released in late June of each year, before the rice has reached panicle initiation. Mr. Stall is also helping with an effort to map flooded rice land for winter decomposition.

California Statewide Crop Mapping; CADWR; California. Participates in ground truth data collection, photo interpretation, and crop classification for all every irrigated acre in California from 2014 to present. Delivery of this dataset includes over 400,000 individual polygons encompassing over nine-million acres of irrigated agriculture.

AGRICULTURAL WATER RESOURCES

Historic Land Use and Agricultural Water Use Estimates; Confidential Client. Data management lead to evaluate land and water use in litigation. Historic imagery was used to evaluate cropping patterns over time in the area, supplemented by tabular data from crop reports. Using multiple historic weather stations, total water use was calculated and compared through the period of interest.

Historical and Present Crop Evaluation and Water Use Estimate; Brownstein, Hyatt, Farber, Schreck – Water Law Firm – representing a Confidential Client; Bakersfield, California. This project involved the historical and present quantification of water use at a confidential site near Bakersfield. Archived imagery and land use maps from the California Department of Water Resources were used to evaluate the cropping patterns from the 1950s to present day. Water use was modeled and evaluated for this area of interest to estimate the safe water yield of the groundwater.

Agricultural Land Fallowing Program; Confidential Client; Arizona. Project lead to evaluate the irrigated agricultural water use in an Arizona Irrigation district annually. A crop map and potential water use is calculated each year in this Arizona irrigation district for approximate 5,000 acres. This map is produced with high resolution aerial imagery and time series evaluation of multispectral imagery. Using local AZMET weather stations, consumptive use per field is calculated and a report is generated to estimate the potential water savings to fallow acreage in the district.

Consumptive Use Evaluation; Yuma Mesa Irrigation and Drainage District; Yuma, Arizona. Collected ground truth data to complete a crop mapping effort for the Yuma Mesa Irrigation and Drainage district. The contemporary map was used to inform historic crop mapping efforts. Using the spatial and temporal data, along with relevant weather data, a consumptive use evaluation was completed for the district.

Cold Water Rice Yield Loss Calculation via Remote Sensing; California DWR; Butte County, California. Conducts yearly field by field yield loss calculations for over 110,000 acres of rice affected by cold water releases from the Oroville Dam. This project involves collecting GPS yield data, calibration of imagery, modeling yield via remote sensing, and spatial analysis of the results.

SOIL SCIENCE

Soil Evaluation for Manganese Toxicity Impact on Agriculture, Yolo Bypass Wildlife Area; City of Davis; Davis, California. Conducted sampling and analysis efforts to characterize chemical and physical soil conditions in relation to the potential for manganese toxicity. Included comprehensive literature review to identify soil, crop and environmental conditions that cause manganese toxicity. Developed a summary report to assess site-specific soil data results and determine the potential for manganese toxicity to impact agriculture within the Yolo Bypass Wildlife Area.

Owens Lake Dust Control Operational Monitoring Support, Shallow Flood Mapping; LADWP; Lone Pine, California. This task was assigned to match satellite imagery with data collected from ground truthing events on the dry lakebed survey in support of wetness mapping technique refinement. Satellite imagery, once calibrated to set ground targets, will be used to remotely detect compliance with set standards of soil moisture in Owens Lake. This work was being conducted in response to dust control management policies on behalf of LADWP.

Education

Ph.D., Soil Science (Water Resources concentration), North Carolina State Univ., Raleigh, 1996
M.S., Soil Science (Ag Engineering concentration), North Carolina State Univ., Raleigh, 1992
B.S., Soil Science (Crop Sci. concentration), California Polytechnic State Univ., San Luis Obispo, 1990

Professional Registrations and Organizations

Certified Professional Soil Scientist (CPSS - #18204) – American Registry of Certified Professionals in Agronomy, Crops and Soils; American Society of Agronomy; Soil Science Society of America

Distinguishing Qualifications

Expert/Specialist in the following areas:

- Land use assessments and crop identification
- Production agricultural systems
- Soil/water/plant relations in arid climates
- Irrigation and drainage management
- Crop consumptive use estimates
- Agricultural water resources
- Soil nutrient interactions and environmental issues in soils
- Soil and water salinity management for agriculture
- Water quality for irrigated agriculture
- Regulatory support and negotiation for agriculture
- Agricultural research

Relevant Experience

Dr. Kimmelshue is a Principal Soil and Agricultural Scientist for Land IQ. Dr. Kimmelshue is also a founding owner in the firm. He has experience in agricultural and water resources consulting in the western United States (especially California), and agricultural research and crop production throughout the United States. Dr. Kimmelshue has performed technical leadership and/or managed numerous projects and tasks of nearly \$40 million dollars over the past 26 years.

Dr. Kimmelshue's consulting experience includes practical and applied solutions for development of water/soil management systems and agricultural systems, specifically with irrigated agriculture. This technical expertise also includes crop consumptive use estimates, crop classification, regulatory support and negotiation, water resources science and planning, land reclamation, soil/plant nutrient dynamics, irrigation and drainage in arid and semi-arid climates, soil classification, and crop production. Predominantly, the objective scientific work that Dr. Kimmelshue performs is driven by ever-changing policy, legislative and environmental pressures on production agricultural systems.

Select Representative Projects

- Principal in Charge and Technical Lead – Quarterly Crop Mapping in Palo Verde Irrigation District – Metropolitan Water District, Los Angeles, CA
- Principal in Charge and Technical Lead – Nationwide Mapping of Pecans – American Pecan Council.
- Principal in Charge and Technical Lead – Statewide Crop and Land Use Mapping – California Department of Water Resources.
- Principal in Charge and Project Manager – Monthly Remotely Sensed Crop Consumptive Use – Semitropic Water Storage District, North Kern Water Storage District, Shafter Wasco Irrigation District and 19 other GSAs for a total of 2.3 million acres.
- Project Manager and Technical Lead–Cold Water Rice Yield Loss Determination; Western Canal Water District, Richvale Irrigation District, Biggs West Gridley Irrigation District; Cold Water Influences on Rice Yield; Nelson, Richvale, and Gridley, CA.
- Principal In Charge/Technical Specialist – Statewide Spatial Mapping of Almonds, Walnuts, Pistachios, and Dried Plums; Almond Board of California, California Walnut Commission, California Pistachio Research Board, California Dried Plum Board; Modesto/Sacramento/Fresno, CA.
- Technical Lead and Project Manager – Kern River Watershed Coalition Authority, Sub Basin Review of Agricultural Irrigation and Drainage Practices and Crop Impacts; Bakersfield, CA.
- Technical Lead – San Joaquin River Restoration Program, Seepage Management Plan, Expert Review Panel Member; United States Bureau of Reclamation; Sacramento, CA.
- Project Manager and Technical Lead–Historical and Present Crop Evaluation and Water Use Estimate; Brownstein, Hyatt, Farber, Schreck – Water Law Firm – representing a Confidential Client; Bakersfield, California.
- Project Manager and Technical Lead–Blending of Saline Mine Water with Central Arizona Project (CAP) Water for Irrigation to Cotton, Alfalfa, and Sod; Rio Tinto Mining Company – Resolution Copper; Superior and Queen Creek, Arizona.
- Technical Lead and Task Manager–Blackfeet Indian Reservation Water Right Adjudication; Bureau of Indian Affairs/Department of Justice; Browning, Montana.
- Technical Specialist – Owens Lake Dust Control; Los Angeles Department of Water and Power; Los Angeles/Lone Pine, CA.
- Project Manager and Technical Lead–Irrigation Water Reuse – Water Demand Estimates and Water Quality Suitability; City of Hollister and San Benito County Water District; Hollister, California.
- Project Manager and Technical Lead–Santa Clara River Watershed Total Maximum Daily Load (TMDL) Collaborative Process; Agricultural Irrigation Thresholds for Chloride and Salinity; Los Angeles County Sanitation Districts; Fillmore, California.

Education

B.S., Agronomy, B.S. Environmental Studies, Iowa State University, Ames, Graduated 2008

M.S., Soils and Biogeochemistry, University of California, Davis, Graduated 2013

Professional Registrations & Affiliations

- Certified Professional Agronomist and Certified Crop Advisor (# 337303) – American Registry of Certified Professionals in Agronomy, Crops and Soils
- Soil and Water Conservation Society
- Soil Science Society of America
- Crop Science Society of America

Distinguishing Qualifications

Specialist in the following areas:

- Soil and water quality
- Water quality monitoring and improvement
- Agricultural production systems
- Plant, water, and soil relationships
- Geospatial analysis
- Agroclimatology
- Photo interpretation
- Field data collection

Relevant Experience

Mr. Mulder has been a consulting agronomist/soil scientist in the western United States since 2008. The bulk of his work has been focused on the collection, development, marriage and leveraging of spatial and non-spatial agricultural and environmental datasets in a manner that helps address large scale landscape challenges in the agricultural community. To date, Mr. Mulder has conducted multiple large scale crop survey efforts in the states of California, Arizona, New Mexico and Texas that total over 25,000 miles and 35+ crop types. Additionally, he actively manages a network of biometeorological stations for use in field level crop water use modeling for over one million acres. At the field scale, Mr. Mulder has been closely involved with wastewater reuse projects, dust control strategies for western agriculture, agricultural consumptive use analysis, herbicide drift investigations and an array of other agricultural projects. During which, substantial experience and knowledge has been gained in the areas of field sample collection and analysis. Additionally, Mr. Mulder possess significant abilities in the use of GPS/GIS technologies, database software and statistical analysis software. All of which are fully utilized in tandem to provide the highest level of product quality to his clients.

Representative Project Experience

CROP MAPPING

- **Data Collection and QA/QC Lead– Statewide Spatial Mapping of Irrigated Agriculture in California; Department of Water Resources; Sacramento, California.** Mr. Mulder serves as the primary lead for the annual field collection of land use data throughout the state of California. Land use surveys are conducted quarterly statewide and involve the collection of tens of thousands of crop type data points

captured along thousands of miles throughout California. These data then inform a remote sensing process that classifies that remaining lands that were not physically visited during the survey process. This is an ongoing, multiyear project.

- **Data Collection and QA/QC Lead – Land Use Mapping of the Sacramento/San Joaquin Delta for 2015/2016/2017; Department of Water Resources; Sacramento, California.** This project involved the collection of land cover data for over 4,500 fields within the Sacramento/San Joaquin Delta in California. Mr. Mulder was the lead scientist in charge for the collection and QC of this dataset as well as the QC of the final land use dataset that was developed from the collected ground truth data. This effort included the mapping of native vegetation classes in addition to agricultural crop types.

AGRICULTURAL WATER RESOURCES

- **Lead Spatial Agronomist – Consumptive Use Analysis; Private Client; Ehrenberg, Arizona.** Land use, and corresponding crop consumptive use, was determined for approximately 600 acres of irrigated agriculture in western Arizona. This analysis spanned a ten year time frame and involved the aggregation and analysis of imagery and climate data from multiple data sources. The results of that work were used as justification for water transfer negotiations.
- **Lead Spatial Agronomist – Consumptive Use Analysis; Yuma Mesa Irrigation and Drainage District; Yuma, Arizona.** This project involved the complete surveying of the Yuma Mesa Irrigation District to develop a crop type map that was then used as a point of reference for the development of crop type maps from previous years via photo interpretation of historic images. The crop layers were then used to quantify the consumptive use of water for the entire district.
- **Project Agronomist - Evapotranspiration Field Measurement in Kern, Kings, Tulare, and Fresno Counties; Multiple Irrigation Districts and Groundwater Sustainability Agencies.** Mr. Mulder is responsible for the deployment and management of nearly 100 agroclimatology stations within the Southern San Joaquin Valley of California where the active area of analysis currently spans over one million acres. Over half of these stations were custom built by Mr. Mulder and associates. These stations employ modified forms of the eddy covariance methodology to measure actual crop consumptive use on half hourly intervals. These data are used to guide a remote sensing modeling process that quantifies the evapotranspiration of the remainder of the landscape on a monthly basis. This project work is ongoing.
- **Associate Agronomist – Evapotranspiration Field Measurement in the Sacramento/San Joaquin Delta; Semitropic Water Storage District.** Mr. Mulder led the acquisition and installation efforts for three surface renewal stations located on an island in the delta. The data collected from the stations guided a remote sensing effort that mapped the actual evapotranspiration of the island which then dictated water transfer decisions.

REUSE AND LAND APPLICATION/WATER QUALITY

- **Lead Soil Scientist–Resolution Copper; Resolution Copper Mine Dewatering and Irrigation Project; Queen Creek, Arizona.** This is currently an ongoing project for the past ten years. Mr. Mulder is the field personnel responsible for quarterly sampling of soil, water, and plant tissue on approximately 5,000 acres of irrigated cotton and alfalfa. He is also responsible for maintaining close contact with all participating growers, irrigation personnel, and mine representatives. In addition to sampling and on-site technical support, he is also responsible for maintenance of remote water quality sensors and related telemetry equipment.

Education

M.S., Soil Science, University of Saskatchewan, 2001

B.S., Agriculture (Environmental Science), University of Saskatchewan, 1998

B. Music Performance – Brandon University, 1993

Professional Registrations & Experience

- Certified Professional Soil Scientist (CPSS) – American Registry of Certified Professionals in Agronomy, Crops and Soils
- Fellow, California Agricultural Leadership Program, 2012

Distinguishing Qualifications

Expert/Specialist in the following areas:

- Interpreting scientific literature on soil fertility; crop nutrient management and environmental quality in agricultural systems; global, national and regional information on crop, soil and water resource interactions
- Managing projects with multi-disciplinary analysts and data types including GIS, remote sensing, grower opinions, and historical and current soil, water, and crop quality constituents
- Managing nutrients for crop production and environmental quality; soil inputs for salinity and sodicity management
- Providing regulatory support and communication between members of the agricultural industry and regulatory agencies
- Evaluating industrial co-products, soil and cropping systems for beneficial agricultural use; impacts of water quality and irrigation management on soil and crop quality
- Designing and implementing field-scale studies and nutrient, salinity and sodicity monitoring programs; regulatory compliance programs for land application of industrial wastewater
- Reclaiming sodic/saline soils
- Writing technical grant applications

Relevant Experience

Ms. Tillman has worked in the consulting and agri-business industries for 21 years in Central Canada and the Western US. Her work has focused on various aspects of agronomy and soil quality management in agricultural systems. She has experience in nutrient, water and crop management for production and regulatory management. Ms. Tillman also works with clients and growers to understand and comply with regulations related to beneficial agricultural use and land treatment of industrial wastewater. She has experience in managing and reclaiming saline and sodic soils and has extensive experience working with growers and grower representatives on various projects such as nutrient and water management, fertilizer co-product development, regulatory compliance, and beneficial reuse irrigation projects. Ms. Tillman has managed numerous projects with multi-disciplinary analysts, data types and deliverables suited to a wide array of client needs.

Representative Project Experience

Regulatory Compliance and Support

- **Land and Water Use Change Analysis and SGMA Regulatory Support; Agricultural Groundwater Users of Butte County; Vina, CA.** Conducted analysis and comparison of past and present land and water use for all crops in Butte County; track GSA stakeholder and board meetings; provide technical review for regulatory support.
- **Sacramento Valley Water Quality Coalition, Sacramento, CA.** Currently provide regulatory compliance support through managing a multi-disciplinary team of grower representatives, spatial analysts, agronomists and statisticians to aggregate, manage, analyze and report on regional nitrogen management data for a coalition of 8,600 growers that encompasses 1.1 million acres in Northern California.

Beneficial Reuse

- **Water and Soil Quality Monitoring and Crop Water Use Estimating; Resolution Copper Mining; Superior, AZ.** Assisted in determining and developing monitoring protocol for irrigation district using blended, treated mine discharge water to irrigate approximately 5,000 acres of cotton and alfalfa. Developed estimates for water quantity and quality appropriate for applicable crops.

Project Management and Data Compilation/Interpretation in Multi-disciplinary Teams and Datasets

- **Historical Agricultural and Riparian Land and Water Use Analysis, Confidential Client, Texas and New Mexico.** Collected, interpreted and summarized information from scientific literature, extension publications, local planning documents, and regional and national surveys on historical urban water use to inform water rights adjudication.
- **Evaluation of Crop Water Use Estimates Using Crop Coefficients, Confidential Client, Texas and New Mexico.** Reviewed historical and current yields in relation to standard crop coefficients used to estimate crop water use in pecan, cotton and alfalfa; developed recommendations for modifying crop water use estimates on current crop yields using various crop water use estimation approaches.
- **Evaluation of Crop Water Use Estimates Using Crop Coefficients, Friant Water Authority, Fresno.** Reviewed historical and current yields in relation to standard crop coefficients used to estimate crop water use in major forage (alfalfa, corn) and tree (almond, walnut, pistachio) crops; developed recommendations for modifying crop water use estimates on current crop yields using various crop water use estimation approaches.
- **Sustainable Water Management Strategy for Specialty Crop Expansion in the Sacramento Valley, Sacramento Area Council of Governments, Sacramento, CA.** Currently managing technical team of consultants and sub-consultants to develop and provide inputs for Rural Urban Connections Strategy economic model. Technical work includes characterization of regional groundwater dynamics and surface water delivery systems; using spatial crop data and a groundwater suitability index to determine specific cropped fields suitable for groundwater recharge; conducting outreach and compiling feedback from water providers and growers in the six-county SACOG region to determine; and developing per acre metrics and scenarios for model runs to achieve feasible results.

Agricultural Specialists Resumes

LAND IQ SPECIALIST RESUMES

Education

M.S., Soil and Irrigation Science, Colorado State University, Fort Collins, 1986

B.S., Agronomy, Colorado State University, Fort Collins, 1983

Professional Highlights

- UC ANR Instructor AB 589 Water Diversion Measurement: Complying with new regulations, 2018-19
- Reviewer for CDFA of SWEEP Grant Applications, 2016 - 2020
- Invited UC Chile-Davis Extension Development Program, Santiago, Chile, 2019
- VIII International Symposium on Irrigation of Horticultural Crops, Lleida, Spain, 2015
- Member of UC ANR Water Strategic Initiative Panel, 2011-20
- President, California Chapter American Society of Agronomy, 2012
- Executive Officer, California Plant and Soil Conference, 2009-2013
- Friend of the Farm Bureau, Tehama County, 2003
- Technical Advisory Member, Sacramento Valley Integrated Regional Water Management, 2015-19.
- Glenn County Groundwater Technical Advisory Committee, 2001-2015
- Tehama County Groundwater AB-3030 Advisory Committee, 2002-2012

Distinguishing Qualifications

Expert/Specialist in the following areas:

- Irrigation management and soil management practices for orchard, pasture, and agronomic systems.
- Water measurement practices.
- Groundwater aquifer systems, groundwater management and conjunctive use water management approaches.
- Salt tolerance in agronomic crops, trees, and halophytes.
- Nitrogen management practices.

Relevant Experience

Mr. Fulton has served as a Senior Advisor to Land IQ since 2021. Mr. Fulton has nearly 40 years of experience working in the agricultural community, including 20 years as a UC Cooperative Extension Irrigation and Water Resources Farm Advisor in Tehama, Glenn, Colusa, and Shasta Counties. Mr. Fulton's professional career focused on applied research and extension programs in on-farm irrigation management has led to a positive change in on-farm water use, efficiency, and sustainable production in the Northern Sacramento Valley. In his retirement, Mr. Fulton provides senior review to Land IQ on their field-level consumptive use (ET) estimates for over 2 million acres in the Southern San Joaquin Valley.

Irrigation & Water Resources Farm Advisor, UC Cooperative Extension Tehama, Glenn, Colusa, and Shasta Counties (April 2000 – June 2020).

Develop, demonstrate, and extend information on irrigation and soil management practices for orchard, pasture, and agronomic cropping systems that sustain production, use water and energy efficiently, and prevent off-site water quality impacts. Extend knowledge to water users in the northern Sacramento Valley concerning water measurement, groundwater aquifer systems, groundwater management approaches, and conjunctive water management concepts. Educate water users of water measurement and non-point source water quality regulations facing irrigated agriculture and the role of watershed management approaches to respond.

Managing Agronomist & Licensed PCA, Den Dulk Farming, Kingsburg, CA (1997 - 2000).

Farmed 1100 acres of orchard and vine crops and 2400 acres of alfalfa and row crops in Kings, Fresno, and Kern Counties, California. Managed irrigation, soil quality and plant nutrition, and advised on pest management decisions.

Soils, Water, and Winter Grains Farm Advisor, UC Cooperative Extension Kings County (1986-1997).

Develop, demonstrate, and teach irrigation management practices for orchard and agronomic crops that use water efficiently by reducing agricultural drainage and runoff. Investigate and provide information on soil and water amendments to manage soils with slow water infiltration caused by irrigation water quality. Evaluate salt tolerance of agronomic crops, trees, and halophytes. Study blending and cyclical approaches to re-use saline-sodic agricultural drainwater for irrigation of crops. Research and extend knowledge on all agronomic aspects of irrigated wheat and barley production.

Selected Publications and Presentations

Taghvaeian, S., A. Andales, N. Allen, I. Kisekka, S. O'Shaughnessy, D. Porter, R. Sui, A. Fulton, and J. Aguilar. Irrigation Scheduling in the United States: The Progress Made and the Path Forward. 6th Decennial National Irrigation Symposium. Sponsored by ASABE. San Antonio, Texas. November 30 – December 4, 2020. In Review.

Forero, L., R. Satomi, K. Bali, D. Zaccaria, A. Fulton, and J. Davy, Determining volume in a small pond with a staff gauge. UC ANR 8000 Publication. December, 2019. In press.

Fulton, Allan and Dan Munk, Irrigation and Nitrogen Management. September 2018. pp. 27. <http://ciwr.ucanr.edu/files/300671.pdf>.

Jarvis-Shean, K., A. Fulton, D. Doll, B. Lampinen, B. Hanson, R. Baldwin, D. Lightle, and B. Vinsonhaler. Young Orchard Handbook. August 2018. <http://ccfruitandnuts.ucanr.edu/files/238596.pdf>.

Fulton, Allan, E., Cayle C. Little, Richard L. Snyder, Bruce D. Lampinen, and Richard P. Buchner. Evaluation of Crop Coefficients and Evapotranspiration in English Walnut. ASABE 2017 Annual International Meeting. July 2017. Paper Number 1701457. DOI: 10.13031/aim.201. pp. 12.

RMC, Woodard and Curran Water and Environmental Consultants. Assessment of Interconnected Subbasins: Technical collaboration on interconnected subbasins to advance sustainable groundwater management. June 2017. <https://www.buttecounty.net/waterresourceconservation/Special-Projects/Interbasin-Groundwater-Flow-Project>.

Butte County Department of Water and Resource Conservation. Fact Sheet: Addressing Interconnected Subbasins under SGMA. June 2017. <https://www.buttecounty.net/waterresourceconservation/Special-Projects/Interbasin-Groundwater-Flow-Project>.

Education

M.S., Water Science/Irrigation and Drainage, University of California, Davis, 1987

B.S., International Agricultural Development/Agronomy, University of California, Davis, 1978

Professional Affiliations

- American Society of Agronomy/Soil Science
- American Society of Agricultural and Biological Engineers
- California Irrigation Institute (President 2008-2009)
- Irrigation Association

Professional Awards

- 2022 Award of Honor, American Society of Agronomy, California Chapter
- 2017 Irrigation Person of the Year, California Irrigation Institute

Distinguishing Qualifications

Expert/Specialist in the following areas:

- Irrigation management, including irrigation scheduling and crop water use, optimal system design and maintenance.
- Salinity and fertility management, including reclaiming and improving soil structure and nutrient availability.
- Agronomy, including traditional commodity responsibilities for dry beans, sugar beets, safflower, alfalfa, and other forage crops.
- Crop water demand (ET) in permanent and annual crops.
- Green waste compost and application of biosolids to farmland.
- Field trials and seminars.
- Applied research and extension programs.

Relevant Experience

Mr. Sanden has served as a Senior Advisor to Land IQ since 2021. Mr. Sanden has over 40 years of experience working in the agricultural community, including 26 years as a UC Cooperative Extension Irrigation and Agronomy Farm Advisor in Kern County. Mr. Sanden's professional career focused on applied research and extension programs in irrigation management, salinity and fertility management and agronomy, including the development of field salt tolerance thresholds for California pistachios, crop water use coefficients (Kc) and fertility for high yield almond production. In his retirement, Mr. Sanden provides senior review to Land IQ on their field-level consumptive use (ET) estimates for over 2 million acres in the Southern San Joaquin Valley.

Irrigation & Agronomy Farm Advisor, UC Cooperative Extension Kern County (July 1992-July 2018). Education and research programs relating to soil/salinity/irrigation management in almonds, pistachios, other crops in Kern County. Agronomic production practices for alfalfa, dry beans and oil crops.

Irrigation Technical Advisor, Paramount Farming, Lost Hills, CA (February 1988 – July 1992). Management of irrigation on 26,000 acres of pistachios, almonds, olives, grain, and cotton.

Graduate Research Assistant and Teaching Assistant, UC Davis Department of Land, Air & Water Resources, Davis, CA (January 1985 – February 1988).
Developed original research to monitor seepage of ponded drainwater in five agricultural drainwater evaporation ponds in the San Joaquin Valley.

Farm Manager, Woodlake High School, Woodlake, CA (June 1983 – January 1985).
Planned and carried out operations for maintenance and production on 44-acre high school farm.

Fraternal Worker/Missionary, United Presbyterian Church, USA; Zambia, Africa & U.S. (July 1978 – January 1985). Developed strategies and programs stressing self-reliance for increasing agricultural production in a rural area of Zambia, Africa through demonstration plots of local field and vegetable crops, design, and construction of hand-powered processors for some crops, village extension/education.

Selected Publications and Presentations

Sanden, B.L., L. Ferguson, C. Kallsen, D. Corwin. 2007. Large-Scale Utilization of Saline Groundwater for Development and Irrigation of Pistachios (*P. integerrima*) Interplanted with Cotton (*G. barbadense*) Proceedings of the Vth International Symposium on Irrigation of Horticultural Crops, Eds: I. Goodwin and M.G. O'Connel, Acta Horticulturae, ISHS 792:551-558.

Hanson, B., S. Orloff, B. Sanden. 2007. *Monitoring Soil Moisture for Irrigation Water Management*. Univ. California, Davis, Dept. Land, Air and Water Resources, UC ANR Publication 21635, 48 pp.

Sanden, B.L. A.E. Fulton, D.S. Munk, S. Ewert, C. Little, F. Anderson, J.H. Connell, M.D. Rivera, M. Orang and R.L. Snyder. 2012. California's Effort to Improve Almond Orchard Crop Coefficients. European Geosciences Union General Assembly 2012, Vienna, Austria, 22–27 April, 2012, Session SSS11.3: Soil and irrigation sustainability practices. Abstract EGU2012-7043 and presentation.

Sanden, B.L., S. Muhammad, P.H. Brown, K.A. Shackel, R.L. Snyder. 2014. Correlation of individual tree nut yield, evapotranspiration, tree stem water potential, total soil salinity and chloride in a high production almond orchard. ASABE Annual International Meeting Montreal, Quebec Canada July 13-16, Amer. Soc. Agri. and Bio. Eng., 2950 Niles Road, St. Joseph MI 49085-9659. <http://elibrary.asabe.org/> paper No. 141912431, 8 pp.

McCullough-Sanden, B.L., McBride, J., Urban, D., Heilmayr, R., Kilham, N., Madgavkar, A., Lampinen, B., and Shackel, K. 2020. Correlation of almond yield with applied water and remotely sensed canopy temperature in the San Joaquin Valley of California. 6th Decennial National Irrigation Symposium Amer. Soc. Agric. & Biol. Eng. <https://doi.org/10.13031/irrig.20-060>

In addition are extension research project summaries to commodity workgroups and grant agencies, regular publications of the Kern Soil & Water and Kern Crop newsletters and on-going contributions to popular press outlets such as Western Farm Press, Ag Alert, Pacific Nut Producer and Ag Consultant magazines.

EVAPOTRANSPIRATION PLUS RESUMES

Satellite-based ET Mapping
Hydrologic Modeling
Micrometeorology
Water Balances
Ecohydrology



Dr. Richard G. Allen

Professor of Water Resources Engineering
University of Idaho
Kimberly Research and Extension Center
Office@Allen-Engineering.com

Dr. Allen is the owner of ET+ and leads the Water Resources Research Program at the University of Idaho Kimberly Research Center. He specializes in evapotranspiration, irrigation water requirements and hydrologic systems. His research focuses on developing physics-based approaches and tools to solve water-related problems, including water consumption over large areas using satellite-based energy balance. Allen's research team is the developer of the METRIC process (Mapping Evapotranspiration at high Resolution using Internal Calibration).

Allen has published more than 100 refereed journal articles and chapters, with 55 refereed journal articles, three encyclopedia entries and nine books or book chapters related to evapotranspiration. He was lead author of the UN Food and Agriculture Organization publication "*Crop Evapotranspiration*" that has served as an international practice standard. He was coeditor of the American Society of Civil Engineers Practices Manual 70 "*Evapotranspiration and Irrigation Water Requirements*." He has served as a consultant to the UN, the World Meteorological Organization, US-AID and governments of Portugal, Spain and Australia with missions to India, Pakistan, Jordan, Yemen, Morocco, Egypt, South Africa, Brazil, Saudi Arabia and Turkey. He was a member of the *NASA/USGS Landsat Science Team* from 2007-2018 and is a current member of the *NASA ECOSTRESS Science Team*. Allen has supervised four Ph.D. and one M.S. theses and six post-docs over the past 10 years on METRIC development and application.

Allen has a B.S. in Agricultural Engineering from Iowa State University, an M.S. in Agricultural Engineering and Ph.D. in Civil Engineering from the University of Idaho. He has been a Professor of Water Resources Engineering in the Department of Civil Engineering and Department of Biological and Agricultural Engineering at the University of Idaho since 1998. Prior to that he was Professor of Biological and Irrigation Engineering at Utah State University and Assistant Professor of Civil Engineering at Iowa State University. He received the *Outstanding Faculty Award* by the University of Idaho College of Engineering in 2010.

Relevant Web sites

<http://www.kimberly.uidaho.edu/water/metric/index.html> <http://www.idwr.idaho.gov/GeographicInfo/METRIC/et.htm>
<http://www.westernstatesetworkshop.com/past-events/boise-2011/>
http://wmp.gsfc.nasa.gov/workshops/ET_workshop.php

ET+ LLC, 6740 Leesburg CT, Lincoln, NE 68516
ph. 1 208 320-2837 (cell)
Office@Allen-Engineering.com

Satellite-based ET Mapping
Hydrologic Modeling
Micrometeorology
Water Balances
Ecohydrology



Dr. Ayse Kilic

Professor of Civil Engineering and School of Natural Resources
University of Nebraska-Lincoln
Lincoln, NE
AKilic@unl.edu

Dr. Ayse Kilic is a Professor in the School of Natural Resources and in the Department of Civil Engineering at the University of Nebraska-Lincoln. She has a Ph.D. degree from the University of Florida in Agricultural and Biological Engineering. Dr. Kilic's research at UNL develops and evolves procedures for applying satellite imagery to determine evapotranspiration from agricultural and natural vegetation. Her research has been applied by Nebraska Natural Resources Districts to improve management of ground-water and surface water systems and several of her software tools are used to support satellite-based remote sensing of water consumption throughout the American west.

Dr. Kilic has published 75 refereed journal publications and published the book *Evapotranspiration -- Remote Sensing and Modeling* in 2012. Dr. Kilic was a funded member of the national *Landsat Science Team* from 2012-2017, was a member of the *NASA Energy and Water Cycle Science Team*, and is a current member of the *NASA ECOSTRESS Science Team*. Dr. Kilic has supervised four Ph.D. students and five MS students through the completion of their degrees and currently supervises three Ph.D. students and 2 MS students.

Her current research includes developing specifications for thermal imagers on future Landsat satellites and creating Google Apps for mapping evapotranspiration and conserving water in residential and agricultural landscapes including the EEFlux and GEARUP applications on the Google Earth Engine. Dr. Kilic teaches university courses in Surface Hydrology, GIS in Water Resources, GIS and Remote Sensing in Natural Resources, and Python Programming in Natural and Water Resources.

Satellite-based ET Mapping
Hydrologic Modeling
Micrometeorology
Water Balances
Ecohydrology



Dr. Jan Hendrickx

Professor Emeritus of Hydrology

New Mexico Tech

Principal of Soil and Water Assoc., Los Lunas, NM

janhendrickxnmt@gmail.com

Phone: (575) 835-5892

BS, MS, Agricultural University of Wagenigen, The Netherlands

PhD, New Mexico State University (1984)

Research Areas of Interest include:

Soil, water, plant and atmospheric interactions and feedbacks

Remote sensing of vegetation and evapotranspiration

Irrigation water requirements

Surface and groundwater interactions

Climate change impacts on water resources

Groundwater recharge

Isotope hydrology

Water rights

**Qualifications for
Groundwater Management Services
(Beginning July 2022)**

COSUMNES GROUNDWATER AUTHORITY



Submitted by

GEI Consultants, Inc.
2868 Prospect Park Drive, Suite 400
Rancho Cordova, CA 95670
T: 916.631.4500
F: 916.631.4501

June 14, 2022

1. COVER LETTER

June 14, 2022



Consulting Mr. Stephen Julian
Engineers and Consumnes Groundwater Authority
Scientists 8970 Elk Grove Blvd.
Elk Grove, CA 95624
Julian@CosumnesGroundwater.org

**Subject: Request For Qualifications - Groundwater Management Services
(RFP No. 2022.5.27-Projects)**

Dear Mr. Julian:

GEI Consultants, Inc. (GEI) has reviewed the Request for Qualifications (RFQ) for Groundwater Management Services and prepared our submittal in accordance with the requirements in the RFQ. We have assembled a team of qualified agriculture and natural resource, economic, Sustainable Groundwater Management Act (SGMA) and public outreach experts (GEI Team) to support voluntary land repurposing, conservation/water use efficiency, small scale recharge projects, support for refinements to the numeric model, and public outreach. GEI looks forward to the opportunity to provide these services to the Cosumnes Groundwater Authority (CGA).

Key Members of the Hand-Picked GEI Team: The GEI Team consists of a combination of staff with a wide range of experience in in agriculture, natural resources and groundwater to support all of work described in the RFQ. The GEI Team has numerous staff and managers that have worked in Sacramento County, San Joaquin County, and the Central Valley over the last 20 years.

Bryan Thoreson, P.E. Ph.D., will serve as the GEI's project manager and the lead for Task 2. Dr. Thoreson has over 30 years of experience in California agricultural focusing on conservation, water use efficiency and conjunctive use of groundwater. He has contributed to Agricultural Water Management Plans for nine agriculture water suppliers and more than 20 water budgets.

Rodney Fricke, P.G., C.E.G., C.HG., will serve as the lead for Task 4. Mr. Fricke worked with the Sacramento County Groundwater Sustainability Agency (GSA) in the Cosumnes Subbasin during the 4-year development of the Groundwater Sustainability Plan (GSP). His experience also includes the design and implementation of groundwater monitoring plans and field investigations of soil and groundwater; and interpretation of construction and geophysical well logs for purposes of aquifer characterization and development of site-specific conceptual hydrogeologic models, and interpretation of water quality data.

Sam Schaefer, P.E., will serve as the lead for Task 3. Mr. Schaefer has extensive experience in agricultural engineering, including farming and developing regional water supply and conjunctive use projects from conception through construction with emphasis on securing grant funding to support groundwater recharge.

Duncan MacEwan, Ph.D., will serve as the lead for Task 1. Dr. MacEwan worked with stakeholders to develop a voluntary land repurposing program for the Madera County GSA. This work included an economic and financial analyses of program costs and incentives and supported the Madera County GSA's successful application for a \$10 million grant from the Department of Conservation.

These senior leaders are supported by numerous staff from our Sacramento office experienced in agriculture, natural resources and groundwater.

Experience and Qualifications: The GEI Team is uniquely qualified to complete this project because of our wide range of experience and expertise in developing voluntary land repurposing programs and our long history in assessing and developing managed aquifer recharge and recovery facilities.

In addition, we bring a team of highly skilled staff who have previous experience in the groundwater management and have completed numerous hydrogeologic investigations to support groundwater recharge and recovery projects. We appreciate the opportunity to assist the CGA with implementation of the Cosumnes Subbasin GSP. Please contact our Project Manager, Bryan Thoreson at 530.867.2510 or bthoreson@geiconsultants.com, if you have questions about our proposal.

Sincerely,

GEI Consultants, Inc.



Bryan Thoreson, Ph.D., P.E.
Project Manager



Mike Cornelius, P.G.
Principal-in-Charge

Contents

1.	Cover Letter	
2.	Tasks Supported and Project Team	1
3.	List of Subcontractors	2
4.	Project Team.....	3
5.	References.....	6
6.	Additional Information.....	7

Appendix A – Resumes

Appendix B – Project Descriptions

Appendix C – Managed Aquifer Recharge Brochure

2. TASKS SUPPORTED AND PROJECT TEAM

The GEI Team has been assembled to support all the services requested in the RFQ.

Task 1: Voluntary Land Repurposing – Task Manager: Duncan MacEwan, ERA Economics

Dr. MacEwan is the lead economist developing the Madera County GSA land repurposing program. The Madera County GSA land repurposing program includes a financial incentive structure for agricultural land conversion or preservation in specific areas based on land use, water use, and opportunities for achieving multi-benefits. He worked with Bryan Thoreson and other team members that developed a map inventory of GSA parcels, water use, and land use types. Duncan worked with stakeholders over an 18-month public process to develop the program, which included an economic and financial analyses of program costs, incentives, and design. This work supported the Madera County GSA's successful application for a \$10 million grant from the Department of Conservation to begin implementing components of the land repurposing program focused specifically on multi-benefit outcomes. He has led projects preparing water valuation and risk assessments, benefit-cost analyses, feasibility studies, and economic analysis to support implementation of sustainable groundwater management. He is a primary developer of California's State-wide Agricultural Production Model (SWAP) and has worked with clients to evaluate local, state, and federal water resource policies using similar economic modelling frameworks. He has worked with a range of local irrigation districts and private entities to develop economic models for financial feasibility and financial risk analyses for agricultural asset management.

Task 2: Conservation/Water Use Efficiency – Task Manager: Bryan Thoreson, GEI

Dr. Thoreson grew up on a family farm and has more than 30 years of professional experience in water resources and irrigation engineering with a primary focus on agricultural water use, water conservation and water use efficiency. Most recently, he has led multi-disciplinary, multi-firm teams implementing voluntary land repurposing, groundwater recharge and crop water use measurement projects as part of implementing GSPs in the critically overdrafted Chowchilla and Madera Subbasins. Additionally, Dr. Thoreson has evaluated Efficient Water Management Practices (EWMPs) (also, called Best Management Practices) using his knowledge of irrigated lands practices in the Central Valley as part of Agricultural Water Management Plans (AWMPs) development. He has developed water balances for more than 20 irrigation and water districts in the Sacramento, San Joaquin and Imperial Valleys of California and elsewhere. These water balances included crop ET developed from remote sensing (SEBAL® and METRIC) algorithms and quantification of water conserved by various water conservation practices. These water balances have ranged from the field to basin scale and included analysis and formulation of conjunctive management strategies. Dr. Thoreson also specializes in water flow measurement and uncertainty analyses and data management, including database development for water balances, water right analysis, crop water use, land use analysis, and reservoir operations. Dr. Thoreson has worked extensively using Access and Oracle databases to store time series data for assembling and computing water balances.

Task 3: Small Scale Recharge Projects – Task Manager: Sam Schaefer, GEI

Mr. Schaefer is a Professional Engineer with experience in agricultural and environmental water resources projects including facilitating an integrated regional water management plan (IRWMP), developing regional water supply and conjunctive use projects from conception through construction, and securing grant funding. He has participated in preparing environmental documents, conceptual design, cost estimating, and in construction management for all scales of recharge projects in the Central Valley of California. He has experience leading multi-disciplinary teams developing recharge projects.

Task 4: Data Collection, Data Gaps, and Groundwater Monitoring to Support Refinement of Numeric Model – Task Manager: Rodney Fricke, GEI

Mr. Fricke is a California Certified Hydrogeologist and Professional Geologist with extensive experience in managing groundwater resources, including compliance with SGMA, installation and rehabilitation of wells, and the investigation and remediation of groundwater contamination. He worked with the Sacramento County Groundwater Sustainability Agency (GSA) in the Cosumnes Subbasin during the development of the GSP, including attendance at monthly GSA meetings and the review of GSP chapters. Through this work, Mr. Fricke is very knowledgeable of irrigated lands practices in the Cosumnes Subbasin. His experience also includes the design and implementation of groundwater monitoring plans and field investigations of soil and groundwater; and interpretation of construction and geophysical well logs for purposes of aquifer characterization and development of site-specific conceptual hydrogeologic models, and interpretation of water quality data. Mr. Fricke is also currently working on planning, pilot testing and designing well injection systems (Aquifer Storage and Recovery Wells) for both urban and agricultural settings in Davis, Zone 40 of Sacramento County, and in Sebastopol California.

Task 5: Public Outreach – Task Manager: Maria Pascoal, GEI

Ms. Pascoal is a senior communications professional specializing in public outreach, technical writing, and graphic design. She has 17 years of experience with communications for engineering and scientific clients. Maria leads GEI's Strategic Communications Team to combine industry knowledge, technical writing, and graphic design to produce clear, effective communications for stakeholders and the public. Ms. Pascoal has produced hundreds of outreach materials such as brochures, outreach plans, guides, infographics, and presentations.

Ms. Pascoal has expert knowledge in graphics software including Adobe InDesign, Photoshop, and Illustrator, and is highly proficient in Microsoft Word, Excel, Visio, and PowerPoint. In 2017, she completed a University of California Extension Certificate in Technical Communications, including extensive coursework related to technical documentation, user-centric design, and visual systems.

Task 6: Project Management – Task Manager: Bryan Thoreson, GEI

Dr. Thoreson has managed numerous projects over the course of his career including most recently multiple GSP Implementation activities for the Madera County GSA and the Chowchilla and Madera Subbasin GSPs. These projects were completed on time and within budget. He has the support of GEI's project management and invoicing system to ensure that the project stays on schedule and within budget. Dr. Thoreson will coordinate with GEI's account team to submit monthly invoices by the 15th of the following month. Each invoice will include a description of services provided during the invoice period (progress report).

3. LIST OF SUBCONTRACTORS

The GEI Team includes two subcontractors to support all the services requested:

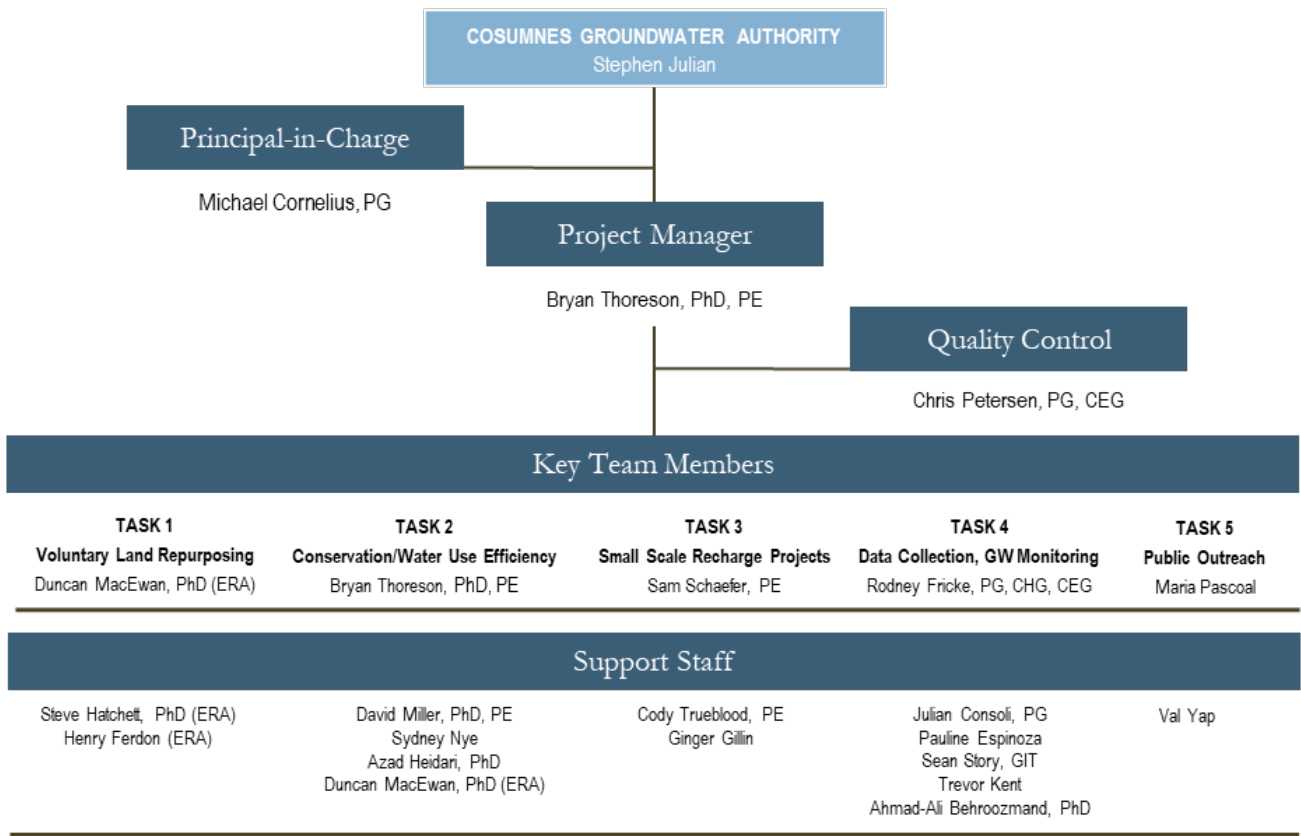
- ERA Economics: Lead the voluntary land repurposing task and assess the feasibility of compensation to farmers for implementing conservation practices.
- Ramboll: Provide addition geophysical surveys to estimate the extent of the inferred clay bed in the southern portion of the basin

4. PROJECT TEAM

The key personnel responsible for performing the work for this project have been chosen based on their extensive knowledge and experience with voluntary land repurposing, conservation/water use efficiency, small scale recharge projects, support for refinements to the numeric model, and public outreach. The organization chart (**Figure 1**) identifies these individuals and is followed by a summary of their experience, education, and licenses obtained that demonstrates their qualifications for this work.

Resumes for our key team members and support staff are provided in **Appendix A**. The greatest factor for success of any project is the experience, commitment, and communication skills of the project management team. Recognizing this, GEI has assembled an exceptional project team with the experience necessary to support the required services.

FIGURE 1. PROJECT TEAM ORGANIZATION



SHORT BIOS OF KEY TEAM MEMBERS



Bryan Thoreson, Ph.D., P.E. – PROJECT MANAGER/ TASK 2: CONSERVATION/WATER USE EFFICIENCY

Education/Registration: Ph.D., Agricultural Engineering, M.S., Agricultural Engineering, B.S., Agricultural Engineering; Professional Engineer, CA No. C56194; Professional Engineer, WA No. 36249

Dr. Thoreson grew up on a family farm and has more than 30 years of professional experience in water resources and irrigation engineering in the western United States with a primary focus on agricultural water use, water conservation and water use efficiency. Most recently, Dr. Thoreson has led multi-disciplinary, multi-firm teams implementing voluntary land repurposing, groundwater recharge and crop water use measurement projects as part of implementing GSPs in the critically overdrafted Chowchilla and Madera Subbasins. Additionally, Dr. Thoreson has used his knowledge of irrigated lands practices in the Central Valley to lead Agricultural Water Management Plans (AWMPs) development. These plans include evaluation of Efficient Water Management Practices (EWMPs) (also, called Best Management Practices). Dr. Thoreson has developed water balances for more than 20 irrigation and water districts in the Sacramento, San Joaquin and Imperial Valleys of California and elsewhere. These water balances included crop ET developed from remote sensing (SEBAL® and METRIC) algorithms and quantification of water conserved by various conservation practices. These water balances have ranged from the field to basin scale and included analysis and formulation of conjunctive management strategies. Dr. Thoreson also specializes in water flow measurement and uncertainty analyses and data management, including database development for water balances, water right analysis, crop water use, land use analysis, and reservoir operations. Dr. Thoreson has worked extensively using Access and Oracle databases to store time series data for assembling and computing water balances. Dr. Thoreson has authored more than 40 papers focusing on data management for irrigation water resources planning and management and on analysis of remotely sensed crop ET.



Michael Cornelius, P.G. - PRINCIPAL-IN-CHARGE

Education/Registration: M.S., Civil Engineering, B.S., Geology; Professional Geologist, CA No. 6222

Mr. Cornelius will serve as the GEI's principal-in-charge. Mr. Cornelius has over 30 years of experience in California groundwater. He was one of the original developers and users of the San Joaquin County IGSM model. He was the project manager for the Tracy Subbasin Groundwater Management Plan and supported the GEI team preparing the Tracy Subbasin GSP. More recently, he managed the completion of the 2020 San Joaquin IRWMP Addendum for the Greater San Joaquin IRWM Region.



Christian Petersen, P.G., C.H.G. – QUALITY CONTROL MANAGER

Education/Registration: M.S., Hydrology, B.S., Geology; Professional Geologist, CA No. 6189; Certified Hydrogeologist, CA 463

Mr. Petersen will serve as GEI's Quality Control Manager. Mr. Petersen has over 30 years of experience, and specializes in groundwater recharge and recovery, including the planning, design, and construction of ASR wells. He also worked on the Farmington Groundwater Recharge Project from 2003 to 2011 which evaluated recharge opportunities in San Joaquin County for Stockton East Water District with the U.S. Army Corps of Engineers as their Federal Partner. Chris is experienced using

geophysics for aquifer delineation and is currently GEI 's project manager for the team providing support to the DWR Airborne Electromagnetic (AEM) Survey Program.



Duncan MacEwan, Ph.D. – TASK 1: VOLUNTARY LAND REPURPOSING

Education/Registration: P.h.D., Economic Geography, M.S., Agricultural and Resource Economics, B.S., Mathematical Economics and Applied Math

Dr. MacEwan is the managing partner of ERA and principal economist specializing in agriculture and water resources. Prior to co-founding ERA in 2013, Duncan held a position as a consultant economist with CH2M and as a postdoctoral scholar in the department of Agricultural and Resource Economics at UC Davis. Some of his current projects include water valuation and risk assessments for agribusiness clients, benefit-cost analyses, feasibility studies, and economic analysis to support Groundwater Sustainability Plan development. Duncan is also a primary developer of California's Statewide Agricultural Production (SWAP) model and has worked with private entities and public agencies to evaluate impacts of local, state, and federal water policies using the SWAP model, and other similar economic modeling frameworks.



Samuel W. Schaefer, P.E. – TASK 3: SMALL SCALE RECHARGE PROJECTS

Education/Registration: M.S., Agricultural Engineering/Water Resources, B.S., Bio-Resource and Agricultural Engineering; Professional Engineer, CA No. 66337; Professional Engineer, CO No. 38324

Mr. Schaefer is a Professional Engineer with experience in agricultural, urban, and environmental water resources projects. His expertise in assisting Central Valley clients includes facilitating an integrated regional water management plan (IRWMP) in Kern County, developing regional water supply and conjunctive use projects from conception through construction, and securing funding from DWR and the US Bureau of Reclamation. He has participated in preparing environmental documents, conceptual design, cost estimating, and in construction management. Other experience includes conducting water rights studies, providing litigation support, and preparing reports documenting surface and groundwater conditions. He has experience in multi-disciplinary teams as well as mentoring staff. Mr. Schaefer is a dynamic leader with solid technical expertise in public and private water infrastructure development.



Rodney Fricke, P.G., C.H.G., C.E.G. – TASK 4: DATA COLLECTION, DATA GAPS, AND GROUNDWATER MONITORING TO SUPPORT REFINEMENT OF NUMERIC MODEL

Education/Registration: M.S., Geology, B.S., Geology; Professional Geologist, CA No. 4089; Certified Hydrogeologist, CA No. 11; Certified Engineering Geologist, CA No. 1476

Mr. Fricke is a California Certified Hydrogeologist and Professional Geologist with experience in managing groundwater resources, including compliance with SGMA, installation and rehabilitation of wells, and the investigation and remediation of groundwater contamination. Over the course of his career, he has worked as both a client and consultant. His early career focused on evaluation and development of groundwater resources for potable water supply and for the mining industry and then groundwater contamination. More recently, he has focused on water supply and the management of groundwater resources, including compliance with SGMA regulations. Mr. Fricke worked with the Sacramento County Groundwater Sustainability Agency (GSA) in the Cosumnes Subbasin during the 4-year development of the GSP, including attendance at monthly GSA meetings and the review of GSP chapters. He uploaded the Cosumnes GSP to the DWR SGMA website on behalf of CGA. His

experience also includes the design and implementation of groundwater monitoring plans and field investigations of soil and groundwater; and interpretation of construction and geophysical well logs for purposes of aquifer characterization and development of site-specific conceptual hydrogeologic models, and interpretation of water quality data. Mr. Fricke also lead the development of a GSP in the Kaweah Basin and development of the hydrologic conceptual model for the “North of the River” GSA’s in Kern County. Both of these project are located in agricultural areas of the southern portion of the Central Valley.



Maria Pascoal – TASK 5: PUBLIC OUTREACH

Education/Registration: B.F.A., Graphic Design, Technical Writing and Communication Certificate, Facilitation Training

Ms. Pascoal is a senior communications professional specializing in public outreach, technical writing, and graphic design. She has 17 years of experience with communications for engineering and scientific clients. She leads GEI’s Strategic Communications Team to combine industry knowledge, technical writing, and graphic design to produce clear, effective communications for stakeholders and the public. Ms. Pascoal has produced hundreds of outreach materials such as brochures, outreach plans, guides, infographics, and presentations.

Ms. Pascoal has expert knowledge in graphics software including Adobe InDesign, Photoshop, and Illustrator, and is highly proficient in Microsoft Word, Excel, Visio, and PowerPoint. In 2017, she completed a University of California Extension Certificate in Technical Communications, including extensive coursework related to technical documentation, user-centric design, and visual systems.

5. REFERENCES

We have included three client references below and encourage you to contact them about the quality of our experience and services our team has provided. We have also included project descriptions for the three clients listed here as well as additional project experience of our team in **Appendix B**. We have included GEI’s Managed Aquifer Recharge brochure in **Appendix C**.

1. **GEI: SGMA On-Call Compliance and Support Services** – Linda Dorn, Groundwater Sustainability Manager (retired), Sacramento County; 916.479.4701; Lbabiak62@gmail.com
2. **ERA: Madera County GSA Land Repurposing Program Development** – Stephanie Anagnoson, Madera County Water and Natural Resources Director, Water and Natural Resources Department, 200 W. Fourth Street, Madera, CA 93637; 559.598.0362; stephanie.anagnoson@maderacounty.com
3. **Ramboll/GEI: Airborne Electromagnetic Surveys for California Department of Water Resources** – Katherine Dlubac, California Department of Water Resources, AEM Project Manager, 715 P Street, 8th Floor, Sacramento, California 95814; 916.902.7289; Katherine.Dlubac@water.ca.gov

6. ADDITIONAL INFORMATION

FIRMS QUALIFICATIONS



Established in 1970, GEI Consultants, Inc. (GEI) is a national employee-owned consulting engineering and environmental firm with 44 offices in the United States and Canada. GEI provides engineering, environmental, water resources, and geotechnical consulting services, and devotes a major portion of its resources to evaluate and improve California and U.S. water supplies and flood protection. Our services are built on the expertise and teamwork of over 1,000 employees nationwide, including 240 in California. GEI has proven experience managing complex water projects, and our decades-long work in our water practice has afforded what many clients and regulatory agencies view as unique insight in developing strategic approaches leading to cost-effective and reliable projects.

GEI has worked on hundreds of water resources projects in the West Region for local, state, and federal agencies. The GEI projects cover agriculture and natural resources, groundwater management, hydrology and hydraulic, FEMA floodplain evaluations, levee and dam inundation mapping and condition assessment, pipelines, canals, wells, pump stations, water quality and habitat enhancement. Our focus in water resources includes developing integrated master plans, developing water management strategies for our clients to meet their ever-increasing challenges, and the planning and the design of water supply infrastructure throughout the west. This encompasses the formulation of multi-purpose projects, feasibility studies, recharge basins, canals and pipelines, hydrology and hydraulic studies, storage and conveyance system configurations, decision support, and dam safety evaluation and rehabilitation.

GEI has a long-standing history throughout California providing water resources engineering services to water districts, municipalities, and water purveyors. Our experience in the design and implementation of water conveyance, water recharge basins, and flow control structures uniquely provides us with the insight to provide engineering services for the Project.

ERA Economics

ERA Economics is a California Certified Small Business specializing in the economics of water resources and agriculture. Founded in 2013 and based in Davis, California, our firm has grown from 2 founding partners to current team of 11 professionals experienced in agricultural and water resource economics. We provide clients with data-driven economic analysis, policy support, and quantitative modeling of policy questions related to water resources and agriculture in California, and across the western U.S. Our services include GSP development, project feasibility studies, resource valuation, agricultural commodity market outlooks, economic and fiscal impact analysis, regulatory impact analysis, and policy evaluation. Members of our team have worked on California water policy and agricultural economics for over three decades, and we understand how economics integrates with other technical and legal analyses to support effective water policy decisions. Our team has extensive experience working with stakeholders and the public in the context of highly scrutinized water and agricultural policy decisions.

GEI Consultants, Inc.
Incorporated in 1970

GEI Corporate Office
400 Unicorn Park Drive
Woburn, MA 01801

GEI Local Office
2868 Prospect Park Drive
Suite 400
Rancho Cordova, CA 95670

Number of Employees
Over 1,000

Number of Clients
Over 680

Ramboll US Consulting, Inc.

Ramboll is a global engineering, design and consultancy company founded in Denmark in 1945. The company employs 16,500 experts globally and is growing rapidly in North America. With California offices in six locations, Ramboll combines local experience with a global knowledgebase, constantly striving to achieve inspiring and exacting solutions that make a genuine difference to our clients, the end-users and society at large. In North America, Ramboll works across the following markets: Water, Environment & Health, Buildings, Planning & Urban Design, Energy and Management Consulting. Ramboll has a strong and ongoing working history with GEI Consultants. GEI and Ramboll are presently partners on the DWR aquifer mapping project via Airborne Electromagnetic Surveys in support of SGMA office and programs.

APPENDIX A - RESUMES

Bryan P. Thoreson, Ph.D., P.E.

Senior Agricultural Engineer

Dr. Thoreson grew up on a family farm in South Dakota and has more than 30 years of professional experience in water resources and irrigation engineering in the western United States with a primary focus on agricultural water use, water conservation and water use efficiency. Most recently, Dr. Thoreson has led multi-disciplinary, multi-firm teams implementing voluntary land repurposing, groundwater recharge and crop water use measurement projects as part of implementing Groundwater Sustainability Plans (GSPs) in the critically over-drafted Chowchilla and Madera Subbasins. Additionally, Dr. Thoreson has used his knowledge of irrigated lands practices in the Central Valley to lead Agricultural Water Management Plans (AWMPs) development. These plans include evaluation of Efficient Water Management Practices (EWMPs) (also, called Best Management Practices). Dr. Thoreson has developed water balances for more than 20 irrigation and water districts in the Sacramento, San Joaquin, and Imperial Valleys of California and elsewhere. These water balances included crop ET developed from remote sensing (SEBAL® and METRIC) algorithms and quantification of water conserved by various conservation practices. Many included analysis and formulation of conjunctive management strategies. Dr. Thoreson also specializes in water flow measurement and uncertainty analyses and data management.

PREVIOUS PROJECT EXPERIENCE

Sustainable Agricultural Land Conservation (SALC), GSP Implementation Project, Madera County GSA, Madera, CA.

(<https://www.maderacountywater.com/land-conservation/>) The study developed an incentive structure for agricultural land conversion or preservation in specific areas based on the land categories identified by the analysis. Developed estimates of water use to identify parcels with high water use and collaborate with project team on outreach and incentive structure development to incentivize voluntary land repurposing. Madera County GSA recently received a \$10 million grant from the Department of Conservation to begin implementing the incentive-based SALC voluntary land repurposing program.

Water Use Measurement Program, GSP Implementation Projects Madera County GSA, Madera, CA.

(<https://www.maderacountywater.com/measurement/>)

(<https://www.irriwatch.com/en/>) Led the program to measure crop water use, or evapotranspiration (ET) and evapotranspiration of applied water (ETAW), with satellite technology provided by Irriwatch using SEBAL (Surface Energy Balance Algorithm for Land). Managed outreach to growers and quality assurance and quality control in close collaboration with Madera County staff. Led the development of reports comparing water use with an allocation of ETAW established by the Madera County GSA to reduce demand.



EDUCATION

Ph.D., Agricultural Engineering, University of Arizona, Tucson

M.S., Agricultural Engineering, South Dakota State University, Brookings

B.S., Agricultural Engineering, South Dakota State University, Brookings

EXPERIENCE IN THE INDUSTRY

30 Years

EXPERIENCE WITH GEI

Less than one year

REGISTRATIONS/CERTIFICATIONS

Professional Engineer, CA No. C56194

Professional Engineer, WA No. 36249

PROFESSIONAL AFFILIATIONS

American Society of Agricultural Engineers

American Society of Civil Engineers

ASCE Task Committee on Remote Sensing of ET

Groundwater Resources Association

U.S. Committee on Irrigation and Drainage (Life Member)

Associate Editor of Irrigation and Drainage Managing Water for Sustainable Agriculture (2000-2017)

Board of Directors (2009-2015), President of USCID (2014-2015)

Managed Aquifer Recharge (MAR) Program, GSP Implementation Project, Madera County GSA, Madera, CA. (<https://www.maderacountywater.com/recharge/>) Led the development of the phased groundwater recharge plan, including water rights acquisition and environmental compliance, for the Madera County GSA areas. The GSP implementation plan estimated about \$190 million to develop recharge to utilize all the available flood waters. Recharge projects evaluated include flood-managed aquifer recharge (Flood-MAR, or on-farm recharge), dedicated recharge or spreading basins, targeted in-lieu recharge opportunities (using flood water for irrigation instead of pumping groundwater), and others. Identified suitable locations for recharge projects, determined the most cost-effective method to convey flood water to recharge locations, and refined GSP estimates of costs and benefits of recharge projects. Interactions between the recharge program and other projects and management actions was evaluated. Projects were ranked by cost effectiveness and scheduled for detailed design, permitting, environmental compliance and construction according to the ranking. Simultaneously led preparation of two successful grant applications for a total of about \$8.4 million.

Agricultural Water Management Planning and Water Use Efficiency, Various Irrigation and Water Districts, CA. Developed Agricultural Water Management Plans (AWMP) following the current Department of Water Resources (DWR) guidelines and Water Management Plans (WMPs) following the current Reclamation guidelines for multiple irrigation and water districts. AWMPs and WMPs include water budgets, an accuracy assessment and evaluation of efficient water management practices (EWMPs) and best management practices (BMPs). Served as the project manager and lead engineer for most of the entities listed below with the date of submittal of the AWMP or WMPs:

1. East Stockton Water District, WMP, 2020
2. South San Joaquin Irrigation District, AWMP, 2012, 2015 and 2021
3. Oakdale Irrigation District, AWMP, 2012, 2015 and 2021
4. Turlock Irrigation District, AWMP, 2002, 2012, 2015 and 2021
5. Solano Irrigation District, AWMP, 2015 and WMP, 2019
6. Yuba Water Agency, AWMP, 2012, 2015 and 2020
7. Orland Unit Water Users Association, WMP, 2012 and AWMP, 2015
8. Shafter-Wasco Irrigation District, WMP, 2022
9. Southern San Joaquin Municipal Utility District, WMP, 2022

Crop Consumptive Water Use and Agricultural Water Budget Projects. Served as project manager and lead engineer developing agricultural water budgets for numerous irrigation and water districts in the Sacramento and San Joaquin Valleys. Technical aspects of the work involved estimating agricultural applied water use and using a root zone water budget to estimate evapotranspiration (ET) of applied water and precipitation. Worked closely with local district staff to develop the water use estimates and water budgets. Remotely sensed ET estimates were typically used to develop crop coefficients for these projects. Customized semi-automatic water budget tools to assemble data from supplier spreadsheets and databases and develop the water budget were developed for the first four entities on the following partial list of the entities and time periods for these agricultural water budgets.

1. Imperial Irrigation District (2006 – 2009 completed by Dr. Thoreson, 2010 – 2020 District completed with tool)
2. Turlock Irrigation District (1950 – 2010 completed by Dr. Thoreson, 2011 – 2020 District completed with tool)
3. Sonoma County Water Agency (2002-2014 completed by Dr. Thoreson)
4. South San Joaquin Irrigation District (1994-2020 completed by Dr. Thoreson)
5. Yuba County Water Agency (2001-2020)
6. Oakdale Irrigation District (2005-2019)
7. Merced Irrigation District (1970-2009)
8. Stony Creek Fan Area includes Orland Unit Water Users' Association, Orland-Artois Water District, Glen Colusa Irrigation District and surrounding groundwater pumpers (1970-1999)
9. Chowchilla Water District (1991-2020)
10. Glenn-Colusa Irrigation District (1970-2012)
11. Orland Unit Water Users Association (1970-2016)

Michael J. Cornelius, P.G.
Vice President and Principal Geologist

Michael Cornelius is principal geologist in GEI's Sacramento office and has 34 years of experience in water resources management in California. His experience includes conducting and managing groundwater management, integrated regional water management (IRWMP), and flood management projects with budgets up to several million dollars. His larger projects often include managing a multi-discipline team of consultants. Mr. Cornelius is currently responsible for managing and working on several projects related to the Sustainable Groundwater Management Act (SGMA) for the California Department of Water Resources (DWR) and the local agencies.

PROJECT EXPERIENCE

Drought Management—Sustainable Groundwater Management Program Support, California Department of Water Resources, Statewide, CA. This effort includes working with Sustainability Groundwater Management Program (SGMP) staff to support the development of discussion papers on the various components of GSPs, providing graphics support to facilitate communications and engagement with various technical advisory committees, and participating in the technical advisory committee meetings. Also directed GEI's efforts to assist DWR Groundwater Sustainability Program Draft Strategic Plan which was prepared in March 2015.

Paso Robles Groundwater Basin Regional Groundwater Management Plan, City of Paso Robles, CA. Served as the project manager for the preparation of the Paso Robles Groundwater Basin Regional Groundwater Management Plan (Plan), which was completed in 2011. The preparation of the Plan was led by the City of Paso Robles and the San Luis Obispo County Flood Control and Water Conservation District in coordination with the Groundwater Advisory Committee (GAC), which included stakeholder and other interested parties in the Basin, including agricultural, municipal, and rural groundwater interests.

Western Placer County GMP Implementation, Placer County, City of Roseville, CA. Provided review and support of the Sacramento Regional Model for the North American River Groundwater Subbasin prepared by the City of Roseville for consistency with the information used to develop the North American River Integrated Groundwater Surface Water Model (NARIGSM) and Sacramento County IGSM (SCNIGSM).

Paso Robles Subbasin Groundwater Sustainability Plan, City of Paso Robles, CA. Serving as a member of the consulting team, GEI provided technical and information management support for the development of a GSP. Led GEI efforts which included the development of hydrogeologic conceptual model and the groundwater conditions sections of the Groundwater Sustainability Plan (GSP). GEI also supported the development of the Communication and Engagement Plan (C&E Plan) and deployment of the Paso Robles



EDUCATION

M.S., Civil Engineering, California State University, Sacramento
B.S., Geology, University of California, Davis

EXPERIENCE IN THE INDUSTRY
34 years

EXPERIENCE WITH GEI
17 years

REGISTRATIONS AND LICENSES
Professional Geologist, CA No. 6222

Groundwater Communications Portal (GCP) to support the implementation of the C&E Plan. GEI also developed an Access database to support the data collection and management requirements of SGMA. The Paso Robles Subbasin is considered in critical overdraft, so the GSP had to be completed by the January 31, 2020 deadline.

Atascadero Subbasin Groundwater Sustainability Plan, Atascadero Mutual Water Company, CA.

Currently serving as the project manager for the preparation of a GSP to meet the requirements of the SGMA. Efforts to date have included assisting in the successful preparation of a Basin Boundary Modification application to DWR to form the Atascadero Area Subbasin from the Paso Robles Subbasin, and providing support in the formation of the Atascadero Area Subbasin Groundwater Sustainability Agency. Led the preparation of a successful Proposition 1 Groundwater Sustainability Grant to support the development of the GSP which is scheduled for completion in summer of 2021, about 6 months prior to the due date of January 31, 2021.

Sustainable Groundwater Management Services, Santa Barbara County, Santa Ynez, California. Project Manager for GEI's efforts to support the development of GSP for the East Management Area of the Santa Ynez River Basin. GEI's efforts include the preparation of GEI also supported the development of the C&E Plan and deployment of the GCP for the entire Santa Ynez River Basin to support the implementation of the C&E Plan. GEI also developed a web-based Data Management System (DMS) to support the data collection and management requirements of SGMA.

San Luis Obispo Creek Valley Groundwater Basin Groundwater Sustainability Plan, San Luis Obispo County, California. Currently leading GEI's efforts (as a subconsultant to Water Systems Consulting, Inc) on this project which includes developing web-based tools to support SGMA compliance. These include a communication and outreach tool called the to support the communication and engagement activities and documentation of the implementation of the Communication and Engagement Plan as required by SGMA. GEI is also developing a San Luis Obispo County-Wide Data Management System to collect, store, manage, and present all the data needed to meet the SGMA requirement.

Sustainable Groundwater Management Program Support, California Department of Water Resources, Statewide, CA. Currently responsible for managing the GEI-lead consulting team to provide support to the SGMP for the 2015 to 2020 period. In this role, was responsible of the overall project delivery and coordination of the consulting team with SGMP. Worked closely with DWR staff and consulting team staff to develop program policies and procedures to support the development and implementation of the DWR SGMA-related responsibilities. Activities completed to date have included providing support for the development of the Emergency Groundwater Sustainability Plan Regulations and preparation of the GSP Guidebook; providing support to the development and Basin Boundary Modification web-page and descriptions of the updated basin boundaries; and assisting with the development of the Best Management Practices, Adjudicated Basins Reporting Systems, and web pages.

Groundwater Banking Feasibility Study, County of San Luis Obispo, CA. Project Manager responsible for the preparation of this study to determine the feasibility of banking surplus State Water Project water in the Paso Robles Groundwater Basin in northern San Luis Obispo County. The initial project focus was to identify the technical (hydrogeologic and engineering) constraints which may limit water banking opportunities. Environmental considerations, groundwater management, and potential project partners and funding sources were identified. The project included a significant stakeholder involvement component that includes numerous presentations the Groundwater Banking Subcommittee of the Water Resources Advisory Committee.

Tracy Regional Groundwater Management Plan, City of Tracy, CA. Served as the project manager for the preparation of the Tracy Regional Groundwater Management Plan (GMP) for the Tracy Subbasin. The project prepared an SB1938-compliant GMP for the Tracy Subbasin, a historically agricultural area that is undergoing rapid urban development. The GMP focused on actions to maintain and improve groundwater quality, which is the primary concern of the water users in the subbasin. The GMP included the preparation of the first hydrogeologic assessment of the entire basin, and a groundwater monitoring plan to allow monitoring of the proposed Basin Management Objectives. The GMP was prepared under the direction of the Groundwater Advisory Committee that consisted of local water purveyors, stakeholders, and local and state agencies.

Christian E. Petersen, P.G., C.Hg.

Senior Hydrogeologist

Christian Petersen has 33 years of experience providing groundwater technical expertise for large interdisciplinary water resources investigations and planning efforts, many of which involve conjunctive use. He has broad experience in the planning, design, and optimization of groundwater recharge techniques, an important element of most conjunctive use programs. Mr. Petersen has assisted numerous clients in obtaining state and federal funding assistance for the development of conjunctive use programs throughout California and in New Mexico. Key to the success of every groundwater management planning effort is building trust and reaching consensus among project stakeholders, including the regulatory community. Mr. Petersen has demonstrated success in this environment, resulting in projects that meet water supply needs while protecting the environment.

PROJECT EXPERIENCE

Statewide Aerial Electromagnetic Survey, California Department of Water Resources, Statewide, CA. Task Order manager for DWR's statewide AEM survey of all high and medium priority groundwater basins. Leading a team of scientists involved in the compilation, review and mapping of well log information used in planning flight lines and interpretation of AEM data. Also assisting with development of public outreach flyers and briefing material.

Groundwater Sustainability Program Support, California Department of Water Resources, Statewide, CA. Part of the leadership team for GEI in providing assistance to DWR in the development and implementation of the Groundwater Sustainability Program recently formed to implement the Sustainable Groundwater Management Act of 2014 (SGMA). Under this contract, GEI is providing technical consulting services to DWR in the development of new policy and regulations for basin boundary adjustments and groundwater sustainability plans. Involved in development of white papers and numerous stakeholder meetings designed to provide stakeholder input in the development of new regulations. Also involved in the development of graphics used in presentations and information guides designed to help stakeholders understand complex groundwater concept. Currently serving as GEI's task manager for the assisting DWR with the development of Best Management Practices (BMPs).

SGMA Strategic Services, Santa Ynez River Water Conservation District, CA. Currently serves as the project manager for GEI in providing Strategic planning services to Santa Ynez Water Conservation District for SGMA compliance in the Santa Ynez River Valley Basin. This basin is comprised of three management areas (Lompoc Plain/Terrace/Uplands, Santa Ynez Uplands, and Buellton Uplands) for the purpose of SGMA compliance with a goal of submitting a single Groundwater Sustainability Plan (GSP). Work to be completed in early 2017 includes assistance with GSP regulatory



EDUCATION

M.S., Hydrology, University of Arizona

B.S., Geology, California State University, San Jose

A.S., General Education, Modesto Junior College

EXPERIENCE IN THE INDUSTRY

33 years

EXPERIENCE WITH GEI

6 years

REGISTRATIONS AND LICENSES

Professional Geologist, CA No. 6189

Certified Hydrogeologist, CA No. 463

interpretation and implementation, hydrogeologic data gap analysis, and grant tracking and application assistance.

SGMA Strategic Services, Mid-Kaweah Groundwater Sustainability Agency, CA. Project Hydrogeologist for the subbasin wide coordination efforts and the Mid-Kaweah GSA's groundwater sustainability plan. Developed and compiled the Introduction, Basin Setting, Monitoring Network and data on sustainability indicators and sustainable management criteria for the Draft Groundwater Sustainability Plan. Also assisted in the completion of the projects and management actions chapter. Projects and management actions include a combination of demand reduction measures as well as an expansion of groundwater recharge capacity throughout the basin and in each of the three GSAs.

SGMA Support Services, Big Valley Groundwater Basin, Lassen and Modoc Counties, CA. GEI is working with two rural counties to implement SGMA in a small, agricultural groundwater basin that has experienced recent declines in groundwater levels. In 2015, implemented a state grant to assess and enhance their CASGEM groundwater monitoring network. Recent activities have involved supporting the counties in becoming the Groundwater Sustainability Agencies (GSAs) for their portions of the basin and performing outreach to ensure engagement of local stakeholders in the process of developing a Groundwater Sustainability Plan (GSP). Serving a senior technical review role on the SGMA compliance activities associated with this project.

SGMA Support Services, Mendocino County, Ukiah Basin GSP Development. Mr. Petersen is leading a team of specialists in the development of an Access based Data Management System and the Hydrogeologic Conceptual Model in support development of a GSP due in 2022. The DMS and HCM are being closely coordinated with the development of a numerical groundwater model for the Ukiah Basin which will be used to forecast the impact of climate change and future demands on stream flow within the basin. This groundwater modeling tool will also be used to quantify the benefits of projects and management actions. GEI is partnering with Larry Walker and Associate for the development of GSP for the Ukiah Basin.

San Pasqual Groundwater Management Plan, City of San Diego, CA. Provided technical leadership in the development and implementation of the San Pasqual Groundwater Management Plan. This project is the City of San Diego's first effort to actively managing groundwater within the city limits. The City of San Diego is showing renewed interest in groundwater to reduce dependence on imported water, and to protect the local resource. Served as Project Manager, responsible for participating in client meetings to agree on the management goals and objectives for the basin, guided the compilation and review of groundwater data for San Pasqual Basin, and provided technical direction and leadership for all groundwater tasks and documents. Assisted in the public outreach and education process. The City of San Diego intends to develop conjunctive use projects within this basin and the GMP provided the necessary framework for development of these projects in a sustainable manner. During the implementation of the GMP, Chris also managed the development of a salinity assessment for the entire basin. The salinity assessment inventoried all sources of salinity and nitrating loading to the groundwater system and then identified best management practices to be implemented at the surface to reduce the loading of salinity and nitrated into the groundwater system.

Western Placer County Groundwater Management Plan, Cities of Roseville and Lincoln, California American Water Company, and Placer County Water Agency, Roseville, Lincoln, CA. Project Manager providing strategic planning and project management service for the plan partners involved in the development and implementation of the Western Placer County Groundwater Management Plan (GMP). Led the team involved in development of the GMP, which was adopted by the plan partners in 2007. In 2008, the team was successful in assisting the partnership in obtaining grant funding for the design and construction of three monitoring wells for the collection of groundwater level and groundwater quality data. Also assisted the plan partners with the implementation of management actions which support the GMP basin management objectives to avoid inelastic land subsidence, protect groundwater levels, basin sustainability, and groundwater quality. Responsible for designing three monitoring wells for the collection of groundwater level and groundwater quality data. Assisted the plan partners with the bidding of this work. Provided technical direction and supervised the site geologist during well construction activities. Also reviewed and stamped the well completion report in May 2011. This work was partially funded by DWR through the AB 303 grant program.

Duncan MacEwan, Ph.D.

Principal Economist, ERA Economics

Bio: Duncan is the managing partner of ERA Economics. He previously worked as a consultant economist with CH2M where he led agricultural economic impact analyses for proposed water storage and investment projects, and concurrently held a position as a postdoctoral scholar in the Department of Agricultural and Resource Economics at UC Davis. Some of the projects he manages at ERA Economics include water valuation and risk assessments, benefit-cost analyses, feasibility studies, and economic analysis to support implementation of sustainable groundwater management. He is a primary developer of California's State-wide Agricultural Production Model (SWAP) and has worked with clients to evaluate local, state, and federal water resource policies using similar economic modelling frameworks. He has worked with a range of local irrigation districts and private entities to develop economic models for financial feasibility and financial risk analyses for agricultural asset management.

Education

Ph.D., Economic Geography, University of California Davis

M.S., Agricultural and Resource Economics, University of California Davis

B.S., Mathematical Economics and Applied Math, California State University Long Beach

Professional Memberships

American Agricultural and Applied Economics Association

Western Agricultural Economics Association

Selected Projects

Madera County GSA Land Repurposing Program Development, Chowchilla, Delta Mendota, and Madera Subbasins, Madera County, CA, 2020 - . Duncan is the lead economist developing the Madera County GSA land repurposing program. The Madera County GSA land repurposing program includes a financial incentive structure for agricultural land conversion or preservation in specific areas based on land use, water use, and opportunities for achieving multi-benefits. Duncan worked with Davids Engineering team members that developed a map inventory of GSA parcels, water use, and land use types. Duncan worked with stakeholders over an 18-month public process to develop the program. This included preparing economic and financial analyses of program costs, incentives, and design. This work supported the Madera County GSA's successful application for a \$10 million grant from the Department of Conservation to begin implementing components of the land repurposing program focused specifically on multi-benefit outcomes.

Groundwater Sustainability Plan (GSP) Development/Implementation, Chowchilla and Madera Subbasins, Madera County, CA, 2017 - . Duncan is the lead economist preparing and implementing the Madera and Chowchilla Subbasin GSPs. Developed economic impact analyses to evaluate potential projects and management actions, and support broader GSP development. Continuing to support GSP implementation, including development of an agricultural land repurposing program.

Groundwater Sustainability Plan (GSP) Development, Solano Subbasin, Solano County, CA, 2018 - Present. Lead economist for the Solano Subbasin GSP. Preparing agricultural economic evaluations of potential projects and management actions to support broader GSP development.

Groundwater Sustainability Plan (GSP) Development, Colusa Subbasin, Colusa County, CA, 2019 - Present. Lead economist for the Colusa Subbasin GSP. Preparing agricultural economic evaluations of potential projects and management actions to support broader GSP development.

Groundwater Sustainability Plan (GSP) Development, East Contra Costa Subbasin, Contra Costa County, CA, 2020 - 2021. Lead economist for the East Contra Costa Subbasin GSP. Assisted with development of the projects and management actions, plan implementation, and funding/financing chapters of the GSP.

Crop Market and Water Risk Assessments. Farm Credit West and Northwest Farm Credit Services. California. 2020 - Present. Lead economist and project manager to develop analyses to quantify water risk and commodity risk in California to support grower business decisions and portfolio risk management. Water risk assessments establish water costs, value, and risk under current and projected future availability of irrigation water supply to agricultural regions in California. The studies are used by the client to manage portfolio risk, and to provide market insights for their customers (growers).

Processing Tomato Industry Baseline Analysis, California Tomato Growers Association, Sacramento, CA. 2018-. Lead economist for an assessment of the processing tomato industry costs, returns, markets, and market potential. The analysis was commissioned by the Association due to significant cost, price, and regulatory pressure faced by the industry. The study includes establishing production cost, regulatory costs, and returns. A second phase of the analysis evaluates domestic and international market trends.

Third-Party Impact Analysis of Colorado River Water Transfers. Central Arizona Groundwater Replenishment District. Yuma, AZ. 2014. Duncan developed a calibrated economic model of irrigated agriculture for irrigation districts along the Lower Colorado River. The model was used to assess the value and quantity of water offered by agriculture for potential urban transfers.

Walker River Basin Walker Basin Conservancy. Stored Water Lease Program. Nevada. 2018. Reviewed the Stored Water Lease Program proposed fee structure, incentives, and proposed payments. This included reviewing program goals and agricultural land and water asset values in the region. Developed recommended water leasing values. Proposed alternatives to the direct payment structure that included bidding and other approaches to better align payments with the underlying value of the land and water.

Water Supply Valuation, Confidential Client, Fresno, CA. Duncan is working with a client to assess water supply options, cost, and value under potential implementation of the Sustainable Groundwater Management Act (SGMA). The study includes strategic advice on possible water supply investment options (and partners), establishing regional water supply values, and quantifying potential economic outcomes under SGMA implementation.

Selected Publications

Msangi, S. and MacEwan, D. (eds). (2019). Applied Methods for Agriculture and Natural Resource Management. Natural Resource Management and Policy Series. Springer International.

Samuel W. Schaefer, P.E.

Senior Program Manager / Project Development

Samuel Schaefer is a Licensed Professional Engineer with experience in agricultural and environmental water resources projects. Mr. Schaefer's expertise includes strategic planning, illustrated through his facilitation of the Poso Creek Integrated Regional Water Management (IRWM) planning group); developing regional water supply and conjunctive use projects from conception through construction; securing grant funding; and management of all aspects of a project's life-cycle. In addition, he has participated in projects that involve salt characterization and analysis, agricultural and irrigation practices, and groundwater recharge. He has experience with multi-disciplinary teams, as well as managing and mentoring staff. Mr. Schaefer is a dynamic leader with strong technical expertise in public and private water infrastructure development.

PROJECT EXPERIENCE

Poso Creek Integrated Regional Water Management Plan (IRWMP), Shafter-Wasco Irrigation District, Wasco, CA. Project Facilitator for implementing over 100 agreements for over \$230million in Projects with \$90M in grants funding towards implementing the projects in the Plan with agricultural water districts cooperating with disadvantaged communities, and stakeholders. The goal is to improve regional conveyance and banking facilities for Central Valley Project (CVP) Contractors and Non-CVP Contractors (NCVPC) within the Plan Area. The contractors include Shafter-Wasco ID, Delano-Earlimart ID, Southern San Joaquin MUD, Semitropic WSD, North Kern WSD, Cawelo WD, and Kern-Tulare WD.

Drought Contingency Plan for the Poso Creek IRWM Plan Region, Shafter-Wasco Irrigation District, Wasco, CA.

Reclamation funded drought contingency plan for Poso Creek IRWM.

System Optimization Review for the Poso Creek IRWM Plan Region, Shafter-Wasco Irrigation District, Wasco, CA. Evaluated non-structural and structural projects for implementation. "Plan of Action" for the Poso Creek IRWM Plan. CEQA and NEPA documents for 25-year water banking program between seven districts with surface supplies from CVP Friant, CVP Delta, and SWP.

Program and Project Management for Design, Bidding, and Construction Management for Water Districts in Kern County, CA (received multiple Federal and State Grant Funding). Directed teams preparing funding proposals on water conveyance and GW storage projects for Reclamation and California Department of Water Resources (DWR). Once funded, directed teams preparing design, bidding documents, and construction management as districts implemented funded projects through construction.

Willow Springs Groundwater Bank, CIM Group, Antelope Valley, CA. Alignment study for eight miles of 84-inch ID pipeline from the California Aqueduct to the Willow Springs Water Bank.



EDUCATION

M.S., Agricultural Engineering/Water Resources, South Dakota State University

B.S., Bio-Resource and Agricultural Engineering, South Dakota State University

EXPERIENCE IN THE INDUSTRY

38 years

EXPERIENCE WITH GEI

17 years

REGISTRATIONS AND LICENSES

Professional Engineer, CA No. 66337
Professional Engineer, CO No. 38324

PROFESSIONAL ASSOCIATIONS

Board Member of U.S. Committee on Irrigation and Drainage (USCID)

Past Treasurer of Coastal Branch of the Groundwater Resources Association of California

Multiple Agriculture Water Management Plans, CA. AWMPs to meet DWR's requirements for Cawelo WD, North Kern WSD, Semitropic WSD, Wheeler Ridge-Maricopa WSD, and Shafter-Wasco ID.

Salt and Nutrient Plan, Coachella Valley Water District, Coachella, CA. Provided water use and salt loading evaluation for agriculture and golf course land use for input into the Salt and Nutrient Plan for Coachella Valley. GEI provided root-zone moisture model to account for the agricultural water demands for 73 crop categories.

Northern Cities Management Area, Annual Monitoring Reports, Cities of Grover Beach, Arroyo Grande, Pismo Beach, and Oceano Community Services District, CA. Provide agricultural supply and demand for the annual report to the court as part of an adjudication of the Santa Maria basin.

Water Supply and Demand Current Uses and Future Estimates, Santa Barbara County Water Agency, Santa Barbara County, CA. Agricultural water use and demand for the water supply and demand assessment.

Groundwater Assessment for the Santa Maria Valley, Santa Barbara County Salt and Nutrient Planning Workgroup, Santa Barbara County, CA. Groundwater Assessment report regarding agricultural water management practices, summary of nutrient management practices, and preparation of salt and nutrient balance.

Water Rights and Litigation Support Experience

Construction of the Cochiti Agricultural Drainage System near Cochiti Lake, U.S. Army Corps of Engineers (USACE), Albuquerque District, NM. Provided field investigation, planning, design, engineering, and pre-construction meeting services to USACE CM team; testimony in the defense to claims by the contractor.

Hydrologic Inventory of Nipomo Mesa Management Area, Nipomo Community Services District, Nipomo, CA. Urban and agricultural consumptive use values for the hydrologic inventory as part of litigation.

Nicoll Ditch Field Reconnaissance Study, Lynch and Lynch, LLP, Kern County, CA. Designated as an expert witness for an agricultural water delivery canal.

San Bernardino Valley Municipal Water District's Water Rights Application for Supplemental Water Supply EIR, Kevin O'Brien, Downey Brand, LLP, San Bernardino Valley Municipal Water District, San Bernardino County, CA. Water allocation modeling in support water rights application, analysis involved interpreting the Watermaster rules for the replenishment of the San Bernardino Basin Area.

Practically Irrigable Area Assessment as Part of a Native American Water Right Settlement, Department of Ecology, Lummi Peninsula of Whatcom County, WA. Arable land evaluation and crop payment capacity in determination of the PIA. Followed the Reclamation Land Classification Guidelines in this PIA determination.

AWARDS

2020 - Outstanding Water Project, ASCE S.J. Branch and L.A. Section Excellence Award. Groundwater Recharge Intertie "Diltz" Pipeline. Shafter-Wasco Irrigation District, Semitropic Water Storage District, GEI Consultants, Zeiders Consultants, and W.M. Lyles Co. received the award for the cooperative effort.

2019 - Outstanding Water Project. Calloway Canal Lining. American Society of Civil Engineers (ASCE) received by North Kern Water Storage District, GEI, and Zeiders Consultants.

2016 - Outstanding Water Project. CRC Pipeline to North Kern Water Storage District for delivery of Oil-field Produced Water. ASCE Excellence Award to North Kern Water Storage District, GEI, and Zeiders Consultants.

2015 - Outstanding Water Project. Cross Valley Canal to Calloway Canal Intertie. ASCE Excellence Award received by North Kern Water Storage District, Cawelo Water District, GEI, and Zeiders Consultants.

2013 - Outstanding Water Project. Poso Creek IRWM Plan Regional Water Management Group's Water Management Program. ASCE Award. Shafter-Wasco Irrigation District and GEI Consultants received award on behalf of seven districts working to collaborate on regional water supply reliability.

2012 - Outstanding Water Project. Calloway Canal to Lerdo Canal Intertie. ASCE award to North Kern Water Storage District and GEI Consultants for constructing this regional water conveyance facility.

Rodney Fricke, PG, CHG, CEG

Senior Hydrogeologist

Rodney Fricke is a California certified Hydrogeologist and Professional Geologist specializing in groundwater remediation. Over the course of his career, he has worked as both a consultant and a client. His early career focused on evaluation and development of groundwater resources for potable water supply and for the mining industry and then groundwater contamination. More recently, he has focused on water supply and the management of groundwater resources, including compliance with SGMA regulations. Mr. Fricke has worked with state and federal regulatory agencies in achieving compliance in soil and groundwater cleanup projects, evaluating alternative water supplies for impacts to municipal resources, and delisting/entitlement processes for land development. His experience also includes the design and implementation of groundwater monitoring plans and field investigations of soil and groundwater; and interpretation of construction and geophysical well logs for purposes of aquifer characterization and development of site-specific conceptual hydrogeologic models, and interpretation of water quality data.

PROJECT EXPERIENCE

Cosumnes Subbasin - On-Call Technical Services for SGMA Compliance, Sacramento County Water Agency (SCWA), CA.

Attended monthly GSA meetings and committee meetings for the Cosumnes Subbasins. Assisted SCWA with the creation of a groundwater sustainability agency (GSA) for the unmanaged area in the Cosumnes Subbasin. Reviewed and provided comments and revisions on draft sections of the groundwater sustainability plans (GSP) for the Cosumnes Subbasin and GSPs for the adjacent subbasins, including the Eastern San Joaquin and the South American Subbasins. Uploaded the Cosumnes GSP to the DWR SGMA Portal.

Evaluation of Surface Water-Groundwater Interactions,

Cosumnes River, Sacramento County, CA. Installed transducers in piezometers in the north levee of the Cosumnes River and in a nearby domestic ranch well to measure water levels, temperature, and specific conductance during Spring 2017. Downloaded stage data for Cosumnes River from California Data Exchange Center for comparison to transducer data. Presented findings at the Annual Meeting of the Groundwater Resources Association in October 2017.

Evaluation of Hydrogeologic Conditions of Placer Diggings,

North Columbia, CA. Project geologist for the comprehensive evaluation of hydrogeologic conditions of a historic hydraulic gold mine in support of the CEQA Environmental Impact Report. Responsible for design and installation of nested observation wells in the white gravel and underlying gold-bearing blue gravel, aquifer testing, water level measurements, groundwater sampling, streamflow measurements, and sampling for acid-mine drainage potential from sulfide minerals in the blue gravel. Participated in installation of stream gage monitoring station and measured flow of stream for rating curve.



EDUCATION

M.S., Geology, University of Nevada

B.S., Geology, Southern Illinois University

EXPERIENCE IN THE INDUSTRY

42 years

EXPERIENCE WITH GEI

6 years

REGISTRATIONS AND LICENSES

Professional Geologist, CA No. 4089

Certified Hydrogeologist, CA No. 11

Certified Engineering Geologist, CA No. 1476

PROFESSIONAL ASSOCIATIONS

Groundwater Resources Association of California, including Treasurer of the Sacramento Branch since 2008 and, beginning in 2020, GRAC Treasurer and member of the GRAC Executive Committee. Editor of quarterly HydroVisions beginning in 2021.

Investigation of Groundwater Conditions, McDonnell-Douglas Inactive Rancho Cordova Test Site (IRCTS), Sacramento County, CA. Project manager for multi-phased investigation and remediation of contaminant plumes, including trichloroethylene (TCE) and perchlorate, from aerospace and industrial facilities. Installation of numerous monitor wells (single completions and nested completions) at over 100 locations, and extraction wells using casing hammer and mud rotary equipment. Well design was based on geophysical logs and boring logs.

Aquifer Storage and Recovery (ASR) Program, Sacramento County Water Agency, CA. Project manager for an evaluation of four existing supply wells near the Vineyard Surface Water Treatment Plant for potential use in an ASR program, including the local hydrogeologic conditions, estimates of hydraulic parameters and storage capacity, groundwater mounding potential and the quality of surface water and groundwater. Prepared a Technical Report in support of a NOI to conduct a 3-cycle ASR pilot test during a 5-month period using 40 million gallons of drinking water from the Sacramento River.

Groundwater Sustainability Plan for Greater Kaweah GSA, Kaweah Subbasin, Kings and Tulare Counties, CA. Project manager for the preparation of the final GSP, including sustainable management criteria, monitoring network, and projects and management action. Uploaded the GSP to the DWR SGMA Portal.

Groundwater Sustainability Plan for Big Valley Basin, Lassen and Modoc Counties, CA. Co-author and professional geologist for the preparation of the hydrogeologic conceptual model for the GSP. Provided technical assistance with other components of the GSP.

Hydrogeologic Conceptual Model, North of River Area, Kern County Subbasin, CA. Author of draft hydrogeologic conceptual model (HCM) of the North of River area of the Kern County Subbasin of the San Joaquin Valley. The HCM addresses the requirements of the Sustainable Groundwater Management Act and utilizes information from numerous existing documents from various sources, including USGS, DWR, RWQCB, County, water districts, and consulting reports. The HCM was integrated with similar information for other areas within the Kern County Subbasin GSP for submittal by January 2020.

Design of Municipal Supply Well, California Department of Water Resources, Porterville, CA. Designed 16-inch diameter well to a depth of 640 feet, based on isolation zone testing of water quality, geophysical log, and lithologic log. Well installation was based on a conformed Bid, Contract, and Specification. Aquifer testing showed the well has a long-term yield of 600 gallons per minute and produces dilute sodium/calcium-bicarbonate water (low TDS).

Rehabilitation of Production Well No. 5, City of Tracy, CA. Prepared specifications and bid schedule for the rehabilitation of an 18-inch diameter, 1000-foot-deep production well. Specification addressed pump removal and installation, video surveys, mechanical cleaning, chemical treatments, developmental pumping, and well disinfection. Project manager for the implementation of the rehabilitation work after assisting with contractor selection.

Maria E. Pascoal

Strategic Communications Lead

Maria Pascoal is a senior communications professional specializing in public outreach, technical writing, and graphic design. She has 17 years of experience with communications for engineering and scientific clients. She leads GEI's Strategic Communications Team to combine industry knowledge, technical writing, and graphic design to produce clear, effective communications for stakeholders and the public. Ms. Pascoal has produced hundreds of outreach materials such as brochures, outreach plans, guides, infographics, and presentations.

Ms. Pascoal has expert knowledge in graphics software including Adobe InDesign, Photoshop, and Illustrator, and is highly proficient in Microsoft Word, Excel, Visio, and PowerPoint. In 2017, she completed a University of California Extension Certificate in Technical Communications, including extensive coursework related to technical documentation, user-centric design, and visual systems.

PROJECT EXPERIENCE

Strategic Plan 2021-2026 (SP26+), Calaveras County Water District, San Andreas, CA. Collaborated with District management and Board of Directors to develop refreshed mission and vision statements for the organization and its SP26+. Assisted with development of core values, goals, and objectives via remote working meetings. In collaboration with project team, designed and distributed a stakeholder survey to gather information for the Plan. Provided materials for and helped conduct three Board of Directors workshops to ensure Board participation and support. Tasked with designing final Strategic Plan document (to be completed mid-2021).

Paso Robles Subbasin GSP, City of Paso Robles, CA. Supported community engagement for the five GSAs in the Paso Robles Subbasin. Co-author of Paso Robles Subbasin Communication and Engagement Plan. Assisted with planning and execution of public meetings and workshops. Developed a variety of outreach materials including presentations, mailers, and handouts. Led deployment of the Paso Robles Groundwater Communication Portal, an online tool for use by the GSAs to conduct and document outreach in the Subbasin.

Sustainable Groundwater Management Program, California Department of Water Resources, Statewide, CA. Provided communications support in the form of graphics and document development, technical editing, and user experience for DWR's implementation of the Sustainable Groundwater Management Act (SGMA). Collaborated with program team to develop graphics for DWR's best management practices (BMPs) and guidance documents for Groundwater Sustainability Plan (GSP) development, including the Stakeholder Communication and Engagement guidance document. Assisted with development of DWR's GSP Emergency Regulations Guide, a document created to outline the GSP process and required contents for a GSP. Created technical and conceptual illustrations, presentations, and print materials used in statewide outreach.



EDUCATION

B.F.A., Graphic Design, University of the Pacific
Technical Writing and Communication Certificate, U.C. Santa Cruz Silicon Valley Extension
Facilitation Training, American Water Resources Association

EXPERIENCE IN THE INDUSTRY

17 years

EXPERIENCE WITH GEI

15 years

Atascadero Subbasin GSP Support, Atascadero Mutual Water Company, CA. Project manager to develop a groundwater communications portal for assisting the Atascadero Subbasin GSA to engage the public and track public outreach and engagement activities. Provided graphics to support successful basin boundary modification request to DWR. Authored the Communication and Engagement Plan for GSP development. Updated existing website to reflect most recent SGMA activities. Developed stakeholder outreach materials such as SGMA FAQ, postcards, and newsletters.

Kaweah Subbasin GSP Development and SGMA Support, Mid-Kaweah Groundwater Sustainability Agency, CA. Project manager to develop a web-site and groundwater communications portal for assisting the Mid- and Greater-Kaweah GSA to engage the public and track their public outreach and engagement activities. Assisted with user interface for web-based data management system (DMS). Prepared the Communications chapter of the GSP. Provided editorial review of the Final Mid-Kaweah GSP.

San Luis Obispo Valley Basin GSP, County of San Luis Obispo, CA. Project manager to develop a groundwater communications portal for assisting the County of San Luis Obispo and the City of San Luis Obispo to engage the public and track their public outreach and engagement activities for GSP development. Provided support for public meetings and presented communications portal to the public. Currently assisting with user interface design for countywide DMS.

Santa Ynez Subbasin, Eastern Management Area GSA, CA. Project manager to develop and maintain a basinwide web-site and groundwater communications portal to engage the public and track public outreach and engagement activities for the three GSAs in the subbasin. Authored Communication and Engagement Plan for GSP Development for the Eastern Management Area (EMA). Assisted with development of a Data Management Plan (DMP) for the EMA and currently providing user interface design for the web-based DMS described in the DMP.

Tracy Pre-GSP Development, San Joaquin County, CA. Project manager to develop and maintain a web-site and groundwater communications portal to engage the public and track public outreach and engagement activities for the Tracy Subbasin.

Big Valley Subbasin GSP Support, Lassen County, CA. Project manager to develop and maintain a web-site and groundwater communications portal to engage the public and track their public outreach and engagement activities. Authored a Communication and Engagement Plan for GSP development.

Semitropic GSP Communication and Engagement Plan, Semitropic Water Storage District, Kern Groundwater Subbasin, CA. Co-author and graphic designer for Communication and Engagement Plan to support the development of a GSP for Semitropic Water Storage District. Assisted in the preparation of the stakeholder online portal.

San Antonio Valley Basin GSP Communication Portal, San Antonio Basin Groundwater Sustainability Agency, CA. Project manager to develop and maintain a groundwater communications portal to engage the public and track public outreach and engagement activities for SGMA in the San Antonio Valley Basin.

Forecast-Coordinated Operations Program, California Department of Water Resources and F-CO partners. Sacramento and San Joaquin River Systems, CA. Collaborated with project managers to develop outreach materials, such as brochures and fact sheets, for the Forecast-Coordinated Operations Program. Assisted in the execution of a 10-year anniversary event celebrating the Program's accomplishments. Developed materials for public presentations such as PowerPoint slideshows and conceptual illustrations.

Delta Islands Land Use Opportunities Assessment, Strategy, and Concepts, Metropolitan Water District of Southern California, Sacramento-San Joaquin Delta, CA. Graphic designer assisting with preparation of land use opportunities brochure for Metropolitan's five Delta islands. Strategized with project managers to create a summary graphic for each island outlining potential land use and management options. Provided reader-friendly design for a report outlining Metropolitan's objectives, trends in the Delta, land use opportunities, and potential benefits and constraints.

AHMAD-ALI BEHROOZMAND

Senior Geophysicist, Managing Consultant, Ph.D.

PROFESSIONAL SUMMARY

Ahmad-Ali Behroozmand has a PhD degree in Geophysics and specializes in the field of Hydrogeophysics. Dr. Behroozmand has more than 13 years of professional experience in the development and application of geophysical methods (*airborne, ground based, logging*) for subsurface characterizations. He has a strong background in data acquisition, forward modeling, processing & inversion, as well as interpretation of geophysical data.

Ahmad has been involved in numerous groundwater-related projects worldwide. During the past 7 years, Ahmad has taken an active role in several projects in California in compliance with the Sustainable Groundwater Management Act (SGMA). In particular, he has conducted projects across the state of California to assess suitable sites for managed aquifer recharge (MAR) among other applications and is currently a key member of the California Department of Water Resources statewide AEM project.

As a research scientist at Stanford University and Aarhus University, Dr. Behroozmand conducted fundamental research in EM geophysics within the framework of different research projects. The results of his research works have been published as peer-reviewed scientific journal articles and presented at numerous conferences. He taught university courses at graduate and undergraduate levels.

With an international mindset and a strong believe in team working, Ahmad has during his career developed collaboration with governmental agencies as well as water stakeholders and other private sectors to identify and develop solutions for improved groundwater management. Ahmad is highly interested in data fusion and integration of advanced geophysical investigations with other investigations within water resource management projects.

CAREER

2020-present	Senior Managing Consultant, Ramboll
2019-2020	Senior Geophysicist, Vista Clara Inc.
2017-2018	Senior Geophysicist, Stanford University
2014-2017	Research Scientist / Postdoc, Stanford University
2012-2014	Postdoc, Aarhus University

EDUCATION

2009-2012
Ph.D. in Geophysics
Aarhus University, Denmark



CONTACT INFORMATION

Ahmad-Ali Behroozmand

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+1 415-430-7173

Ramboll
2200 Powell Street
Suite 700
Emeryville, CA 94608
United States of America

AWARDS AND HONORS

2014	Individual Postdoctoral Grant, awarded by The Danish Council for Independent Research
2012	Postdoctoral Fellowship, awarded by Aarhus University, Denmark
2011	American Geophysical Union (AGU) outstanding student paper award
2010	Research visiting grant, ETH Zurich
2012-2014	Postdoc, Aarhus University
2007	Distinguished Master Student, Tehran University

PUBLICATIONS & CONFERENCE PRESENTATIONS

23 Peer-Reviewed Journal Articles | 30+ Peer-Reviewed International Conference Presentations
 Google Scholar: <https://scholar.google.com/citations?user=HbZWMykAAAAJ&hl=en>

SERVICES

Session Chairman, Conference Committee Member and Reviewer

2017-2018	31st Symposium on Application of Geophysics to Eng. and Env. Problems
2016-2017	7th International Workshop on Magnetic Resonance Sounding
2016	23rd European Meeting of Environmental and Engineering Geophysics
2015	6th International Workshop on Magnetic Resonance
2012-2014	Postdoc, Aarhus University
2007	Distinguished Master Student, Tehran University

Journal Editor and Reviewer

2015-2016	Editor: Geophysics Reviewer: Hydrogeology Journal, Water Resources Research, Geophysical Research Letters,
2012-present	Geophysics, Geophysical Journal International, Journal of Applied Geophysics, Near Surface Geophysics

SELECTED PROJECTS

2021-present	Statewide Airborne Electromagnetics (AEM) Surveys California Department of Water Resources AEM Data Acquisition Coordinator data acquisition and analysis project planning participant
2012-present	Salinas Valley Deep Aquifer Study E.L. Montgomery & Associates, CA Data acquisition and analysis project planning Managed Aquifer Recharge Site assessment (several projects) Kings County Water District, CA Sacramento Area Flood Control Agency, United States
2020-present	GSI Water Solutions Inc., CA Rosedale-Rio Bravo Water Storage District, CA Orange County Water District, United States, CA Project Manager data acquisition and analysis GD: Geophysical Investigation (Phase II) for Levee Underseepage Assessment - Fremont Weir Adult Fish Passage Modification
2020-2021	Gregg Drilling, CA Project planning data acquisition and analysis LWA: TTEM and WalkTEM in Shasta Valley
2020-2021	Larry Walker Associates, CA Project planning data acquisition and analysis The Stanford University gap project - Qualifying existing data for developing hydrogeological models and uncertainty quantification
2017-2018	Stanford University, CA Project partner data analysis

Julián H. Consoli, P.G.

Project Geologist

Julián Consoli is a California Professional Geologist with six years of experience in planning and executing water resource, environmental, and geotechnical investigations for municipal, state, mining, landfill, commercial, and industrial clients. Mr. Consoli's experience includes hydrogeologic investigations, well siting assessments, well construction, aquifer storage and recovery (ASR) programs, groundwater sustainability plans, and drinking water source assessments.

Mr. Consoli has experience with drilling and geophysical logging oversight, lithologic logging, well construction, soil and groundwater sampling, well and aquifer testing and analysis, and transducer installations as well as technical report writing, data management, and preparation of figures, groundwater contour maps, hydrographs, and cross-sections.

PROJECT EXPERIENCE

Groundwater Sustainability Plan Support Services, West Placer County GSA, West Placer County, CA. Assist in data collection in support of the development of a groundwater sustainability plan (GSP) for the West Placer GSA as part of the North American Subbasin. Includes groundwater sampling and water quality analysis, transducer data collection, and groundwater level monitoring. Data collection and analysis serve to satisfy requirements of the Sustainable Groundwater Management Act (SGMA) and further understanding of the hydrogeologic system of the subbasin.

On-Call Groundwater Services (2020-2021), City of Roseville, CA. Prepared DWSAPs for six planned production and ASR wells for submission to State Board's Division of Drinking Water (DDW). The DWSAPs included hydrogeologic analysis of potential contaminating activities in the vicinity of each well and determining vulnerability of each drinking water source to contamination. Also assisted in updating the City's water quality database with new data.

Aquifer Storage and Recovery (ASR) Feasibility Study, City of Davis, CA. Assisted with the development of an ASR Feasibility Study for the City to assess ASR operations and pilot test results within the City. Tasks for the pilot study included deploying water level transducers, measuring groundwater levels, and transducer data collection. Assisted with aquifer pumping test analysis and the development of a technical report. The feasibility study report included an assessment of the hydrogeologic setting of the City and ASR target aquifer characteristics. Groundwater levels, groundwater gradients, and hydrologic properties of the target aquifer were assessed to determine local potential for storage and recharge capacity.

Emergency Groundwater Supply Wells, City of Healdsburg, CA. Assisted with the Phase 1 evaluation of deep groundwater resources (>200 feet) beneath the City, based on available well logs from DWR and existing technical reports. Phase 2 will include drilling and



EDUCATION

B.S., Earth Science, University of California, Santa Barbara

EXPERIENCE IN THE INDUSTRY

6 years

EXPERIENCE WITH GEI

1 year

LICENSES AND REGISTRATIONS

Professional Geologist, CA No. 10007

TRAINING

OSHA 40-Hour HAZWOPER

MSHA 24-Hour Part 46/48

construction of test wells at three locations to determine if the deep aquifer can be developed as a source of potable groundwater during drought conditions and a reservoir for the storage of potable surface water from the Russian River during wet conditions. Please 3 will included the production of ASR wells.

Long Term Facilities Plan, Tahoe Keys Water Company, South Tahoe, CA. Helped prepare recommendations report to Tahoe Keys as part of their long term water facilities plan. Helped develop an approach to rehabilitate existing wells to reduce tetrachloroethylene (PCE) and uranium contamination. Conducted a high-level hydrogeologic analysis to assess viability of TKWC #2 as a suitable extraction well to capture and remove PCE from the aquifer. Made recommendations for exploratory drilling and siting for a new production well to meet water demand. Coordinated with state agencies to explore funding opportunities.

Drilling Bid Package and Well Specifications, Sonoma County Water Agency, CA. Assisted with the preparation of a drilling bid package for 10 triple-completed nested monitoring wells in Sonoma County. The bid package included technical specifications and a bid schedule for drilling and construction details, well materials, geophysical logging, and well development.

Rehabilitation of Two Existing Wells at the Sebastopol Road Site, Sonoma County Water Agency, CA. Evaluate the potential use of the two 1000-foot-deep municipal wells for an aquifer storage and recovery program. Evaluation included the use of static and dynamic temperature and conductivity depth profiles, depth-specific flow contributions, depth-specific sampling. Rehabilitation work included brushing of well to remove scale, air-lift surge pumping, and developmental pumping with a test pump.

Water Master Plan Update, WSC and San Juan Water District, CA. GEI is a subconsultant to WSC providing groundwater services during the master plan update. The project objective is to develop alternatives to improve SJWD's water supply reliability by summarizing the groundwater setting in the study area and developing and aquifer storage and recovery (ASR) alternatives.

Hydrogeologic Assessment, Confidential Client, Auburn, CA. Oversaw air rotary, hollow-stem auger, and roto-sonic drilling. Logged soil and rock cuttings and oversaw the construction and development of monitoring wells. Oversaw drilling and construction of piezometers used to delineate the potentiometric surface beneath the site. Deployed transducers to evaluate groundwater level trends and collected groundwater samples for water quality testing. Collected and managed data, prepared hydrographs, lithologic logs, and cross-sections, and assisted with hydrogeologic report.

Hydrogeologic Assessment, Lehigh Calaveras Cement, San Andreas, CA. Investigated the influence of creek and groundwater affecting water levels in sump at a closed tailings pile. Directed advancement of geotechnical borings and logged soil and rock core for geotechnical properties. Oversaw the installation of vibrating wire piezometers. Installed transducers in existing wells, creek, and sump to evaluate water level and quality trends. Prepared lithologic boring logs with well construction details, prepared cross-sections, and assisted with hydrogeologic report.

Monitoring Well Construction Oversight, Valley Water, Bakersfield, CA. Oversaw mud rotary drilling of approximately 400-foot deep boreholes and logged continuous soil core. Oversaw geophysical logging and construction of multi-depth monitoring wells. Directed well development and collected groundwater samples for water quality testing.

Injection/Extraction Well Construction Oversight, Confidential Client, Los Angeles, CA. Directed the advancement of approximately 400-foot boreholes at a closed landfill as part of a groundwater treatment feasibility investigation. Oversaw air and mud rotary drilling, logged cuttings, and directed the construction and development of groundwater extraction and injection wells.

Dewatering Assessment, Confidential Client, Davis, CA. Oversaw the drilling, construction, and development of monitoring wells, logged soil, and collected soil samples for geotechnical laboratory testing. Deployed transducers in wells, performed step-drawdown and constant-rate pumping tests, and analyzed test data in AQTESOLV. Prepared lithologic borehole logs and figures; wrote report summarizing the hydrogeologic conditions and estimated flow into proposed excavation areas.

Pauline Espinoza

Staff Professional

Pauline Espinoza is a staff professional in GEI's Sacramento office who is experienced in geologic and hydrogeologic field work. Her experience with geologic mapping and report writing includes creating geologic maps based on the landscape in Death Valley, Emigrant Pass; over 1,000 ft of deep rock coring in Ely, Nevada; and draft writing for various Groundwater Sustainability Program (GSP) chapters and Water Quality reports.

Her experience with environmental studies and planning for water technology include water quality sampling; monitoring, well construction oversight, and ASR feasibility studies. She has overseen drilling and construction of single monitoring wells, multi-completion monitoring wells, and injection wells throughout areas in Northern, Central, and Southern California. This includes performing field analysis of sediment using Unified Soil Classification System, soil color identification using Munsell Color system, and post pilot borehole drilling activities such as aquifer zone testing, well design, casing installation, and well development.

In the area of data management, Ms. Espinoza has helped download, format, and upload large datasets for online data systems such as CASGEM, DWR, and several county's DMS websites.

Ms. Espinoza has experience in lab work, including operating a Liquid Water Isotope Analyzer (LWIA), setting up and running a water distillation apparatus, and sieving sediment core samples for forums. Additionally, she has experience with Geographic Information System (GIS).

PROJECT EXPERIENCE

City of Roseville ASR Monitoring Well Construction, Roseville, CA. Field oversight of multi-completion monitoring well construction, installation, and on-site bore hole soil analysis; involvement with creating final well designs. Well development oversight and field water quality sampling. Documentation of field parameters during development using a Horiba U-52 Multimeter. Operating well pump equipment for purging. Assisted with writing the Well Completion Report alongside project manager.

Big Valley Implementation of Groundwater Sustainability Plan and GSP Development for Big Valley, Modoc, Lassen Counties, CA. Monitoring well construction and installation oversight and on-site bore hole soil analysis. Collected water level samples for newly constructed monitoring wells and created hydrographs for local existing monitoring wells. Assisted with final well designs alongside project manager. Created maps in ArcGIS portraying water quality constituents.

ASR Feasibility Study, City of Davis, CA. Collected groundwater samples from each well after purging well of stagnant water while monitoring field parameters (pH, specific conductance, temperature,



EDUCATION

B.A., Earth Science, Sonoma State University

EXPERIENCE IN THE INDUSTRY

2.5 years

EXPERIENCE WITH GEI

2.5 Years

PROFESSIONAL ASSOCIATIONS

Groundwater Resources Association of California (Member 2020-present)

dissolved oxygen, turbidity) for stability. Field filtered a portion of each sample for dissolved metals analysis and submitted the samples to a state-certified laboratory under a standard chain-of-custody protocol for analyses.

GSP Development for the Yolo Subbasin, Yolo County, CA. Created hydrographs for selected monitoring wells using Excel. Assisted project manager in creating criteria for setting Measurable Objective (MO) and Minimum Thresholds (MT) sustainable management criteria. Wrote initial draft of Monitoring Network chapter for the GSP.

GSP 2022 Annual Report for the North American Subbasin; Sacramento, Sutter, Yuba, and Placer Counties, CA. Updated all SGMA Representative well hydrographs for water year 2022 using the North American DMS. Assisted with upload of Spring 2022 measurements for all SGMA Representative wells to SGMA portal. Provided support in annual report drafting and writing.

GSP Development for the North American Subbasin; Sacramento, Sutter, Yuba, Placer Counties, CA. Created long-term and short-term hydrographs for over 200 CASGEM wells, used to understand interactions between upper and lower aquifers in the subbasin. Used ArcMap to create location maps for nested and clustered wells, maps showing head-direction of water levels at nested or clustered sites, and maps showing locations of all wells obtaining long-term water surface elevation data. Determined sustainable management criteria such as Measurable Objectives and Management Thresholds for representative monitoring wells by analyzing historic groundwater levels.

GSP 2022 Annual Report for the Tracy Subbasin; City of Tracy, CA. Updated all SGMA Representative well hydrographs for water year 2022 using the Tracy DMS. Assisted with upload of Spring 2022 measurements for all SGMA Representative wells to SGMA portal. Provided support in annual report drafting and writing.

GSP Development for the Tracy Subbasin; City of Tracy, CA. Created hydrographs for long-term, nested, and clustered well sites. Used ArcMap to create location map for all wells used in hydrographs. Research and select data to create plots portraying surface water/groundwater relationships and subsidence in the subbasin. Determined sustainable management criteria such as Measurable Objectives and Management Thresholds for representative monitoring wells by analyzing historic groundwater levels.

Data Management System (DMS) for North American; Tracy, Santa Ynez, Atascadero, San Luis Obispo, and Big Valley Subbasins, CA. Downloaded and compiled well water level, water quality, and location data for each subbasin then formatted data into DMS upload templates. Transcribed data originally from clients and formatted into DMS upload templates. Populated most recent groundwater level data, and Minimum Threshold and Measurable Objective values for representative wells.

GSP Development for the Butte, Vina, and Wyandotte Creek Subbasins, CA. Assisted with formatting Power Point Presentation for public meeting. Downloaded and queried water quality data from Envirostore and GAMMA Groundwater for all subbasins. Also assisted with minor changes to maps using ArcGIS.

Kern County GSP, Kern County, CA. Provided support in technical development of Data Management System DMS. Support included web-site testing and assistance in User Guide development.

PREVIOUS PROJECT EXPERIENCE

Folsom Lake Isotopic Model, Sacramento State University, Sacramento, CA. Volunteered for Sacramento State University Water Analysis Lab. Collected samples from Folsom Lake using a Van Dom Bottle Sampler. Prepared and processed samples using a Liquid Water Isotope Analyzer (LWIA). This process was done to investigate the relationship between location, depth, and isotopic variation in Folsom Lake, California.

Harry Ferdon, MS

Economist, ERA Economics

Bio: Harry completed his undergraduate in economics and mathematics at the University of California, Santa Barbara and his masters in agribusiness at Cal Poly San Luis Obispo. His master's thesis developed an economic analysis of district-level agricultural water transfers (markets). Prior to joining ERA Economics, Harry worked with growers on agricultural water management issues, most recently at SWIIM System, Ltd. He managed technical support for water management software and consulting engagements with clients to improve the economic performance of their operations using improved irrigation management information.

Education

M.S. Agribusiness, Cal Poly San Luis Obispo

B.A. Economics, University of California, Santa Barbara

Professional Experience

Economist, ERA Economics, 2022 - Present

Associate Economist, ERA Economics, 2020 - 2022

Business Development Manager, SWIIM Systems, 2017 - 2020

Regional Manager, Soilmoisture Equipment Corp, 2014 – 2017

Certifications

Certified Agricultural Irrigation Specialist – Irrigation Association (January 2018)

Selected Projects

Delta Conveyance Environmental Impact Report, Department of Water Resources, Sacramento, California. 2020 – Present. Harry is working with a team of ERA economists and other consultants to update the planning and feasibility analysis for the revised configuration of the Delta Conveyance project. The project is the current iteration of the previously proposed twin tunnels. It would improve operational flexibility of water supply between north and south of Delta water users. The project includes a comprehensive update of socioeconomic data, water use, and economic impacts under proposed Delta Conveyance alternatives.

North-of-the-Delta Offstream Storage Project (NODOS) Feasibility Study, U.S. Bureau of Reclamation, Sacramento, CA, 2022 - Present. Harry is leading the development of an ability-to-pay (ATP) analysis to quantify different water contractors' payment capacities for increased stability and flexibility of CVP water deliveries. This analysis is an addition to Statewide Agricultural Production model (SWAP) updates and other technical support provided by ERA for the feasibility study.

Groundwater Sustainability Plan (GSP) Development, East Contra Costa Subbasin, Contra Costa County, CA, 2021. Harry assisted in authoring the projects and management actions and plan implementation sections. He prepared economic assessments of potential projects and management actions to support

broader GSP development. He has helped prepare annual GSP costs including those for multiple GSAs, projects, monitoring, administration, and joint costs.

Leafy Green Buyer Specifications, Western Growers Association, Irvine, California. 2020 – Present. Harry is providing technical economic analysis support for an assessment of proposed buyer specifications for California leafy greens. The purpose of the economic analysis is to illustrate the costs of additional specifications, potential market impacts, and potential impacts to buyers and consumers. Harry is leading the grower outreach and data management components of the analysis.

Fire Break and Carbon Sequestration Benefits of Avocados, Avocado Commission, Irvine, California. 2020. Harry developed a report summarizing the economic benefits of fire break and carbon sequestration provided by avocado orchards in California. The study is being used to support discussions of nonmarket benefits provided by avocados that may justify lower agricultural water rates.

Crop Market and Water Risk Assessments. Farm Credit West and Northwest Farm Credit Services. California. 2020 - Present. Harry is assisting with developing analyses to quantify water risk and commodity risk in California to support grower business decisions and portfolio risk management. Water risk assessments establish water costs, value, and risk under current and projected future availability of irrigation water supply to agricultural regions in California, including projected implementation of the Sustainable Groundwater Management Act (SGMA). The studies are used by the client to manage portfolio risk, and to provide market insights for their customers (growers).

Groundwater Sustainability Plan (GSP) Development, Colusa Subbasin, Colusa and Glenn Counties, CA, 2020 – 2022. Harry assisted ERA team members with the projects and management actions and plan implementation sections of the GSP. He prepared economic data and summary information for potential projects and management actions to support broader GSP development. This included summarizing GSP administrative and project costs.

Delta Plan Update Rulemaking. Delta Stewardship Council, Sacramento, CA, 2018 – 2022. Working with the Delta Stewardship Council to navigate the rulemaking process for proposed updates to the Delta Plan. Developing the required economic and fiscal impact analyses. Harry was the technical lead for an analysis in 2021 and 2022 of proposed changes to the Delta Plan RRP1. He will be supporting the Council with outreach and responses to comments as the regulations are released in the coming months.

Groundwater Sustainability Plan (GSP) Finance Plan, Solano Subbasin, Solano County, CA, 2022 – Present. Harry is working with ERA economists to develop and implement a finance plan for the Solano Subbasin GSAs. The plan identifies revenue needs over time and evaluates alternative cost allocation strategies.

Ginger G. Gillin

Vice President, Principal Environmental Scientist

Ginger Gillin is an environmental scientist working out of GEI's Portland, Oregon, office. She has been a project manager and/or project scientist on assignments involving hydroelectric license compliance. Ms. Gillin's project experience has also involved fish passages, environmental permitting, ecosystem restoration planning, fisheries monitoring, and environmental documents preparation. She specializes in National Environmental Policy Act (NEPA) and California Environmental Protection Act (CEQA) compliance for water resources projects, particularly water conservation and groundwater banking projects.

PROJECT EXPERIENCE

CEQA and NEPA Compliance Support Services for the Bureau of Reclamation Grant-Funded Northern Area Project, Buena Vista Water Storage District, Buttonwillow, CA. As the Project Manager, prepared an Initial Study and Mitigated Negative Declaration for a project to improve water use efficiency by replacing leaking irrigation canals with a water pipeline. We also prepared an Environmental Assessment on behalf of the Bureau of Reclamation and a Biological Assessment which reviewed potential impacts to Federally-listed Threatened and Endangered Species. The project included management of an interdisciplinary team to evaluate potential impacts to wildlife, sensitive plants, groundwater quality and quantity, and cultural resources. Issues addressed included potential impacts to groundwater level and quality in a perched aquifer containing high salinity, a potentially historic canal system, and the Buena Vista Lake shrew, a federally-listed threatened species. All issues were successfully resolved and the project is currently in operation.

CEQA Compliance, New Well Site Project, Lost Hills Utility District, Kern County, CA. Project Manager. Prepared an addendum to a previously prepared Initial Study/Mitigated Negative Declaration on a project to develop a new well to provide drinking water to customers in the Lost Hills Utility District. The addendum was needed to update the CEQA documentation to address changes in the CEQA Guidelines in regard to analysis to potential impacts to groundwater in light of the passage of the Sustainable Groundwater Management Act.

CEQA Compliance, Highland Avenue Well Development, Citrus Heights Water District, Citrus Heights, CA. Project Manager. Prepared an Initial Study/Mitigated Negative Declaration for a project to purchase a property for the purpose of installing a drinking water supply well. Managed the public noticing and public review for the project, including Tribal consultation and response to comments. Also presented the final documentation to the Water District Board, who approved the project.

CEQA Compliance, Corn Camp Groundwater Recharge Pond, Buena Vista Water Storage District, Buttonwillow, CA. Project Manager. Prepared an Initial Study/Mitigated Negative Declaration for



EDUCATION

M.S., Wildlife Biology, University of Montana

B.A., Geography, University of Colorado

EXPERIENCE IN THE INDUSTRY

39 years

EXPERIENCE WITH GEI

19 years

CERTIFICATIONS

Fisheries Professional

PROFESSIONAL ASSOCIATIONS

American Fisheries Society

National Hydropower Association

Northwest Hydroelectric Association

a project to construct and operate a groundwater recharge facility. The project would allow the Water District to recharge up to 24,500 acre-feet per year in a 50-acre recharge pond during wet years, when more water is available to the District than is needed to supply the needs of their customers.

Financial Assistance Application, for the Clean Drinking Water State Revolving Fund on behalf of the Willow Springs Water Bank. CIM Group, Kern County, CA. Assisted with the development of the environmental package for the application for financial assistance for this southern California water banking project.

Upper Amargosa Creek Flood Control and Recharge Project, City of Palmdale, CA. Managed preparation of a Supplemental Environmental Impact Report for compliance with CEQA. Issues were potential environmental impacts to cultural resources, biological resources, threatened and endangered species, noise, and water resources. Managed an interdisciplinary team to evaluate baseline conditions and potential impacts.

CEQA Compliance for Construction and Operation of Recharge Ponds at the “Palms” Groundwater Bank, Buena Vista Water Storage District, Buttonwillow, CA. As the Project Manager, prepared an Initial Study and Mitigated Negative Declaration for a project to store floodwaters in a groundwater bank. The project included management of an interdisciplinary team to evaluate potential impacts to wildlife, sensitive plants, groundwater quality and quantity, and cultural resources. Issues addressed included archeological resources, potential soil contamination, and potential impacts other groundwater users in the region. All issues were successfully resolved and the project is currently in operation.

NEPA and CEQA Environmental Compliance for the Bureau of Reclamation Grant-Funded Friant-Kern Canal and 8-23 Canal Intertie Pipeline, Cawelo Water District, Bakersfield, CA. Provided support services for the NEPA environmental compliance for U.S. Bureau of Reclamation’s CALFED Water Use Efficiency Grant for the Friant-Kern Canal and 8-23 Canal Intertie Pipeline Project and CEQA environmental compliance for the California Department of Water Resources Agricultural Water Use Efficiency 2015 Grant for the same Project.

NEPA Environmental Compliance for the Bureau of Reclamation 2018 WaterSMART Grant for the Drought Response Program: Drought Resiliency Projects, North Kern Water Storage District, Bakersfield, CA. Managed a project to complete NEPA environmental compliance for this project to construct additional wells and pipelines to allow the Water District to have an enhanced ability to recover banked groundwater and transfer it to customers inside and outside the District. Managed the collection of baseline biological and cultural resources data, preparation of technical reports, and preparation of the Environmental Assessment on behalf of the Bureau of Reclamation.

Programmatic Environmental Impact Report (EIR) for CEQA Compliance for the Expanded Groundwater Banking Program, North Kern Water Storage District, Bakersfield, CA. As the Project Manager, prepared a Notice of Preparation and Program EIR for a project to expand the existing groundwater banking system within the North Kern Water Storage District. The project included management of an interdisciplinary team to evaluate potential impacts to wildlife, sensitive plants, groundwater quality and quantity, and cultural resources. Issues addressed included water quality and potential impacts other groundwater users in the region.

NEPA and CEQA Environmental Compliance for the Bureau of Reclamation Grant-Funded Calloway Canal Lining and Water Delivery Improvements Project, North Kern Water Storage District, Bakersfield, CA. Managed a project to complete NEPA and CEQA environmental compliance for this water conservation project. Managed the collection of baseline biological and cultural resources data, preparation of technical reports, and preparation of the Environmental Assessment on behalf of the Bureau of Reclamation. The project entailed lining a section of the Calloway Canal to reduce seepage losses and improve water delivery efficiency. The project also included installation of water control and monitoring instruments at District-owned wells and evapotranspiration stations at strategic locations within the District. The project was partially funded by grants from the U.S. Bureau of Reclamation.

Stephen Hatchett, Ph.D.

Director, ERA Economics

Bio: Steve is an economist and project manager specializing in water resources, agriculture, mathematical modelling, and statistical analysis. He joined ERA Economics in August 2018. Prior to that, he was senior principal economist and project manager in the Sacramento office of CH2M HILL for more than 20 years, from 1987-1998 and 2009-2018, and was principal and owner of Western Resource Economics from 1999 to 2009. Dr. Hatchett's primary focus is on interdisciplinary studies of agricultural production and water use, in which economics is integrated with hydrologic, biological, and engineering analyses. He has more 30 years of experience in project evaluation, including financial and risk analysis, benefit-cost analysis, cost allocation, CEQA/NEPA support, and regional economic impacts. He has assisted federal, state, and local agencies in implementing large programs resulting from new laws, regulations, and court decisions. Dr. Hatchett has also assisted private clients in assessing overall economic feasibility, financial costs and returns, and risk associated with irrigated agricultural production and water use. He has provided technical analysis and testimony to many Boards and Commissions and made numerous presentations at public meetings.

Education

Ph.D., Agricultural Economics, University of California at Davis

M. A., Administration, University of California at Riverside

B. S., Forestry, University of California at Berkeley

Selected Projects

Madera County GSA Land Repurposing Program Development, Chowchilla, Delta Mendota, and Madera Subbasins, Madera County, CA, 2020 - . Steve is the senior technical adviser developing the Madera County GSA land repurposing program. The Madera County GSA land repurposing program includes a financial incentive structure for agricultural land conversion or preservation in specific areas based on land use, water use, and opportunities for achieving multi-benefits. Steve worked with stakeholders and ERA team members over an 18-month public process. This included preparing economic and financial analyses of program costs, incentives, and design. This work supported the Madera County GSA's successful application for a \$10 million grant from the Department of Conservation to begin implementing components of the land repurposing program focused specifically on multi-benefit outcomes.

Economics Task Manager; Efficiency Conservation Program; Imperial Irrigation District; El Centro, CA;

Worked with the District Program Manager and staff to develop and implement IID's water conservation program. Responsible for designing and evaluating alternative incentive programs to encourage growers to adopt water-conserving irrigation technologies. Worked with engineers and hydrologists to develop a field-level grower decision model of the District that compared costs and water savings under different conservation program designs. Assisted in developing the conservation agreements, rules, and payment structure for participating growers. Participated in many meetings and workshops with District growers and staff.

Water Market Development, McMullin Area GSA, Kings County, CA, 2017 - 2021. Worked with the ERA team and consultants at other firms to develop a water market (trading) strategy in the McMullin GSA. The analysis includes a review of other water markets and outline of potential options for the MAGSA area. The market is being considered to support SGMA implementation and reduce land idling or lower the cost of and specific land idling that is required. The project includes water market design and simulation of financial/economic outcomes for growers in the MAGSA.

Lead Economist; Klamath Basin On-Project Plan Demand Management, Klamath Water and Power Association, Klamath Falls, OR; 2012-2013. Assisted a team developing options to reduce agricultural water demands in order to meet diversion limits from the Klamath River.

Project Economist; Confidential Client, Phoenix, AZ; 1999-2005. Served as economist on a team of experts that evaluated the water use and economic benefits for a large development in Arizona. Costs included land and infrastructure development; irrigation water distribution and application; and crop production, harvesting, and marketing.

Economics Task Leader; Snake River Decision Support System; U. S. Bureau of Reclamation; Pacific Northwest Region; Boise; ID. Lead economist in development of a computer-based decision support system (DSS) for management of the Snake River Basin in Idaho. Compiled data on crop acreages, revenues, and costs and created a model of irrigated agricultural production in the Basin. The DSS allows resource managers to access, display, and analyze information related to water resource decisions, and facilitates the coordination of hydrologic, biological, and economic analysis. Prepared the agricultural impact analysis for a study of acquiring water from agricultural uses to augment in-stream flow.

Lead Economist; Update to the Lower Colorado Salinity Economic Impact Model, U.S. Bureau of Reclamation; 2018-2020. Currently assisting Reclamation and its stakeholder partners to review and update the salinity cost model for agricultural, municipal, and industrial water use in the Lower Colorado Basin, including southern California. A team of engineers, agronomists and economists is reviewing data structures, inputs, and damage calculations to bring the model up to an improved and consistent form to use for policy analysis.

Project Economist; Confidential Client, Cairo; Egypt; 1996-1998. Served as economist on a team of experts that evaluated the life-cycle costs and returns of a potential large-scale irrigation project in Egypt. Costs included land and infrastructure development; irrigation water distribution and application; and crop production, harvesting, and marketing. Revenue and cost streams for several different cropping scenarios were developed. These estimates were used to prepare a project prospectus that included financial rate-of-return.

Project Manager, Implementation and Rulemaking for the Sustainable Groundwater Management Act, Department of Water Resources, Sacramento, CA; 2015-16. Assisted DWR with developing regulations, including supporting economic analysis and other documents, to implement the Sustainable Groundwater Management Act of 2015. This act requires local agencies to develop and implement management plans to achieve sustainable groundwater use. Regulations addressed groundwater basin boundary changes and criteria for evaluating local groundwater management plans.

Azad Heidari, Ph.D.

Project Professional

Azad Heidari is a civil engineer in GEI's Sacramento office and doctoral graduate from the Michigan Technological University. Dr. Heidari specializes in water resources with advanced skills in hydrologic and watershed modeling, agricultural water modeling, GIS analysis, and interpersonal and technical communication. He is experienced with SWAT, ArcGIS, IDC, IWFm, C2VSim, HEC-HMS, HEC-RAS, Aqua Crop and MS Office.

PREVIOUS PROJECT EXPERIENCE

Water Use Estimate for Sacramento Central Ground Water Authority, Sacramento, CA. Lead hydrologic modeler. Collected and processed hydrologic, climatic and spatial data sets. Simulated agricultural water consumption using Integrated Water Flow Model Demand Calculator (IDC) model for 2016-2021 period. Processed remote sensed ET data to support the modeling results. Set up a complex spreadsheet to estimate water use per parcel in the region. Technical support including addressing concerns and complaints from the property owners.

Tracy Groundwater Sustainability Plan, County of San Joaquin, San Joaquin County, CA. Worked as an assistant to the lead modeler. Extracted and analyzed results from C2VSim model. Prepared various spatial maps and groundwater contour maps. Prepared water balance budgets in the Tracy Basin for current conditions and future climate change scenarios.

Kern Groundwater Basin Model, Semitropic Water Storage District, Kern County, CA. Lead Hydrologic modeler. Collected and processed extensive hydrologic, spatial and climatic data. Used CUP spreadsheet model and developed IDC model to analyze agricultural water demand. Estimated groundwater extraction and groundwater recharge for 1980 - 2020 period. Prepared spatial maps and water contour maps.

2019, 2020 and 2021 Agricultural Water Supply Requirements for Northern Cities Management Area, CA. Collected and updated hydrologic, spatial and climatic data. Used Consumptive Use Program (CUP) (DWR Spreadsheet Model) and IDC to simulate water use and irrigation requirement for various agricultural crops for three consecutive years.

Central Valley Flood Protection Plan (2022 Update), CA. Performed hydrologic simulations using the Variable Infiltration Capacity (VIC) model as a team. Simulated historic and several future climate change scenarios to evaluate potential flood risks over the central valley with a focus on key dams and locations.

State Maintained Area Report for California Department of Water Resources Flood Management Office, Sacramento, CA. Collected and analyzed extensive inspection and evaluation data on all State maintained structures including levees, flood control structures,



EDUCATION

Ph.D. Water Resources, Michigan Technological University

M.S. Civil Engineering, Michigan Technological University

M.S., Irrigation and Drainage Engineering, University of Tehran

EXPERIENCE IN THE INDUSTRY

8 years

EXPERIENCE WITH GEI

2 years

TRAINING AND CERTIFICATION

Graduate Certificate in Sustainable Water Resources Systems, Michigan Technological University

Intro to VIC Hydrologic Model with NASA Earth Observations Applied Remote Sensing Training Program

Advanced NASA Webinar: Techniques for Wildfire Detection & Monitoring (NASA, ARSET).

MATLAB Onramp and MATLAB Fundamentals (MathWorks).

PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers, (Student Member Since 2014)

American Geophysical Union, (Student Member Since 2017)

channels and bridges. Prepared detailed condition and maintenance need charts for every structure. Collected and analyzed financial datasets and prepared report on maintenance expenditures.

2019 Drought Contingency Plan, Inland Empire Utilities Agency, Inland Empire, CA. Conducted water demand analysis and demand projections support.

2020& 2021 Maintenance Area Resource Plan, California Department of Water Resources Flood Management Office, Sacramento, CA. Analyzed and summarized seasonal levee inspection reports. Provided insights on areas of concern and effort prioritization. Conducted detailed budget analysis on approved budgets and actual costs.

Various Research, Michigan Technological University, Houghton, MI. Acted as lead hydrologic modeler and analyst for multidisciplinary \$4.5 million project on impacts of biofuel feedstock development on the environment. Collected and processed extensive hydrologic, climatic spatial data sets to set up and calibrate complex hydrologic/watershed models using Soil Water Assessment Tool. Utilized hydrologic model output to assess hydrologic impacts of land cover/land use change at local and watershed scale and to recommend best practices for biofuel feedstock cultivation. Performed site suitability assessments in GIS to locate potential algae cultivation farms in Rio Grande Basin. Prepared various spatial products and maps including soil-based thematic maps (e.g., flooding frequency) and used them in resource assessment and management through GIS analysis. Collaborated with junior and senior scientists and engineers from broad disciplinary and cultural backgrounds.

PRESENTATIONS

Heidari, A., Watkins, D., & Mayer, A. Hydrologic impacts and trade-offs associated with developing Oil Palm for bioenergy in Tabasco, Mexico and Pará, Brazil. World Environmental & Water Resources Congress (EWRI 2019), May 2019.

Heidari, A., Watkins, D., & Mayer, A. Hydrologic impacts of developing Oil Palm for bioenergy in Tabasco, Mexico. (EWRI 2018), June 2018.

Heidari, A., Mayer, A., & Watkins, D. Hydrologic Impacts of Developing Forest-based Bioenergy Feedstock in Wisconsin, USA and Entre Rios, Argentina Watersheds. American Geophysical Union Fall Meeting, Dec 2017.

SELECTED PUBLICATIONS

Heidari, A., Mayer, A., & Watkins, D. (2019). Hydrological impacts and trade-offs associated with forest-based bioenergy development in Wisconsin, USA. *Journal of Hydrology* 574, 421-429.

Heidari, A., Mayer, A., Watkins Jr, D. and Castillo, M.M., 2020. Hydrologic impacts and trade-offs associated with developing oil palm for bioenergy in Tabasco, Mexico. *Journal of Hydrology: Regional Studies*, 31, p.100722.

Heidari, A., Watkins Jr, D., Mayer, A., Propato, T., Verón, S. and de Abelleira, D., 2021. Spatially variable hydrologic impact and biomass production tradeoffs associated with Eucalyptus (*E. grandis*) cultivation for biofuel production in Entre Rios, Argentina. *GCB Bioenergy*, 13(5), pp.823-837.

Mayer, A., Tavakoli, H., Fessel Doan, C., **Heidari, A.** and Handler, R., 2020. Modeling water-energy tradeoffs for cultivating algae for biofuels in a semi-arid region with fresh and brackish water supplies. *Biofuels, Bioproducts and Biorefining*, 14(6), pp.1254-1269.

Soltani, M., Liaghat, A. M., Sotoodehnia, A., **Heidari, A.**, & Kamali, B. (2015). Conjunctive effects of supplemental irrigation and planting date on rainfed lentil in Qazvin Plain, Iran. *Journal of Irrigation and Drainage Engineering*, 141(12), 05015005.

Javani, H., Hassanoghli, A., Liaghat, A., & **Heidari, A.** (2016). A study of columns to reduce mineral and biological pollutants during recharge operation by treated municipal wastewater. *Desalination and Water Treatment*, 57(32), 14919-14928.

Trevor Kent
Staff Geologist

Trevor Kent has six years of experience in the water resources industry both as a project manager and providing technical services. Technical projects include work on aquifer storage and recovery (ASR) systems, groundwater sustainability plan development and implementation under the Sustainable Groundwater Management Act (SGMA), production and monitoring well construction, geologic analysis, and water resource planning. Project management experience includes overseeing the construction of multi-level nested monitoring wells and providing ASR on-call support to expand recharge programs.

PROJECT EXPERIENCE

Monitoring Network Enhancement Program, Sonoma County Water Agency, Sonoma, CA. Project manager for the Monitoring Network Enhancement Program (MNEP) to expand groundwater monitoring networks for the three Sonoma Valley Groundwater Basin, Santa Rosa Plains Groundwater Subbasin, and the Petaluma Valley Groundwater Basin. Efforts including support in bidding for drilling services, oversight of the borehole drilling and well construction/development, water quality sampling, and preparation of a well completion report. Monitoring wells were designed and constructed to support groundwater monitoring under the SGMA and targeted areas and aquifers of domestic and agriculture pumping in the region along with shallow wells to monitor groundwater/surface water interaction. Managed and tracked level of effort and billing over the duration of the project and prepared invoices to assist Sonoma Water in meeting requirements of Department of Water Resources (DWR) grant funding.

Surface Water Gauging, West Placer County Groundwater Sustainability Authority, West Placer County, CA. Conducted both field investigations and desktop studies regarding surface water flow and the potential for surface water/groundwater interaction across the major surface water systems in Placer County. A desktop study was performed to identify key sites for surface water gauging based on geologic material, groundwater levels, and surface water characteristics. Stream gauging was performed using an acoustic doppler flow profiler with flow measurements taken across transects of the selected sites. Flow data was then used with pressure transducer data to assess changes in river stage and groundwater recharge along with relationships between flow, precipitation, and groundwater levels.

Exploratory Drilling and Monitoring Well Construction, City of Roseville, Roseville, CA. Managed field activities on an exploratory drilling program for the City of Roseville. The purpose of this program was to expand the City's groundwater monitoring network to address future expansion of their ASR program. Based on regional geology and hydrogeology (groundwater levels, etc.) exploratory boreholes were drilled at eight locations identified throughout the City of Roseville with monitoring wells constructed at six of these locations. Oversaw the drilling of the boreholes, construction and development of



EDUCATION

B.S., Earth Science, California
Polytechnic State University, San Luis
Obispo

EXPERIENCE IN THE INDUSTRY

6 years

EXPERIENCE WITH GEI

5 years

REGISTRATIONS/CERTIFICATIONS

OSHA 40 HAZWOPER

monitoring wells, water quality sampling, and managed field staff collecting data. Collected data was used to identify which locations were suitable for constructing monitoring wells, future ASR wells, and development of the final Well Completion Report. Data was also used to further define aquifer materials in the region.

SB88 Water Diversion Monitoring and Reporting, Multiple Clients, Northern California Assisted with surface water monitoring and flow measurements to comply with requirements under SB88 for multiple sites in the Butte Creek watershed. Includes installation, calibration, and maintenance of acoustic doppler flow monitoring devices, stream surveys, bathymetric surveys, and installation and calibration of staff gauges. Data from flow measurement devices is collected annually and processed for submittal the State Water Resources Control Board.

Ukiah Valley Groundwater Basin Groundwater Sustainability Plan Support, Larry Walker and Associates, Ukiah, CA Oversaw the development of a hydrogeologic conceptual model (HCM) and data management system (DMS) for the Ukiah Valley Groundwater Basin. Tasks were completed for the purpose of developing a groundwater sustainability plan (GSP) to meet requirements of the Sustainable Groundwater Management Act. Development of the HCM included textural and lithologic cross sections, textural analysis of the basin for hydrogeologic modeling, assessment of water supplies (surface and groundwater), and identification of data gaps in the region along with future studies to address these gaps. Textural and lithologic cross sections were used to further a groundwater model of the region and identify regions of potential connection to surface water systems along with characterization of surface water/groundwater interaction. Monitoring well transects were planned to further enhance the existing groundwater monitoring network and provide improved data on surface water/groundwater interaction.

Central Coast Co-operative Monitoring Program, Central Coast, CA. Conducted surface water sampling and monitoring of potentially impacted streams across the Central Coast of California to determine the effects of agricultural activities in storm water runoff. This included conducting monthly stream flow measurements, stream condition assessments, measuring stream cross-sections, and collecting surface water samples. Streams were monitored for a variety of constituents from neo-nicotinoids, toxicity sampling, and chlorophyll sampling. Flow data and bathymetry data collected during surveys were used to determine runoff impacts to surface and groundwater supplies.

City of Roseville Groundwater Strategic Plan, Roseville, CA Assisted the City of Roseville in the development of a Groundwater Strategic Plan to help guide the City's growing groundwater division. Components of the plan included an assessment of the City's surface and groundwater supply to meet projected demand out to 2040, emergency water demands in the event of a severe drought, recharge potential and groundwater storage within the City's main production aquifer, an assessment of current groundwater infrastructure, and recommendations on future groundwater infrastructure improvements to meet emergency water demands. Infrastructure evaluation included an assessment of existing groundwater supply and ASR wells to meet current and future demand in addition to their operational capacities. An initial siting study was performed to determine sites with favorable conditions for which future ASR wells could be constructed based on hydrogeologic conditions, such as groundwater storage, aquifer properties, and groundwater gradients were assessed.

David Miller, P.E., Ph.D.
Agricultural Engineer



David has applied his extensive water resource engineering experience throughout the United States and overseas. For the past twenty years he has focused on resource issues in the western United States working with agricultural and urban water districts on planning, design and construction management assignments. In addition to his engineering activities, he has prepared successful grant applications on behalf of GEI clients for funding from a range of state and federal sources. David has served on the Board of Directors of the California Irrigation Institute for the past nine years and has served two terms as president of that organization.

SELECTED PROJECT EXPERIENCE

Agricultural Water Management Plan, Buena Vista Water Storage District, Buttonwillow, CA. Project Manager for preparation of this plan which was developed to assist the district comply with the provisions of the Water Conservation Act of 2009. The plan provides detailed information on the district's conjunctive management of surface water from the Kern River and the California Aqueduct and groundwater pumped from aquifers underlying the district's service area. The plan also describes the history of the district and major operational changes now underway to enable the district to operate more effectively. David has led preparation of all subsequent updates to the district's original AWMP including the 2020 plan update.

Long-term Drainage Implementation Master Plan, San Luis Water District, Los Banos, CA. Project Manager for preparation of a long-term master plan that will serve as a road map for enabling the San Luis Water District to assume responsibility for drainage management within its service area. The proposed program centers on blending drain water with fresh water from the Delta-Mendota Canal and application of this blended supply to non-drainage impacted lands in the southern part of the district.

Regional Water Management Plan, Stevinson Water District, Newman, CA. Participated in development of an integrated program for managing water at the confluence of the Merced and San Joaquin Rivers. Elements of this plan included water recycling and conservation, salinity control, water table management, management of flood waters, creation of wetlands to control non-point source discharges and generation of water for transfers. Implementation of many plan elements has been funded through grant programs.

Regional Conveyance System Improvement Project, Sutter Extension Water District, Yuba City, CA. Managed a study of enhancements to improve operation of the Butte-Sutter Main Canal which delivers water to Butte Water District and Sutter Extension Water District. Possible improvements to the canal included expansion of culverts which now restrict flow, structural rehabilitation and automation of control structures and concrete lining of portions of the canal to reduce seepage. The study included modeling of portions of

EDUCATION

Ph.D., Biology/Agriculture Eng., North Carolina State University
M.S., Irrigation Engineering, Utah State University
B.A., English Literature, University of North Carolina

EXPERIENCE IN THE INDUSTRY

40 years

EXPERIENCE WITH GEI

18 years

REGISTRATIONS AND LICENSES

Professional Engineer, IL No. 00620-045998

the Main Canal and geotechnical and environmental assessments that supported development and evaluation of system improvement alternatives. The study serves as the foundation for an ongoing series of expansions and modernizations of control structures including the Thresher, Pennington and Looney weirs.

Thresher, Pennington and Looney Weir Replacements, Sutter Extension Water District and Butte Water Districts, Butte County, CA. David served as Project Manager for the replacement of the Thresher and Pennington weirs and rehabilitation of the Looney Weir on the Sutter-Butte Main Canal. The projects replaced old, manually operated control structures with automated weirs that both increased the conveyance capacity at each location and improved the district's ability to measure and control upstream water levels. Project activity included permitting, preliminary and final design, bidding and construction management. Because the projects are used to deliver both irrigation water and water for rice decomposition, all had to be completed within narrow construction windows to avoid disruption of district operations.

San Carlos Irrigation Rehabilitation, San Carlos Irrigation and Drainage District, Coolidge, AZ. As Project Manager for Phase 1 of this project, David led coordination with agencies including Reclamation and the U.S. Army Corps of Engineers necessary for completion of the Environmental Assessment and for issuance of federal and state permits required for construction. He was heavily engaged in preparation of designs for rehabilitation and modernization of the Ashurst-Hayden Diversion Dam and for construction of a new settling basin to retain sediment diverted from the Gila River and was later involved in construction management of these facilities. These projects are joint works facilities that serve both the San Carlos Irrigation and Drainage District (SCIDD) and the Pima-Maricopa Irrigation Project (P-MIP) of the Gila River Indian Community requiring close coordination between SCIDD and P-MIP management and technical staff to ensure that the project met the design standards and operational requirements of both entities as well as those of BIA and Reclamation.

Agricultural Drainage Control Project, Stevinson Water District, Newman, CA. David was Project Manager for a State of California-funded project to enhance a wetland system for storage, treatment and controlled release of agricultural drainage and storm water to the San Joaquin River. Activity performed included design, permitting, equipment procurement, construction management, and project monitoring. The primary purpose of the project is to retain agricultural drainage in a chain of managed wetlands to encourage uptake of nutrients and detention of drainage flows. This operation enables releases to the San Joaquin River during the winter when the assimilative capacity of the river is high. An ancillary feature of this project was design and construction of a broad-crested flume installed in the East Side Canal to measure canal flow.

Phase I and Phase II Lateral Pipelines, Stevinson Water District, Newman, CA. To support implementation of the district's Integrated Water Management Plan, David served as Project Manager for both phases of project implementation which included environmental studies, permitting, design, and construction management. Both phases of the work were successfully completed and are now fully operational.

Water Transfer to Wildlife Refuges, Stevinson Water District, Newman, CA. David prepared NEPA documents required to support the district's program of water transfers to wildlife refuges managed by Reclamation. In addition, he prepared NEPA documents and Storm Water Pollution Prevention Plans (SWPPPs) required for various construction projects carried out by the district.

Imperial Irrigation District/San Diego County Water Authority Water Transfer Project, Imperial Irrigation District, Imperial, CA. The EIS for this historic water transfer included extensive modeling of the IID irrigation and drainage system to anticipate the impacts that the transfer would have on the hydrology and water quality of the Salton Sea. David worked with staff of Keller-Bliesner Engineering to develop algorithms for modeling of on-farm processes and for simulating the fate and transport of sediment and agricultural chemicals on their paths to the Salton Sea. He was also among the experts who testified before the California State Water Resources Control Board at hearings where the Board approved the conditions of the transfer.

PROFESSIONAL ASSOCIATIONS

California Irrigation Institute, Board Member and Past President, American Society of Civil Engineers

Sydney Nye

Water Resource Engineer

Sydney Nye is a staff engineer specializing in water resources and treatment in GEI's Sacramento office and graduate of Stanford University with a strong science, mathematics, leadership, and communication background. She has been involved in numerous water quality, planning, data science, and communication-intensive projects and grant applications to meet a variety of water district needs.

PROJECT EXPERIENCE

Hydrogeologic Conceptual Model and Groundwater Conditions, Semitropic Water Storage District, Bakersfield, CA. Worked with a team of hydrogeologists and engineers to collect and analyze documents and data used in development of the Hydrogeologic Conceptual Model (HCM) section of Groundwater Sustainability Plans being developed by eight Groundwater Sustainability Agencies located in Kern County north of the Kern River.

Groundwater Quality Data Analysis, Kern County, CA. Extracted and analyzed water quality data for various public water systems in the Kern Sub-basin to obtain a historical dataset for groundwater contaminant levels in active wells.

Poso Creek Group Integrated Regional Water Management Plan Update, Northern Tulare Lake region, Kern County, CA. Co-wrote each section of the 2019 update, including Goals and Objectives, Impacts and Benefits, Project Review Process, Plan Performance Monitoring, Data Management, Technical Analysis, Land Use Planning, Stakeholder Involvement, and Climate Change Assessment.

Sustainable Groundwater Management Act Planning Document, Rosedale Ranch Improvement District, Kern County, CA. Drafted the SGMA Planning Document to summarize historical water demand and supplies, estimate future demands and supplies, and evaluate revenue needs. Created graphs, tables, and text to describe the past, present, and future status of finances, water exchanges, impacts of SGMA, legislative agreements with the State and other water districts, and details of operations and maintenance of key facilities.

Heat Vulnerability Assessment for San Mateo Climate Adaptation Plan, San Mateo County, CA. Examined relationships between pavement temperature, air temperature, shade factor, water proximity, and other factors by creating a mathematical model based on physical principles. Compared Superpave and LTPP Bind methods and tracked key assumptions.

Groundwater Sustainability Plan, Buena Vista Water Storage District, Kern County, CA. Collected, analyzed, visually represented, and confirmed accuracy of a decade's worth of groundwater quality data from multiple sources and for multiple constituents. Assisted in writing of narrative portions of GSP, created hydrographs for wells in the GSA, and performed extensive technical editing. Additionally, coordinated administrative elements of the final GSP submission



EDUCATION

B.S., Chemical Engineering, Stanford University

EXPERIENCE IN THE INDUSTRY

4 years

EXPERIENCE WITH GEI

4 years

process, including collecting and documenting all baseline information and references, migrating CASGEM data to SGMA, carefully correlating each SGMA article to the pertinent GSP section, and submitting every required element to the online portal.

Basin Setting and Monitoring Network Sections for Groundwater Sustainability Plan, Butte County, CA.

Assisted in composition of Monitoring Protocol and selection/creation of cross sections for the area, as early steps in the process of writing a Groundwater Sustainability Plan.

Poso Creek Group Drought Contingency Plan, Northern Tulare Lake region, Kern County, CA. Oversaw initial development of a Drought Contingency Plan as part of the USBR WaterSMART Drought Response Program, including developing a task force, detailed work plan, communications and outreach plan and draft.

Long-Term Drainage Master Plan, San Luis Water District, CA. Assisted in fine-tuning dynamic operations model for project to utilize historic trends, annual demand and drainage, and water quality thresholds to determine important drainage and blending information. This model was critical in making key project decisions to ascertain how various structural and blending decisions would impact the district's ability to utilize drainage in the most efficient way.

Assessment of Potential Groundwater Impacts for Corn Camp Groundwater Recharge Project and Daley Ranch Groundwater Recharge Project, Buena Vista Water Storage District, CA. Assisted in development of report, including groundwater analysis, Hantush modeling, and technical writing.

Variable Infiltration Capacity (VIC) Model and Documentation for 2022 Central Valley Flood Protection Plan (CVFPP), Department of Water Resources, CA. Used VIC versions 4.1 and 4.2 to model hydrologic conditions in the Central Valley for various climate change scenarios, with results to be incorporated into the 2022 update of the CVFPP. Analyzed results statistically and graphically using R, Python, and Microsoft Excel while also performing QA/QC on model results. Additionally, adapted and tailored an R package to accept input data files in their existing format and execute VIC version 5. Co-wrote the Technical Appendix documenting this modeling effort for the 2022 CVFPP.

Preparation of Storm Water Grant (Round 2) for Prop 1 Funding, Buena Vista Water Storage District, CA. Prepared and submitted grant funding application to the State Water Resources Control Board's Storm Water Grant Program for a vital BVWSD project. Grant materials included multiple technically written sections outlining details of benefits, funding, permitting and environmental work, construction, and operation of the project. Additionally, drafted visual process flow schematics to show engineered components of the project.

East San Joaquin County Integrated Regional Water Management Plan 2020 Update, San Joaquin County, CA. Led the writing effort for an addendum to the 2014 IRWMP to make compliant with 2016 standards and saw the document through the approval process with the Coordinating Committee and County staff. Provided a detailed response to every public comment on addendum draft. Assisted in evaluating projects proposed by multiple entities in the region (both with and without Disadvantaged Community benefits) and ranked them with multiple criteria to determine which should be at highest priority for funding.

Agricultural Water Management Plan 2020 Update, Buena Vista Water Storage District, CA. Updated AWMP to bring to compliance with 2020 standards, including new content demonstrating the District's reduced Delta reliance, more detailed water budget and analysis, and expanded Water Use Efficiency and Efficient Water Management Practices sections.

WaterSMART: Drought Contingency Plan Grant Application, Three Valleys Municipal Water District, Los Angeles County, CA. Co-wrote grant application to U.S. Bureau of Reclamation requesting funding for development and implementation of a Drought Contingency Plan to increase water supply reliability and proactively address the region's concern with drought.

CV-SALTS Prioritization and Optimization Study Baseline Characterization Report, Central Valley Salinity Coalition. Responsible for GIS map production of administrative entities in the Central Valley, researching historical water use and management in the Central Valley, and analyzing fate and transport of salt in the Central Valley.

Sean Michael Storey, G.I.T.

Geologist

Sean Storey is a Geologist-in-Training that has experience in water quality sampling, interpreting hydrogeologic data to aid in evaluations for groundwater management, well construction and development, managing groundwater for varying basins and hydrologic areas, and facilitation of groundwater transfers through SGMA regulations.

PROJECT EXPERIENCE

North American Subbasin Prop 1 GSP Grant Preparation Sacramento, Sutter, Yuba, Placer Counties, CA. Mapping Water Quality Network wells for future sampling. Groundwater elevation and depth-to-water contouring to determine locations of new nested monitoring wells using multiple databases.

Tracy Subbasin GSP Development, City of Tracy, Eastern San Joaquin County, CA. Developed Groundwater Monitoring Networks, assessed local geology for cross section analysis, Groundwater contouring for the major aquifers in the subbasin, assisted with permitting and applications for new monitoring well installation, coordination with neighboring subbasins to agree on shared groundwater data.

Paso Robles Subbasin GSP Development, Paso Robles, CA. Hydrogeologic conceptual modelling for the subbasin. Developed Groundwater Monitoring Networks, assessed local geology for cross section analysis, Groundwater contouring for the major aquifers in the subbasin.

San Joaquin Annual Groundwater Reporting, San Joaquin County, CA. Redevelopment of the groundwater monitoring network while maintaining historic reporting requirements. Creation of new comprehensive monitoring network shared across multiple counties and Groundwater Sustainability Agencies, approximate base of groundwater cross sections, and representative hydrographs of wells throughout the East San Joaquin Subbasins.

Butte Water District Groundwater Annual Groundwater Transfers, Butte County, CA. Assisted water rights holders in facilitation of proper groundwater transfer procedures under SGMA regulations. Worked with Department of Water Resources in developing pre-transfer, during transfer, and post transfer, monitoring requirements including groundwater elevation contouring, water quality sampling, comparison of minimum thresholds and pumping rates, and investigation of potential new monitoring network wells in the area.

Sutter Extension Water District Groundwater Transfers, Sutter County, CA. Assisted water rights holders in facilitation of proper groundwater transfer procedures under SGMA regulations. Worked with Department of Water Resources in developing pre-transfer, during transfer, and post transfer, monitoring requirements including groundwater elevation contouring, water quality sampling, comparison



EDUCATION

B.S., Geology, California State University Sonoma

A.S., Natural Sciences, Sierra Community College

EXPERIENCE IN THE INDUSTRY

6 years

EXPERIENCE WITH GEI

6 years

REGISTRATIONS AND LICENSES

Geologist-in-Training, CA No. 812

CERTIFICATIONS

AED/First Aid Certified

of minimum thresholds and pumping rates, and investigation of potential new monitoring network wells in the area.

Sutter Subbasin Alternative Submittal to a Groundwater Sustainability Plan, Sutter County, CA. Created more than a dozen maps highlighting multiple aspects of the Sutter Subbasin as well as creation of appendices of hydrographs for approximately 200 CASGEM wells included in the submittal that was submitted to the California Department of Water Resources on behalf of Sutter County and Stakeholders to show that the Sutter Subbasin is operating within its sustainable yield and should not be required to produce a Groundwater Sustainability Plan as part of the Sustainable Groundwater Management Act.

Dos Palmas Oasis, Coachella Valley Water District, Kern County, CA. Assisting with Watermaster duties and recommendations for maintaining surface water flow while balancing groundwater extraction in a delicate ecosystem. Monitoring and maintaining monthly groundwater monitoring plan of water supply activities as well as figure creation using ArcGIS software for new wells, site descriptions and well designs.

Exploratory Drilling and Monitoring Well Construction, City of Roseville, Roseville, CA. Assist with oversight of an exploratory drilling program for the City of Roseville with the purpose of identifying optimal locations for future ASR wells. Exploratory boreholes were drilled at eight locations identified throughout the City of Roseville with monitoring wells constructed at six of these locations. Characterized encountered lithologic material to identify the extent and location of local aquifers and site suitability for monitoring well construction. Assisted with monitoring well design and oversaw well construction.

East Porterville Municipal Supply Well Construction, California Department of Water Resources, Porterville, CA Preliminary site assessment and construction oversight of a municipal supply well for the City of Porterville as part of the Department of Water Resources drought response. Served as the on-site geologist during drilling and construction of the well to ensure the completion was to specifications. Assessed well construction materials in relation to well design, installation of filter pack, bentonite seals, and sanitary seals, and final development of the well.

Dunnigan Wastewater Treatment Facility – Water Quality Sampling, Dunnigan, CA. Assessed the multiple onsite monitoring wells for Total Dissolved Solids, Nitrate, Chloride, Bromide, pH, and Sodium levels and delivered samples within time frame for optimum lab results. As well as created contour maps of groundwater flow and levels of constituents in ArcGIS software for quarterly reporting.

Martis Valley Groundwater Management Plan and Modeling Study and Annual Reports, Truckee, CA. Modeling Technician. Analyzed groundwater measurements throughout the valley and created hydrographs highlighting areas of sustainability and areas in need of improvement, as well as GIS mapping of Groundwater wells and groundwater contours for analysis of groundwater pumping and recharge.

Dam and Spillway Assessments, Confidential Client, Sierra Nevadas, CA. Assisted multiple PMs across GEI's west coast branches to assess damages and sites of future repairs along spillways and dams by digitally annotating inspection field notes onto maps in a consistent format for final reports.

Well Destructions, City of Roseville, CA: On-site geologist for destruction of Wells 1, 2, and 3 and facilities. Carried out the work plan and oversaw the destruction approach from Regional Water Quality Control Board for Wells 2 and 3 that had previous tetrachloroethylene contamination. Oversight of the contractor was performed by both City of Roseville staff (facilities) and GEI (well destructions). Well destructions methods varied from using mechanical ripping to explosives.

Well Destructions (2018 to 2019), Sacramento Suburban Water District, CA: On-site geologist for destruction of Wells N-11, N-15, and N-19 with the contractor contracted directly to GEI. Carried out plans and specifications as work progressed. Work included a ground vibration survey to assess the shaking potential of using explosives to destroy the wells on nearby residential buildings and swimming pools. Oversaw the use of a combination of explosives and mechanical ripping of the well without exceeding seismic parameters.

Cody Trueblood, P.E.

Water Resources Engineer

Cody Trueblood is an agricultural and water resources engineer in GEI's Sacramento office and a graduate from California Polytechnic State University (Cal Poly). Mr. Trueblood has experience in and knowledge of California Central Valley irrigation methods, management, groundwater recharge, and system efficiency improvements, and alternative methods of irrigations for drought periods including deficit irrigation. Mr. Trueblood has used his knowledge in development of evapotranspiration mapping for various locations in the Central Valley based on METRIC process. This mapping included performing quality control water balances to verify evapotranspiration data. Mr. Trueblood has conducted water balance for the Kern and Tulare subbasins which were used to identify minimum thresholds and measurable objectives for SGMA. Mr. Trueblood performed complete irrigation system improvement design and scheduling working with a grower in San Luis Obispo County for a lemon orchard. He has reviewed and provided recommended irrigation system improvements on farm level and at district level. He has exemplary technical and analytical skills used to process complex problems and synthesize information and is comfortable assuming a variety of roles to ensure project success.

PROJECT EXPERIENCE

Rosedale Ranch Recharge Basins, North Kern Water Storage District, Kern County, CA. Served as Engineer identifying and ranking potential recharge sites based on recharge capabilities and capital costs. Determined the recharge capabilities of each site and capital costs. Provided recommended ranking of recharge sites based on cost per acre of recharge.

Recharge Basins, Southern San Joaquin Municipal District, Kern County, CA. Served as Engineer evaluating potential recharge sites based on recharge capabilities. Identified capital improvements required for each site and provided cost estimates for each potential recharge site in terms of cost per acre of recharge.

Kimberlina Spreading Grounds, Shafter-Wasco Irrigation District, Wasco, CA. Created budget and provided grant report writing support for the project and communication with the United States Bureau of Reclamation on behalf of the District. Prepared GIS mapping for project site and calculations for budget.

Borehole Testing for Recharge Site Feasibility, Maricopa Orchards, Kern County, CA. Served as Field Engineer collected soil samples of borehole at various depths. Collected and analyzed data for determination of recharge site feasibility.

METRIC, Irrigation Internship, Irrigation Training and Research Center, San Luis Obispo, CA. Served as a data analyst. Responsible for mapping Evapotranspiration in California using LandSat images with ArcGIS and ERDAS using METRIC. Tasks



EDUCATION

M.S. Water Engineering, California Polytechnic State University
B.S., BioResource Agricultural Engineering, California Polytechnic State University

EXPERIENCE IN THE INDUSTRY
6 years

EXPERIENCE WITH GEI
5 years

REGISTRATIONS/CERTIFICATIONS
Professional Engineer, CA No. 90942
HAZWOPPER 40 Hour

SOFTWARE EXPERIENCE
AutoCAD, WaterCAD, StormCAD, IRRICAD, Groundwater Vista, Hec-RAS/HMS, EPANET, and ArcMap

included developing, updating, and troubleshooting models for data analysis of evapotranspiration data for the central valley. Created procedures and writing technical reports.

Plant Health and Irrigation Scheduling, California Polytechnic State University, San Luis Obispo, CA.

Served as Irrigation Technician. Worked with growers to monitor plant health and provide recommended irrigation scheduling. Methods of irrigation for either permanent, or row crops included drip (subsurface and above surface), furrow, and alternative set sprinkler pipe.

Equipment Testing, Irrigation Internship, Irrigation Training and Research Center, San Luis Obispo, CA.

Responsible for flow measurement testing using various equipment to be calibrated in alternative use, including testing and calibration of ultrasonic velocity meter to be used to measure flow rates on partially filled culvert pipes to be used as a quick in field measurement tool.

Sustainable Groundwater Management Planning, Kern County, CA. Serving as a Technical Team Member for development of a Groundwater Sustainability Plan for various local clients, including Semitropic Water Storage District, Southern San Joaquin Municipal District, Shafter-Wasco Irrigation District, and North Kern Water Storage District. Wrote technical components of GSP. Evaluated methods, and performed calculations for setting measurable objective, minimum thresholds, water budget, and provided expertise in choosing site locations for future monitoring network.

Canal and Meter gate Evaluations in Wapato, WA, Irrigation Internship, Irrigation Training and Research Center, San Luis Obispo, CA. Served as a field technician evaluating canal efficiency and recommended improvements. Identified problem areas in the canal for further investigation. Measured meter gates in project areas and developed rating table for meter gates on canal system in Wapato, WA to be used to better measure deliveries to growers.

Canal and Irrigation Investigations in Montrose, CO, Irrigation Internship, Irrigation Training and Research Center, San Luis Obispo, CA. Served as a field technician identifying crop, irrigation method, and potential inefficiencies in systems and recommended improvements. Identified problem areas along canal for further investigation.

Emergency Water Supply System, Department of Water Resources (DWR), East Porterville, CA. Project consist of connecting to existing city waterlines a 1,670 GPM outdoor booster pump station and a 1.2 MG water storage tank. Served as Field Engineer providing construction support consisting of pipeline, pumps, valves, appurtenances, water tank, irrigation, variable frequency drive, coating, cathodic protection, and associated testing. Reviewed and responded to all submittals and request for information to the Contractor. Solved and foresaw construction issues and provided in field recommendations to appropriate design engineer and provided design recommendation. Provided cost estimates of design change. Coordinated project with internal engineering staff, DWR, the contractor, and The City of Porterville.

DWR Stream Modeling, CA. Served as Hydraulic Modeler for 1D/2D HEC-RAS modeling on various streams in California in determination of inundation mapping.

Friant-Kern Pump Back Water Quality modeling, North Kern Water Storage District, Kern County, CA.

Served as Technical Member creating model to use historical water quality and flows to analyze the effect of implementation of proposed new pump back wells and predicted water quality.

Kern Groundwater Authority Development, KGA Umbrella, Kern County, CA. Provided support for GSP on Sub-Basin setting including obtaining information on water quality and well information from Envirostor, GeoTracker, CASGEM, and District wells. Analyzing and manipulating data to plot contaminants and well information using ArcMap.

Groundwater Modeling, North Kern Water Storage District, Kern County, CA. Served as a data analyst and modeler. Responsible for collecting required data for modeling groundwater in Kern County. Editing and creating files in ArcMap. Creating model in Groundwater Vista to simulate groundwater flow. Calibration of model to past water level.

Valerie Febre Yap

Graphic Designer

Valerie Febre Yap is a graphic designer in GEI's Sacramento office. She has 30 years of graphic design and marketing experience. Ms. Yap applies her design skills to multi-page layouts, components for web-based applications, and client deliverables, and various types of infographics. She has several years of experience working with engineers to design marketing material such as proposals, brochures, and advertisements. Ms. Yap is proficient in Microsoft Office, Adobe InDesign, Illustrator, Acrobat, and Lightroom as well as Wordpress.

PROJECT EXPERIENCE

Sustainable Groundwater Management Program, California Department of Water Resources, Statewide, CA. Provided design and layout of the SGMA Portal Users Manual and brochure in compliance with Federal and State accessibility laws.

Tracy Subbasin Wordpress Website Development. Tracy Subbasin GSAs, Tracy, CA. Developed organization and layout of Wordpress website integrating use with that of the Tracy Subbasin Groundwater Communications Portal.

Flood Maintenance Office Environmental Support Branch Presentation, California Department of Water Resources, Statewide, CA. Provided design, layout and illustration services for the overview presentation of the Environmental Support Branch.

Flood Emergency Operations Manual, California Department of Water Resources, Statewide, CA. Provided layout and editing of the manual in compliance with Federal and State accessibility laws.

Flood Maintenance Office Fact Sheets, California Department of Water Resources, Statewide, CA. Provided design and layout of fact sheets describing the various branches and services of the Flood Maintenance Office.

Headlands 2 Floodplains Program, California Department of Water Resources, Statewide, CA. Updated the illustration for the H2F poster to better represent the geography of California. Provided design and layout a variety of brochures and flyers.

Septic Brochure, Orange County Public Works, Orange County, CA. Provided design and layout services for the publicly distributed Septic Brochure.

Department of Safety of Dams Factsheet, California Department of Water Resources, Statewide, CA. Provided design and layout services for the 2-page fact sheet as well as the illustration of the corresponding graphic.

Cor-on-call Hydrologic Services, City of Roseville, Roseville, CA
Created three-dimensional illustration of project area aquifer conditions.



EDUCATION

B.A., Art History, University of California, Berkeley

EXPERIENCE IN THE INDUSTRY

30 years

EXPERIENCE WITH GEI

4 years

Delta Concept Plans, Metropolitan Water District, Los Angeles, CA. Provided design, layout and illustration services to create a set of leave-behind informational documents.

PREVIOUS PROJECT EXPERIENCE

Valerie Febre Yap Studios, Rocklin, CA. Created and maintained business website using Wordpress. The project required researching Wordpress themes which accommodate a multi-category portfolio, an About Us, Contact, and Blog pages. Additionally, photos and graphics had to be optimized for use on the website. Created websites for clients including a local dance studio and Bed and Breakfast. Used Photoshop to design the concept and layout. Used Dreamweaver to create and edit the HTML code.

Business Operations, VIERCO Consulting Engineers Inc., Roseville, CA. Responsible for administrative and operational details, including creating company identity, designing and organizing company website, designing and coordinating production for company brochures, designing resumes and project descriptions, and managing bookkeeping system.

Graphic Design and Marketing Material Coordination, HydroScience Engineers, Sacramento, CA. Designed marketing materials such as proposals, brochures and advertisements. Designed and maintained company website, coordinated proposal efforts. Responsible for writing, editing and proofreading marketing material, laying out proposals, and marketing material.

Graphic Design Specialist, California State University, Sacramento, CA. Produced marketing material such as catalogs, brochures, direct-mail pieces, web and online presentations.

Graphic Artist, Montgomery Watson Americas, Walnut Creek, CA. Produced marketing materials such as proposals, brochures, stationary, and direct-mail pieces.

Graphic Designer, Compass Maps Inc., Modesto, CA. Designed and produced advertisements for specialty maps, typically for city Chambers of Commerce, shooting photomechanical transfers from both positive and negative media, performing manual type specs, paste-up, layout, color separations and blueline checks, and managing client projects according to a specific 14-week production schedule.

Environmental Project Leader/Coordinator, URS Consultants, Inc., San Francisco, CA. Assisted in marketing efforts for the Environmental Division. Collected environmental statistics and site information from federal, state, and local regulatory agencies. Compiled information into reports to be submitted to the U.S. Environmental Protection Agency (USEPA) as part of their Superfund Site Assessment program. Authored sections of a Community Relations Plan for a USEPA Superfund site as well as various other technical reports. Proofread, edited, revised, formatted, assembled, and distributed technical and business development documents. Developed, implemented, and maintained administrative standard operating procedures.

APPENDIX B – PROJECT DESCRIPTIONS



PROJECT

SGMA On-Call Compliance & Support Services

Location: Sacramento County, CA

Client: Sacramento County Water Agency

Sacramento County Water Agency became the Groundwater Sustainability Agency (GSA) for unmanaged areas within the County in the Cosumnes, Solano, and South American Subbasins.

GEI assisted Sacramento County in various ways of SGMA compliance, including the upload of documents to the DWR website to establish a GSA in each of the three subbasin, successful modification of a basin boundary to incorporate a small portion of the Tracy Subbasin into the Solano Subbasin, technical review of various documents, including the draft and final Groundwater Sustainability Plans (GSPs), and the upload of the Cosumnes GSP into the DWR SGMA Portal. GIS mapping was an important component in the early stages of SGMA compliance.

The Cosumnes Subbasin includes seven GSAs in a mostly rural, agricultural environment in Sacramento and Amador counties. The Sacramento County GSA is located on the western side of the subbasin and includes agricultural and riparian land uses. The Cosumnes Subbasin is challenged by a persistent cone of depression to the northeast of Galt, near Herald. Groundwater flows from the perimeter of the subbasin toward the center of this cone. Increased recharge is recognized by the GSP as a means to achieve sustainability rather than reducing the agricultural potential of the land. The Folsom South Canal is a potential conveyance that could provide recharge water during periods of high flow in the late fall, winter, and early spring. Similarly, high flows in the Cosumnes River, and Dry Creek to some extent, could be a source of recharge water with appropriate diversion and conveyance structures and monitoring networks of nested wells and stream flow gauges.

Service Dates

2017 to present

Project Fee

\$480,700

Client Reference

Linda Dorn
Groundwater Sustainability Manager,
retired

Phone 916.479.4701
Lbabiak62@gmail.com

Key Elements

Surface water / groundwater
connection Monitoring network
Multi-depth wells

Key Staff

Rodney Fricke



Madera County GSA Land Repurposing Program Development: Madera, Chowchilla, and Delta Mendota Subbasins

In 2018, the Groundwater Sustainability Agencies (GSAs) comprising Chowchilla and Madera Subbasins, and a small portion of the Delta Mendota Subbasin, began developing comprehensive, coordinated Groundwater Sustainability Plans (GSPs) to comply with requirements of SGMA. The Madera County GSA is responsible for county lands in Chowchilla, Madera, and Delta Mendota areas. These lands are fully groundwater dependent, without access to district surface water supplies. The Madera County GSA developed a combination of water supply and groundwater recharge projects to bring its groundwater use into balance and avoid large reductions in agricultural demand. Projects include facilities and investments to bring new water supplies into the region and to manage and recharge flood flows available to the region. Recharge strategies include delivering and spreading excess flow onto agricultural fields, in-lieu recharge, and dedicated recharge basins.

A land repurposing program was concurrently developed to shift currently irrigated lands into other, non-irrigated uses. The program was developed with extensive stakeholder input over an 18-month period between 2020 and 2022. The study inventoried current irrigated lands in the Madera County GSA and identified options for multi-benefit land repurposing opportunities. An incentive structure with a range of financial payments for voluntary agricultural land conversion or preservation in specific areas based on the land categories identified by the analysis was developed. The incentives were linked to water use by parcel and developed consistent with other projects and management actions (e.g., the Madera County GSA recharge program).

The program is currently moving into the implementation phase. This includes refining agricultural land incentive payments, multi-benefit land repurposing options, and setting rules for program participation. The Madera County GSA recently received a \$10 million grant from the Department of Conservation to support multi-benefit land repurposing. This additional funding would be used to support program development and implementation.



California Department of Water Resources

DWR AEM Project

Date June 13, 2022

The Department of Water Resources (DWR) has launched state-wide Airborne Electromagnetic (AEM) surveys across all the medium- and high priority groundwater basins in California. The Ramboll and GEI Team was chosen by DWR to lead this very large and prestigious project due to our world-class experienced team of AEM geophysicists and GEI having in-depth knowledge of California Geology.

Ramboll
Olof Palmes Allé 22
DK-8200 Aarhus N
Denmark

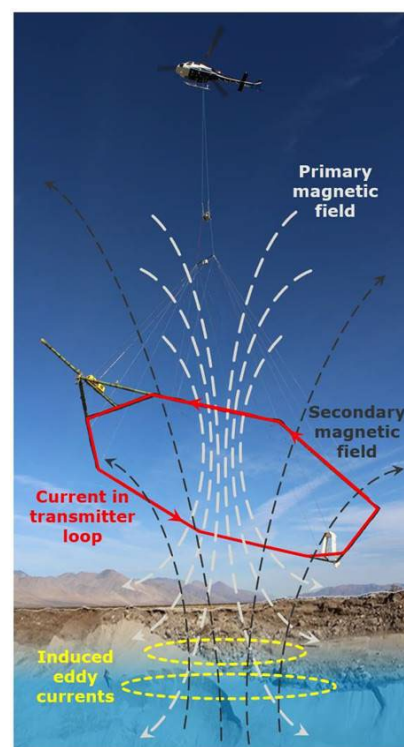
T +45 5161 1000
<https://ramboll.com>

The goal of AEM data collection (Figures 1 and 3) is to provide a 3D grid-image of the groundwater basins, thereby supporting the Sustainable Groundwater Management Act (SGMA) with foundational information on subsurface hydrogeologic characteristics of aquifer systems in groundwater basins in California.

In addition, information from a large number of boreholes has been digitized based on scanned Well Completion Reports and geophysical e-logs (figure 2). The location of the boreholes is a significant challenge, but when the data are made available as tabular data this very valuable resource of data about the aquifer systems plays a significant role in the interpretation of the AEM data.

The 3D grid of AEM data will be used to reduce uncertainty in hydrogeologic conceptual models, provide supporting information for groundwater models, and improve the potential for successful development and implementation of projects, such as groundwater recharge projects (figure 4), and management actions proposed in Groundwater Sustainability Plans (GSPs).

Figure 1 The helicopter flying the AEM system while taking off in the Indian Wells Valley, California, Autumn 2017. The dashed lines illustrate the transmitted and received electromagnetic signals.



Page 176 of 327

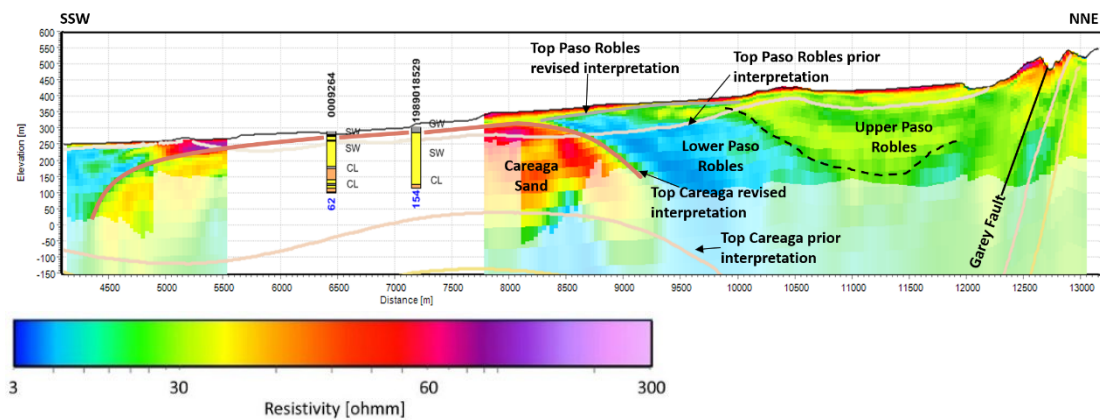


Figure 4 A very large anticline delineated by the results of the AEM survey in Santa Ynez. The anticline was prior to the AEM survey interpreted to be 200-300 meter below the surface. Based on the AEM data the anticline is interpreted to be found just beneath the terrain surface and as a structure that will create a significant hydraulic barrier within the basin.

Geophysics for Assessment of Managed Aquifer Recharge

Cosumnes River, California



Ramboll surveyed seven locations on open fields in the Cosumnes Subbasin. Towed and stationary TEM were utilized to rapidly and cost-effectively measure the subsurface lithology and screen areas for potential managed aquifer recharge sites. Recommendations were provided based on geophysical interpretation for focused intrusive field investigations to further characterize and prioritize MAR sites.

Ramboll conducted a Towed-Transient Electro Magnetics (tTEM) survey at a location adjacent to the Folsom South Canal and conducted six (stationary) WalkTEM measurements adjacent to the Cosumnes River in the Cosumnes Subbasin, California. The objective of the geophysical investigations was to improve the understanding of the variations in geologic sediments to assess the suitability of the sites for managed aquifer recharge (MAR). The results of the data collected were presented as a geophysical inversion, the tTEM data were interpreted as smooth (multi-layer) electrical resistivity models. The tTEM method provided a high-resolution representation of the variations in electrical resistivity along the paths where an all-terrain vehicle (ATV) pulled the sensor. Prior to data acquisition, GIS layers containing geographic locations of the study area and tTEM lines were loaded into the tTEM navigation software, which enabled real-time tracking of the paths. This setup also allowed the operator to view the density of the data being collected and facilitate proper coverage of the site with the tTEM. During the tTEM survey, data quality and the entire system functionality were checked by the operator. A survey line spacing was approximately 30 m (100 ft). The measured data were modelled to represent the electrical resistivities at different depths, which was then interpreted as lithology to understand the geology of the site. Depth of investigation of the tTEM was approximately 90 m and for the WalkTEM was +200 m. The results were presented as plan-view maps, cross sections, and 3D fence diagrams. Recommendations from the surveys included additional WalkTEM survey points in the area to extend the depth of understanding to +200 m. The results of the tTEM and WalkTEM surveys helped EKI prioritize the sites for MAR and identified areas for future focused intrusive field investigations.

CLIENT

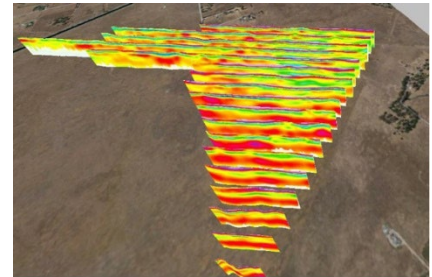
EKI Environment & Water, Inc.

PERIOD

2020

EXPERIENCE

- ☒ HCMs for storage or conjunctive use
- ☒ Surface and Subsurface Storage





PROJECT

Agricultural Water Management Plan

Location: Buttonwillow, California

Client: Buena Vista Water Storage District

Service Dates

Start: April 2020

Completion: March 2021

Client Reference

TIM ASHLOCK

Engineer Manager

661.324.1101

tim@bvhd2o.com

525 North Main Street,
Buttonwillow, CA 93206

Key Elements

- Agricultural Water Management
- Water Budgets
- Agricultural Water Use
- Agricultural Water Use Efficiency
- Water Conservation
- Conjunctive Management

Key Team Members

- David Miller, Project Manager/
Agricultural Engineer
- Sydney Nye, Engineer

The Water Conservation Act of 2009 (SB X7-7) requires agricultural water suppliers serving more than 25,000 irrigated acres (excluding recycled water deliveries) to adopt and submit to the Department of Water Resources (DWR) an Agricultural Water Management Plan (AWMP). These plans must include water budgets describing surface and groundwater use and water use efficiency practices including reports on the implementation status of specific Efficient Water Management Practices (EWMPs) that were required under SB X7-7.

GEI prepared an AWMP for the Buena Vista Water Storage District (BVWSD, or District) in 2012, 2015 and 2020. The GEI team described the District's agricultural water management practices, developed a water budget including an assessment of uncertainty and evaluated EWMPs including both cost and water conservation potential. The GEI team also supported the public involvement and responded to comments. GEI prepared the public notices and filings DWR. We worked closely with staff to develop the water budget and estimate uncertainty and evaluate EWMPs. GEI drafted the plan, prepared responses to comments and stakeholder consultation. The BVWSD Board of Directors approved the AWMP in 2021. DWR accepted the AWMP in 2021.

GEI has prepared similar plans for six other water districts.



Aerial view of the Palms Recharge Pond



APPENDIX C – MANAGED AQUIFER RECHARGE BROCHURE

GEI'S CAPABILITIES

Managed Aquifer Recharge



What is Managed Aquifer Recharge?

Integrated Surface Water and Groundwater Management Solution

Managed Aquifer Recharge (MAR) is a water resource management tool available to agencies looking to augment and stabilize groundwater supplies in their basins. MAR is a voluntary resource management strategy of intentionally infiltrating water into an aquifer and storing it for subsequent recovery and achieving the other benefits while the water is in storage. Most recently driven by the 2014 Sustainable Groundwater Management Act's comprehensive groundwater management requirements, MAR fits into multiple planning processes that already exist for agencies to achieve groundwater sustainability.

Variations on MAR include Flood-MAR which involves using flood waters for recharge, and Aquifer Storage and Recovery which involves injecting drinking water into aquifers primarily for domestic and municipal uses. MAR has increasingly become a recognized element of an integrated surface water and groundwater management solution due to the multitude of benefits it provides. In addition to water supply reliability and aquifer replenishment, MAR projects have the potential to provide flood risk reduction, drought preparedness, ecosystem enhancement, subsidence mitigation, water quality improvement, climate change adaptation, and recreation. Additional benefits to the agencies that implement these types of projects include effectively managing excess flows, wastewater, and stormwater.



MAR helps to fulfill management objectives identified through multiple planning processes.

Developing sustainable MAR programs or projects requires a phased approach that links and integrates surface water and groundwater management and planning, technical studies and modeling, information management, and permitting and project implementation. GEI Consultants, Inc. (GEI) provides services for every phase of MAR implementation. Our team, led by seasoned senior professionals with specialized strategic planning experience, is able to assist agencies with their programs and projects using their extensive groundwater management, planning and engineering, and project implementation experience and expertise.

GEI's services cover all phases of MAR implementation



The GEI Approach to MAR

Interdisciplinary Implementation

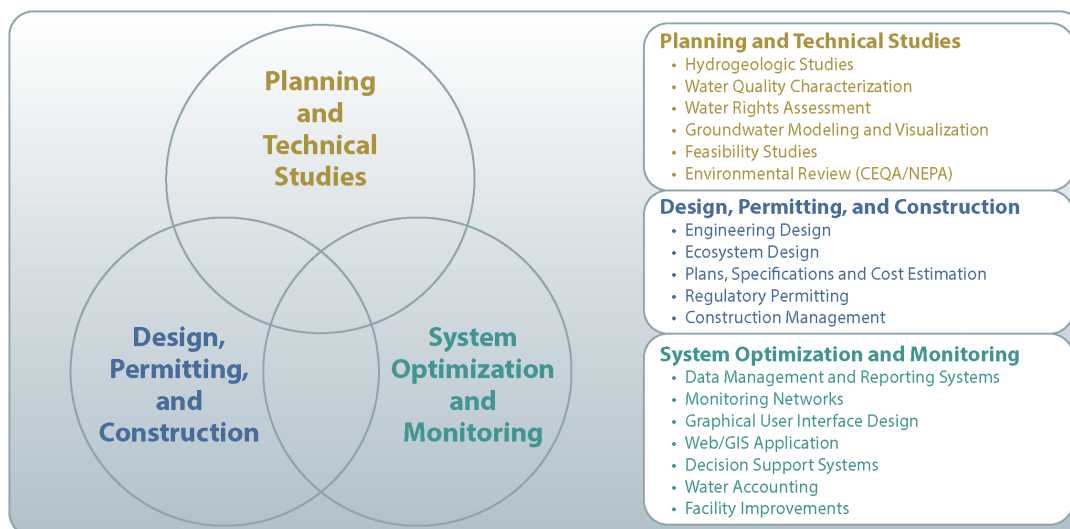
The planning and implementation of MAR projects presents complex technical, legal, and institutional barriers and challenges that require an integrated approach. GEI is a multi-disciplinary firm of engineers and scientists that delivers cohesive groundwater, water resources, environmental, flood management and geotechnical solutions for a diverse water resource clientele. Over the last 50 years, GEI has established itself as the go-to groundwater firm with many years of experience in groundwater management planning, hydrogeology and aquifer characterization, groundwater modeling, groundwater science, technology, and policy. GEI pioneered groundwater recharge, conjunctive use, and water banking in California.

GEI staff has unique expertise in MAR related project development and implementation. We have unparalleled experience in designing and implementing groundwater management and recharge projects in California. GEI combines this experience with our understanding of water policy and funding to help our clients successfully implement MAR programs and projects.

The GEI Team believes that the success of MAR projects depends on a holistic approach to planning and implementation. Because of our extensive experience, our team understands and is prepared to assist agencies with the range of integrated services necessary for success.

GEI'S GRANT FUNDING SUCCESS FOR CLIENT PROJECT IMPLEMENTATION

TYPE OF PROGRAM	GRANTS AWARDED	GRANT FUNDS AWARDED (USD)
Integrated Regional Water Management	25	\$130,631,653
Conjunctive Use	13	\$332,838,676
Water Use Efficiency	62	\$46,855,433
Groundwater Management	27	\$30,588,229
Flood Control	24	\$150,927,144
Water Storage Investment Program	2	\$302,306,000
Other	11	\$19,073,000
Total	164	\$1,013,220,136

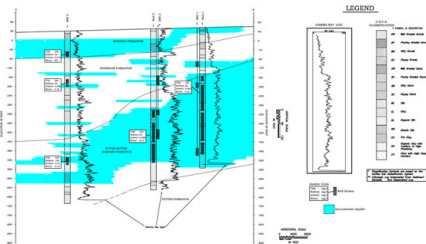


GEI's services cover all phases of MAR implementation

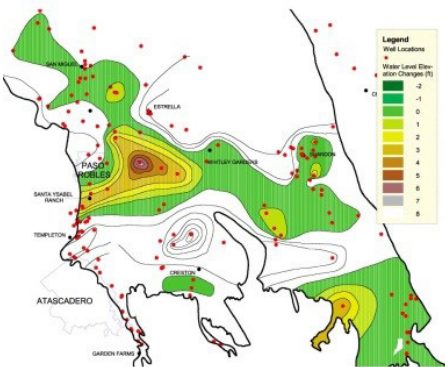
A History of Integrated Surface Water and



1. 50 Years of Water Resources Planning and Management, *Semitropic Water Storage District*.



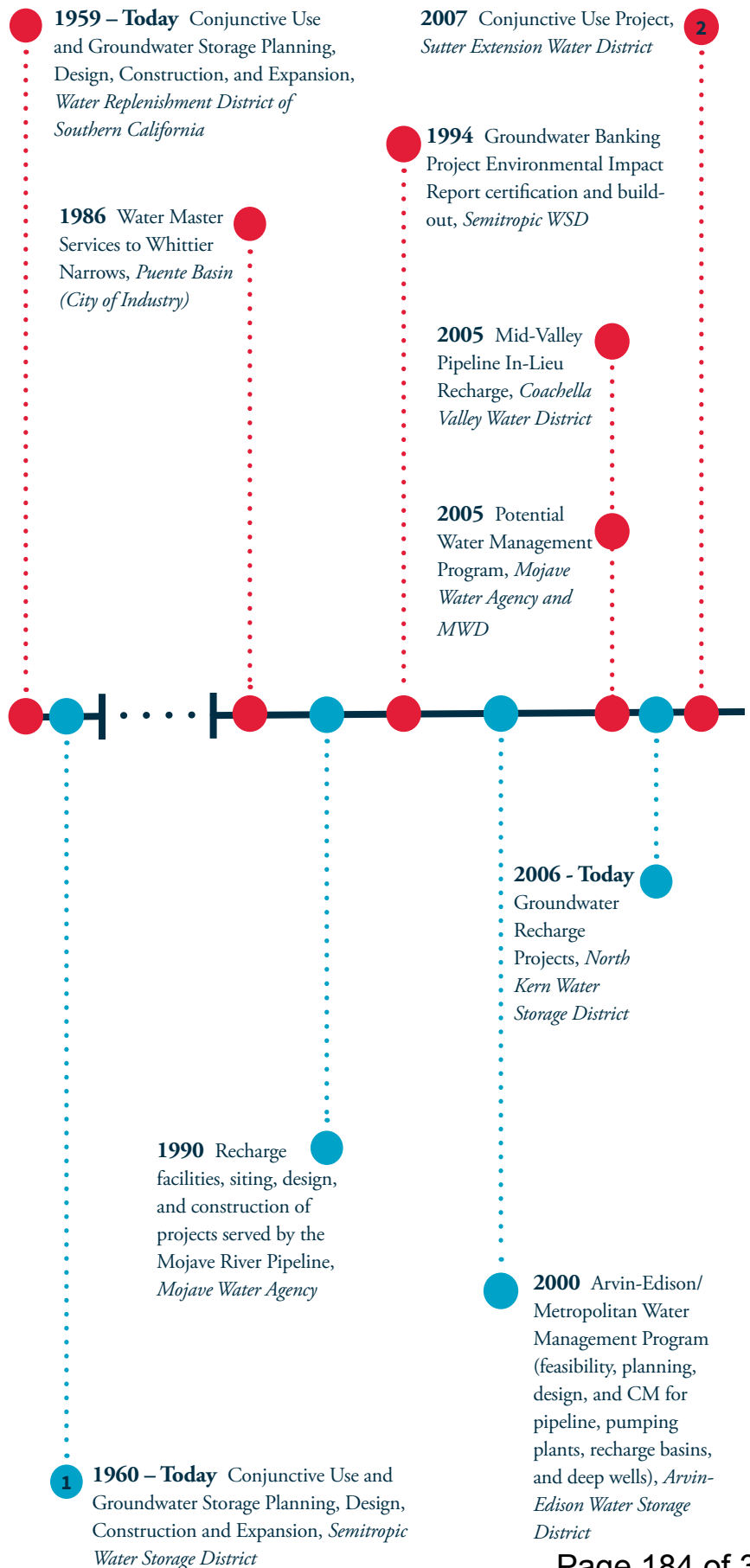
2. Conjunctive Use Program, *Sutter Extension Water District*.



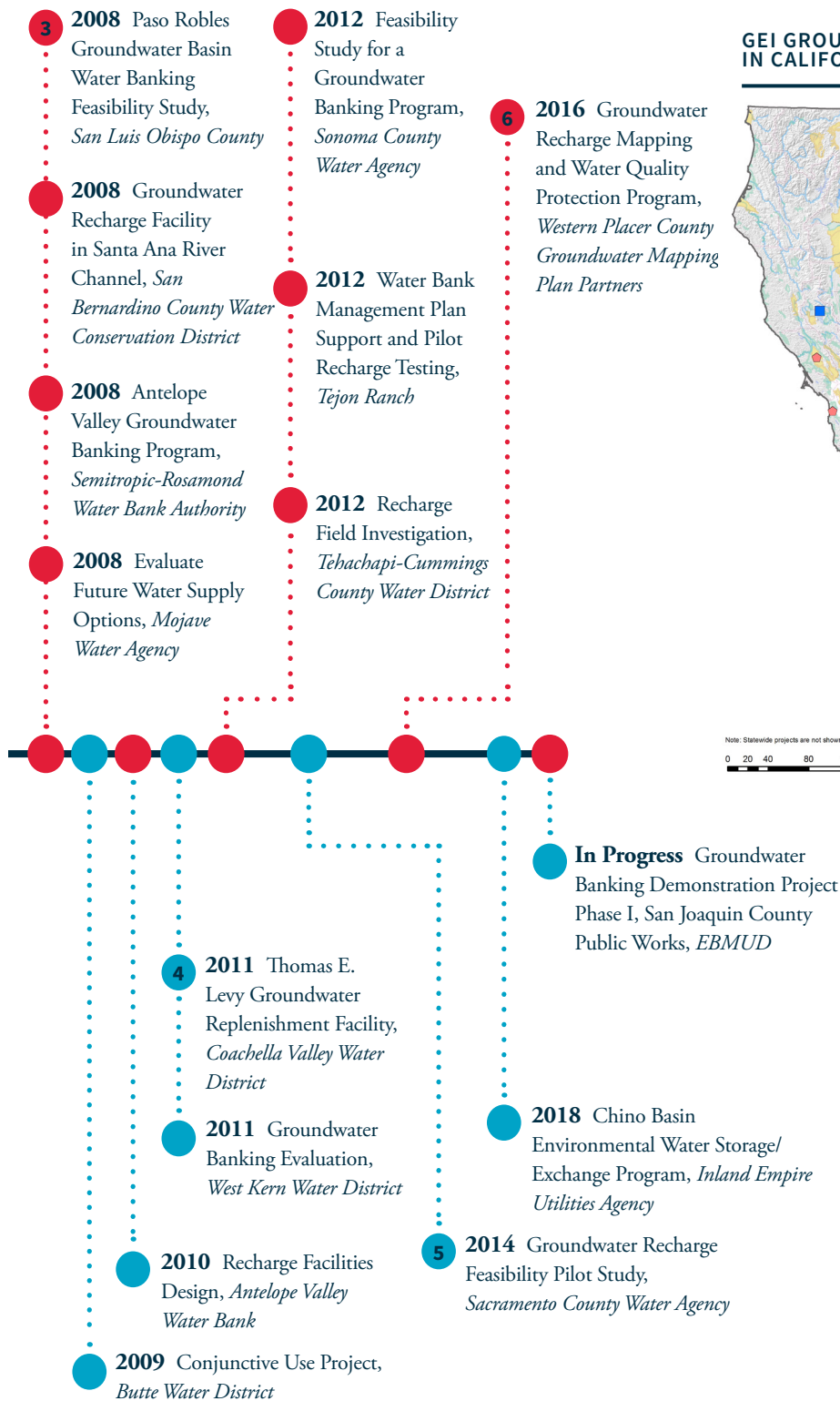
3. Paso Robles Groundwater Basin Study, *San Luis Obispo County*.



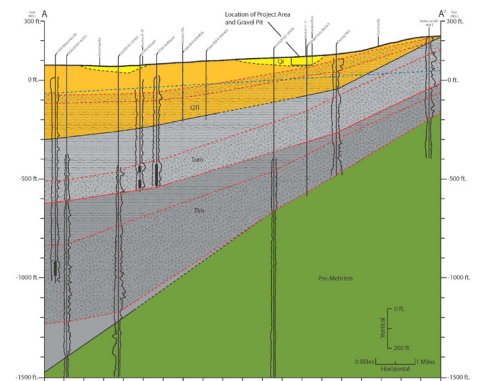
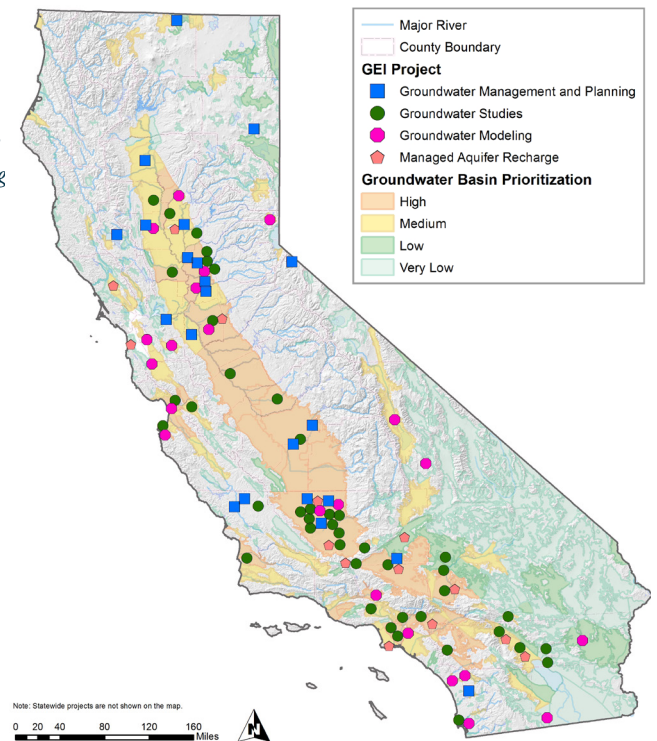
4. Thomas E. Levy Groundwater Replenishment Facility, *Coachella Valley Water District*.



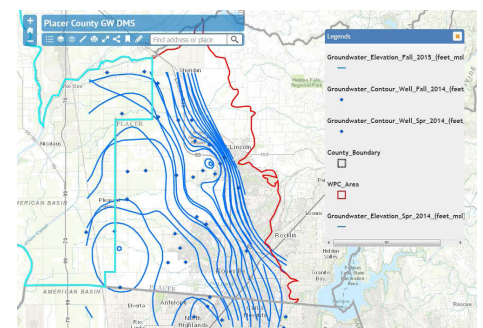
Groundwater Management Projects with GEI



GEI GROUNDWATER AND MAR PROJECT EXPERIENCE IN CALIFORNIA



5. Groundwater Recharge Feasibility Pilot Study, Sacramento County Water Agency.



6. Western Placer County Groundwater Data Management System, California.

Project Highlights



Groundwater Banking Program-Initial Recharge and Recovery Facilities Improvement Project - Semitropic-Rosamond Water Bank Authority

This large-scale banking project has a storage capacity of 500,000 acre-feet with 100,000 acre-feet of annual recharge and recovery capacity. Water is recharged in basins and recovered through existing and new wells. GEI planned, designed, acquired rights-of-way, and provided construction management for the Initial Recharge and Recovery Facility Improvement Project (a direct recharge project), which was Phase 1 of the Semitropic-Rosamond Water Bank. This phase of the work included: 3.75 miles of distribution and well field collection pipeline ranging in diameter from 18 inches to 54 inches, 6 Recovery Wells, 160 acres of recharge basins, 5 turnouts, instrumentation, and a tie-in connection to Antelope Valley East Kern Water Agency.



Willow Springs Water Bank - CIM Group

Since 2008 GEI has been serving as the Consulting Engineers to the Willow Springs Water Bank (Bank). The Bank, located in Antelope Valley, California has a storage capacity of 500,000 acre-feet with 100,000 acre-feet per year recharge and recovery capacity using basins and existing and new wells. In 2009, GEI effectively prepared an American Recovery and Reinvestment Act grant application that allowed the project to construct \$10.8 million in improvements. GEI has performed a wide variety of assignments in support of the bank operation and development, including everything from program management and planning to design to construction management.



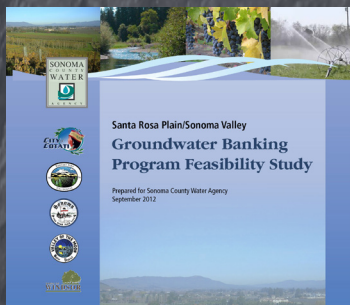
Conjunctive Use Water Distribution System and Water Bank - Semitropic Water Storage District

Semitropic Water Storage District (SWSD) encompasses approximately 225,000 acres, of which 140,000 acres are irrigated agriculture. Included within the overall district are two improvement districts. GEI engineers planned, designed, and supervised the construction of a conjunctive use water distribution system for each. Engineering services included developing and implementing a groundwater banking and exchange program for SWSD that increases the yield of the California State Water Project. An 11,000 foot-long, 78-inch pipeline supplied by a 5,000-horsepower pumping plant returns banked water to the California Aqueduct.



Poso Creek Integrated Regional Water Management Plan - Poso Creek Regional Water Management Group

GEI is responsible for developing and implementing the Integrated Regional Water Management (IRWM) Plan for the Poso Creek Regional Water Management Group (RWMG). The RWMG has implemented \$144 million in programs and projects utilizing \$61 million in State and Federal grant funds. The focus of the RWMG is to plan and implement projects to increase the conjunctive use of available groundwater and surface water supplies by using the groundwater basin as a large regulating reservoir to store surplus surface water supplies in wet years for use in dry years when surface water supply availability is reduced. Improvements under the IRWM Program included recharge basins, interties, groundwater recovery capacity, habitat improvements, and environmental compliance for groundwater banking.



Feasibility Study for a Groundwater Banking Program - Sonoma Water

GEI is assisting Sonoma Water and its project partners, the cities of Cotati, Rohnert Park, and Sonoma; Valley of the Moon Water District, and the Town of Windsor, by performing a Feasibility Study for a Groundwater Banking Program. The goals of the study are to identify primary regional considerations that will frame and guide a groundwater banking program; evaluate and rank potential methods and locations for conducting groundwater recharge pilot programs; and develop detailed work plans for implementing pilot-scale programs in favorable areas. The study focuses on the technical issues related to the hydrogeologic and engineering feasibility of various groundwater banking opportunities, taking into account institutional, legal, permitting, environmental, and financial factors.



Potential Water Management Program - Mojave Water Agency and MWD

This project consolidates several recharge and extraction projects included in the Regional Water Management Plan into a larger project now known as the Regional Recharge and Recovery Project. GEI identified the upper Mojave River floodplain aquifer as having the greatest potential for groundwater recharge, while the greatest need for new water supplies is in the tighter, less transmissive regional aquifer. The study included initial alternatives and screening to consider all possible projects. It also included engineering and hydrogeology assessment of groundwater storage and recovery, groundwater storage locations. In addition, it looked at local water use alternatives to State Water Project water, facilities cost estimate, and environmental and adjudication screening.



Groundwater Recharge Projects - North Kern Water Storage District

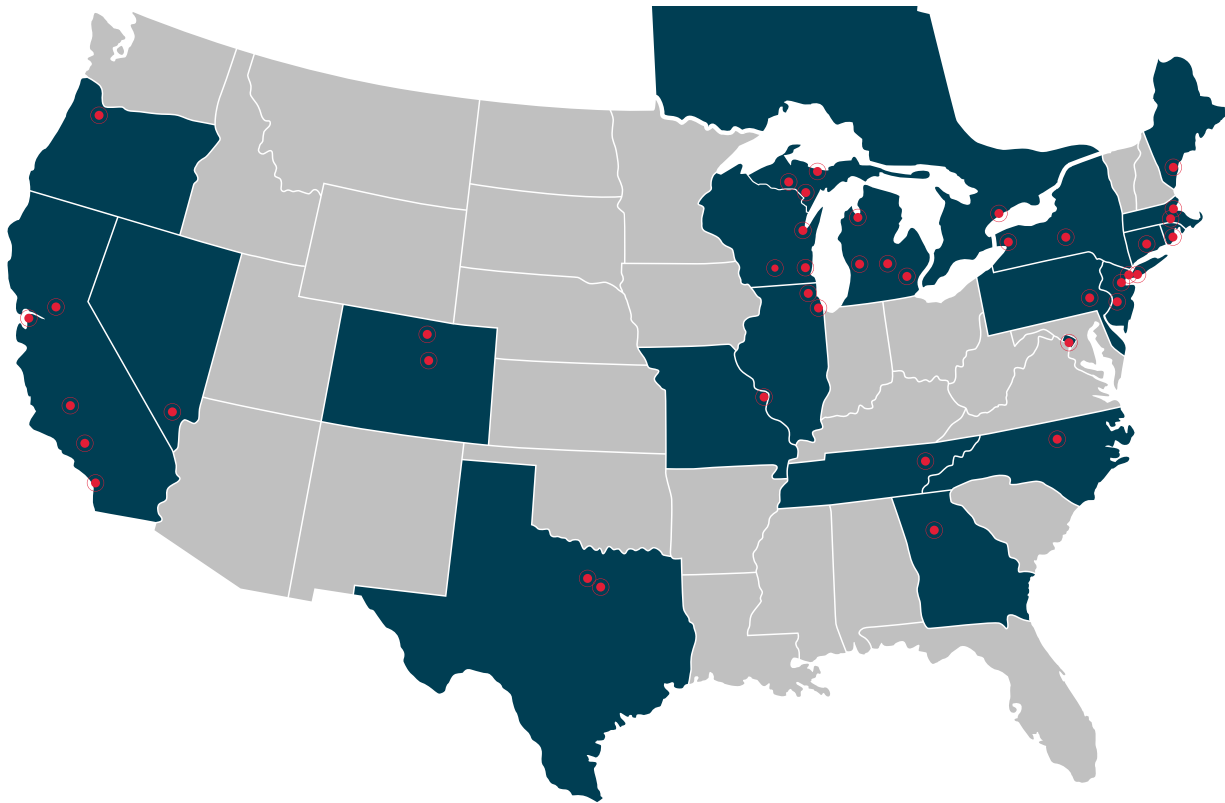
For over 25 years, GEI has had the privilege of working with the District to maintain and enhance its conjunctive use operations. During that time, GEI has prepared a groundwater management plan that documented the District's extensive groundwater management activities.

GEI also studied a proposed water banking project between the district and the State of California as a local element of the Kern Water Bank. The proposed project was based on in-lieu recharge and included an evaluation of the accomplishments of expanding the District's conjunctive use operations. Most recently, GEI prepared CEQA documentation for a pilot water banking program with the Metropolitan Water District of Southern California to store up to 60,000 acre-feet in the North Kern groundwater basin.



Chino Basin Environmental Water Storage/Exchange Program - Inland Empire Utilities Agency (IEUA)

GEI worked closely with IEUA to prepare a successful application for the Proposition 1 Water Storage Investment Program funding for the Chino Basin Conjunctive Use Environmental Water Storage/Exchange Program (CBP). The California Water Commission approved funding of \$206.9 million to the program in 2018. The CPB would construct an advanced water treatment facility and distribution system that will treat and recharge recycled water. The CPB, in partnership with a State Water Project (SWP) Contractor, will then use the locally stored water and provide water from the Chino Basin for ecosystem benefits in the Feather River below Lake Oroville. GEI staff's extensive knowledge of integrated water management, regional planning and feasibility analysis, ecosystem and natural resource systems, and SWP operations was critical to evaluate the program's multiple operational and institutional elements and assess various configurations to develop the most cost-effective program.



GEI is a multi-discipline engineering and scientific consultancy that employs over 1,000 professionals in offices located throughout North America. For more information about Managed Aquifer Recharge, please contact:



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Cali Consulting Service, Inc.

Patricia "Tish" Espinosa
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June 14, 2022

RE: Response to RFQ for Groundwater Management Services

For a Qualified Agriculture and Natural Resources Consultant

To: Cosumnes Groundwater Authority (CGA)

Mr. Stephen Julian,

As owner of Cali Consulting Service, Inc., please consider my qualifications for "Groundwater Management Services". I am an Agriculture and Natural Resources Consultant, located here in the Cosumnes Subbasin. I believe that my skillset and experience match well with the needs of the Cosumnes Subbasin and I am knowledgeable of the Cosumnes Groundwater Authority (CGA). I look forward to sharing with you what I have to offer to the Cosumnes Groundwater Authority, Cosumnes Subbasin Plan, stakeholders of the basin, and adjacent basins.

My unique combination of education, hands on in the field skills, and 18 years of professional work experience not only from the USDA NRCS but also as an independent Agricultural / Biological Consultant in an everchanging field has allowed me to develop my strengths in conserving our natural resources; recommending cultural practices unique to individual sites and areas; and the ability to coordinate multiple programs to promote available resources. Due to my varied background, I am a resourceful and creative problem solver. I can always find multiple solutions to even the most complex problems.

I've attached the qualifications and experience of Cali Consulting Service Inc., my knowledge, skills, and abilities to perform the list of tasks, my resume, and list of references. If you have any questions, or request any additional information please feel free to contact me.

Sincerely,



Tish Espinosa
Owner / Operator
Cali Consulting Service Inc.

Cali Consulting Service, Inc.

Tish Espinosa
caliag@att.net

12960 Ivie Road
Herald, CA 95638


Cali Consulting Service, Inc. was founded by Tish Espinosa in October of 2004 with its office in Herald, California. It is a Hispanic female owned independent consulting firm which operates on a basis of trust, honesty, and full disclosure to achieve resolutions to complex agricultural and environmental issues that farmers and landowners face daily. In today's environment there is a need to balance agricultural production, while sustaining our natural resources, and protecting the environment. Cali Consulting Service, Inc. provides Agricultural, Biological, and Environmental services to landowners while still maintaining compliance established by governmental agencies such as Environmental Protection Agency (EPA), NEPA, CEQA; California Regional Water Quality Control Board's (RWQCB), Waters of the State, General Orders, Sediment and Erosion Control; U.S. Army Corps of Engineers (ACOE), Clean Water Act (CWA); U.S. Fish & Wildlife Service (USFWS), Federal Endangered Species Act; California Fish & Wildlife Service (CFWS), State Endangered Species Act; San Joaquin Air Recourses Board, Air Quality Regulations, and technical assistance for numerous other local, state, and federal regulations that Agriculture has to abide by.

Cali Consulting Service, Inc. offers clients technical advice; focused surveys and studies; innovative strategies to solve issues that arise; and quality work products. Cali Consulting Service, Inc. has experience in the field of Production Agriculture; Range and Pasture Management; Habitat Creation, Enhancement, and Restoration; Land Repurposing; Crop Conversions; Wetland Surveying; Endangered and/or Special Status Species Assessments; Water Quality and Groundwater Recharge; Governmental / Environmental Regulations and Compliance; Permitting; USDA Farm Bill Programs and Implementation of Conservation Practices Funded under Cost Share Programs.

The combined agricultural, environmental, and regulatory knowledge and experience that Cali Consulting Service, Inc. brings to the client, positions Cali Consulting Service, Inc. to address a vast number of issues from many different perspectives. Extensive hands-on field experience provides Cali Consulting Service, Inc. the ability to carry out all services it has to offer to the client efficiently and effectively. Cali Consulting Service, Inc. works closely with all aspects of the farming community including but not limited to Dirt Movers, Well Drillers, Farm / Ranch Managers, Irrigation Design and Supply Companies, Nursery's, Pest Control Advisors / Certified Crop Advisors; Educators; etc.. Cali Consulting Service, Inc. brings experience in project management, strong leadership, and public relations to better serve the diverse group of people that make up California's agriculture.

If you have any questions, please feel free to contact me.

Thank You,



Tish Espinosa
Owner
(209)810-2538

Cali Consulting Service, Inc.

12960 Ivie Road
Herald, CA 95638
(209)810-2538

I have lived and worked in the Cosumnes Basin since 1995. I am familiar with the topography, hydrology, land uses, and cropping history of the area. Over the years I have developed and maintained good working relationships with most of the growers and landowners in the area. I also frequently participate in local trade shows, conferences, and other events to stay current with issues and concerns on topics affecting the Agricultural / Environmental sector. As a professional Agronomist with over 18 years of experience in the field, I have a sound understanding of the Natural Resource issues and concerns of the Cosumnes Basin.

Task 1 Voluntary Land Repurposing

I am proficient in evaluating and interpreting land uses, water uses, cropping patterns and potential groundwater projects by utilizing current technology such as aerial imagery, USGS Topographic Maps, USDA NRCS Soils Maps, Habitat Maps, GIS Maps, etc.. I have a strong understanding of soils, agricultural crops, irrigation systems, and water consumption by various crops.

I am skilled at compiling, developing, discussing, and implementing a list of land repurposing activities, conservation practices and/or best management practices, and alternate cropping systems with various water management practices that can result in improved water savings to help bring the aquifer into sustainability. I have successfully repurposed thousands of acres of flood irrigated hay, pastureland, row crops, orchards, and vineyards within the Cosumnes basin and the central valley to less intense water dependent crops, orchards and vineyards on drip or micro-sprinklers, irrigation return systems, and solar. I have also successfully enhanced and created wetland / wildlife habitats to improve ground water recharge projects.

While serving in various technical and leadership positions with the USDA NRCS I developed proficiency in many areas of conservation planning and implementation.

I can work independently, with individuals, groups, and/or organizations and know the importance of developing good working relationships and partnerships to develop and achieve cooperative approaches on projects. I am skilled at offering ideas, opinions, and cooperation to leadership.

I am capable of discussing efficiencies of existing irrigation systems and evaluate if alternate systems would improve distribution and be more economical and beneficial. I am familiar with existing cost-share programs and other funding opportunities that may help subsidize proposed improvements. I have worked closely with irrigation companies to ensure that irrigation water does not impact seasonal wetlands when crop conversions have occurred on non-native annual rangeland to irrigated orchards and vineyards. I have

experience completing all necessary reports for on farm solar projects, Biological Assessments for Special Status Species; 1602 Stream Bed Alteration Agreement, etc..

Based on my previous experience I am capable of assisting CGA staff in applying for potential grant opportunities. While working with the NRCS and in conjunction with the Resource Conservation District I participated in many conservation activities that resulted in funding opportunities and programs for various projects such as conservation field trials, watershed planning, field days, outreach activities, brochures, equipment purchases, etc.

Task 2 Conservation / Water Use Efficiency

As an Agricultural / Biological consultant I am skilled in having farming discussions pertaining to their cultural practices with farmers, ranchers, and landowners. I am capable of generating ideas and interest of farmers on conservation efforts in their high water use crop. I am very capable of evaluating and interpreting the crops, soils, irrigation systems, topography, and hydrology of this area. I can discuss various types of irrigation systems for improved irrigation water management while achieving and maintaining good crop health

Based on my past experience with NRCS, I was fortunate to work in a very busy irrigation cost-share county. I am therefore, proficient in the planning and implementation of conservation practices and/or best management practices for better Irrigation Water Management and I am capable of developing a water savings accounting system to account for water savings on a farm by farm basis.

I have worked effectively with local landowners to help them better understand and manage their land and any natural resources; therefore, I have knowledge and an understanding of what type of conservation practices a grower would be willing to invest in on their own land or may need assistance by way of monetary compensation or a form of cost sharing. I can therefore identify specific conservation practices relevant to farmers in the Subbasin and assess feasibility of compensation to farmers for implementing various conservation practices.

Irrigation water management is one of many components of reducing water usage and ground water recharge; soil types, soil conditions, cover cropping, topography and various cultural practices are all important contributors to achieve efficient water savings and development of small-scale recharge projects.

Knowledgeable of various grant sources available since I have worked collaboratively with multi-level organizations from local non-profits to Federal Government to successfully acquire grants for projects and outreach efforts. I am capable of assisting CGA staff with pursuing grant funding opportunities to implement conservation practices in the basin.

Task 3 Small Scale Recharge Projects

Since I submitted 3 worksheets listing several small-scale recharge projects for consideration on private lands throughout the south part of the basin, I am completely

capable of coming up with other projects to be considered as well as putting more details and efforts into the planning of small scale recharge projects. Proper outreach and developing partnerships with growers is key in developing effective recharge projects on their lands. knowledge of the crop, farming practices, and existing on-site features, that with some enhancements or modifications could create new recharge opportunities.

Evaluating the benefits of recharge projects is multi-faceted. There is a benefit to the land that the land-owner owns and there is a benefit to the basin as a whole. I have developed, implemented, and am currently working on recharge projects for growers in other basins in the central valley. Completely capable of quantifying existing basin data to develop recharge projects that could benefit the basin and the cone of depression. Ability to analyze each site, conduct the necessary field work, write up a work plan with available options, seek any required permits from various agencies, implement and coordinate work.

Task 4 Data Collection, Data Gaps, and Groundwater monitoring to support refinement of the model

I have a strong understanding of the principals of SGMA and the Cosumnes Groundwater Plan that was submitted to Department of Water Resources. I believe my knowledge of the area, familiarity with growers, soil science background and my passion to balance the basin are the most important items needed to work with CGA and staff to address data gaps and support the improvement of the hydrological mode. I am capable of collaborating and communicating with the CGA and subcommittees on data gaps, shortfalls and/or subpar data used to populate the model because I am familiar with the CGA leadership, issues and concerns with groundwater recharge projects, and possible model corrections.

I am knowledgeable of cropping patterns and surface irrigation uses to refine irrigated acres used in support of the model while being able to offer site specific practices that may result in water savings.

I am very capable of observing a site; determine how it is being irrigated (groundwater, surface water or a combination of both) depending on the season, crop, or time of year. Ability to identify crops, irrigation system, and weather / CIMIS data to determine the ET and the potential water use.

I have contributed three (3) last minute project description information sheets by way of Galt Irrigation District (GID) and Clay Water District (CWD) since there were no recharge projects identified in the Cosumnes Groundwater Plan and especially in the south part of the basin and the cone of depression area.

Proficient in reading and understanding aerial imagery. I can provide site or area specific GIS maps if needed. All mapping is done with my GPS unit and maps are created inhouse.

Having a strong soil background, I understand the Clay layer that exists in areas of the Cosumnes Subbasin. Knowledgeable of cultural practices required by land repurposing or crop conversions to get water past the hard-pan or plow-pan and deeper into the soil profile to assist with recharge.

As a certified wetland scientist, I am skilled and capable of assessing water dependent ecosystems, seasonal and perennial wetlands, or perched aquifers along the various waterways in the basin.

Based on the topography of the Basin and an evaluation of the current well monitoring network I am confident and capable of identifying additional well locations and would be able to coordinate with the groups or permitting agencies to get a stream gage operational in Dry Creek.

Task 5 Public Outreach

As an agricultural consultant, water and farming is essential to my livelihood and to my growers. Growers expect me to keep them informed of programs, issues, concerns, and compliance requirements that might affect them. I understand the importance of ensuring the public, as a stakeholder is included in every step of the planning process. During my tenure at NRCS I assisted with public information workshops and developed informational sheet(s), and other outreach tools when assisting growers with their cost share projects. I have reviewed and developed an understanding of the Cosumnes Basin Plan, as well as other Basin Plans throughout the area and central valley. I am capable of developing and presenting information pertaining to our Cosumnes Basin Plan to the stakeholders in the community via public workshops and other outreach efforts. Because I am familiar with most of the farmers and landowners in the basin, I believe growers may be more receptive to opening a dialogue regarding potential water savings projects.

Task 6 Project Management

As owner of Cali Consulting Service Inc. I am experienced with working with other business entities and submitting invoices for payment in a timely manner.

TISH ESPINOSA

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Excellent communication; organizational, problem solving and project management skills. Ability to adapt to changing environment; multitask; detail oriented, and familiar with local farming community members and irrigation practices, including ability to ascertain and recommend water savings practices.

EXPERIENCE

Cali Consulting Service, Inc. Herald, CA., 2004 to Present. Owner

Project management, leadership skills, public relations, and conflict resolutions. Provides guidance to farmers and ranchers in environmental compliance while developing and farming the land. Assist with compliance, alleged violations, and permitting. Since SGMA, working with growers / landowners in high priority areas to establish ground water recharge projects within their operations. Processing of various types of permit applications to the federal and state governments. I have extensive working knowledge of most landscapes, management issues, and concerns within the area and central valley. I am familiar with and have developed successful working relationships with local, state, and federal agencies at all levels to resolve or process both grower initiated and government regulations. I am extremely familiar with the diversity of landowners and producers and can serve them in a culturally relevant manner. I am proficient in reading land use maps, assessing agricultural lands and habitats, developing multi-species restoration plans, implementing conservation practices, and evaluating the outcomes. As an experienced Professional Agronomist, I have developed hands-on practical field skills. My agricultural expertise, vast knowledge of environmental rules and regulations, and field experience have allowed me to serve as a valuable asset to the farming and ranching community serving multiple roles.

Moore Biological Consultants, Galt, CA., 2002 to 2004. Wetland Specialist / Biologist.

Expanded on my Biological skills by further enhancing my knowledge of the Clean Water Act and State and Federal Endangered Species Acts. Developed skills in evaluating potential impacts to biological resources under NEPA and CEQA guidelines by conducting environmental studies associated with the inventory and management of wildlife, plants, wetlands, and habitats. Conducted general wildlife (biotic and floristic) inventories and focused Special Status Species surveys as well as pre-construction surveys and construction monitoring for compliance with endangered species laws.

United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), 1991 to 2003. Field Agronomist in both the Fresno County Field Office and San Joaquin County Field Office.

Became knowledgeable with conservation programs focused in providing technical and financial assistance that protect and improve natural resources. Assisted with extensive outreach, recruitment, and retention programs for Cal Poly Pomona Ag Department, and other departments under the USDA umbrella, this allowed me to develop strong networking skills with people of all social and economic backgrounds. Wrote, implemented, and evaluated farm and ranch plans which implemented a collection of Conservation Practices and/or Best Management Practices addressing natural resource concerns such as irrigation water management; integrated pest management; sediment and erosion control; habitat restoration or wildlife enhancement; land leveling, cover cropping, etc. on agricultural lands throughout California.

In 1998 I was promoted to a state-wide position as Plant Resource Specialists covering California, Southern Oregon, Western Nevada, and Western Arizona. During that time, I also held a co-lateral position as acting State Agronomist for 2 years. I developed and conducted training opportunities, provided guidance, and technical assistance to landowners providing quality timely solutions to

address resource concerns on agricultural lands. I provided technical support and training to fellow NRCS employees on plant materials and agronomic practices utilized in conservation planning. Built partnerships and worked collaboratively developing, coordinating, supervising, and evaluating field trials to address natural resource concerns within the agricultural community. I was responsible for reviewing and editing National NRCS Conservation Practice Standards and Specifications applicable to California's Irrigated Agriculture and was a key contributor in the creation of new conservation practices pertinent to addressing resource concerns critical to California Agriculture. Designed and coordinated field trials to achieve restoration requirements as per governmental requirements. Extensive experience collaborating with the various local, state, and federal agencies while carrying out conservation projects on Agricultural Lands.

Cal Poly Pomona Farm - 1990 to 1992. Lead Student for Crop Management and Production.

On the school farm, I strengthened my skills in coordination and communication with culturally diverse groups in a timely manner. I provided training to many student groups and organizations. I served in a leadership capacity responsible for training new employees but also the laboratory segments of the crop science classes in all aspects and cultural practices pertaining to field crops, row crops, hay, and grain production. I developed skills in operating any equipment required to prepare fields prior to planting and was a key player in scheduling irrigations, applying fertilizer, monitoring and eradicating weeds and insect pests, harvesting, and preparing crops for market at the on-campus store and local Farmers Markets. I was responsible for maintaining the irrigated pastures for the various livestock units and managed the herb garden for the Culinary Arts School on campus.

EDUCATION

Master of Science (M.S.) in Agricultural Science with emphasis in Agronomy, California State Polytechnic University at Pomona, 1994

Bachelor of Science (B.S.) in Animal Production and a minor in Agronomy, California State Polytechnic University at Pomona. 1991

CERTIFICATIONS AND TRAINING

Certified Wetland Delineator - U.S. Army Corps of Engineers

Certified in Sediment and Erosion Control - the RWQCB

Certified Pest Control Operator - CA Department of Pesticide Regulation

Certified in Cannabis Water Rights

Certified in Flow Measurement Devices and Methods - AB589 Water Measurement

Certified in Backflow regulations, problem identification and prevention in Ag settings

Completed short courses in

Rangeland Watershed Program - Ranch Water Quality Planning

California Browsing Academy

Annual Rangeland Management

USDA/NRCS Courses

Conservation Planning Course, Parts I and II

Nutrient and Pest Management Considerations in Conservation Planning - Pilot Course

Revised Universal Soil Loss Equation (RUSLE) Training

Civil Rights Compliance in Program Delivery

CA Harmony Workshop - Working with Tribes

University of California Agriculture & Natural Resources (UCANR) short courses

Comprehensive Nutrient Management Training

Using Lagoon Water Nutrients for Crop Production

Agriculture Air Quality Training Program

REFERENCES

(See Attached)

Cali Consulting Service, Inc.

Tish Espinosa

12960 Ivie Road
Herald, CA 95638

Cell:(209)810-2538
caliag@att.net

REFERENCES

DRJ Farming Dennis Johnson, Owner 11550 Borden Road Herald, CA 95638 Cell:(209)482-0739 no email	Delu Vineyards Kevin Delu, Owner 15175 DeVries Road Lodi, CA 95242 Cell:(209)601-4140 no email
Gerry Gonzalez Retired USDA NRCS Assistant State Conservationist and Southwest Strategy Coordinator Owner of GRG Consults Inc. 6958 N. Maddax Road Mc Neal AZ 85617 Cell:(602)309-6201 gerry.gonzalez@outlook.com	Joe Williams USDA-NRCS National Soil Health Division West Region Team Leader / Acting Director Regional Soil Health Specialist for AK, WA, and OR 1201 NE Lloyd Blvd., Suite 801 Portland, OR 97232 Cell:(360)480-9771 i.joe.williams@usda.gov
David Simpson Retired USDA NRCS District Conservationist Stockton Field Office Wine Grape Grower 14206 N. Vintage Way Lodi, CA 95240 Cell:(209)479-0653 simpson4grapes@yahoo.com	L5 Farming Nelson Lares, Owner 20038 E. Milton Road Stockton, CA 95236 Cell:(209)988-3522 l5farming@yahoo.com
AAA Ranches Ty Angle, Owner PO Box 1120 Hughson, CA 95326 Cell:(209)602-4500 Ty@cal-almond.com	Manna Ranch / Acampo Ag Mike Manna, Owner 775 E. Acampo Road PO Box 247 Acampo, CA 95220 Cell:(209)403-3333 mike@mannaranch.com
Fuso Farming David Fuso, Owner Tony Fuso, Owner 9851 E. Acampo Road Acampo, CA 95220 Cell:(209)601-3876 Cell:(209)607-3665 ffg3@comcast.net	Constellation Brands GM Grape Management and Commercial Vineyards Scott Warren 3066 Blane Way Napa, CA 94558 Cell:(707)490-5515 scott.warren@cbrands.com

Agenda Item #9

Cosumnes Groundwater Authority Board of Directors Meeting

Agenda Date: June 20, 2022

Agenda Item #: 9

Agenda Item Subject: Long Term Funding

To: CGA Board of Directors

From: CGA Staff

Background

At the May CGA Board Meeting, a Request for Qualifications (RFQ) to find a consultant to develop a long-term funding proposal was approved. On May 27, 2022 the RFQ was posted to the CGA website and emailed to our listserv. Two Statement of Qualifications (SOQs) were received.

Attachments

- [SOQ: Bartle Wells Associates](#)
 - Subconsultant: EKI Environment and Water
- [SOQ: SCI Consulting Group](#)
 - Subconsultant: Larry Walker Associates

Staff Recommendation

- Direct CGA Staff to interview the interested firms and to schedule a Special Meeting in early July for consultant selection.



Cosumnes Groundwater Authority



Statement of Qualifications for a Groundwater Fee Study

June 10, 2022



BARTLE WELLS ASSOCIATES
INDEPENDENT PUBLIC FINANCE ADVISORS



BARTLE WELLS ASSOCIATES
INDEPENDENT PUBLIC FINANCE ADVISORS

2625 Alcatraz Ave, #602
Berkeley, CA 94705
Tel: 510 653 3399
www.bartlewells.com

June 10, 2022

Cosumnes Groundwater Authority
8970 Elk Grove Blvd.
Elk Grove, CA 95624

Attn: Austin Miller
Email: info@cosumnesgroundwater.org

Re: Statement of Qualifications for a Groundwater Fee Study

Bartle Wells Associates (BWA) is pleased to submit this statement of qualifications to develop a financial plan and groundwater fee study for the Cosumnes Groundwater Authority (CGA). BWA specializes in developing financial plans and utility rate studies for California water and wastewater agencies. BWA is also an independent, MSRB-Registered municipal advisory firm that help public agencies evaluate funding options and obtain financing for capital projects. BWA will be assisted by EKI Environment & Water, Inc. (EKI), who will provide technical support on this study. EKI has been actively working in the Cosumnes Subbasin since 2017 and assisted the CGA with development of a coordinated Groundwater Sustainability Plan.

BWA has been a leader in California water and sewer rates and finance since 1964 and has served over 500 public agencies throughout California and the western United States. We have extensive experience developing long-term financial plans and rate studies for a wide range of water and wastewater agencies. We have helped many agencies develop multi-party agreements and equitable cost-sharing arrangements. And we have a strong track record building consensus and public acceptance for final recommendations.

BWA and EKI are currently both working with the Arvin-Edison Water Storage District. EKI assisted the District with Groundwater Sustainability Agency (GSA) formation and preparation of a Groundwater Sustainability Plan. BWA has been developing a 10-year financial plan to identify future funding needs, evaluate financing alternatives, and identify rate increases needed to support implementation of the plan. BWA is also currently assisting the Fox Canyon Groundwater Management Agency with development of groundwater pumping charges to support basin sustainability.

BWA proposes to assign Alex Handlers, a principal and vice-president of BWA, as project manager and lead consultant of this assignment. Alex has consulted for over 150 California water and wastewater agencies and is highly experienced developing strategic financial plans and a wide range of water rate structures for public agencies. Alex has substantial experience working with governing bodies and community advisory groups to build understanding and consensus for recommendations. He is also a Certified Independent Professional Municipal Advisor and a current Board Member of the National Association of Municipal Advisors (NAMA).

Alex will be assisted by Erik Helgeson, a senior consultant with substantial experience developing utility rates and long-term financial plans. Erik has developed water rates, including and groundwater rates, for a number of California agencies, has prior experience working for Denver Water, and currently serves on the American Water Works Association (AWWA) Rates and Charges Committee. Other members of BWA's project team are available for support.

EKI's technical support team for this project will include Anona Dutton, John Fio, Kristyn Lindhart and Tyler Colyer. EKI has been actively working with CGA and its member agencies and is uniquely qualified to provide technical support to the fee study.

This statement of qualifications includes summaries of firm and project team expertise and qualifications for BWA and EKI as well as a summary of a general project approach. Billing rate schedules for each firm are also attached. BWA would be happy to work with CGA to develop a more-detailed scope of services and budget for the groundwater fee study.

We are very interested in assisting CGA with development of a groundwater fee study and appreciate your consideration. Please do not hesitate to contact us if you have any questions or would like additional information.

Sincerely,



Alex Handlers, MPA, CIPMA
Principal/Vice-President



Erik Helgeson, MBA
Senior Consultant

Bartle Wells Associates Contact Information



Bartle Wells Associates
2625 Alcatraz Ave, #602
Berkeley, CA 94705
510.653.3399
www.bartlewells.com

BWA Contact & Project Manager

Alex Handlers MPA, CIPMA

Tel: 510.653.3399 (x109)

Cell: 510.421.1313

alex@bartlewells.com

Bartle Wells Associates was established in 1964 and is a California Corporation and certified State of California Small Business. Our Federal Tax ID number is 94-1664409

TABLE OF CONTENTS



BWA FIRM QUALIFICATIONS.....1

BWA PROJECT TEAM 3

EKI TECHNICAL SUPPORT FIRM QUALIFICATIONS..... 4

GENERAL PROJECT APPROACH 8

BWA & EKI PROJECT TEAM RESUMES..... 8

BWA CLIENT REFERENCES.....20

APPENDIX A: BWA & EKI BILLING RATE SCHEDULES



BWA FIRM QUALIFICATIONS



BARTLE WELLS ASSOCIATES

Leaders in Utility Rates and Finance

Bartle Wells Associates (BWA) is an independent financial advisory firm with expertise in the areas of water and wastewater rates and finance. BWA was established in 1964 and has over 50 years of experience advising cities, special districts, and other agencies on the complexities and challenges in public finance. We have advised over 500 public agency clients throughout California and the western United States. We have a diversity of abilities and experience to evaluate all types of financial issues faced by local governments and to recommend the best and most-practical solutions.

Bartle Wells Associates has a highly-qualified professional team. Our education and backgrounds include finance, civil engineering, business, public administration, public policy, and economics.

BWA specializes in three professional services: utility rate and fee studies, financial plans, and project financing. We are one of the few independent financial advisors providing *all three* of these interrelated services to public agencies.

BWA Key Services

- *Rate & Fee Studies*
- *Financial Plans*
- *Project Financing*

RATE AND FEE STUDIES Our rate studies employ a cost-of-service approach and are designed to maintain the long-term financial health of a utility enterprise while being fair to all customers. We develop practical recommendations that are easy to implement and often phase in rate adjustments over time to minimize the impact on ratepayers. We also have extensive experience developing impact fees that equitably recover the costs of infrastructure required to serve new development. BWA has completed hundreds of utility rate and fee studies. We have helped communities implement a wide range of rate structures and are knowledgeable about the legal requirements governing rates and impact fees. We develop clear, effective presentations and have represented public agencies at hundreds of public hearings to build consensus for our recommendations.



*BWA has served
over 500 public
agencies
throughout
California and
the western
United
States.*

FINANCIAL PLANS Our financial plans provide agencies with a flexible roadmap for funding long-term operating and capital needs. We evaluate the wide range of financing options available, develop a plan that recommends the best financing approach, and clearly identify the sources of revenue for funding projects and repaying any debt. We also help agencies develop prudent financial policies, such as fund reserve targets, to support sound financial management. BWA has developed over 2,000 utility enterprise financial plans to help public agencies fund their operating and capital programs, meet debt service requirements, and maintain long-term financial health.



PROJECT FINANCING Our project financing experience includes over 300 bond sales and numerous bank loans, lines of credit, and a range of state and federal grant and loan programs. We generally recommend issuing debt via a competitive sale process to achieve the lowest cost financing possible. To date, we have helped California agencies obtain over \$5 billion of financing via bonds, bank loans/private placements, lines of credit, low-rate State Revolving Fund Loans, and other funding programs. We work only for public agencies; we are independent financial advisors and do not buy, trade, or resell bonds. Our work is concentrated on providing independent advice that enables our clients to finance their projects on the most favorable terms—lowest interest rates, smallest issue size, and greatest flexibility.

Bartle Wells Associates is a charter member of the **National Association of Municipal Advisors** (NAMA), which establishes strict criteria for independent advisory firms. All of our lead consultants are *Certified Independent Professional Municipal Advisors* and are MSRB-Registered Municipal Advisors.



Bartle Wells Associates is committed to providing value and the best advice to our clients. Our strength is *quality*—the quality of advice, service, and work we do for all our clients.

EXPERIENCE BWA has extensive experience developing long-term financial plans, utility rates, and capacity fees for public agencies from all areas of California and the western U.S. In recent years, we have completed assignments for numerous California agencies including:

Sample Districts

- Elk Grove Water District
- Arvin-Edison Water Storage District
- Modesto Irrigation District
- Fox Canyon Groundwater Management Agency
- Alameda County Water District
- Monterey One Water
- Nevada Irrigation District
- San Luis Water District
- South San Luis Obispo County San District
- Olivehurst Public Utility District
- Rio Linda/ Elverta Community Water District
- Florin County Water District
- Panoche Water District
- Cambria Community Services District
- Sonoma County Water Agency
- Joshua Basin Water District
- Ramona Municipal Water District
- Montara Water & Sanitary District
- East Bay Municipal Utility District
- Union Sanitary District
- West Valley Sanitation District
- San Francisco Public Utility District

Sample Cities

- City of Modesto
- City of Paso Robles
- City of Fresno
- City of Benicia
- City of Vacaville
- City of Placerville
- City of Tulare
- City of Davis
- City Morro Bay
- City of Patterson
- City of San Mateo
- City of King
- Redwood City
- City of South San Francisco
- City of San Carlos
- City of Guadalupe
- City of Santa Barbara
- City of Monterey
- City of Mountain View
- City of North Miami Beach
- City of Millbrae
- City of San Bruno

BWA uses a **team approach** for most projects, typically assigning two consultants to each assignment, including at least one principal consultant. Our general project approach is to work closely with staff and other members of the project team, identify objectives, set milestones, have frequent communication, and remain flexible to resolve unanticipated issues.

Bartle Wells Associates has a highly-qualified professional team. Our education and backgrounds include finance, civil engineering, business, public administration, public policy, and economics. Bartle Wells Associates has a long track record of completing projects on time and on or under budget.

Bartle Wells Associates will perform all work related to this assignment and does plan to use any subcontractors for this project. Our consulting staff has availability to assist on this project as needed to ensure all project work and deliverables are completed on schedule.

Alex Handers, Project Manager

Alex Handers is a principal and vice-president of BWA and will serve as project manager for this engagement. He has extensive experience developing strategic financial plans and utility rate studies and has consulted for more than 150 California agencies. Alex has substantial experience working with governing bodies and community advisory groups to build understanding and consensus for recommendation. He is a Certified Independent Professional Municipal Advisor and Board Member of the National Association of Municipal Advisors. *Alex will serve as the primary contact person and manage the day-to-day project work. He will be involved in all aspects of the project from kickoff to implementation.*



Erik Helgeson, Project Consultant

Erik Helgeson is an Assistant Vice President of BWA and a senior consultant with substantial experience developing long-term financial models and utility rates based on a cost of service approach. Erik served as a consultant on Paso Robles' recent Sewer Rate Study. His experience includes working for as a senior finance analyst for Denver Water in the rates and charges group, and as a utility rate consultant in Colorado and California for over 45 agencies. His prior experience working at a large public utility gives him a unique perspective on the internal challenges a utility faces when implementing a study's recommendations. He currently serves on the American Water Works Association (AWWA) Rates and Charges Committee. *Erik will serve as project consultant and will assist in managing day-to-day project work.*



EKI will provide technical support on this project. EKI's project will include Anona Dutton, John Fio, Kristyn Lindhart and Tyler Colyer. EKI has been actively working with CGA and its member agencies and is uniquely qualified to provide technical support to the rate study.

Resumes for all members of the project team are attached.



EKI Environment & Water, Inc. (EKI) is an employee-owned company that has provided comprehensive water resources and engineering services to public and private sector clients since our founding in 1989. Our staff includes over 100 engineers, geologists, hydrogeologists, environmental scientists, computer-aided designers, geographic information system (GIS) specialists, database specialists and support personnel in offices throughout California and the United States.

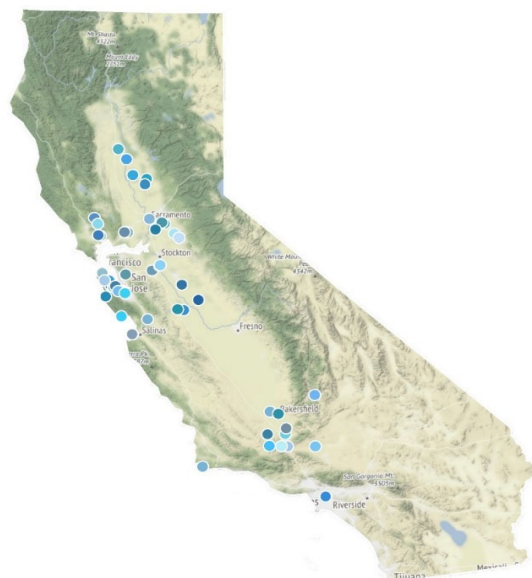
Company Philosophy

EKI takes a solution-oriented approach to projects that builds from a strong technical foundation and emphasizes proactive and effective communication. The size of our firm, the high level of experience and continuity of our multi-disciplinary staff, and our established credibility in our fields of expertise and with regulatory agencies allow us to effectively support our clients to meet their objectives across a variety of sectors and issues.

It's in the Mix

EKI's staff comprises an effective mix of disciplines, including environmental engineers, civil engineers, chemical engineers, geologists, hydrogeologists, and environmental scientists. This complementary mix is an asset to understanding and effectively resolving a wide variety of complex technical challenges. As shown below, EKI's planning, engineering, and hydrogeology services for similar projects include:

- Strategic and technical support for Sustainable Groundwater Management Act (SGMA) implementation and compliance, including Groundwater Sustainability Plan (GSP) development and implementation;
- Numerical groundwater modeling in support of basin water budgeting, basin sustainable yield analysis, GSP implementation optimization, project evaluation, and chemical fate and transport;
- Presenting technical findings and approaches to clients in a way to support decision making;
- Water supply portfolio development and management, including water transfers, conjunctive use studies, and aquifer storage and recovery (ASR) projects;
- Evaluation of managed aquifer recharge, including with recycled water for direct or indirect potable reuse (IPR/DPR) purposes;
- Cost-estimation and feasibility assessments and development of systematic ranking tools for water supply project alternatives analysis;
- Program and project management services to augment engineering and other technical staff resources for public agencies;



EKI has broad experience in planning, engineering, and hydrogeology services for water resources projects across California.

- Develop public outreach materials and present technical findings, approaches and project statuses at public meetings;
- Water supply system planning, design, program management, and construction management;
- Data management system (DMS) design and maintenance;
- Local and state regulatory and permit support;
- Design, construction, and testing of wells for monitoring purposes to large-capacity water supply wells, including municipal supply wells;
- Design, direct, and interpret results from geophysical, geochemical, and groundwater dependent ecosystem (GDE) investigations; and,
- Technical expert support for basin adjudication proceedings and litigation support services.

Client Loyalty

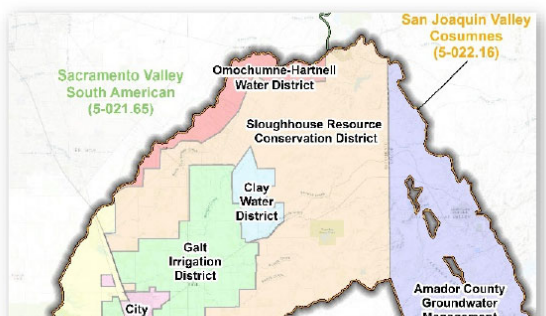
EKI takes pride in repeat business from satisfied clients. The low turnover of our staff permits the development of long-term working relationships with our clients and each other. Our project management team offers continuity, tenacious attention to detail, responsiveness, and quality service.

SGMA Experience

EKI is working with entities throughout California to develop strategic responses to comply with SGMA, and on other groundwater characterization and resource issues including: supporting scientific basin boundary modification requests; assisting in the formation and administration of Groundwater Sustainability Agencies (GSAs); conducting extensive stakeholder engagement; developing and applying numerical models to assess basin conditions and response to project and management action (P/MA) implementation; developing and analyzing the technical information to support the policy decisions required for GSP development and implementation including land repurposing and groundwater recharge projects.

EKI is uniquely qualified to provide technical support to this Fee Study. EKI has been actively working in the Cosumnes Subbasin since 2017. The Cosumnes Subbasin is managed by the Cosumnes Groundwater Authority (CGA) that includes representatives from the Amador County Groundwater Management Authority (ACGMA) GSA, Clay Water District GSA, City of Galt GSA, Galt Irrigation District (GID) GSA, Omoichumne-Hartnell Water District (OHWD) GSA, Sacramento County GSA, and Sloughhouse Resource Conservation District (SRCD) GSA. EKI assisted the CGA with the development of a coordinated GSP that addressed, among other things, the technical and political issues related to the fact that the Cosumnes

River is the last major undammed river in California, historically supported fall runs of Chinook salmon and a diversity of GDEs and connected to varying degrees to the underlying groundwater basin.



EKI supported SGMA implementation in the Cosumnes Subbasin, including development of a GSP and development and application of the numerical groundwater model.

EKI's SGMA-related work in the Cosumnes Subbasin included: securing grants and providing grant administration support; design, construction, and on-going maintenance of a DMS; developing the basin-wide hydrogeologic conceptual model (HCM) (including detailed geologic interpretation and the development of multiple, detailed cross-sections based on geologic borings and geophysical logs),

water budget, and assessment of groundwater conditions based on compilation and review of water level, water quality and geochemical data; assessing GDE occurrence and surface water / groundwater interactions in the Cosumnes River, Dry Creek, and other minor creeks and drainages; with representatives from adjacent basins, collaboratively developed, calibrated, and applied the Integrated Water Flow Model (IWFM) platform based numerical model; and design and implementation of the SGMA-compliant monitoring network to identify undesirable results. EKI also helped develop the Technical Support Services (TSS) grant application which resulted in the first DWR-constructed monitoring wells through the TSS program in the State, and directed and interpreted technical field investigations that included geophysical surveys (methods included Electrotelluric Sounding [ETS], Surface Nuclear Magnetic Resonance [SNMR], and Time-Domain Electromagnetic [TEM]), water quality and geochemistry (including isotopic analysis to assess recharge conditions), water level data collection, detailed mapping and field assessment of GDEs, and monitoring well installation to focus on surface water / groundwater interactions.

A key action for reaching sustainability is managed aquifer recharge (MAR) via the controlled flooding of dormant farm fields with winter runoff. The MAR sites were preliminarily determined based on proximity to natural drainages and existing conveyance structures (e.g., the Cosumnes River and Folsom South Canal). Recharge potential was inferred from USDA Soil Conservation Survey (SCS) data, the Soil Agricultural Groundwater Banking Index (SAGBI), and subsurface stratigraphic conditions inferred from geophysical survey results and available boring logs. The ETS soundings show that the westernmost portion of the Principal Aquifer may be underlain by an inferred clay deposit at about 100 ft bgs. In this portion of the basin, the inferred clay may limit hydraulic interaction between recharge, water table level changes, and groundwater extractions from depths beneath the clay. The SNMR and TEM results revealed that in some locations shallow groundwater can occur within 30 feet below ground surface (ft bgs). However, the data also show that this shallow water is likely perched and separated from the Principal Aquifer by predominantly fine-grained sediments in the 45 to 50 ft bgs interval. The complex cause-and-effect relationships between managed recharge activities and the resulting changes in water table elevation, seepage to and leakage from interconnected surface water features, subsurface inflow and outflow across basin boundaries, and the resulting change in Basin groundwater storage were quantified by the numerical surface water groundwater model.

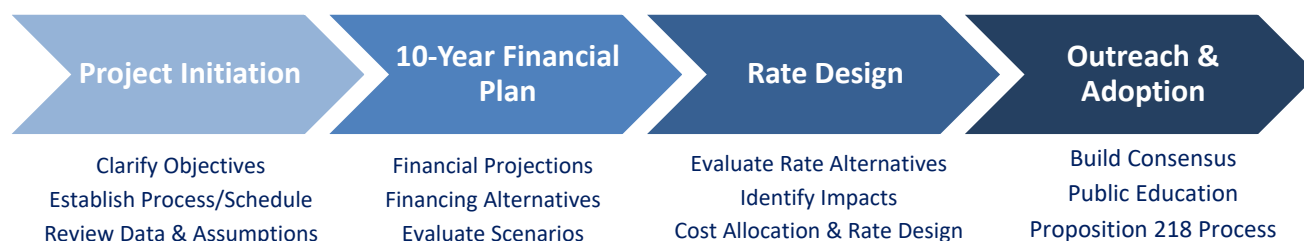
Reference

Cosumnes Subbasin GSAs

Kerry Schmitz, Division Chief, Water Supply
Sacramento County Department of Water Resources
801 I Street, Room 301, Sacramento, CA 95814
(916) 874-4681

BWA has successfully developed financial plans and rate studies for hundreds of California agencies, from small rural cities and districts to large cities and regional agencies. Our general project approach is to work closely with staff and other members of the project team, identify objectives, set milestones, have frequent communication, and remain flexible to resolve unanticipated issues. This section summarizes our general approach for developing a groundwater fee study. A final scope of services and budget can be developed in consultation with CGA staff.

Rate Study Process



Key tasks of our study will include:

- **10-year Financial Plan:** Develop a comprehensive 10-year financial plan for the Cosumnes Groundwater Authority. The plan will serve as financial roadmap for funding projected operating and capital programs, meeting debt service requirements if applicable, and maintaining long-term financial stability. The financial plan will include evaluation of financing alternatives for capital projects, recommendation of fund reserve targets, and development of an Excel-based rate model designed to help evaluate financial and rate scenarios. The plan will evaluate options for determining member agency contributions for each agency's share of allocated costs.
- **Groundwater Rate Design:** Work with CGA and its member agencies to identify and evaluate groundwater rate alternatives. Develop a cost-of-service analysis to support proposed groundwater rates. The goal will be to recommend rates that a) recover the costs of providing service, b) are fair and equitable to all customers, c) are easy to understand and administer, and d) comply with the substantive requirements of Proposition 218 (Article 13D, Section 6 of the California Constitution).
- **Build Consensus for Recommendations:** BWA has a strong track record of building consensus and public acceptance for final recommendations. We will work closely with CGA and its member agencies throughout the project to gain input, assist with public outreach efforts, develop public education materials, and help coordinate all phases of the groundwater fee development and implementation process including drafting the required Prop 218 Notice and participating in the Public Rate Hearing.

BWA will assist CGA in all phases of the study, from project initiation through final adoption of a financial plan, cost-sharing arrangements, and groundwater fees. BWA has a long track record of completing projects on time and on budget and has helped many agencies evaluate rate alternatives and build consensus and public acceptance for rates and fees

BWA & EKI PROJECT TEAM RESUMES

ALEX HANDLERS, MPA, CIPMA



Principal Consultant / Project Manager

Alex Handlers is a principal and vice president of Bartle Wells Associates with expertise in the areas of utility rates and finance. He has extensive experience developing long-term financial plans, utility rates, and development impact fees for utility enterprises. Alex has helped agencies implement a wide variety of water and sewer rate and fee structures and is knowledgeable about the legal requirements of rates and fees. He has managed projects for over 150 cities, counties, and special districts.

Alex is also an independent financial advisor who helps public agencies secure low-cost financing for capital projects. He is an MSRB-Registered Municipal Advisor, a Certified Independent Professional Municipal Advisor, and a current Board Member of the National Association of Municipal Advisors. He has expertise helping public agencies evaluate financing alternatives for capital improvement programs and obtain over \$2 billion in financing via bonds, COPs, bank loans/private placements, lines of credit, and various state and federal funding programs.

Education

M.P.A. - University of Washington

B.A. - Lehigh University

Certifications

Board Member – National Association of Municipal Advisors

CIPMA – Certified Independent Professional Municipal Advisor

MSRB-Registered Municipal Advisor (Series 50)

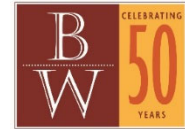
Representative Projects

- **City of Benicia:** Developed comprehensive water and wastewater financial plans and rate studies leading to adoption of a 5-year phase-in of rate increases and revisions to the water and sewer rate structures designed to reflect the cost of providing service. Evaluated rate impacts under a range of capital improvement funding scenarios. Developed updated water and wastewater capacity charges designed to recover the cost of infrastructure benefiting new development.
- **Arvin-Edison Water Storage District:** Developed a 10-year financial plan supporting funding of \$55 million of SGMA-related capital projects and \$40 million of other water system capital improvement needs. Served as financial advisor on 5 private placement bank loans generating over \$70 million for capital improvements, the District's buyout of USBR water supply facilities, and various debt refinancings to achieve savings.
- **City of Paso Robles:** Developed a comprehensive sewer rate study. Evaluated a range of fixed and usage-based residential rate alternatives. Final recommendations reflected substantial input from the City's project team and included multi-year sewer rate increases and a phase-in of fixed monthly charges to supplement the City's usage-based rates. Currently assisting City with development of a water rate study.
- **City of Redwood City:** Developed water and sewer financial plans and utility rate studies supporting a) construction of a \$72 million recycled water project, b) funding the City's roughly \$400 million share of improvements to the regional wastewater treatment plant, c) funding major increases in wholesale water rates, and d) increasing funding for ongoing investment in the City's aging infrastructure.



- **South San Luis Obispo County Sanitation District:** Developed 10-year financial plan and wastewater treatment rate recommendations. Recommended a multi-year phase-in of rate increases to support financial stability and construction of \$37 million project to address permit requirements and improve reliability. Served as financial advisor on issuance of \$27 million of wastewater revenue bonds and \$4.5 million low-interest rate USDA Loan.
- **Joshua Basin Water District:** Long-term financial plan and water rate study recommending a gradual increase in water rates coupled with rate structure modifications to provide additional conservation incentive. Updated District's connection fees. Worked closely with a community advisory committee to evaluate rate options and develop final recommendations.
- **City of San Carlos:** Developed a sewer enterprise financial plan and rate study designed to support sewer collection system capacity improvements, long-term pipeline replacements, and over \$120 million for the City's share of costs for rebuilding the regional wastewater treatment plant. Evaluated residential rate alternatives. Updated the City's sewer capacity charges levied on new development. Developed solid waste rate recommendations to support future funding requirements and improve rate equity between customer classes and cart sizes.
- **City of Morro Bay:** Developed 10-year water and wastewater financial plans and rate studies supporting construction of a new \$145 million Water Reclamation Facility and recycled water infrastructure. Evaluated water and sewer rate structures and recommended modifications based on a cost of service analysis. Developed emergency water shortage rates. Updated the City's water and wastewater connection fees. Served as financial advisor on issuance of \$62 million of low-rate WIFIA financing and \$67 million of low-rate State Revolving Fund financing.
- **City of San Mateo:** Developed a sewer enterprise financial plan and rate recommendations supporting funding for a roughly \$900 million wastewater capital improvement program needed to improve wet weather capacity and rebuild the City's aging wastewater treatment plant. Transitioned residential sewer rates from 100% volumetric rates (subject to a minimum charge) to a hybrid 50% fixed & 50% volumetric rate structure.
- **San Francisco Public Utilities Commission:** Developed financial projections supporting issuance of over \$2 billion of bonds used to fund a \$4.3 billion upgrade to the Hetch-Hetchy regional water system and improvements to the City's wastewater system and Hetch-Hetchy power facilities.
- **City of North Miami Beach:** Developed water and sewer financial plans and rate studies designed to support each utility's updated capital improvement programs and a substantial increase in costs for wastewater treatment provided by Miami-Dade County.
- **South Tahoe Public Utility District:** Serves as independent financial advisor on competitive and negotiated bonds sales and 5 competitively bid private placements generating over \$50 million to fund water and sewer capital improvements and refinance outstanding debt to achieve savings.
- **City of Tulare:** Served as financial advisor on 12 competitive and negotiated bond sales issues including over \$250 million of wastewater revenue bonds, \$33 million of water revenue bonds, \$22 million of successor agency tax allocation bonds, \$7 million of short term notes, and \$33 million of lease revenue bonds. Developed water and wastewater financial plans supporting capital and debt financing.
- **City of Millbrae:** Developed water and sewer rate studies and revised the City's Clean Bay Charges levied to fund improvements designed to eliminate sanitary sewer system overflows during storms.
- **Alameda County Water District:** Comprehensive development fee study; recommended a series of modifications to existing charges to improve revenue recovery, equity and fee administration
- **City of Fresno:** Developed wastewater enterprise financial plan and Excel-based financial model that is used by City staff to update projections. Developed new water connection fees designed to recover costs of existing facilities and future supplemental water supply projects benefiting new development.

ERIK W. HELGESON, MBA



Senior Consultant

Erik Helgeson is an assistant vice president and senior consultant with Bartle Wells and Associates. His areas of expertise include the development of financial plans, ratemaking, and policy solutions for water, stormwater and wastewater utilities. He has eight years of utility finance experience- as a finance analyst at Denver Water and now as a utility rate consultant. Erik has extensive expertise in working with executive level staff and assisting in strategic decisions. He serves on the American Water Works Association (AWWA) Rates and Charges Committee and has presented at the Utility Management Conference.

Education

M.B.A., Entrepreneurship – University of Colorado, Denver

B.A., Business Administration – Gonzaga University

Representative Projects

- **Fox Canyon Groundwater Management Agency:** Currently assisting the Agency with development of groundwater pumping charges to support groundwater basin sustainability and recharge.
- **City of Modesto:** Developed water and sewer rate studies designed to support long-term operating and capital improvement fund needs.
- **City of Paso Robles, CA:** Served as a consultant on a comprehensive sewer rate study that included evaluation of a range of fixed and volumetric residential rate alternatives.
- **Modesto Irrigation District:** Designed a cost-allocation methodology between the district's domestic water, irrigation and electric enterprises.
- **San Miguel Community Services District, CA:** Lead consultant providing water and wastewater financial plans and rate studies. The District was nearing insolvency and large rate increases were needed to save the District.
- **City of Hemet, CA:** Water budget rate design and cost of service study (in progress)
- **City of Imperial, CA:** Lead consultant providing water and wastewater financial plans and rate studies
- **Madera County, CA:** Lead consultant providing rate studies for twenty-three of the county's water and sewer special service districts
- **Castle Pines North Metropolitan District, CO:** Lead consultant providing annual water and wastewater financial plans and rate study updates
- **City of Placerville, CA:** Analytical support for water financial plans and rate studies.
- **City of Modesto, CA:** Analytical support for water and wastewater financial plans and rate studies
- **Las Gallinas Valley Sanitary District, CA:** Support for annual budget process
- **City of Willits, CA:** Lead consultant providing water and wastewater financial plans and rate studies
- **The Cities of Pinole and Hercules, CA:** Assisted the cities with the co-financing of a wastewater project with SRF loans. This included the design of the payment and reimbursement process, the administration of the process, and navigating the State requirements.
- **Humboldt Bay Municipal Water District, CA:** Lead consultant providing 10-year financial plan update



- **Carlsbad, CA:** Played a key role in completing the 2016 water cost of service study. Created a supply-based cost allocation and supply layered, tiered, water rate design
- **Sacramento County Water Authority, Sacramento, CA:** Lead analyst supporting water financial plan and rate study
- **Marin Municipal Water District, Marin, CA:** Lead Analyst supporting development of a comprehensive water financial plan and rate study.

Public Utility Experience

Denver Water, Denver, CO:

Senior Finance Analyst- Assisted with the annual cost of service study and financial plan, provided regular revenue reports, and oversaw the gathering and reporting of metrics to support Denver Water's organizational improvement initiatives. As the lead analyst on the initiative to change the rate design he facilitated research (customer survey and affordability study), performed rate design analysis, and assisted with stakeholder outreach (municipalities, customers, business representatives, non-profits, and Denver Water executives and Board) which led to the adoption of new rate structures. He coordinated the implementation efforts between various business units to ensure a successful rollout of the new rates and rate structures.

Professional Memberships

American Water Works Association – Member of Rates and Charges Committee

Certifications

MSRB-Registered Municipal Advisor (Series 50)

Anona L. Dutton, PG, CHg

Vice President / Principal-in-Charge/ Project Manager

Ms. Dutton has over twenty years of professional experience managing water resources projects. She has managed multi-million dollar efforts to secure reliable water supplies for water agencies and developers, including leading the technical efforts to minimize the water footprint of new and existing development, assessing groundwater and surface water supply yields, supporting development of groundwater allocations within and outside of basin adjudications, securing water transfer options, and evaluating the feasibility and cost of developing new water supply sources such as recycled water, desalination water, and other non-potable sources.

Ms. Dutton is deeply involved in implementation of the Sustainable Groundwater Management Act (SGMA) throughout the State, including provision of strategic and technical support for Groundwater Sustainability Agency (GSA) formation and administration, basin boundary adjustments, Groundwater Sustainability Plan (GSP) development and implementation, and securing grant funding. She has been actively involved in SGMA implementation in the Cosumnes Subbasin since 2017.



Education

- M.S., Hydrogeology, Stanford University, 2000
- B.S., Environmental Sciences, Stanford University, 1998

Registrations/Certifications

- Professional Geologist in California (#7683)
- Certified Hydrogeologist in California (#841)
- LEED Green Associate
- Water Use Efficiency Practitioner - Grade 1

Relevant Experience

- **Sustainable Groundwater Management Act (SGMA).** *Multiple Clients.* Ms. Dutton's recent SGMA work includes supporting GSA coordination, securing grant funding, and GSP preparation and implementation. She oversees stakeholder engagement efforts, numerical groundwater modeling, application of water budgets, and the development of projects and management actions (P/MAs), including frameworks for groundwater reduction and allocation programs and supply augmentation projects. Her SGMA-related projects span California including: White Wolf Subbasin GSP development and implementation, Castac Basin GSP development and implementation, Cosumnes Subbasin GSP development and implementation, Cuyama Basin strategic support for GSP development and implementation, Cal Water strategic support in many basins, Cordua Irrigation District strategic support for GSP development and implementation, City of Lathrop strategic support for SGMA compliance, GSP development and implementation for Kern County Subbasin entities, GSP implementation in the Delta-Mendota Subbasin, Alternative GSP development in the Livermore Valley Basin, and technical support for GSP development in the East Bay Plain Subbasin.
- **Technical and Strategic Support For Land Repurposing Program.** *Merced Subbasin GSA.* Ms. Dutton is overseeing EKI's work to provide technical and strategic support for the land repurposing program (LRP) in the Merced Subbasin. The program objective is to reduce

consumptive groundwater demand by 15,000 AFY by 2025. EKI is centrally involved in the development of all LRP components, including the landowner application process, scoring framework, contracting, support for the basin's Proposition 218 process and associated cost estimation and outreach materials including a FAQ document. EKI also assisted MSGSA bring additional partners to advise, support, and publicize the LRP program.

- **Technical and Strategic Water Resources Support.** *South of Kern River GSAs.* Since 2016 Ms. Dutton has provided strategic technical support to Arvin-Edison Water Storage District, Tejon-Castac Water District, Wheeler Ridge-Maricopa Water Storage District in groundwater sustainability matters. She is leading efforts to comply with SGMA in the White Wolf and Kern County Subbasins, including GSP preparation and implementation. She is supporting efforts to develop conjunctive use projects and to maintain water quality in the Friant-Kern Canal, including conducting in-depth investigations of surface and groundwater quality trends and developing a salinity mitigation policy. She is supporting the costing, prioritization and implementation of P/MAs related to procuring grant funds and developing land-repurposing and other demand reduction programs, in addition to supply augmentation projects. She developed a water rights based water budget and groundwater allocation method that considered native safe yield, the surface water imports and water banking operations, and historical water use information for the GSAs and local landowners.
- **Technical Support for Analysis of Demand Management.** *Cosumnes Subbasin GSAs.* As part of GSP development in the Cosumnes Subbasin Ms. Dutton oversaw the evaluation of the various P/MAs that are being contemplated to bring the basin into sustainability by 2042. A key management action being contemplated by the GSAs is demand management through voluntary or mandatory fallowing. EKI applied the numerical model we developed to assess which crops and areas of the basin create the most benefit (in terms of increased groundwater storage) as a result of fallowing. This analysis is supporting the GSAs to minimize the amount of acres that will need to be fallowed, while achieving the savings objectives.
- **Conjunctive Use Study.** *Zone 7 Water Agency.* Ms. Dutton is leading the development of a Conjunctive Use (CU) Study to support Zone 7 to identify the preferred integration of known and potential future sources and new infrastructure to increase yield, operations, and reliability. The CU Study is considering a variety of sources and options, including optimization of the groundwater basin, recharge of imported and reclaimed water, investments in LVE and Sites reservoir, and water bank operation, among other things.
- **Valley Water.** *Multiple water banking related analysis.* Ms. Dutton leads EKI's efforts to support Valley Water in the assessment of multiple water banking opportunities. Work efforts have included in-depth analysis of existing water bank performance and risk factors, including those related to water quality and declining groundwater levels, and systemizing the process to support Valley Water's on-going assessment of water bank performance and identification of new water banking sites.
- **IPR/DPR Feasibility Assessment.** *Marina Coast Water District (MCWD).* Ms. Dutton conducted a technical assessment of the feasibility to develop an indirect or direct potable reuse (IPR/DPR) project in Monterey Subbasin. As part of this assessment, she developed a hydrogeologic conceptual model of the local groundwater system and conceived of and priced out options to augment potable water supplies with Salinas River storm flows or highly treated municipal wastewater. This project is now being pursued as part of GSP implementation.
- **Water Strategy.** *City of East Palo Alto.* Ms. Dutton managed the development and implementation of a comprehensive water strategy to address the water shortage crisis within the City of East Palo Alto, which is a Disadvantaged Community (DAC). She supported the City in negotiating a water transfer agreement for the first-ever transfers of Individual Supply Guarantee (ISG) within the San Francisco Regional Water System and in the development of their groundwater program, including feasibility assessment, design and cost-estimation.

John L. Fio

Principal Hydrogeologist

Mr. Fio has almost 40 years of experience in water resources consulting and project leadership. His professional experience includes ten years of research and project leadership with the U.S. Geological Survey, and more than 25 years of experience in private consulting (20 of those years as a co-founder of his own consulting firm located in Davis, CA). John has developed water management plans; evaluated the performance of planned and operating conjunctive use projects (e.g., in the Cosumnes, Westside, Madera, and Pajaro Valley basins); evaluated groundwater quality effects of wastewater and recycled water disposal to land and surface water bodies; and determined water sources using chemical and age-dating techniques. Much of his work has involved numerical groundwater-flow and solute transport modeling where he has employed models to quantify water budgets and their sensitivity to changes in land- and water-use practices, groundwater-flow paths and time-of travel, migration of dissolved constituents, saltwater intrusion, groundwater surface-water interactions, and the effects of climate change and sea level rise. His work is published in 16 peer-reviewed journal articles and government reports.



Education

- M.S., Civil Engineering, University of California, Davis, 1987
- B.S., Soil and Water Science, University of California, Davis, 1984

Relevant Experience

- **Groundwater Sustainability Plan Development.** Cosumnes Subbasin, CA. Mr. Fio managed GSP development for the Cosumnes Subbasin, which includes the Cosumnes River. The Cosumnes River is the last, undammed drainage originating in the Sierra Nevada, and supports Salmon and Steelhead populations. The basin is managed by seven newly formed Groundwater Sustainability Agencies, and no coordinated data collection, compilation, or evaluation programs existed within the basin. The more than \$2.5 million effort required design, construction and population of a comprehensive, basin-wide Data Management System; the Hydrogeological Conceptual Model of the basin and quantitative evaluation of Groundwater Conditions; development of the basin numerical model which employs DWR's Integrated Water Flow Model (IWFM); and, data gap filling efforts that included geophysical investigations, sampling and evaluation of stable isotope data, biological surveys related to the identification of groundwater dependent ecosystems, and design and construction of monitoring infrastructure (stream gauges, well meters, and monitoring wells).
- **San Mateo Plain Subbasin Groundwater Assessment.** *San Mateo County.* Mr. Fio developed a groundwater-flow model to quantify groundwater conditions beneath San Francisco Bay and cross-boundary flows between adjacent basins located in San Francisco, San Mateo, Santa Clara and Alameda counties. The model was utilized to estimate expected yields and likely hydraulic effects from aquifer pumping on existing groundwater users and assist future basin management and

compliance with SGMA. Data sets were developed to represent projected changes in groundwater recharge because of climate change on rainfall, temperature, and run-off.

- **Optimization of Groundwater Recharge and Recovery Operations. Santa Cruz and Monterey Counties, CA.** The Pajaro Valley Water Management Agency (Agency) is actively working to prevent further increases in long-term overdraft. One of the Agency's water supply projects diverts surface water runoff from Harkins Slough to an open recharge basin, and the infiltrated surface water is extracted by recovery wells located around its periphery. Past project performance has captured only 36% of the total volume of slough water diverted to the recharge basin. John evaluated measured water levels and water quality time-series data and numerical groundwater-flow and transport modeling results to show that project performance can be improved by: (1) increasing the pumping rates from select recovery wells, and (2) construct additional wells downgradient of the recharge basin. John is currently overseeing tests to maximize pumping rates and evaluate potential well interferences to recommend locations and construction details for additional recovery wells near the basin. On a parallel track, the information is guiding decisions on the number and locations of additional extraction wells to optimize recovery from additional recharge basins planned north and south of the existing basin. The numerical model is being deployed to optimize project operations to meet the timing and magnitude of the irrigation requirements of agriculture.
- **San Francisquito Creek Alluvial Fan Groundwater. Menlo Park, CA.** Mr. Fio constructed a groundwater-flow model that quantified the hydraulic relationships in Bayland aquifers and beneath South San Francisco Bay – relationships that were not widely recognized by the hydrologic community. Results showed that pumping in both the Menlo Park area and western Alameda County can affect groundwater flow and constituent movement in shallow aquifers on either side of San Francisco Bay. He then utilized local geohydrologic, geochemical, and stable isotope data to develop a focused, site-specific groundwater-flow model for the shallowest water bearing zones and constituent transport model to project the movement of chlorobenzene, 1,1-DCE, and PCBs. These models evaluated the potential for off-site constituent migration under a variety of possible alternative future land use and hydrologic conditions.
- **Westside Groundwater Basin, City of Daly City.** San Francisco and San Mateo Counties, CA. Since 1998, as a consultant to Daly City, Mr. Fio has provided key technical analyses and consensus building efforts toward improved management of the Westside Groundwater Basin located in San Francisco and San Mateo Counties. The basin is a source of drinking water for the City of San Francisco, City of Daly City, Town of Colma, City of South San Francisco (Cal Water), and City of San Bruno. John was a key contributor toward development of the basin management plan and directed development and technical acceptance of the groundwater-flow model utilized to quantify basin hydrogeology. The effort to achieve model consensus required extensive coordination and effective communication with multiple basin stakeholders and their technical representatives. The model has since been employed to design and analyze proposed groundwater development projects in the City of San Francisco and an in-lieu conjunctive use project in San Mateo County to increase drinking water supply reliability for the greater San Francisco Bay area.

Kristyn Lindhart

Hydrogeologist

Ms. Lindhart has over eight years of professional experience supporting agencies and public sector clients with water resources projects including groundwater resource evaluations, Urban Water Management Plans (UWMPs), and water supply and quality assessments of groundwater basins. Her Sustainable Groundwater Management Act (SGMA) implementation and compliance experience includes annual reports and Groundwater Sustainability Plan (GSP) development. Ms. Lindhart conducts hydrogeology-related field-work and excels in evaluating and analyzing hydrogeologic data.



Relevant Experience

- Sacramento County, Cosumnes Subbasin GSP Development.** Sacramento County, CA. Ms. Lindhart is currently aiding in the Proposition 1 and Proposition 68 Grant Management and GSP development for the Cosumnes Subbasin SGMA Working Group. As part of Grant Management, she drafts the quarterly Progress Reports and invoices for submittal to DWR for grant re-imbursement. Ms. Lindhart had an integral part in the GSP development, as she supported project management tasks and drafted many sections of the GSP. She developed monthly presentations, summarizing the GSP development as it progressed throughout the duration of the project, and participated in the monthly Working Group meetings.
- Sacramento County, Cosumnes Subbasin Proposition 68.** Ms. Lindhart managed the application development process of the successful Cosumnes Subbasin's Prop 68 SGM Planning Grant Application, which secured the Subbasin \$750,000 of grant money and \$250,000 of cost share funds to support the GSP development and well installation project. She helped manage the various projects that were funded by this grant, including coordinating with subcontractors, contracting, and invoicing.
- City of Galt, City of Galt 2020 UWMP.** City of Galt, CA. Ms. Lindhart managed and drafted the City of Galt 2020 UWMP. As part of that effort, she compiled historical water use information, projected future demands based on population growth and water conservation assumptions, and assessed the City's development of recycled water and groundwater supplies. Ms. Lindhart evaluated their progress on reaching their targeted reductions as per Senate Bill X7-7, as well as demand management measures as they relate to supply reliability and demographic projections going forward.
- San Joaquin County Resource Conservation District, Irrigated Lands Regulatory Program Groundwater Quality Reporting.** San Joaquin Valley, CA. Ms. Lindhart assisted in drafting the Groundwater Quality Trend Monitoring (GQTM) program and the Quality Assurance Project Plan (QAPP) for the irrigated lands regulatory program groundwater quality reporting in San Joaquin County. She created a sampling network for the trend monitoring program this consisted of matching well logs to coalition members, choosing the best fitted wells, reaching out to the coalition member to volunteer their wells, coordinating with volunteers to canvass the wells. After canvassing the wells,

Education

- B.S., Hydrology, University of California, Davis, 2014

she created a list of ideal candidate wells, created maps showing the distribution of the wells, created tables and excel files of the wells information.

- **Somach, Simmons & Dunn.** *Potential Effects of Mixing Sacramento River Water and Groundwater for Aquifer Storage and Recovery*. Yolo County. Ms. Lindhart assisted in analyzing potential effects of mixing Sacramento River water and groundwater for aquifer storage and recovery. She collected water quality data from numerous wells, researched the hydrogeology and geology of the study area and created a geochemical model to assess clogging of the well screens due to mixing treated river water with groundwater. Additionally, she analyzed isotopic data from the well sampling and found surface water isotopic data from previous studies to estimate the river influence throughout the study area. Using the isotopic data, water quality data and model results she was able to determine which wells would be most ideal for aquifer storage via injection of the treated surface water.
- **RMC Water and Environment,** *Groundwater Recharge Sources Study*. Sacramento Valley, CA. Ms. Lindhart helped assess groundwater recharge sources within the Central basin in the Sacramento Valley. She collected and assessed chemical and isotopic analysis of rain, groundwater and surface-water samples. She coordinated with multiple agencies to gain access to wells to create network of wells for sampling. She performed the sampling of thirty municipal wells and one surface water site. She analyzed the laboratory results and created multiple water quality plots and maps. Using the combined isotopic dataset, she helped determine which wells were most influenced by different recharge sources. She created figures, tables and draft write-ups for the report.
- **RMC Water and Environment,** *South Westside Basin Shallow Groundwater Study*. San Mateo County, CA. Ms. Lindhart assisted with the South Westside Basin Shallow Groundwater Study. She coordinated sampling events and collected groundwater samples, including age-dating and isotopic samples, from monitoring wells with bladder pumps throughout the Westside Basin. She analyzed the laboratory results and performed quality assurance and quality control to make sure the analytical results were up to the correct standards. She performed statistical analysis on the water quality by creating piper plots and box plots. She provided ArcGIS support for modeling outputs. Additionally, she helped draft text, figures, and tables of the Technical Memorandum.
- **City of Lathrop,** *Groundwater Monitoring Program*. Lathrop, CA. Ms. Lindhart performs groundwater quality monitoring and analysis related to land application of wastewater. She analyzes and summarizes water quality results and water level measurements. She creates water level contours using the water the level measurements and performs quality assurance tests on the water quality results. She drafts text, tables and figures for the quarterly groundwater monitoring report. Additionally, she has collected soil samples, overseen monitoring well installations, overseen monitoring well abandonments, collected groundwater samples from nearby monitoring wells and performs a well condition survey every year.

Tyler F. Colyer, PE

Civil and Environmental Engineer

Mr. Colyer has over eleven years of project experience in water and wastewater infrastructure design and planning, water quality engineering, and environmental engineering. He has prepared and managed water supply studies, water treatment system designs, pipeline designs, infrastructure feasibility studies, and development water use reports, and provided construction management and construction observation. Mr. Colyer has played a key role in development of RFPs, scopes, budgets, and schedules. Additionally, he has experience in wastewater plant operations, maintenance, and engineering technical support.



Relevant Experience

- Marina Coast Water District, Groundwater Augmentation Planning and Recycled Water Grant Application.** Marina, CA. Project Engineer and Manager. Mr. Colyer served as Project Engineer for preparation of a feasibility study evaluating technical viability of groundwater augmentation through percolation and/or injection of Salinas River winter storm flows and/or tertiary treated wastewater, including preparation of preliminary cost estimates for construction of each groundwater augmentation scenario. As a follow up to the study, Mr. Colyer prepared a successful application on behalf of MCWD for a State Water Resources Control Board (SWRCB), Clean Water State Revolving Fund recycled water planning grant. This \$150,000 study is 50% funded by a grant from the Clean Water State Revolving Fund program and is being written to adhere to the SWRCB's Water Recycling Funding Program Guidelines. The recycled water feasibility study will identify preferred locations for indirect potable reuse injection wells and will include construction of a groundwater-flow model and conceptual design of a recommended project alternative.
- Marina Coast Water District, Monterey One Water, and Fort Ord Reuse Authority, Fort Ord Reuse Authority Water Augmentation Study.** Marina, CA. Project Engineer. Mr. Colyer prepared a series of four technical memoranda for Marina Coast Water District, Monterey One Water, and the Fort Ord Reuse Authority to identify approximately 1,000 acre feet per year of water supply that will augment MCWD's existing supply portfolio, in order to serve the redevelopment of the Fort Ord Community. Mr. Colyer worked with the three parties to establish strategic goals and selection criteria to screen a variety of water source alternatives. Mr. Colyer developed conceptual cost estimates for the top three alternatives (two indirect potable reuse alternative and one desalination alternative) and evaluated these alternative through a costs/benefit analyses to identify a recommended project. Location options for the recommended indirect potable reuse project have been evaluated and future work needs were identified, which MCWD plans to implement prior to further project development.
- Diablo Water District and Ironhouse Sanitary District, Recycled Water Feasibility Study.** Oakley, CA. Project Engineer. Mr. Colyer prepared a recycled water feasibility study to identify recycled water projects that will benefit the mutual customer base shared by Diablo Water District (DWD) and Ironhouse Sanitary District (ISD). Ironhouse Sanitary District currently produces recycled water that is appropriate for unrestricted reuse but primarily discharges this effluent to the San Joaquin River. The feasibility study developed and evaluated numerous recycled water projects including recycled water distribution alternatives, potable reuse alternatives, and groundwater augmentation alternatives. Project cost and energy use estimates were prepared for each alternative, as well as an evaluation of qualitative criteria such as constructability, ease of maintenance, and

Education

- M.S., Civil and Environmental Engineering, University of California, Berkeley, 2010
- B.S., Environmental Engineering, University of California, Riverside, 2009

Registrations/Certifications

- Professional Civil Engineer in California (C #80141) and Arizona (#64179)
- Forty-hour HAZWOPER Training Course

community benefits. A conceptual design and financing plan were prepared for the recommended project alternative and a series of next steps were included as part of the study.

- **City of East Palo Alto, Gloria Way Well.** East Palo Alto, CA. Project Engineer. Mr. Colyer prepared engineering plans and specifications for the construction of a groundwater treatment system for potable water use at the City of East Palo Alto's Gloria Way Well. The system includes a submersible well pump, iron and manganese treatment system, chemical amendments, Hetch-Hetchy blending system with booster pump station, and a surge tank. Mr. Colyer also assisted the City with the reactivation and permitting of the existing Gloria Way Well, as well as provided engineering services during construction for the Project. In addition, Mr. Colyer worked closely with the City to secure \$3 million of Proposition 84 grant funding to support the City's groundwater development efforts.
- **City of East Palo Alto, Pad D Well.** East Palo Alto, CA. Project Engineer. Mr. Colyer prepared engineering plans and specifications for the construction of a new well and groundwater treatment system for potable water use at the future Pad D Well site. The system is anticipated to be used primarily for emergency purposes and will include a submersible well pump, chemical amendments, and a hydropneumatic tank. The footprint for the system was optimized due to the very small parcel and room must be reserved for potential future treatment units.
- **City of East Palo Alto, Water System Master Plan.** East Palo Alto, CA. Project Manager. Mr. Colyer is overseeing the preparation of the City of East Palo Alto's Water System Master Plan Update. The project includes construction of a new hydraulic model, water demand projections, a risk-based capital improvement plan and a recycled water feasibility evaluation. Cost estimates and schedules will be prepared for each recommended capital improvement project.
- **Valley of the Moon Water District, Well 5A Municipal Supply Well.** El Verano, CA. Project Engineer. Mr. Colyer served as Project Engineer for the mechanical design of the project which includes a new submersible well pump, piping, and appurtenances; and rehabilitation of the existing iron and manganese filtration system. Mr. Colyer also served as Project Manager for the project's construction management services.
- **North Coast County Water District, Recycled Water Planning Study.** Pacifica, CA. Project Manager. Mr. Colyer oversaw the preparation of a recycled water planning study to identify recycled water users within the North Coast County Water Districts service area and to develop conceptual distribution projects that will serve these users. Project cost and energy use estimates were prepared for each alternative, as well as a recommendation for a project to pursue further. Findings were presented to the District's Board of Directors and Mr. Colyer is continuing to advise the District on their recycled water operations and planning efforts.

This section provides references from 3 agencies that BWA has worked with recently. Numerous additional references are available on request.



City of Benicia

BWA has assisted the City of Benicia on a range of financial consulting assignments. We most recently assisted the City in 2021 with development of comprehensive water and sewer rate studies. The rate studies included evaluation of a range of capital improvement funding scenarios designed to support system improvements identified in the City's *2020 Water and Wastewater Master Plans and Major Facilities Condition Assessments*, as well as various scenarios with reduced levels of capital funding designed to support only the highest-priority and most critical infrastructure needs over the next five years.

Rate projections for each scenario were designed to support the City's adopted operating budgets for each utility as well as prudent levels of infrastructure and equipment maintenance to support safe and reliable water and wastewater service. The proposed rates incorporated both overall rate increases as well as some modifications to the City's water and wastewater rate structures designed to improve rate equity. Rate increases were phased in gradually over five years to minimize the annual impacts on City customers.

In 2020, BWA developed updated and modified the City's water and wastewater capacity charges to equitably recover the costs of infrastructure benefitting new development.

Reference..... Kyle Ochendusko, Interim Public Works Director
kochendusko@ci.benicia.ca.us / (707) 746.4240

City of Modesto

BWA has assisted the City of Modesto with a number of projects over the past decade. Most recently, we developed a long-term wastewater enterprise financial plan and rate study. We are currently assisting the City with development of a comprehensive water rate study. The water and wastewater rate studies are designed to support the City's operating and capital programs and also included modifications to the wastewater rate structure to improve equity.



Wastewater Rate Analysis: In 2012, following litigation initiated by a large industrial wastewater customer against the City, BWA was retained to work closely with City staff and special counsel Jarvis Fay to develop a Wastewater Cost of Service Review for the Cannery Segregation Line (Can-Seg). BWA met with City staff and the attorneys several times to develop and refine the cost of service analysis for the peak Can-Seg customers. The analysis was used in settlement talks with the litigant which ultimately resulted in a 2014 Tolling Agreement between the City and the Can-Seg customers.

In 2015, BWA was retained to work with the City and the Can Seg customers to develop a new wastewater rate structure based on the 2014 Tolling Agreement. Working closely with an accountant hired by the City's large industrial customers, BWA developed a separate large industrial rate structure and capacity fee schedule for cannery customers. BWA also developed new rates reflecting the City's tertiary treatment stream and secondary treatment "scalping." We met with stakeholder groups, the wastewater master planning engineering team, Finance Committee, and City Council on many occasions to vet our recommendations and gain consensus. Our rate study was implemented by City Council April 2016.

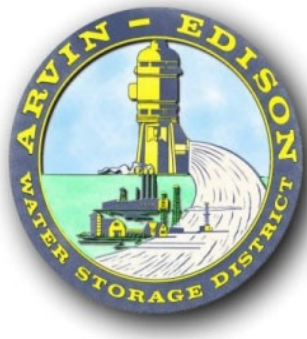
Water Rate Analysis: In 2015, the City of Modesto contracted with Bartle Wells Associates to provide a comprehensive water rate and connection fee study. The City had not raised its rates since 2014 and was facing a significant loss of revenue due to drought conditions. Moreover, the City had been contacted by its bondholders regarding how the City would respond to the loss of revenue and meet its debt service coverage requirements.

BWA developed two financial planning alternatives for the City's water utility. Option 1 consisted of funding only high priority capital improvements and Option 2 fully funded all needed capital projects. The financial plans considered the refunding of existing debt, the issuance of new debt, a phased-in rate increase, and a drawdown of fund reserves.

Another task in the rate study was to evaluate the cost of service for the City's outlying service areas. In the mid-1990's, the City purchased small groundwater systems serving the areas of Del Rio, Grayson, and a portion of the City of Turlock. These areas are non-contiguous and do not receive surface water that is provided to the inner-City system. BWA calculated the accumulated reserves of each area, water quality issues, maintenance costs, and the capital improvement plan to determine the individualized cost of service for each area.

Ultimately, the City elected to pursue an average cost approach which treats the entire water utility as one entity with one rate schedule. BWA's final rate recommendation used the average cost approach and the American Water Works Association's commodity-demand method to allocate costs to customer service, capacity, and water use. BWA provided a drought rate option based on a long-term reduction in water use of 33% compared to 2013 water use and a rate option reflecting permanent conservation of 25% relative to 2013 water use. The rate recommendation was adopted by City Council on August 9, 2016.

Client Reference William Wong, P.E., Sr. Engineer
wwong@modestogov.com / (209) 571-5801



Arvin-Edison Water Storage District

Arvin-Edison Water Storage District provides irrigation water to prime agricultural farmland southeast of Bakersfield in Kern County, California. The District's supplies water to approximately 52,000 acres within its 132,000 acre service area. Water service is provided pursuant to Water Service Contracts with landowners receiving service. The contracts authorize the District to raise, or lower, rates as needed to fund operations. The District has contractual rights with USBR for imported water delivered through the Central Valley Project and operates a water banking program with Metropolitan Water District of Southern California. Excess water is imported in wet years and stored in the groundwater aquifer for use in dry years. Finances vary widely from year to year with the District experiencing substantially higher costs in dry years due to the cost of pumping stored water out of the aquifer.

Bartle Wells Associates has assisted the District with a range of financial consulting assignments over many years. Most recently, BWA has been working to develop a 10-year financial plan to identify future funding needs, evaluate financing alternatives for approximately \$95 million of capital improvements, and identify rate increases needed to support implementation of the plan. The District's capital improvement program includes roughly \$55 million for SGMA-related projects designed to support compliance with the District's recently-developed Groundwater Management Plan.

In addition, BWA has served as independent financial advisor to the District since 2008. In 2008, BWA helped the District secure a \$7.5 million loan via a competitive sale process. BWA developed a comprehensive RFP and worked with various banks and lenders to get them comfortable with the District's finances and credit. The winning bidder noted that information provided by BWA resulted in a lower-cost bid than the bank would have normally provided. In 2010, BWA evaluated financing alternatives for funding the District's buyout of USBR water supply facilities and served as financial advisor on the issuance of both a \$19.9 million loan and an \$8.3 million refunding loan. In 2013, BWA assisted the District with a \$6.1 million refunding to achieve savings. In 2019, BWA helped the District refinance outstanding debt at lower interest rates to achieve savings.

Client Reference David Nixon, Deputy General Manager
danaewsd@aol.com / (661) 854-5573



BARTLE WELLS ASSOCIATES **BILLING RATE SCHEDULE 2022** Rates Effective 1/1/2022

Professional Services

Financial Analyst I	\$110 per hour
Financial Analyst II	\$140 per hour
Consultant	\$170 per hour
Senior Consultant.....	\$200 per hour
Senior Project Manager	\$230 per hour
Principal Consultant	\$270 per hour

The hourly rates for professional services include all overhead and indirect expenses. Bartle Wells Associates does not charge for administrative support services. Expert witness, legal testimony, or other special limited assignments will be billed at one and one-half times the consultant's hourly rate.

Direct Expenses

Subconsultants will be billed at cost plus ten percent. Word processing and computer-assisted services related to official statement production are charged as direct expenses at \$75 per hour. Other reimbursable direct expenses incurred on behalf of the agency will be billed at cost plus ten percent. These reimbursable costs include, but are not limited to:

- Travel, meals, lodging
- Printing and photocopying
- Special statistical analysis
- Outside computer services
- Bond ratings
- Automobile mileage
- Messenger services and mailing costs
- Graphic design and photography
- Special legal services
- Legal advertisements

Insurance

Bartle Wells Associates maintains insurance in the amounts and coverage as provided in the attached schedule of insurance. Additional or special insurance, licensing, or permit requirements beyond what is shown on the schedule of insurance are billed in addition to the contract amount.

Payment

Fees are typically billed monthly for the preceding month and will be payable within 30 days of the date of the invoice. A late charge of 1.0 percent per month may be applied to balances unpaid after 60 days.

SCHEDULE OF CHARGES FOR EKI ENVIRONMENT & WATER, INC.

<u>Personnel Classification</u>	<u>Hourly Rate</u>
Officer and Chief Engineer-Scientist	307
Principal Engineer-Scientist	296
Supervising I, Engineer-Scientist	286
Supervising II, Engineer-Scientist	276
Senior I, Engineer-Scientist	265
Senior II, Engineer-Scientist	255
Associate I, Engineer-Scientist	244
Associate II, Engineer-Scientist	230
Engineer-Scientist, Grade 1	214
Engineer-Scientist, Grade 2	202
Engineer-Scientist, Grade 3	185
Engineer-Scientist, Grade 4	165
Engineer-Scientist, Grade 5	145
Engineer-Scientist, Grade 6	128
Project Assistant	130
Technician	116
Senior GIS / Database Analyst	150
CADD Operator / GIS Analyst	133
Senior Administrative Assistant	147
Administrative Assistant	115
Secretary	96

Direct Expenses

Reimbursement for direct expenses, as listed below, incurred in connection with the work will be at cost plus fifteen percent (15%) for items such as:

- Maps, photographs, reproductions, printing, equipment rental, and special supplies related to the work.
- Consultants, soils engineers, surveyors, drillers, laboratories, and contractors.
- Rented vehicles, local public transportation and taxis, travel, and subsistence.
- Special fees, insurance, permits, and licenses applicable to the work.
- Outside computer processing, computation, and proprietary programs purchased for the work.

A Communication charge for e-mail access, web conferencing, cellphone calls, messaging and data access, file sharing, local and long distance telephone calls and conferences, facsimile transmittals, standard delivery U.S. postage, and incidental in-house copying will be charged at a rate of 4% of labor charges. Large volume copying of project documents, e.g., bound reports for distribution or project-specific reference files, will be charged as a project expense as described above.

Reimbursement for company-owned automobiles, except trucks and four-wheel drive vehicles, used in connection with the work will be at the rate of sixty cents (\$0.60) per mile. The rate for company-owned trucks and four-wheel drive vehicles will be seventy-five cents (\$0.75) per mile. There will be an additional charge of thirty dollars (\$30.00) per day for vehicles used for field work. Reimbursement for use of personal vehicles will be at the federally allowed rate plus fifteen percent (15%).

CADD Computer time will be charged at twenty dollars (\$20.00) per hour. In-house material and equipment charges will be in accordance with the current rate schedule or special quotation. Excise taxes, if any, will be added as a direct expense.

Rate for professional staff for legal proceedings or as expert witnesses will be at a rate of one and one-half times the Hourly Rates specified above.

The foregoing Schedule of Charges is incorporated into the Agreement for the Services of EKI Environment & Water, Inc. and may be updated annually.

June 10, 2022

Submitted electronically via email
info@cosumnesgroundwater.org

Cosumnes Groundwater Authority
Austin Miller, Administrator for the
Cosumnes Groundwater Authority
8970 Elk Grove Blvd.
Elk Grove, CA 95624

Re: Statement of Qualifications for Groundwater Fee Study Development

Dear Mr. Miller:

SCI Consulting Group and teammate, Larry Walker Associates, Inc. (LWA), (hereto collectively referred to as “the SCI Team”) have direct experience in data and fee analysis, and rate setting for public agencies specifically with respect to setting fees and rates pursuant to Propositions 26 and 218 as they relate to the Sustainable Groundwater Management Act.

The SCI Team is pleased to submit, for your review, this Statement of Qualifications (“SOQ”) for Data Review, Fee Analysis and Rate Setting Services to the Cosumnes Groundwater Authority (“Authority”). We have reviewed the Authority’s Request for SOQ and the supporting documents, and this SOQ includes all tasks potentially required for this project.

By way of introduction, SCI is a California Chapter S Corporation formed in 1985 uniquely focused on revenue enhancement services for public agencies, including planning, designing, justifying and successfully establishing new districts, zones, and associated revenues for their service and capital improvement needs, and managing special assessment levies.

EXPERTISE ON PROPOSITIONS 13, 26 AND 218 Throughout the process of designing and establishing new Proposition 13, 26 and 218-compliant fees and benefit assessments and working on these projects with many of the leading specialized attorneys in the State, we have gained unparalleled legal and Proposition 13, 26 and 218 compliance expertise.

KNOWLEDGE OF SACRAMENTO AND AMADOR COUNTIES We have provided consulting and revenue engineering services to many public agencies in Sacramento and Amador Counties, including the City of Sacramento and many special districts. SCI has conducted community outreach and ballot measures and implementations of fees to affected parcels in Sacramento and Amador Counties.

SCI

- City of Sacramento
- Cosumnes CSD
- Delta Fire Protection District
- Fair Oaks RPD

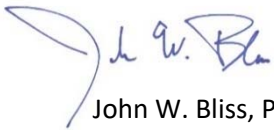
- Reclamation District 349
- Reclamation District 1000
- CAL FIRE – Sacramento County
- CAL FIRE – Amador County
- Amador Water District
- Amador County Recreation Authority

LWA

- Sacramento County Groundwater Authority
- Sacramento Regional County Sanitation District
- City and County of Sacramento
- City of Manteca
- City of Stockton
- Sacramento Area Flood Control Agency
- Omoichumne-Hartnell Water District

We look forward to this opportunity to assist the Authority with this important project and stand ready to proceed. If you have any questions or require additional information, please do not hesitate to contact me.

Sincerely,



John W. Bliss, P.E.,
President

PROPOSED RESPONDENT TEAM (RESUMES)

SCI and LWA have worked successfully together, and continue to work together on numerous projects, primarily for stormwater and groundwater sustainability. LWA provides groundwater sustainability expertise and SCI provides funding expertise. John Bliss will serve as the Principal Engineer on the project with Ryan Aston serving as the day-to-day Project Manager. LWA staff will provide analytical support.

John Bliss, M.Eng., P.E., President, License No. C52091

SCI

john.bliss@sci-cg.com

Mr. Bliss, a professional engineer, and President of SCI, specializes in fee and assessment engineering, cost estimating and budgeting, database design and implementation, regulatory compliance, and revenue measure formations. He has 20 years of experience in this field of expertise. Moreover, Mr. Bliss is a recognized expert assessment engineer and Proposition 218 compliance specialist who has served as an expert witness and technical authority. He also has worked with most of the leading Proposition 218 specialized attorneys in the State, which has further expanded his professional and technical expertise.

During his tenure at SCI, Mr. Bliss has served as the responsible Assessment Engineer on over 300 Fee Studies and Engineer's Reports for new or increased fees and assessments, comprising more post-Proposition 218 new assessment engineering than any other assessment engineer in the State. Mr. Bliss graduated from Brown University with a Bachelor of Science Degree in Engineering and holds a master's degree in Civil Engineering from The University of California, Berkeley, where he was a Regent's Scholar. He is a licensed Professional Civil Engineer in the State of California and is a LEED accredited professional.

Jerry Bradshaw, P.E., License No. C45884

SCI

jerry.bradshaw@sci-cg.com

Mr. Bradshaw is the retired Public Works Director from the City of El Cerrito with over 30 years' experience in public works management and funding. Since 2014 he has worked with SCI Consulting Group, where he has worked with dozens of client cities and special districts to develop and administer funding sources for all sorts of public works improvements. His specialty at SCI is stormwater and groundwater funding, where he has been the project manager for over 15 agency efforts for water-related funding, including financial analyses, fee studies, opinion surveys, ballot measures and community engagement. He has also been a regional leader in green infrastructure funding. He is a licensed Civil Engineer and has a BS in Civil Engineering from the University of Colorado at Denver.

Ryan Aston, Project Analyst

Project Manager – SCI

ryan.aston@sci-cg.com

Ryan Aston, Project Analyst, brings 10 years of customer service and data analysis experience to SCI. He specializes in funding options for groundwater sustainability, including identification of viable methodologies and analysis of parcel attributes that contribute to mutually beneficial funding solutions. Mr. Aston has presented such findings at GSA Governing Board and Community Meetings and annual conferences. He also works closely with the SCI team to assist in public opinion research and in Proposition 218-compliant fees, taxes, and benefit assessments. Mr. Aston has worked with cities, counties, and special districts on a variety of different projects. He earned his B.A. in Politics from the University of California, Santa Cruz, with emphases in political economy and municipal government.

Ms. Elzufon has over 30 years' experience in private industry in the areas of chemical engineering, industrial processes, regulatory assistance, project management and source control. She coordinates wastewater permit renewal for discharges to surface water (NPDES) and discharges to land (WDRs) and permit implementation efforts for clients throughout California, including the Los Angeles, Central Coast, Central Valley and Lahontan Regions. She is actively supporting the management of GSP development projects for clients in Northern California, including assisting Sierra Valley, Siskiyou County and Ukiah Valley with grant reporting requirements and project management.

Dr. Foglia is an Associate Engineer assisting with projects in the areas of hydrological modelling, groundwater management assistance, and managed aquifer recharge. At LWA, she leads the groundwater services for the Ukiah Basin Groundwater Sustainability Agency, the development of Groundwater Sustainability Plans for Siskiyou County, and for the South American Subbasin Sacramento Central Groundwater Authority, and she is designing and implementing groundwater recharge projects for the Omoichumne-Hartnell Water District and the Scott Valley Irrigation District. Since January 2016, Dr. Foglia is also an Adjunct Faculty Staff in the Land, Air, and Water Resources (LAWR) Department at the University of California, Davis, where she teaches a graduate class on groundwater models and model calibration.

Rich Pauloo, Ph.D., is a Project Scientist with Larry Walker Associates, and a hydrogeologist, data scientist, and programmer. He has built simulations of groundwater flow and contaminant transport, open-source frameworks for real-time groundwater monitoring, and models that predict if a well may run dry during drought or unsustainable management. Dr. Pauloo brings over 6 years of experience in physical science (earth science, statistical methods, optimization, mapping), computing (sensor networks, open-source software development), and groundwater modeling. As the technical task lead for GSP development for the medium priority South American Subbasin GSP, Dr. Pauloo developed Sustainable Management Criteria and conducted ad-hoc scientific studies of groundwater, well protection, interconnected surface water, and groundwater dependent ecosystems. His water-related data science work has won national and statewide awards from NASA, Microsoft, the National Science Foundation, the American Geophysical Union, and the California Water Board.

Mr. Applegate is a Project Scientist and hydrologist with work experience at LWA in the groundwater, agriculture, watershed, and stormwater service areas. Mr. Applegate's experience at LWA includes assisting clients with SGMA compliance, Regional Water Board negotiation during Waste Discharge Requirements renewals, stormwater permit compliance, TMDL compliance assessment, NPDES permit assistance, completion of groundwater technical reports, monitoring and reporting programs, and water quality assessments. Mr. Applegate provides a range of services including data management and analysis, participation in monitoring and special studies, compliance and communication with Regional Waterboards, and regulatory analysis. Prior to LWA, Mr. Applegate modeled impacts to groundwater quality from agricultural production in the Central Valley.

INTRODUCTION AND OVERVIEW

SCI CONSULTING GROUP

SCI Consulting Group is a privately-owned California Chapter S corporation headquartered in Fairfield, California, with over 35 years of expertise in assisting public agencies in California with planning, justifying and successfully establishing new revenues for their service and capital improvement needs and objectives and managing special assessment levies. SCI has a staff of 25 employees and over 150 current city, county, special district, and school district clients. SCI also offers extensive expertise with the important legal and procedural issues involving benefit assessments, special taxes, and fees. The principals at SCI are acknowledged experts on these public financing mechanisms and were involved with the cleanup legislation for Proposition 218.

EXPERIENCE WITH FUNDING FOR IMPLEMENTATION OF GROUNDWATER SUSTAINABILITY PLANS including:

- Ukiah Valley Basin GSA (Mendocino County)
- Butte Valley GSA (Siskiyou County)
- Scott Valley GSA (Siskiyou County)
- Shasta Valley GSA (Siskiyou County)
- Sierra Valley Groundwater Management District GSA (Sierra County)
- Santa Rosa Plain GSA (Sonoma County)
- Sonoma Valley GSA (Sonoma County)
- Petaluma Valley GSA (Sonoma County)
- Los Osos Basin Management Committee (San Luis Obispo County)

RECENT WATER-RELATED RATE STUDIES including:

- Santa Rosa Plain GSA
- Sonoma Valley GSA (in progress)
- Petaluma Valley GSA (in progress)
- City of Alameda
- City of Berkeley
- City of Cupertino
- City of Davis
- City of Los Altos
- Town of Moraga

ATTACHMENTS

For reference, please see attached Fee Study and Funding Options Reports:

- Santa Rosa Plain Groundwater Sustainability Agency – Rate and Fee Study
- Ukiah Valley Basin Groundwater Sustainability Agency - Funding Options Technical Memorandum

SCI possesses extensive assessment, tax and fee engineering and formation expertise, including polling and outreach, particularly for balloted agency-wide assessments in politically challenging areas. These successful agency-wide assessments include all the largest successful assessments in the State as well.

LARRY WALKER ASSOCIATES, INC.

LWA is a privately-owned corporation providing environmental engineering and management services throughout California. Headquartered in Davis, CA, LWA has regional offices in Santa Monica, Carlsbad,

Berkeley, San Jose, and Ventura, as well as an office in Seattle, Washington. Founded in 1979, LWA has been a partner, innovator, and industry leader, assisting municipalities and private businesses in navigating and solving complex and important environmental and public policy challenges. LWA provides a wide range of consulting services ranging from traditional water and wastewater engineering to highly specialized water resource management; groundwater modeling, scenario analysis and sustainable planning; surface water and groundwater monitoring; and stormwater and watershed management.

The SCI Team is uniquely qualified to provide the Authority with the highest quality consulting services for the proposed tasks, as detailed in the follow section, including:

- Direct experience with all aspects of GSP implementation funding
- Direct experience with public agencies engagement and funding analysis and strategy
- Considerable success with fee, assessment and tax implementation (over 140 California successes)
- Propositions 13, 26 and 218 expertise
- Specific groundwater sustainability community outreach expertise

SUBCONTRACTORS

Sci will serve as the prime contractor and LWA will subcontract with SCI. No other subcontractors will be used.

SCOPE OF WORK

The SCI Team has thoroughly reviewed the Authority's' Request for SOQ and is well qualified to complete all tasks described in the Project Description.

REFERENCES

Below are summaries of the work from recent and relevant projects for the SCI Team. We encourage you to contact these clients regarding our experience and approach.

Sonoma Valley, Petaluma Valley, and Santa Rosa Plain Groundwater Sustainability Agencies **SCI**

Sonoma and Petaluma Valley GSAs

404 Aviation Boulevard

Santa Rosa, CA 95403

Contact: Ann DuBay, Administrator

Telephone: (707) 524-8378

E-mail: Ann.DuBay@scwa.ca.gov

Santa Rosa Plain GSA

2235 Mercury Way, Suite 105

Santa Rosa, CA 95407

Contact: Andy Rodgers, Administrator

Telephone: (707) 243-8555

E-mail: arodgers@santarosaplaingroundwater.org

Project Staff: John Bliss, Jerry Bradshaw, and Ryan Aston, SCI, Betsy Elzufon and Rich Pauloo, LWA

The Sonoma Valley, Petaluma Valley, and Santa Rosa Plain groundwater sustainability agencies (as a joint project) sought to update and develop their databases and explore various funding mechanism options for groundwater sustainability plan implementation. The scope of work was broken down into two projects: 1) Rural Community Engagement Strategies and Revenue Recommendations; and 2) Data Review, Fee Analysis, and Rate Setting Services.

Rural Community Engagement Strategies and Revenue Recommendations included extensive community outreach, utilizing public opinion surveys and focus groups to identify community perspective and preferences surrounding funding for sustainable groundwater management. Utilizing the results of these efforts, the SCI Team compiled a Funding Options Technical Memorandum for each Basin, tying Agency needs and community preferences to optimal funding mechanisms.

Data Review, Fee Analysis, and Rate Setting Services included in-depth analysis of various funding options using parcel-specific data, numerous community meetings, development of viable datasets detailing groundwater use, and development of robust fee studies for each Agency. The SCI Team analyzed fee studies from across the State, as well as a prior Fee Study Report completed for the Santa Rosa Plain GSA in 2019 in order to determine the best path forward for each Agency.

For each of the three GSAs, the SCI Team worked closely with GSA Agency staff, member agency staff, Advisory Committees, Boards, and various stakeholders throughout the process, utilizing a comprehensive approach to identifying community preferences and viable data in support of fee and rate development. To date, the SCI / LWA team has made over 40 PowerPoint presentations since September 2021.

Los Osos Area Subbasin Management Committee**SCI**2122 9th St.

Los Osos, CA 93402

Contact: Dan Heimel, BMC Executive Director

Telephone: (805) 459-8498

E-mail: danheimel@ConfluenceES.com

Project Staff: Ryan Aston and John Bliss, and Jerry Bradshaw

The Los Osos Basin Management Committee sought to develop funding options for Committee administration and capital projects required to increase the Basin's sustainable yield. SCI provided in-depth analysis of Basin needs and community preferences, including optimal funding mechanisms for different aspects of groundwater management in Los Osos. SCI developed parcel-specific data for the Basin's Plan Area, detailing various aspects of groundwater use that contribute to a comprehensive understanding of options relating to funding mechanism methodology and rate of apportionment.

The complex and unorthodox governance structure of the BMC introduced unique challenges to funding mechanism viability, as the Committee is not a GSA and thus does not retain the funding authority granted by California Water Code § 10730 and § 10730.2. In working closely with Member Agency staff and counsel, SCI was able to identify viable mechanisms that suit the needs of the BMC.

Ukiah Valley Basin Groundwater Sustainability Agency**LWA**

501 Low Gap Road

Ukiah, CA 95482

Contact: Amber Fisette, Deputy Director of Transportation

Telephone: (707) 234-2838

E-mail: fisettea@mendocinocounty.org

Project Staff: Betsy Elzufon, Rich Pauloo, and Laura Foglia

Beginning in 2018, LWA has led a consultant team to work with the Ukiah Valley Basin Groundwater Sustainability Agency (UVBGSA) in developing a groundwater sustainability plan (UVBGSP) for the Ukiah Valley groundwater basin. The LWA Team which included SCI assisted UVBGSA with evaluating the most cost- and resource-effective plan toward groundwater sustainability, in compliance with SGMA requirements. The plan was successfully submitted in January 2022.

A key component of the LWA effort is the development of the Integrated Hydrological Model for the entire Upper Russian River watershed. The model was developed and calibrated using current groundwater heads and streamflow measurements, and is now used to simulate future climate scenarios as well as management scenarios. LWA's efforts included program management and client coordination; facilitation and outreach; analysis of existing data and evaluation of enhancements to the data collection network; supporting UVBGSA with applications for Technical Support Services with the Department of Water Resources; coordination with neighboring subbasins and parallel efforts; development of sustainability goals, measurable objectives and management scenarios; development of UVBGSP implementation plan; and preparation of the UVBGSP. Extensive communication with UVBGSA members and Ukiah Valley stakeholders ensures that groundwater management remains at the local level, while sustainably managing groundwater resources. LWA continues to help Ukiah Valley with GSP implementation of projects and management actions, development of the annual report template, grant completion report and quarterly grant invoicing support.

8970 Elk Grove Blvd.

Elk Grove, CA 95624

Contact: Mike Wackman, General Manager

Telephone: (916) 682-5958

E-mail: info@ohwd.com

Project Staff: Laura Foglia and Rich Pauloo

Omochumne-Hartnell Water District (OHWD) received funding in 2011 to implement a groundwater banking project through a Proposition 84 Integrated Regional Water Management (IRWM) grant submitted by the Regional Water Authority (RWA). As part of an on-call contract, Larry Walker Associates, Inc. (LWA) assisted OHWD in repurposing the existing grant into an off-season irrigation project to enhance aquifer recharge to the underlying groundwater aquifer and the South American and Cosumnes groundwater basins.

LWA provides overall project management for the planning, design, engineering, and construction of surface water diversion pumps and conveyances along the lower Cosumnes River and any irrigation design modifications that would allow groundwater recharge on the identified land parcels.

LWA assisted with installing new or identifying existing monitoring well(s) or monitoring well network(s) in the vicinity of the irrigation flooding to provide a means to assess and quantify groundwater impacts. Every year, LWA applies to SWRCB for the environmental permit needed for water diversion and provides the environmental documentation, reports, and compliance with all federal and state environmental regulations necessary to accomplish the work.

LWA's efforts include:

- Ongoing stakeholder coordination
- Putting together RFPs to irrigation system design and monitoring well installation
- Mapping and GIS shapefiles creation
- Site selection and characterization of the recharge site locations
- Regulatory permitting assistance
- Calculations for water application rates
- Overseeing groundwater monitoring network installation and ongoing monitoring implementation

ADDITIONAL INFORMATION

CURRENT SCI AND LWA PROJECTS

- a. The SCI Team is currently developing Fee Studies for Sonoma Valley GSA, Petaluma Valley GSA, and Santa Rosa Plain GSA in Sonoma County (the Santa Rosa Plain GSA draft study is now published and is included as an attachment herein). Utilizing a combination of actual and estimated groundwater use to create parcel-specific databases, these Fee Studies will be used to establish regulatory fee programs in each Basin beginning with fiscal year 2022-23. This process has included multiple community meetings for each GSA, numerous Board and Advisory Committee presentations, and close collaboration with Agency staff.
- b. The SCI Team has provided Funding Options and Recommendations consulting in support of GSP implementation to the following GSAs: Ukiah Valley Basin GSA, Butte Valley GSA, Scott Valley GSA, Shasta Valley GSA, and Sierra Valley Groundwater Management District GSA. For this work, the SCI Team analyzed the costs associated with GSP implementation as well as the specific parcels,

wells, water pumped, political and historical environment, and other attributes of each basin to develop specific options and recommendations.

- c. The SCI Team has developed robust, Proposition 218-complaint Property Related Fee Studies for the water infrastructure (primarily storm drainage) for the Cities of Alameda, Berkeley, Cupertino, Davis, Del Mar and Los Altos, and the Town of Moraga over the last 4 years - more than all other firms in the state, combined. These Fee Studies require an in-depth cost-of-services analysis, long range budgets including administrations, operations and maintenance, and capital improvements, and strict adherence with Proposition 218 and the associated judicial decisions.

Each of these Fee Studies is the basis for a fee rate. The SCI team works closely with agency staff, stakeholders, and the greater community (we typically conduct a survey) to develop goals and develop a fee methodology and rates that balance attributes including optimal revenue generation, reasonable and equitable distribution of revenue burden amongst various rate payers, administrative ease, legal defensibility, ease of understanding, etc.

- d. Presently, LWA is actively involved in the development and implementation of six Groundwater Sustainability Plans (GSPs) for medium priority basins, which includes end-to-end database design, hydrogeologic data analysis, hydrologic modeling, natural resource monitoring, regulatory interpretation, and report preparation. LWA is now supporting the GSAs with ongoing data collection and administration and is helping with the development and preparation of implementation grant applications

- **County of Mendocino** – lead consultant for development of Ukiah Valley GSP. Includes Financial Evaluation task led by SCI. LWA worked with the County to develop costs of Projects and Management Actions along with costs to implement the GSP. Tasks also include model development and characterization of current and historic conditions, development of sustainable management criteria, projects and managements and other required GSP elements.
- **Sacramento County Groundwater Control Authority** – Lead for consultant team developing the South American Subbasin GSP with responsibilities for developing sustainable management criteria, monitoring network evaluation and development of projects and management actions along with coordination with adjacent basins.
- **Sierra Valley Groundwater Management District** – Lead consultant for development of the Sierra Valley Subbasin GSP. Includes stakeholder engagement, financial evaluation led by SCI, SMC and PMA development along with Financial Evaluation task led by SCI and data management in coordination with DBS&A.
- **Siskiyou County** – Lead consultant for development of 3 GSPs (Scott Valley, Shasta Valley and Butte Valley). Includes financial evaluation task led by SCI along with the same elements as described above for the other GSPs and includes data collection and management tasks.

THE SCI TEAM'S DATA ANALYSIS AND DATABASE DEVELOPMENT EXPERIENCE

Both SCI and LWA are very experienced in database design, development, maintenance, analysis and reporting. For these tasks, LWA would lead the development of the groundwater characteristics while SCI would lead the development of the parcel characteristics.

- a. SCI routinely works with large data sets analyzing and processing property related data. In fact, SCI manages over 13 million parcels in dBase data sets including nearly all 58 California County Assessors data. SCI has developed numerous complex data sets, relational and flat file with complex table schema.

Within the context of groundwater management under SGMA, LWA has been working with GSAs to address the questions and concerns of diverse stakeholder groups that include water agencies, conservation agencies, environmental nonprofits, agricultural and ranching interests, and rural domestic well owners. Our work on GSP development includes end-to-end database design, hydrogeologic data analysis, hydrologic modeling, natural resource monitoring, regulatory interpretation, and report preparation. Additionally, LWA has experience in interbasin coordination, and frequently coordinates technical work products with other project consultants. We have also developed and continue to maintain databases along with annual data analysis and reporting for watershed groups (e.g., Calleguas Creek Watershed Stakeholder Group) and agricultural coalitions (e.g., Sacramento Valley Water Quality Coalition, Ventura County Agricultural Irrigated Lands Group).

- b. SCI uses Microsoft Office, Microsoft Teams, Microsoft Visual FoxPro (with proprietary programs), ArcGIS and proprietary SQL server-based applications.

LWA conducts data analysis in reproducible, open source frameworks (e.g., R, Python, GRASS GIS, GDAL) to take advantage of powerful statistical and geospatial packages, as well as enterprise data analysis software (e.g., MS Excel, ArcGIS, Matlab). Depending on the project, we may use groundwater-specific software including MODFLOW, IWFEM, MODPATH, Paraview, ModelViewer, Model Meuse, Groundwater Vistas, and UCODE. LWA has designed and built open-source PostgreSQL, MySQL, SQLite, and PostGIS relational databases; we have also designed and built enterprise Access databases. Version control and documentation is important to us, and we use Git and Dropbox to ensure work is properly versioned and never lost. We are fluent in cloud-based workflows using Linux, AWS, and Azure. Moreover, we specialize in creating rich, interactive, online data visualizations that allow our clients to explore data and draw management insights. Data privacy and security is critical, and we can password-protect these online resources, or publish them on public-facing sites to drive communication and outreach (e.g., public groundwater level data from the Department of Water Resources in the South American Subbasin). LWA has developed solutions to make data readily accessible in easy-to-use web portals with download buttons that provide data in common formats (e.g., .xlsx, .csv, .shp) to diverse users that may include technical staff, managers, and the public.

- c. The SCI Team is very experienced with the use of ArcGIS and uses it on all projects.

Many water resources data are inherently geospatial, and LWA employs a variety of open source and enterprise tools for geospatial data analysis and management. As needed, LWA can configure PostGIS databases, perform ad hoc geospatial data processing and analysis, create publication-ready maps, conduct remote sensing studies with publicly available data, procure commercial geospatial imagery, perform advanced statistics on geospatial data, and create interactive geospatial data visualizations and dashboards. Our GIS-specific technology stack includes ArcGIS, ENVI, GRASS GIS, R, Python, leaflet, mapview, Shiny, and Google Earth Engine. Beyond general technical fluency in GIS capabilities, LWA merges extensive hydrogeologic, engineering, and regulatory domain experience into all of our GIS workflows so that they inform critical decision-making for water management and drive regulatory compliance.

THE SCI TEAM’S EXPERIENCE WITH 5-YEAR REVENUE REQUIREMENT PROJECTIONS

The SCI Team has assisted numerous new public agencies develop revenue requirement projections including groundwater sustainability plan and stormwater permit costs. In many cases, these projects have been for new agencies formed by JPA from existing agencies and/or annexations, or they are new services provided by existing agencies without any historical cost data.

For example, SCI is currently managing revenue mechanism implementation based upon five-year projected costs for three GSAs in Sonoma County. For the SCI Team’s work with the Ukiah Valley Basin, multi-year revenue requirements have been developed and are driving the revenue option recommendations. In these cases, costs must be projected without the benefit of existing similar history.

LWA is working with the GSAs listed above to develop costs associated with managing the GSP on an annual basis including administration, grant management, monitoring and reporting, model and database maintenance and implementation of projects and management actions. In addition, LWA has supported SCI in the development of costs and rate studies for our GSA clients and for several stormwater programs in California.

EXPERIENCE WITH FEE AND RATE DESIGN AND IMPLEMENTATION

- a. SCI has successfully implemented over 140 balloted fees, taxes and assessments. In each case, SCI has worked closely with governing boards, citizen advisory committees and stakeholders to design and implement the revenue mechanism.
- b. For each of the over 140 balloted fees, taxes, and assessments that SCI has successfully implemented, we have planned and implemented an associated community outreach effort – it is one of our core competencies. Our process is detailed in the Scope of Work section of this SOQ.

Our team understands that the general public’s lack of understanding of groundwater sustainability and associated critical infrastructure exacerbate the funding challenge. Traditional political approaches likely will not work. Accordingly, the SCI team proposes a unique, “hands-on” strategic approach which begins with the development of initial messaging and branding, followed by direct engagement with local stakeholders and the broader community, refinement of the messaging and branding (often through the polling), and finally, effective, and authentic community outreach.

BUDGET

Based upon the current project understanding, the SCI Team's proposed budget is shown in the table below.

SCI TEAM Cosumnes Groundwater Authority Groundwater Fee Study Development											
Assigned Staff		SCI			LWA						
		President	Senior Engineer	Proeject Analyst	Associate Engineer II	Vice President	Project Advisor	Project Staff II.A.	SCI Admin		
Classification		John Bliss	Jerry Bradshaw	Ryan Aston	Betsy Elzufon	Laura Foglia	Rich Pauloo	Olin Applegate			
		\$286	\$265	\$130	\$290	\$310	\$220	\$224	\$73		
Fully Loaded Hourly Rate					10%	10%	10%	10%			
Subcontractor Markup											
Scope of Work											
Work Plan		Hours								Total Hours	Total Costs
1	Board Workshops	2	16	10	4	8		8		48	\$ 12,087
2	Development of Fee Study	4	25	40		12	20	65	8	174	\$ 38,501
3	Public Outreach	2	16	20		8			4	50	\$ 10,432
4	Project Management	0	20	30	2	4				56	\$ 11,202
											\$ -
TOTAL DIRECT HOURS		8	77	100	6	32	20	73	12	328	\$ 72,222
									Total Labor Cost \$ 72,222		
Direct Costs		Number of Units				Cost per Unit		Total Costs			
Incidentals	Travel, property data, maps and other out-of-pocket expenses	1				\$ 3,500		\$ 3,500			
									Direct Costs \$ 3,500		
									TOTAL BASE COSTS \$ 75,722		

GENERAL INFORMATION

Employment Policies

SCI does not and shall not discriminate against any employee in the workplace or against any applicant for such employment or against any other person because of race, religion, sex, color, national origin, handicap, or age or any other arbitrary basis. SCI Consulting Group ensures compliance with all civil rights laws and other related statutes.

Conflict of Interest Statements

SCI has no known past, ongoing or potential conflicts of interest for working with the District, performing the Scope of Work or any other service for this Project.

Insurance

SCI carries professional Errors and Omissions insurance in the amount of \$2 million per occurrence and \$2 million aggregate. SCI also carries general liability insurance in the amount of \$2 million per occurrence and \$4 million aggregate.

Independent Contractor

If selected, SCI shall perform all services included in this SOQ as an independent contractor.

June 2022



SANTA ROSA PLAIN
GROUNDWATER
SUSTAINABILITY AGENCY

Santa Rosa Plain Groundwater Sustainability Agency Rate and Fee Study



Table of Contents

I. Executive Summary	1
Background.....	1
Objectives	2
Agency Characteristics	2
Subbasin Characteristics.....	3
Groundwater Fees.....	5
II. Context	8
Legislative and Legal Understanding.....	8
Funding Methods Considered	11
Outreach Efforts	14
Board Direction	18
III. Fee Determination.....	20
Revenue Requirements	20
Groundwater Extraction.....	22
Fee Calculation	31
Appendices	33
Appendix A – Budget Details	34
Appendix B – Use Codes and Groundwater Assumptions.....	38
Appendix C – Public Water System Extraction Data	44

List of Tables

Table 1 – SGMA Priority Ranking Criteria	5
Table 2 - Santa Rosa Plain Subbasin Priority Points	5
Table 3 – Advisory Committee & Stakeholder Concerns & Communication Methods	17
Table 4 – Annual Costs and Revenue Requirement.....	21
Table 5 – Public System Extraction	27
Table 6 – Agricultural and Turf Irrigation Extraction	28
Table 7 – Residential, Commercial and Urban Well Extraction	30
Table 8 – Summary of Estimated Basin Extraction	31
Table 9 – Annual Rate Examples	31
Table 10 – Rate Impacts on Large Groundwater Users and Other Classes	32
Table 11 – Summary Five-Year Implementation Budget	35
Table 12 – Summary Five-Year Operational Budget	37
Table 13 – Residential Use Codes and Groundwater Assumptions.....	39
Table 14 – Commercial Use Codes and Groundwater Assumptions	41
Table 15 – List of Public Water Providers	45

List of Figures

Figure 1 – Basin Boundary and Well Density	4
Figure 2 – Advisory Committee Priority Poll Results	16
Figure 3 – 5-year Budget and Cash Flow.....	21
Figure 4 – Public Water Service Areas	25

I. Executive Summary

Background

The California Legislature enacted the Sustainable Groundwater Management Act (“SGMA”) in 2014, marking the first Statewide effort to manage its groundwater basins. The goal of this historical legislation is to ensure that groundwater is sustainably managed and protected for all beneficial users, both now and in the future. Although it was enacted at the State level, SGMA was envisioned to be carried out locally. As such, it mandates that local Groundwater Sustainability Agencies be formed in medium and high-priority basins in order to develop and implement Groundwater Sustainability Plans (“GSPs”).

The Santa Rosa Plain Groundwater Sustainability Agency (“GSA” or “Agency”) was formed in 2017 to develop and implement a GSP for the Santa Rosa Plain Subbasin (“Subbasin”). The Agency submitted its GSP to the Department of Water Resources (“DWR”) in January of 2022. While the State may take up to two years to assess the GSP and determine if it complies with SGMA, the Agency is tasked with implementing the tasks laid out by the GSP immediately.

To this point the Santa Rosa Plain GSA has been funded by a combination of grants and Member Agency Contributions. The Agency has received more than \$2 million in grant funding since 2017, helping to offset costs borne at the local level. The Agency’s Joint Powers Agreement established the initial agency funding commitments of member agencies, between \$20,000 and \$55,000 for fiscal year 2017-18 and between \$20,000 and \$64,000 for fiscal year 2018-19.

In June 2018, the Board initiated a Rate and Fee Study, conducted by Raftelis Financial Consultants, to develop a Groundwater Sustainability Fee. The Board made clear its goal of achieving financial independence for the GSA in its management of the Subbasin, placing priority on fairness, efficient administration, and compliance with California law. Over the course of two years and various public meetings and workshops, a fee methodology was designed to incorporate the characteristics of the Subbasin while simultaneously meeting the legal requirements of both SGMA and the California Constitution.

It was anticipated that the GSA would become self-funded by 2019 by implementing a groundwater sustainability fee. While the Board approved a Fee in June of 2019, Board members continued to express concern about charging fees prior to the development of a Groundwater Sustainability Plan. For this reason, an alternative plan was approved in which member agency water suppliers are charged based on acre feet drawn from the Subbasin (approximately \$101,000 per year) through fiscal year 2020-21, and the County of Sonoma and Sonoma Water contribute a combined total of up to \$240,000 annually through 2021. This allowed the Agency to put full fee implementation on hold while it continued its community outreach and GSP development.

In the Fall of 2020, the Agency engaged a consultant team led by SCI Consulting Group (“SCI Team”) to develop rural community engagement strategies, polling, and revenue recommendations. To develop these strategies and recommendations, the SCI Team conducted a survey of rural well owners in the Santa Rosa Plain Subbasin in January 2021. This survey included an invitation to participate in a focus group conducted by SGA Marketing. This community engagement project helped to better define the perspective of the community and guide community outreach efforts as the Agency has worked to update its fee structure.

In November of 2021, the GSA engaged SCI to develop a Rate and Fee Study for the Subbasin. This effort has included comprehensive data analysis, review of funding options for groundwater sustainability agencies, evaluation of rate structure alternatives, and the development of rate and fee schedules. Additional input and modification were provided by staff of the GSA. The scope of work also included a series of community meetings in order to incorporate community perspective and engagement into the Rate and Fee Study. The GSA has conducted four community meetings for the Santa Rosa Plain Subbasin. Two virtual meetings were held via Zoom, and two in-person meetings were conducted, one in Windsor and one in Santa Rosa.

This Study outlines the development of a fee for funding GSA operations through the first five years of GSP implementation. It summarizes the efforts of the GSA, Member Agencies, and consultants in determining the financial, legal, and policy decisions best suited to funding groundwater management the Santa Rosa Plain Subbasin. This summary includes considerations of legal authority, various funding mechanisms, public outreach efforts, and fee methodology.

Objectives

The objectives of this Study include the following:

- Development of a five-year budget
- Development and refinement of parcel-scale data and extraction estimates
- Development of fee methodology and rates
- Documentation of community outreach related to the updated fee structure

Agency Characteristics

The Santa Rosa Plain Groundwater Sustainability Agency was created by a Joint Powers Agreement in May of 2017 to serve as the official Groundwater Sustainability Agency for the Santa Rosa Plain Groundwater Subbasin, as required by the Sustainable Groundwater Management Act. The Joint Powers Agreement consists of ten Member Agencies: The City of Cotati, the City of Rohnert Park, the City of Santa Rosa, the City of Sebastopol, the Town of Windsor, the Sonoma Resource Conservation District, the Gold Ridge Resource Conservation District, Sonoma County

Water Agency (“Sonoma Water”), the County of Sonoma, and a coalition of mutual water systems and investor-owned water companies known as the Independent Water Suppliers. The Agency is governed by a Board of Directors (“Board”) consisting of one Director from each of the nine agencies, as well as a Director representing Independent Water Suppliers. Each Member Agency also appoints an Alternate Director. Additionally, The Agency maintains an Advisory Committee for the purpose of providing input and recommendations to the Board and encouraging community participation in the GSA.

Subbasin Characteristics

The Santa Rosa Plain Subbasin encompasses approximately 80,000 acres underlying central Sonoma County. The population of this area is approximately 260,000, and includes the town of Windsor, the Cities of Cotati, Rohnert Park, Santa Rosa, and Sebastopol, as well as unincorporated rural communities.

Groundwater Use in the Santa Rosa Plain Subbasin

The Subbasin’s GSP includes detailed discussion of groundwater use in the Santa Rosa Plain Subbasin and includes a water budget which describes inflows and outflows to the Subbasin during the current period. Included in the water budget is an estimate of annual groundwater pumping.

The groundwater extraction estimates for this Rate and Fee Study, while similar to that in the GSP, varies slightly. This is largely due to the approach utilized in determining unmetered groundwater use. While the GSP takes into account the Subbasin as a whole, this Study utilizes a parcel-scale approach, which is necessary in order to allocate costs at the parcel level. The GSP estimated annual extraction to be between 16,000 and 22,600 acre-feet per year, while this Rate Study estimated groundwater extraction at 20,574 acre-feet per year. Further discussion of this estimate is included in Section III of this Study in the description of methodology.

Basin Prioritization

The Department of Water Resources assigns each of California’s 515 groundwater basins a prioritization rating. The Basin Prioritization rating dictates whether a basin is designated very low, low, medium, or high priority as shown in Table 1.

Figure 1 – Basin Boundary and Well Density

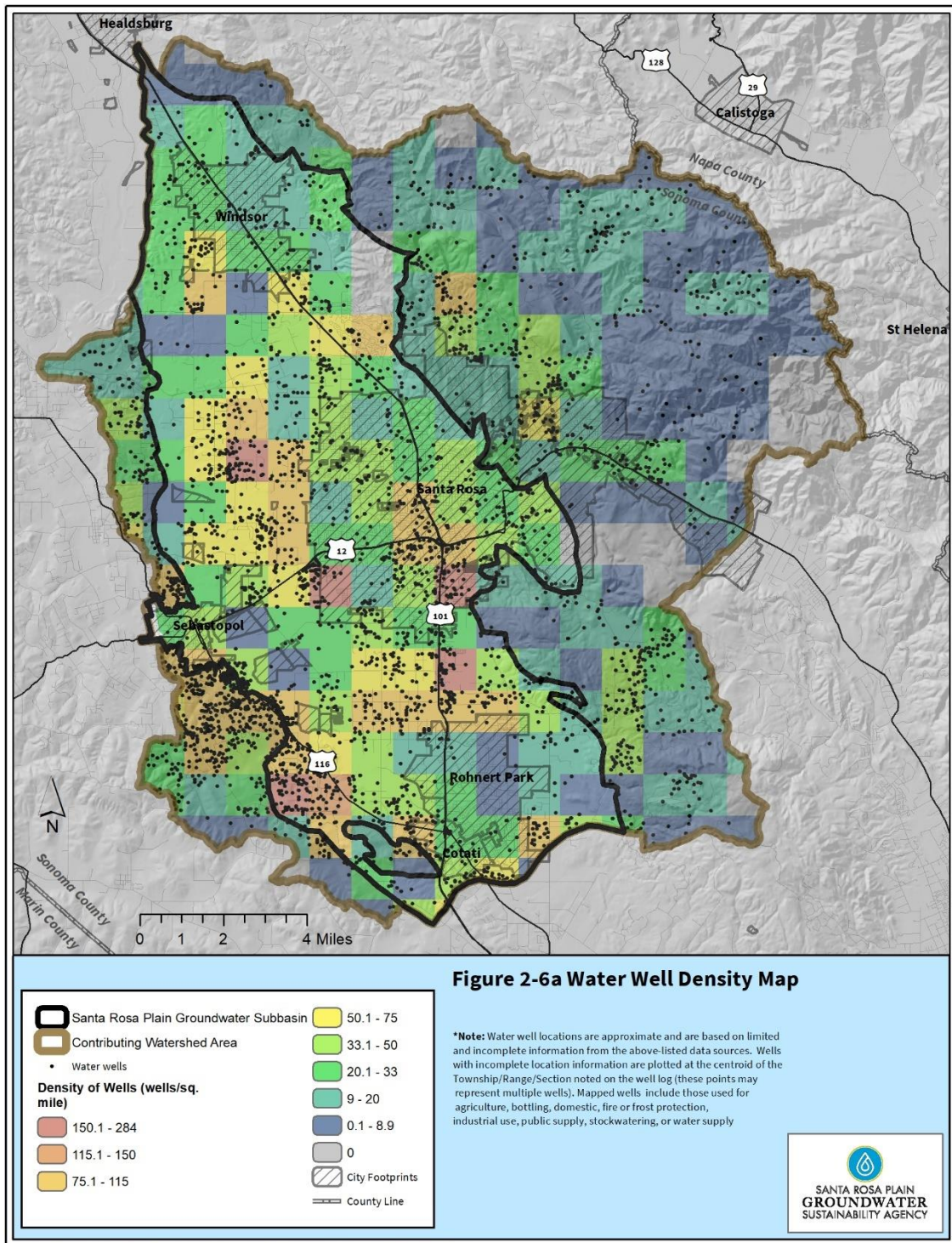


Table 1 – SGMA Priority Ranking Criteria

Priority	Total Priority Point Ranges			
Very Low	over	zero	up to	7
Low	over	7	up to	14
Medium	over	14	up to	21
High	over	21	up to	42

Medium and high priority basins are required to establish a groundwater sustainability agency and develop a groundwater sustainability plan. With a priority ranking score of 21, the Santa Rosa Plain Subbasin is classified by DWR as a medium-priority basin. The Subbasin's priority point allocation is illustrated in Table 2.

Table 2 - Santa Rosa Plain Subbasin Priority Points

Criteria	SRP Priority Points
1 Population	3
2 Population Growth	3
3 Public Supply Wells	5
4 Total Wells	5
5 Irrigated Acres	2
6 Groundwater Reliance	3
7 Impacts	0
8 Habitat and Other Information	0
Total Priority Points	21

Groundwater Fees

As noted above, the GSA was initially expected to be self-funded by 2019. Although a Rate and Fee Study was approved by the Board in June 2019 through Ordinance No. 19-02, continued contributions by the County of Sonoma and the Sonoma County Water Agency have allowed the Agency to delay fee implementation for non-member entities.

Just as SGMA envisions groundwater basins being locally governed, it also envisions GSAs to be locally funded. The intent of this Fee Study is to update the rate and fee schedule for the Santa Rosa Plain Subbasin, providing a reliable stand-alone revenue source to ensure the Agency's ability to implement its GSP. While the Agency has received grant funding in the past, and will actively pursue future grant solicitations, the need for independent revenue is apparent.

A Regulatory Fee Program for the Santa Rosa Plain Subbasin

Through extensive research and numerous discussions with staff, legal counsel, and the SCI Team, a regulatory fee in accordance with Water Code § 10730 and Proposition 26 was selected as the optimal funding mechanism for the Santa Rosa Plain Subbasin. This type of fee is the same mechanism used by the 2019 Raftelis Rate and Fee Study and enacted by the Agency (Ordinance No. 19-02). For many of the reasons this mechanism was optimal then, it is still optimal now, including various legal, financial, and policy approaches that are outlined in this Study.

As such, the methodology of the fee program established by this Study is based on apportioning costs according to the amount of groundwater extraction for each property. Several factors make this the optimal basis on which to allocate the costs of a groundwater sustainability program in the Santa Rosa Plain Subbasin:

- **Proportional:** The fee is equitable in that properties that extract more groundwater (and have more at stake in ensuring a sustainable groundwater supply) would pay more while properties that extract less would pay less.
- **Easy to Administer:** Once extraction amounts are estimated, there will be few changes from year to year making the fee calculation and implementation easier.
- **Easy to Understand:** Proportionality based on estimated groundwater extraction is easy for the average property owner to understand.
- **Common:** This type of fee is the most common one seen among groundwater sustainability agencies across the State.
- **Legally Compliant:** This type of fee conforms with the California Water Code as well as Proposition 26.

Rate Components: Groundwater Extraction Estimates and Revenue Requirements

Precise groundwater extraction data is largely unavailable or non-existent. Public water agencies and certain private entities operating wells are required to report extraction data to the California Department of Drinking Water, which data are publicly available to the Agency. These publicly-available data account for approximately 31% of all water extracted in the Subbasin. However, the remaining 69% of the extraction comes from wells whose extraction data is not public or have no meters. Thus, precise measurement of extraction is impossible at this time. The process of installing meters on all Subbasin wells introduces financial, legal, and policy complexities that prohibit such an approach in the near future. Therefore, this Study will estimate extraction for those non-public wells through a process that is described herein. The total groundwater extraction for the Subbasin is estimated to be 20,574.4 acre-feet per year.

It is worth noting that, while the proposed fees are based on groundwater extraction, the fees are not intended to charge for groundwater extraction itself. Instead, the use of extraction estimates is intended to equitably allocate the benefits of the Agency's groundwater sustainability plan across all groundwater extractors.

The other primary component of the fee program outlined in this Study is the projected budget of the GSA through the first five years of GSP implementation. This budget was scrutinized by Agency staff and the SCI Team, with crucial input by the Board ultimately deciding several factors. Chief among these factors is the inclusion of potential future grant funding in the revenue budget, a decision that reduced the revenue required from a local fee structure. Based on an average annual budget over the next five years of \$1,074,600 reduced by an annual average grant funding amount of \$268,700 (approximately 25% of total budget), the average annual revenue requirement from a regulatory fee structure is \$805,900.

The final calculation of the regulatory fee is a simple equation, as shown below.

$$\frac{\text{Revenue Requirement (\$)}}{\text{Total Extraction (AF)}} = \text{Rate (\$/ AF)}$$

By applying the estimated extraction and revenue requirement, the recommended rate is \$39.20 (round to the nearest 10¢) as shown below.

$$\frac{\$805,900}{20,574.4 \text{ AF}} = \$39.20 \text{ per AF per Year}$$

This Rate and Fee Study provides a detailed outline of the efforts to establish a reliable revenue source to fund GSP implementation in the Santa Rosa Plain Subbasin and represents the culmination of years of effort by the Santa Rosa Plain GSA Board, staff, and consultants.

II. Context

Many factors contribute to an effective fee methodology and a successful fee implementation. Staff and consultants worked together with legal counsel to establish a comprehensive understanding of the applicable legislative and legal factors and the viability of various funding mechanisms. The Board and Advisory Committee played integral roles in guiding this process, placing priority on equity, fairness, and fiscal responsibility. Additionally, a priority has been placed on community engagement throughout the process, with public outreach efforts playing an important part in developing the groundwater sustainability fee.

Legislative and Legal Understanding

Water Code § 10730

Groundwater Sustainability Fees

Within SGMA, two revenue paths are specifically described as a means to fund a groundwater sustainability agency. Water Code § 10730 describes the fee established by this Rate and Fee Study:

A groundwater sustainability agency may impose fees, including, but not limited to, permit fees and fees on groundwater extraction or other regulated activity, to fund the costs of a groundwater sustainability program, including, but not limited to, preparation, adoption, and amendment of a groundwater sustainability plan, and investigations, inspections, compliance assistance, enforcement, and program administration, including a prudent reserve.

The fee developed for this Study is based on estimated groundwater extraction and is intended to primarily fund program administration, and as such falls within the categories described by this code section. Nonetheless, any fee imposed by a government agency must comply with the California Constitution. Further discussion of compliance with Proposition 26 is included below.

Public Meeting Requirements

Water Code § 10730 also provides requirements regarding a public meeting prior to imposing a fee program:

Prior to imposing or increasing a fee, a groundwater sustainability agency shall hold at least one public meeting, at which oral or written presentations may be made as part of the meeting. Notice of the time and place of the meeting shall include a general explanation of the matter to be considered and a statement that the data required by this section is available. The notice shall be provided by publication pursuant to Section 6066

of the Government Code, by posting notice on the Internet Web site of the groundwater sustainability agency.

At least 20 days prior to the meeting, the groundwater sustainability agency shall make available to the public data upon which the proposed fee is based.

In addition to the required public meeting (tentatively scheduled for July 14, 2022), the Santa Rosa Plain GSA held four additional community meetings during the process of developing this fee program. More detail regarding these meetings is provided below.

De Minimis Extractors

De minimis extractors are defined by Water Code § 10721 as those who extract, for domestic purposes, 2 acre feet (“AF”) or less of groundwater per year. An important distinction is made by § 10730 regarding de minimis extractors:

A groundwater sustainability agency shall not impose a fee pursuant to this subdivision on a de minimis extractor unless the agency has regulated the users pursuant to this part.

This indicates that in order to charge de minimis extractors, a GSA must have regulated these users according to their GSP.

For the Santa Rosa Plain GSA, the regulation of de minimis users was accomplished through Ordinance No. 19-02, Article 2, Section 1, Registration, and Section 3, De minimis Extractors:

Section 1, Registration

All groundwater extraction facilities within the boundaries of the Agency shall be registered with the Agency within thirty (30) days of notice given to the operator.

The Operator of an Extraction Facility will be registered by the Agency and provide at a minimum the following information on a form provided by the Agency. The Agency form may ask for, and the Operator may supply additional information if requested.

- A. Name, mailing address, and email address of the operator.*
- B. Name and address of the owner of the land upon which the Extraction Facility is located.*
- C. A description of the equipment associated with the Extraction Facility.*
- D. Location of the water Extraction Facility.*

Section 3, De minimis Extractors

A. It is the intent of the Agency to regulate De Minimis Extractors by this Ordinance, as provided for in Water code section 10730(a).

This provision will be included in the proposed updated ordinance as well. To aid in the exchange of registration information, the Groundwater Users Information Data Exchange (“GUIDE”) Program¹ was implemented in 2019. The GUIDE Program offers community members the opportunity to determine whether their parcel is within the Subbasin boundaries, to view the current data held by the GSA regarding their parcel, and to complete a survey requesting alteration of this data if applicable. By initiating the regulation of de minimis users supplemented by the GUIDE Program, the Agency moved to regulate these users pursuant to Water Code § 10730. This assures that the fee program outlined by this Rate and Fee Study maintains compliance with § 10730.

Fee Collection

Another stipulation of Water Code § 10730 authorizes a GSA to collect fees pursuant to this section of the Water Code on the property tax bills furnished by the County in which its jurisdiction lies. The agency intends to utilize the tax bill method of collection to the extent possible.

Proposition 26

Proposition 26 was passed by voters in 2010, providing a broad constitutional definition of the term “tax”, which was necessary in the wake of Proposition 218’s limitations on local taxes. Proposition 26 is best understood in the context of Propositions 13 and 218.

Proposition 218 was passed by California voters in 1996, adding Articles XIII C and XIII D to the State Constitution. The purpose of this legislation was primarily to address the effects of Proposition 13, passed in 1978, which limited the ability of local governments to impose taxes. While Proposition 218 outlined substantive and procedural guidelines for the imposition of taxes, benefit assessments, and property related fees, the definition of the term “tax” was not succinctly defined.

Proposition 26, as included in Article XIII C of the California Constitution, defines a tax as “any levy, charge, or exaction of any kind imposed by a local government,” with certain exceptions. Among these exceptions are:

- (1) A charge imposed for a specific benefit conferred or privilege granted directly to the payor that is not provided to those not charged, and which does not exceed the reasonable costs to the local government of conferring the benefit or granting the privilege to the payor.*

¹ <https://santarosaplaingroundwater.org/user/>

(2) *A charge imposed for a specific government service or product provided directly to the payor that is not provided to those not charged, and which does not exceed the reasonable costs to the local government of providing the service or product to the payor.*

(3) *A charge imposed for the reasonable regulatory costs to a local government for issuing licenses and permits, performing investigations, inspections, and audits, enforcing agricultural marketing orders, and the administrative enforcement and adjudication thereof.*

Article XIII C goes on to stipulate that the governing agency must establish that any charges imposed by a government agency are not taxes:

The local government bears the burden of proving by a preponderance of the evidence that a levy, charge, or other exaction is not a tax, that the amount is no more than necessary to cover the reasonable costs of the governmental activity, and that the manner in which those costs are allocated to a payor bear a fair or reasonable relationship to the payor's burdens on, or benefits received from, the governmental activity.

Regulatory Fees

The three exceptions listed above provide the basis for a regulatory fee on estimated groundwater extraction. The Santa Rosa Plain GSP provides a benefit or service to groundwater users in the Subbasin. Additionally, costs incurred by the GSA's groundwater sustainability program are regulatory costs, as they represent the regulation of groundwater in the Subbasin.

This Fee Study provides the rationale for how the fee program for the Santa Rosa Plain GSA will comply with the requirements of Article XII A, including the fees charged to groundwater extractors in the Subbasin:

1. Are not taxes.
2. Will not generate more revenue than the reasonable cost of the governmental activity.
3. Are allocated to the payor in a manner that bears a reasonable relationship to the benefits received from the governmental activity.

Funding Methods Considered

There are a number of funding mechanisms available to local agencies in California, several of which were thoroughly explored in compiling this Rate and Fee Study. Although SGMA does provide some guidance on funding GSAs, this guidance is not particularly detailed. Additionally, given the relatively short timeline since the passage of SGMA, there is not a significant amount of legal precedent for GSA funding mechanisms. A lack of clarity on how to proceed is common

among GSAs across the State. For these reasons, it was important to vet several potential options for funding the Santa Rosa Plain GSA.

Well Head Fees

A well head fee program would charge a flat rate for each active well head in the Subbasin. While all groundwater extractors would have been charged, the amount charged would be disproportionate to the quantity of water extracted by each user. This dynamic does not contribute to the concept of an equitable fee program. While a well head fee would be more easily implemented, charges for smaller extractors would be the same as those for larger extractors. For this reason, well head fees were not selected as an optimal choice for the GSA.

Benefit Assessments

A benefit assessment was considered by the Agency as an alternative to taxes or fees. Article XIII D of the California Constitution provides the process through which assessments are established, including strict requirements of benefit proportionality, an all-mail election, and an Engineer's Report establishing the legal justification of the assessment. One advantage of a benefit assessment is that it could potentially increase the amount of Subbasin residents that are charged, thus lowering the rates for some payors.

Several factors contributed to the decision not to pursue a benefit assessment.

- The lack of a clear underlying act authorizing the use of an assessment for groundwater management complicates the pursuit of this mechanism.
- Being subject to landowner approval, the risk of being rejected by voters was significant.
- Additional cost of approximately \$150,000 to conduct polling and execute the election.
- The amount of time it would take to implement a benefit assessment would likely not be implemented in time to secure funding for fiscal year 2022-23.

Special Taxes

Several advantageous factors caused the Agency to consider a special tax as an alternative to a fee program. A special tax would allocate the costs of GSP implementation to as wide a pool of payors as possible, lowering the rates paid by groundwater extractors.

Although the framers of SGMA seem to have envisioned GSP implementation to be paid for by groundwater extractors alone, an argument can be made that all members of the community benefit from a well-managed groundwater basin by virtue of groundwater being approximately 30% of the overall water supply portfolio for all water users in the Basin. The caveat of this perspective is that those who do not rely directly on groundwater may not support such a measure.

The Agency decided not to pursue a special tax for several reasons. A special tax measure requires 2/3 support of registered voters, a high political hurdle that is further complicated by the fact that the Agency itself would be prohibited from running an advocacy campaign. Furthermore, similar to the consideration of a benefit assessment, cost and timing influenced the Agency's decision not to pursue this path. A special tax would likely cost approximately \$200,000 to conduct polling and place on the ballot and would not be implemented in time to secure funding for fiscal year 2022-23.

State Intervention Fees

Although State intervention fees were not realistically considered, they provide a benchmark as to what groundwater extractors in the Subbasin would pay in the event that the GSA would be unable implement its GSP. State intervention fees (generally, \$300 registration fee per well per year plus \$40 per acre-foot) do not provide an alternative to local management of the Subbasin; they act only as a placeholder until a local agency can re-establish local groundwater management. In this sense, intervention fees do not garner any tangible benefit for the Subbasin and its community.

Regulatory Fees

A regulatory fee in accordance with Water Code § 10730 and Proposition 26 was selected as the optimal funding mechanism for the Santa Rosa Plain Subbasin. This type of fee is the same mechanism used by the 2019 Raftelis Rate and Fee Study and enacted by the Agency (Ordinance No. 19-02). For many of the reasons this mechanism was optimal then, it is still optimal now, including various legal, financial, and policy approaches that are outlined in this Study.

As such, the methodology of the fee program established by this Study is based on apportioning costs according to the amount of groundwater extraction for each property. Several factors contributed to the Agency's decision to pursue a regulatory fee program for the Subbasin:

- **Proportional:** The fee is equitable in that properties that extract more groundwater (and have more at stake in ensuring a sustainable groundwater supply) would pay more while properties that extract less would pay less.
- **Easy to Administer:** Once extraction amounts are estimated, there will be few changes from year to year making the fee calculation and implementation easier.
- **Easy to Understand:** Proportionality based on estimated groundwater extraction is easy for the average property owner to understand.
- **Common:** This type of fee is the most common one seen among groundwater sustainability agencies across the State.
- **Legally Compliant:** This type of fee conforms with Water Code § 10730 as well as Proposition 26.

Outreach Efforts

Outreach played a crucial role in the development of this Rate and Fee Study. Stakeholder outreach through the Subbasin's Advisory Committee, as well as direct public outreach through a series of community meetings, provided substantive guidance for GSA staff and the SCI Team in developing the fee methodology.

Public Outreach

SGMA Requirements

As noted above, SGMA requires a public meeting prior to the establishment of a fee program. Although this requirement is met by the meeting in which the fees are adopted, the Agency elected to hold additional community meetings during the Rate and Fee Study process in order to incorporate community perspective into the development of the fee program.

Community Meetings in the Santa Rosa Plain Subbasin

A total of four community meetings were held for the Santa Rosa Plain Subbasin. Virtual meetings were held via Zoom on March 22, 2022, and April 20, 2022. In-person meetings were held at the Windsor Community Center on April 26 and at the Santa Rosa Veterans Memorial Building on April 27, 2022. Each community meeting consisted of an overview of Subbasin conditions and projects, including background of the Subbasin's prioritization and a high-level synopsis of the GSP. Consultants then provided an update to the Rate and Fee Study which consisted of the various funding options under consideration, estimated rate range, and an overview of potential fee methodology.

Virtual Meeting - March 22, 2022

At this first community meeting, 239 attended. Board Chair Tom Schwedhelm provided opening remarks and background, with staff and consultants presenting groundwater basin conditions and rate and fee study updates. Questions were fielded through Zoom's Q&A function, with some questions answered by staff directly in the Q&A and others answered live. All questions and comments were recorded and shared with the GSA Board after the meeting.

Virtual Meeting - April 20, 2022

Seventy members of the community attended this meeting. Board Vice-Chair Susan Harvey provided opening remarks and background, with staff and consultants presenting groundwater basin conditions and rate and fee study updates. Questions were fielded through Zoom's Q&A function, with some questions answered by staff directly in the Q&A and others answered live. All questions and comments were recorded and shared with the GSA Board after the meeting.

Windsor Community Center - April 26, 2020

Ten members of the community attended this meeting. Board Member Sam Salmon provided opening remarks and background, with staff and consultants presenting groundwater basin conditions and rate and fee study updates. Community members were encouraged to complete cards to submit their comment(s) or question(s). Questions and comments were verbally fielded during the meeting.

Santa Rosa Vets Memorial Hall - April 27, 2020

Board Chair Tom Schwedhelm provided opening remarks and background at this community meeting, which was attended by 41 people. Staff and consultants gave presentations on groundwater basin conditions and provide updates on the rate and fee study. Community members were encouraged to complete cards to submit their comment(s) or question(s). Questions and comments were verbally fielded during the meeting.

Public Meeting Adopting Rates and Fees

In accordance with Water Code § 10730 (b), a public meeting must be held at which oral or written presentations may be made. In addition, notice of the meeting must be 1) published in the local newspaper at least twice in the weeks preceding the meeting, and 2) posted on the Agency's website. The GSA must also make available all data upon which the proposed fee is based at least 20 days prior to the public meeting. The public meeting is tentatively scheduled for July 14, 2022.

Stakeholder Outreach

Stakeholder outreach was conducted in two primary ways during the Rate and Fee Study process, both through the Santa Rosa Plain GSA Advisory Committee ("AC") and through direct outreach by Agency staff.

Advisory Committee Input

The Advisory Committee is comprised of 13 Subbasin stakeholders, with representatives of various interests, including agricultural, environmental, rural residential well owners, the County, and several cities and towns. This structure provided the opportunity to engage with a variety of stakeholders throughout the process of developing a fee program, allowing Agency staff and the SCI Team to receive valuable input and constructive feedback on a number of issues.

Advisory Committee Priority Polling

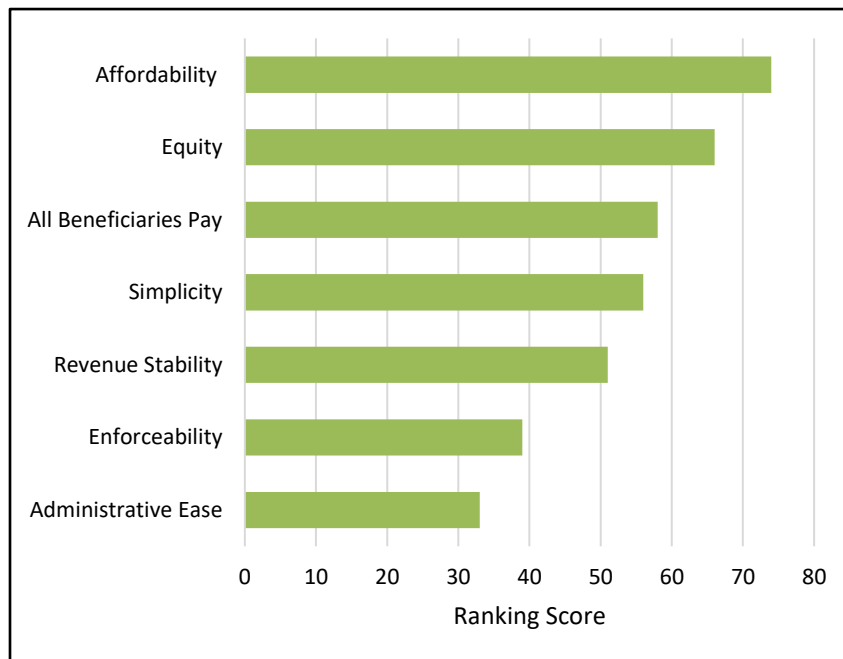
At the January 10, 2022 Advisory Committee meeting, a poll was conducted in order to gauge the priorities of AC members regarding the development of a funding mechanism for the Subbasin.

First, Advisory Committee members were asked to rank options from a list of seven priorities: Equity, Simplicity, Affordability, having All Beneficiaries Pay, Revenue Stability, Enforceability, and Administrative Ease. The results of this poll are illustrated by Figure 2.

In particular, the top three ranked priorities (affordability, equity, and ensuring that all beneficiaries pay) helped to shape the direction of the Rate and Fee Study. Throughout the process, staff and consultants worked to achieve the lowest possible rates for this fee program, while still ensuring the Agency's ability to successfully implement its GSP. In terms of equity and charges on all beneficiaries, the proportionality requirements of Proposition 26 played a key role in pursuing an equitable program that allocates cost across all groundwater users according to their estimated groundwater use.

Furthermore, simplicity, revenue stability, enforceability, and administrative ease were all taken into account based on feedback from Advisory Committee members.

Figure 2 – Advisory Committee Priority Poll Results



Note: the ranking score was calculated by assigning priorities a value based on reverse priority ranking. For example, a priority ranked number 1 is assigned a value of 7 (the highest of the number of options). Conversely, a priority ranked number 7 is assigned a value of 1 (the lowest of the number of options).

Additionally, two general questions were asked regarding the direction of the funding mechanism selection process.

First, Advisory Committee members were asked whether the current approach (a regulatory fee based on estimated groundwater extraction) should be maintained in the Subbasin. Nine Advisory Committee members supported maintaining this approach, while four did not.

Second, Advisory Committee members were asked if the type of funding mechanism should be the same across all three Sonoma County groundwater Basins that are subject to SGMA (Santa Rosa Plain Subbasin, Sonoma Valley Subbasin, and Petaluma Valley Basin). Twelve Advisory Committee members expressed that consistency in this manner should be pursued, while one did not.

Lastly, Advisory Committee members were asked what the primary concerns of their stakeholders are, and how to best communicate with them. Table 3 provides the information shared in answering these questions.

Table 3 – Advisory Committee & Stakeholder Concerns & Communication Methods

Primary Concerns of Stakeholders	Best Communication Methods
Cost	Multiple Communication Methods
How to Value Recharge	In-Person Communication
Intrusive Authority	Email
No Meters	
Transparency	
Value	
Benefit	
Not Paying to Extract Water	
Curtailing Pumpage	
Fairness	
Protect Sources	
Actual Defensible Costs	
Loss of Water Supply	
Value	
Transparency	
All Beneficiaries Should Pay	
Consistent Fee Structure	
Value of GSA Activities	
Impacts of GSA Activities	
Equity	

Input from the Advisory Committee provided guidance for staff and consultants as they refined the approach to rate methodology, community and stakeholder outreach, and policy decisions surrounding the implementation of the fee program.

Direct Outreach

Agency staff also reached out directly to various entities, including homeowners' associations, Sonoma State University, local schools, and other stakeholders. While responses were not received from all stakeholders, some of this direct communication resulted in an improved understanding of groundwater use on specific parcels. These efforts are expected to be ongoing; as the fee program is continued in future years, staff will make efforts to improve the accuracy of parcel-scale data and estimated groundwater use whenever possible.

Pre-2022 Outreach

Prior to the outreach efforts noted above, the GSA conducted an exhaustive community outreach effort in 2018 and 2019 leading up to the adoption of Ordinance 19-02. In addition, the GSA continued its engagement activities in 2020 and 2021 through a Rural Community Engagement Strategies, Polling and Revenue Recommendations effort.

Board Direction

The GSA Board of directors played an integral role in refining the approach to this Fee Study. Staff and consultants provided updates at Board meetings in late 2021 and through Spring of 2022, ensuring the Board's awareness of any progress and requesting input on various decisions. This process allowed staff and consultants to narrow down funding mechanism options, clarify perspective on policy decisions, and ultimately, to build a fee program more suited to the Subbasin. Direction from the Board is summarized below for reference.

February 10, 2022 Board Meeting

The February Board meeting, staff and consultants provided the Board with an update on the Rate and Fee Study Process. All funding mechanism options were presented to ensure the Board had the opportunity to consider all possibilities. Additionally, the issue of assumed future grant funding in the budget for fiscal year 2022-23 was presented to the Board for consideration. Options of no assumed grant funding, 25% future grant funding, and 33% future grant funding were identified as potential decisions.

April 14, 2022 Board Meeting

At the April Board meeting, staff and consultants presented updates on the progress of the Rate and Fee Study. Based on staff recommendation, the Board provided direction to focus efforts on the Rate and Fee Study. While not eliminating other options, a regulatory fee based on estimated groundwater extraction was identified as the most likely funding mechanism for the Subbasin. Another important aspect of Board direction from this meeting was the decision to include an assumed future grant funding amount of 25% in the budget for fiscal year 2022-23.

May 12, 2022 Board Meeting

At the May Board meeting, updates were provided by staff and consultants relating to data refinement and finalizing fee rates. Questions addressed included those surrounding offsets for groundwater use based on other water sources, the appeals process for property owners who believe their use has been over-estimated, and consideration for updating the rates each year.

DRAFT

III. Fee Determination

The Board made clear its goal of achieving financial independence for the GSA in its management of the Subbasin, placing priority on fairness, efficient administration, and compliance with California law in developing a funding method. The Board concluded that a regulatory fee as developed and adopted in 2019 remained the preferred method in 2022 for future funding. Although Ordinance 19-02 remains in effect and authorizes the Board to adopt fees by resolution as needed, that ordinance had no provision for a commercial user rate classification. Therefore, an updated ordinance is being proposed that includes the commercial user rate classification as well as other minor changes.

As noted above, the rate calculation is dependent on two major factors: revenue requirements and groundwater extraction estimates. The development of these two factors is outlined below.

Revenue Requirements

The GSA administrative and technical staff developed a five-year budget of expenditures based on the findings and projections found in the 2021 Groundwater Sustainability Plan (GSP). Some minor updates were done in early 2022 to arrive at a five-year total estimated expenditure of \$5,373,000. From this, the average annual expense is \$1,074,600 as shown in Table 3.

Revenue Sources

In forming the Agency in 2017, the Board determined that the Agency would be self-funding in the future. During the early part of 2022, the Board provided direction that this would be the case beginning in Fiscal Year (FY) 2022-23. Therefore, the primary funding source would be regulatory fees for groundwater users.

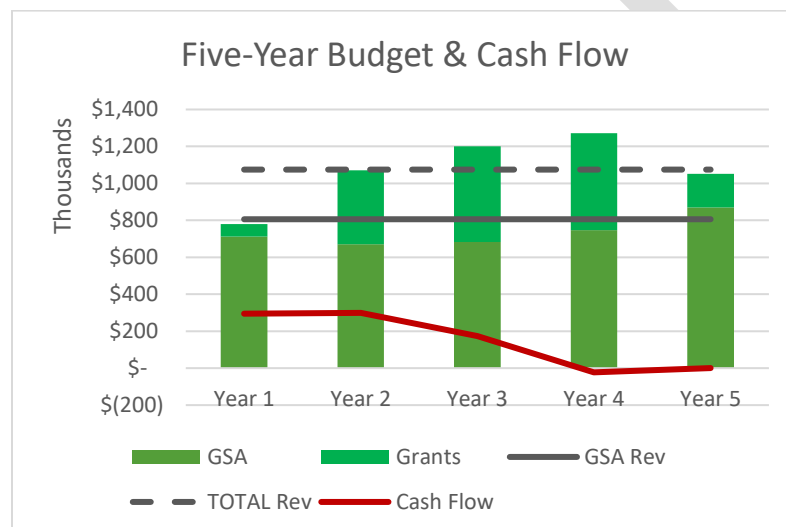
However, Agency staff estimated that approximately \$1,690,000, or 31% of the total budget, represent items that could be well-positioned and eligible for grant funding over the coming five years. If grant funding is received, it would mean that the revenue requirement for a fee structure would be less – an attractive scenario for the Agency and groundwater users alike. But the award of these competitive grant funds will not be known until early 2023; much too late for the FY 2022-23 rate setting process. The Board deliberated about how much, if any, grant funding should be included in the revenue estimates at this time and directed that 25% of total revenue be used. Therefore, the net annual revenue requirement used for this study is approximately 75% of total average annual costs, or \$805,900. This is shown in Table 4. A more detailed budget table is included in Appendix A – Budget Details.

Table 4 – Annual Costs and Revenue Requirement

<i>Costs shown thousands</i>	Year 1	Year 2	Year 3	Year 4	Year 5	5-Year	Average
Item	FY 22-23	FY 23-24	FY 24-25	FY 25-26	FY 26-27	Total	Annual Cost
Operational	\$ 583.0	\$ 520.0	\$ 520.0	\$ 509.0	\$ 546.0	\$ 2,678.0	\$ 535.6
Data Gaps	40.0	209.0	311.0	311.0	125.0	996.0	199.2
Projects & Actions	35.0	95.0	185.0	185.0	60.0	560.0	112.0
GW Model Updates	50.0	150.0	75.0	50.0	25.0	350.0	70.0
5-yr GSP Update	-	-	-	100.0	200.0	300.0	60.0
10% contingency	71.0	97.0	109.0	116.0	96.0	489.0	97.8
	\$ 779.0	\$ 1,071.0	\$ 1,200.0	\$ 1,271.0	\$ 1,052.0	\$ 5,373.0	\$ 1,074.6
					~25% from Grants		(268.7)
					Net Revenue Requirement	\$ 805.9	

As can be seen in Table 4, the annual costs fluctuate significantly from year to year. However, to keep annual rates consistent, these costs have been averaged over the five-year period (shown in the right-hand column). Assuming a fund balance of zero at the beginning of Year 1, an analysis of cash flow shows a modest deficit of \$22,600 would result in Year 4, as shown in Figure 3. It is presumed that the Agency will be able to pace the workflow and expenditures adequately to avoid this deficit in Year 4. In fact, the cash flow is much more sensitive to the grant funding element which could be higher or lower than predicted. Much more will be known as the budget for Year 2 is developed – two years before the shortfall is predicted.

Figure 3 – 5-year Budget and Cash Flow



Groundwater Extraction

As noted above, the methodology of the fee program for the Santa Rosa Plain Subbasin is based, in part, on estimated groundwater extraction. This is necessitated by the lack of data available for groundwater extraction across most user classes. There are approximately 9,450 parcels in the Subbasin reliant on groundwater as their primary water source; none of which make their extraction data public (and many of which are not metered). Of this number, there are approximately 6,100 domestic parcels reliant on groundwater.

There are several factors that inhibit the improvement of data by increasing metering of the Subbasin's wells. While California Water Code § 10725.8 authorizes the GSA to require meters for non-de minimis users, it specifically prohibits it from requiring meters on de minimis users.² Furthermore, requiring installation of meters on all non-de minimis wells could be costly, time-consuming, and likely unwelcomed by groundwater users. Timing is a key issue, as any efforts to increase the number of meters in the Subbasin would likely prevent the GSA from securing funding for fiscal year 2022-23. At this time, there are no plans to embark on a metering program.

Public water systems are the exception to this approach of estimation, as they are required to document and report groundwater extraction. All public water systems in the Subbasin will be charged according to the average reported groundwater use. This is discussed in more detail below.

Data Sources

The estimates used in this Fee Study rely on data from the State, technical studies, and available local data. At this time, using the best available sources to guide estimation of groundwater use is the most optimal path forward for funding the Agency's efforts to implement its GSP. Elements of GSP implementation, include the closing of data gaps, may contribute to a better understanding of groundwater use in the Subbasin. As better data becomes available fee calculations may be altered to incorporate any potential improvements to groundwater use data.

A variety of data sources were used to develop the parcel model. Below is a complete list of data used, followed by the source of the data in parenthesis, and a short description of the data. In the sections that follow, detailed descriptions of each data source are provided with explanations of how the data are used.

- Sonoma County parcel spatial database (Sonoma County): GIS-based spatial database of polygons that delineate parcel boundaries in Sonoma County as of October 2021

² De minimis users are defined in the SGMA as properties using, for domestic purposes, less than 2 acre feet of groundwater per year. Most users in this classification are rural residential users.

- Santa Rosa Plain subbasin boundaries (Bulletin 118 Groundwater Basin Boundary Assessment Tool): Basin boundary spatial polygons that delineate boundaries of the three Sonoma County GSAs as of October 2021
- Recycled water deliveries (Sonoma Valley County Sanitation District, City of Santa Rosa, the Town of Windsor, and from Airport – Larkfield – Wikiup Sanitation Zone): recycled water deliveries to select APNs from 2016-2017
- Surface water diversions (eWRIMS): Annual reported surface water diversions from 2011-2021; points of diversion from eWRIMS
- Water system boundary information (State Water Resources Control Board): spatial polygons that delineate water system service boundaries as of October 2021
- Well locations (Sonoma County): refined spatial well database more accurate than the California Department of Water Resources (CA-DWR) Online State Well Completion Report Database, accessed October 2021
- Explicit connection data (Cities of Cotati, Santa Rosa, and Sebastopol, Town of Windsor, and Canon Manor)
- Crop mapping (CA-DWR): Crop layer polygons from the Department of Water Resources as of 2018
- Land Use mapping (CA-DWR): Land use layer polygons from the Department of Water Resources as of 2013 for mapping of irrigated turf areas
- Public Water System Use (Division of Drinking Water): reported groundwater extraction per PWSID, between 2013-2021

Administrative Data

The database includes general parcel characteristics including parcel area (acres), County Assessor information (i.e., Use Code Description, Use Code Category), and owner information (i.e., Current Owner's Name and Mailing Address). These administrative datasets are associated with each parcel and were obtained from the Sonoma County Assessor's Office.

GSA Jurisdiction and Basin Boundary Parcels

Basin boundary parcels are parcels that intersect the Subbasin boundary. Parcels that intersect the Subbasin are included in the Fee Study and subject to regulation by the Agency; however, a limited subset of basin boundary parcels (75 parcels) intersect both the Santa Rosa Plain Subbasin and the Petaluma Valley Subbasin. For these parcels, the parcel was assigned to the GSA that a larger fraction of the parcel resides within. For example, if 7 acres of a 10-acre parcel lies in the Santa Rosa Plain Subbasin, and 3 acres lies in the Petaluma Valley Subbasin, then the parcel is assigned to the Santa Rosa Plain GSA.

Ultimately, Agency regulation is based off the location of the water well(s) on the parcel. If a boundary parcel does not have a water well within the Subbasin, then the parcel will not be

subject to Agency regulation or the regulatory fee for groundwater extracted from a well outside the Subbasin.

Water Sources

Water source data are composed of the following:

- Groundwater from the Subbasin
- Recycled water deliveries
- Surface water diversions
- Public water systems Public water systems provide water from a mix of groundwater and surface water sources, unique to each system. Many large public water systems provided lists of parcels with a connection tot their system.

Recycled Water and Surface Water Deliveries

Best available information for per-parcel recycled water deliveries come from 2016-2017, and were provided by the City of Santa Rosa, the Town of Windsor, and from Airport – Larkfield – Wikip Sanitation Zone. Best available data for per-parcel surface water deliveries are reported by eWRIMS for the period spanning 2011-2022.

Parcels that receive recycled water or surface water deliveries tend to be zoned “agricultural.” All recycled and surface water data units were converted to AF/year per parcel and assigned to the respective parcels. Surface water use is estimated by processing the annual reported uses for the period from 2011 to 2021. The average value for years in which diversions are reported is used as the surface water available for parcel use. Though the data is commonly incomplete, an attempt was made to identify the place of use for each water right and apportion the diversion volume to the appropriate parcel or parcels.

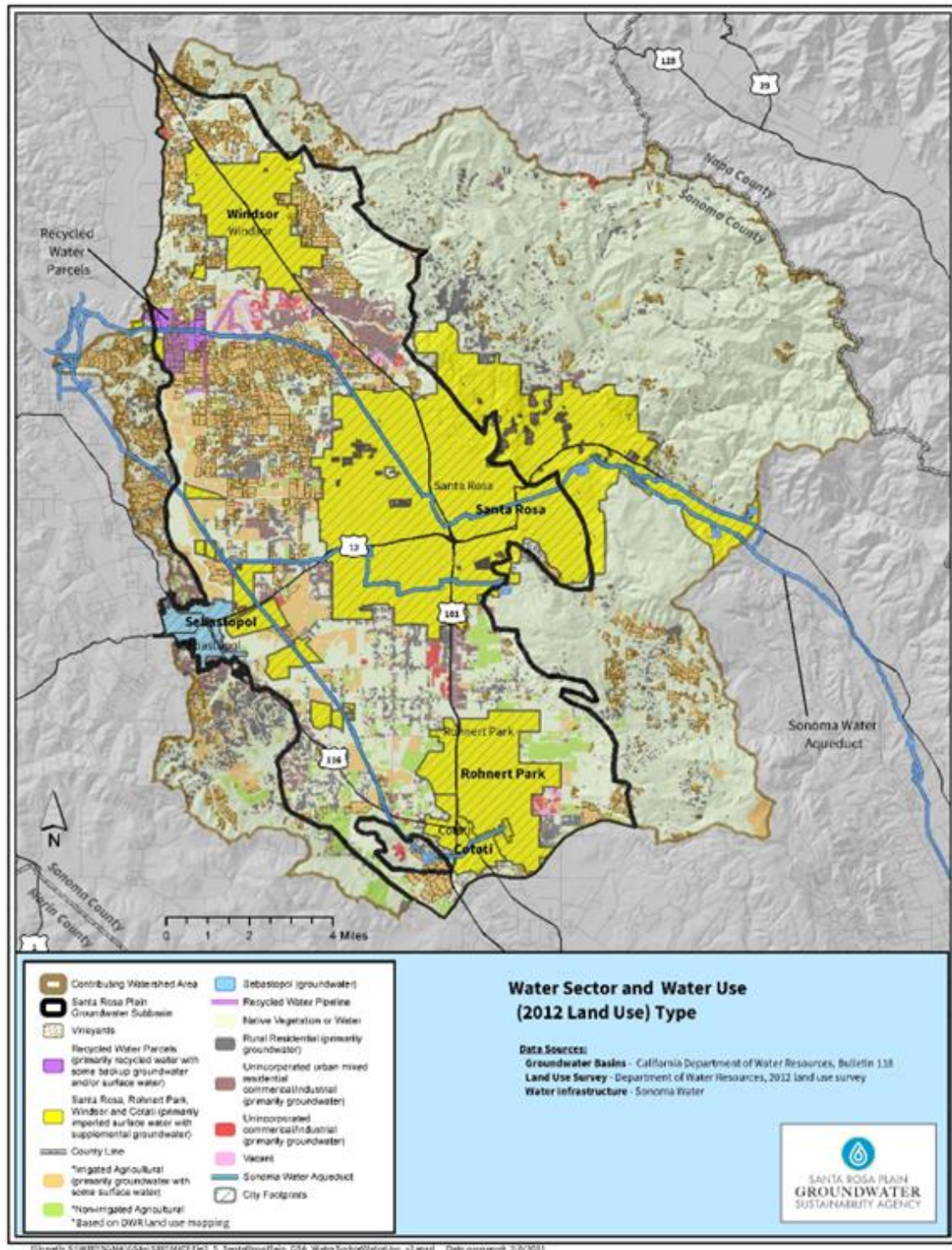
These recycled and surface water deliveries count as a credit towards estimated groundwater use for agricultural or turf irrigation because it is assumed that these water deliveries offset water demand otherwise met by groundwater extraction.

Water Service Areas

Water service boundary areas for public water systems (Figure 4) were obtained from the State Water Resources Control Board and intersected with the parcel database to label parcels with a public water system connection. It is assumed that residential and commercial water use demand determined from Assessor codes are met by the parcel’s water system connection if one is present, otherwise, it is assumed this water demand is met by groundwater. In other words, we assume that parcels outside of water system boundaries or without an explicit water system connection use groundwater to meet residential and commercial water demand. Furthermore, certain Use Codes (e.g., “Condominium Unit”, “City Building”, “Municipal Utility Property”, and so on) were assumed to be connected to public water. A full list of Use Codes that are assumed to

be connected to public water are provided in Appendix B – Use Codes and Groundwater Assumptions.

Figure 4 – Public Water Service Areas



Urban Wells

Cities provided lists of parcels within their service areas that are connected to public water, but also known or suspected of having a private water well. To calculate urban irrigation (a negligible fraction of the overall groundwater budget), we assume that if an urban well and public water connection are present, urban irrigation is 0.1 AF/year, in-line with prior assumptions from Raftelis, 2019.

Future Data Updates

Throughout this process the Agency has maintained an openness to improve data wherever possible. This perspective will provide avenues in the future to alter estimates, when possible, to better estimate groundwater use. The GUIDE Program is one example of this potential, as it may be used to improve the Agency's understanding of groundwater use on individual parcels and in user classes overall.

Another avenue for updating data is through the appeals process included in the Agency's rate ordinance. This process allows for property owners to furnish additional data that can be incorporated into future extraction estimates and fee levels for specific parcels.

Groundwater User Classes

In order to optimally organize groundwater use estimation, groundwater users are grouped into five primary rate classes in the Subbasin. Different approaches were used to estimate groundwater use for each rate class to achieve the most accurate estimation possible as discussed below.

Municipal and Other Public Service Providers

Public water supply systems are the only user class in the Subbasin for which reported data is available regarding groundwater extraction. The Division of Drinking Water (DDW) collects and reports annual surface and groundwater extraction for public water systems (DDW, 2021). These data, summarized in Table 5, were obtained and analyzed to obtain groundwater extraction from the period from 2013-2021 per water system. The full dataset of annual municipal extraction per public water system that was used to generate aggregate statistics are provided in Appendix C – Public Water System Extraction Data.

Importantly, reported water uses are not typically captured at the parcel scale, and are hence added to overall basin extraction estimates in the results. This two-step process (i.e., calculate parcel-based groundwater use, then add reported municipal extraction) is preferred for two reasons: (1) we lack a sensible approach to spatially disaggregate reported DDW municipal extraction to individual parcels, and (2) within a fee and rate billing structure, water systems will

be directly charged for groundwater use rather than the parcels connected to those systems, which in turn pay the water purveyor.

As the methodology of this fee program was developed, the question remained of how to utilize these ongoing annual data to charge municipal and other public groundwater users. The municipal extraction can vary greatly in the Subbasin, dependent on rainfall, surface water availability, and other factors. Ultimately, a five-year average³ was selected as the optimal method for allocating charges in this case. There are several benefits to this approach. First, using an average smooths out charges so that public water service suppliers do not incur large charges relative to previous years. Second, this contributes to revenue stability for the GSA, as changes in the cost allocation for this user class would not change as drastically from year to year as they would if a shorter range was used.

Table 5 – Public System Extraction

Public System Extraction (AF)										
NAME	2013	2014	2015	2016	2017	2018	2019	2020	2021	5-Year Average
Cal Water - Am-Larkfield	606.54	553.52	501.70	467.93	489.57	0.00	487.10	600.69	0.00	509.4
City of Cotati	394.97	117.07	284.64	298.47	300.59	366.39	330.07	0.00	0.00	316.0
City of Rohnert Park	1,341.10	1,589.69	1,457.72	1,873.00	1,800.33	1,675.43	2,181.80	2,410.00	2,481.00	2,109.7
City of Santa Rosa	1,129.35	1,138.56	1,196.87	1,227.56	1,309.00	0.00	665.95	1,253.00	1,323.00	1,261.9
City of Sebastopol	1,153.90	1,021.02	907.16	932.02	1,021.94	1,006.60	993.40	1,071.61	947.74	1,008.3
Sonoma State	212.07	217.95	184.66	0.00	225.53	187.23	168.18	159.89	0.00	185.1
Town of Windsor	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.0
Sonoma County Water	756.96	1,271.80	829.13	72.63	27.15	2.08	0.00	0.00	10.00	591.5
Small Systems	912.04	921.38	938.89	902.16	960.66	890.00	865.57	894.32	0.00	949.3
PUBLIC SYSTEM TOTAL										6,981.2
NOTES:										
-- Green highlight: years used for 5-year average; anomalous years omitted										
-- Beige highlight: 5-year average is taken individually for each small system, then totaled. Value shown is not the average of the five recent years aggregate totals shown.										

Agricultural and other Irrigation Users

Crop irrigation use represents a substantial portion of the total groundwater extraction in the Subbasin. The best available crop map (CA-DWR, 2018) information was used to assign crop-specific acreage to each parcel. Groundwater extraction rates for crops are assumed to be equivalent to published values of crop consumptive demand for each crop. Crop consumptive demand parameters are based on agricultural practices specific to Sonoma County. Crop-specific

³ A review of the municipal extraction data showed some anomalies. For instance, municipal wells may be shut down for a year or two for servicing, repairs, or rehabilitation. To better represent the ongoing demand on the groundwater basin by municipal users, the rolling five-year average omitted anomalous years.

consumption rates (“Irrig Rate” in Table 5) are multiplied by the acreage of each crop to arrive at the annual crop demand per parcel per crop (in AF/year). Note that pasture irrigation rates are negligible, and grain rates are zero because grain tends to be dry farmed in Sonoma County. Vine, grain, and pasture predominate crops in Sonoma County (Table 5).

Parcels with large, irrigated turf or lawns were identified and incorporated into the Rate Study. This includes uses such as golf courses, schools, cemeteries, and other large landscape uses. The rural residential assumptions include irrigation of turf areas, and so small turf areas were not included as part of the turf calculations. This is accomplished by including no additional turf irrigation demand to rural parcels with mapped lawn areas smaller than 0.2 acres. Similarly, there is no additional turf irrigation for urban parcels with mapped lawn areas less than 0.5 acres. The 2012 DWR land use data was used to map irrigated turf areas. Mapped Irrigated turf polygons with recycled water or surface water sources were removed. These estimates were refined by Agency staff contacting many of these parcel owners to confirm our assumptions of groundwater use. This information was incorporated into the extraction estimates on an individual parcel basis.

Offsets for the use of recycled water or surface water (discussed above) for agricultural and turf irrigation purposes are also presented in Table 5. These offsets were deducted from the crop/turf demand estimates to determine the net extraction. Offsets for parcels with multiple crops are presented in a separate line item in Table 6.

Table 6 – Agricultural and Turf Irrigation Extraction

<u>Irrigation Demand Estimates</u>					
CROP TYPE	Acre	Irrig Rate (AF/acre)	Irrig Demand (AF)	Offset (AF)	Net GW Demand (AF)
Citrus & Subtropical	15.6	1.85	28.8	0.0	28.8
Deciduous Fruits & Nuts	146.5	1.83	268.0	0.0	268.0
Grain	957.7	0.00	0.0	0.0	0.0
Pasture	5,465.3	0.04	218.6	(23.2)	195.4
Truck Nursery & Berry	582.4	1.78	1,036.7	0.0	1,036.7
Vinyard	9,090.9	0.60	5,454.5	(460.2)	4,994.3
Cannabis (outdoor)	3.6	2.00	7.2	0.0	7.2
Cannabis (indoor)	0.0	4.00	0.0	0.0	0.0
Idle or Unknown	462.7	0.00	0.0	0.0	0.0
Multi-Crop Parcels	<i>(included above)</i>			(139.1)	(139.1)
Turf Irrigation	642.9	3.50	2,250.3	0.0	2,250.3
IRRIGATION TOTALS	17,367.7		9,264.1	(622.5)	8,641.6

NOTES: Offsets for Turf are built into the Irrigation Demand

Rural Residential, Commercial and Urban Well Users

Residential and Commercial water demand was determined by analyzing all unique Assessor Use Codes in the Sonoma County parcel database and assigning reasonable water uses (provided in Appendix B – Use Codes and Groundwater Assumptions). These determinations were made by Permit Sonoma agency staff and informed by prior fee and rate studies (Raftelis, 2019).

For residential uses, the primary assumption is that a single residence has a demand of 0.5 AF/year. This is based on the Raftelis Rate and Fee Study (June 11, 2019) for the Santa Rosa Plain GSA. That report states in Section 5.2.4:

Raftelis and staff used an estimate of 0.5 AF of water use per year for each developed rural residential parcel. This estimate is consistent with estimates for rural residential from several published sources and studies, as show [below].

- *0.19 AFY per capita (assuming 2.5 residents per household = 0.48 AFY): Simulation of Groundwater and Surface Water Resources of the Santa Rosa Plain Watershed, Sonoma County, California (U.S. Geological Survey, 2014)*
- *0.5 to 0.75 AFY: County of Napa Water Availability Analysis Guidance Document (County of Napa, 2015)*
- *0.53 AFY: Canon Manor West Subdivision Assessment District Groundwater Study (Todd Engineers, June 2004)*
- *0.40 to 0.55 AFY (average of 0.47 AFY): Reported Groundwater usage per connection for nine public water suppliers, including mutual water companies, within Santa Rosa Plain Groundwater Subbasin (California State Water Resources Control Board – Division of Drinking Water, 2011 to 2017)*

For parcels containing more than one residential unit, additional units were assigned 0.25 AF/year (e.g., duplexes are assigned 0.75 AF/year of water use, 100-unit buildings are assigned 25 AF/year of water use, and so on).

Examples of commercial uses range from warehouses at 0.5 AF/year, to churches at 2.0 AF/year, dairies at 5.0 AF/year and hospitals at 10.0 AF/year. Similar assignments were made for all residential and commercial use codes and applied across the parcel database. It is assumed that parcels connected to a water system meet their demand via the water system. For parcels not connected to a water system, water demand for commercial and residential water use is assumed to be provided by a private water well. Note, unlike water demand for agricultural irrigation, surface water diversions or recycled water deliveries are not assumed to offset residential and commercial water use.

As discussed previously, for parcels with urban wells (parcels with a public water connection and a known or suspected private well) a small water use of 0.1 AF/year is assigned for landscape irrigation. This is consistent with the assumption made in Section 5.2.5 of the Raftelis Report:

The urban residential groundwater user class represents residential properties in areas served by water service providers that also have a well on the property. Raftelis and staff assumed that these wells would primarily be used for irrigation purposes. Based on the City of Santa Rosa's most recent water rate study, average residential winter usage is roughly 4,000 gallons per month. It is generally assumed that winter water usage correlates to indoor water demand due to the reduced irrigation needs in winter months. Santa Rosa's average residential year-round use is roughly 7,000 gallons per month. Indoor residential use is assumed to be constant year-round, so the difference between average year-round usage and average winter usage extrapolated to an annual amount of usage can be assumed to be average irrigation demand. This amount, roughly 36,000 gallons, corresponds to roughly 0.1 AF. Thus, it is assumed the urban residential groundwater users extract an average 0.1 AF per parcel per year for irrigation purposes.

Table 7 summarizes the Rural Residential, Commercial, and Urban Well extraction by municipality.

Table 7 – Residential, Commercial and Urban Well Extraction

Jurisdiction	Other Classes					
	Rural Residential		Commercial		Urban Wells	
	Parcels	AF	Parcels	AF	Parcels	AF
City of Cotati	44	26.25	8	14.50	17	1.7
City of Rohnert Park	117	59.25	1	5.00	0	0
City of Santa Rosa	992	720.00	289	515.50	929	92.9
City of Sebastopol	25	14.00	4	6.50	19	1.9
Town of Windsor	125	84.75	6	12.00	99	9.9
Unincorporated	5,569	3,231.25	330	779.00	135	13.5
TOTALS	6,872	4,135.50	638	1,332.50	1,199	119.90

Summary of Estimated Groundwater Extraction

Table 8 shows a summary of estimated groundwater extraction from the Subbasin by classification. In addition to the data shown in earlier tables, the overall extraction estimate includes an allowance for a reduction in overall extraction based on anticipated appeals by property owners and other updates and corrections to data that are likely to occur in the coming months and years. This allowance is estimated to be 3% of overall extraction.

Table 8 – Summary of Estimated Basin Extraction

Extraction Summary (AF)	
Large Public Extraction	6,031.9
Small Public Extraction	949.3
Agriculture	6,391.3
Turf Irrigation	2,250.3
Rural Residential	4,135.5
Commercial	1,332.5
Urban Wells	119.9
Appeal Allowance (3%)	(636.3)
TOTAL ESTIMATED EXTRACTION	20,574.4

Fee Calculation

The final rate calculation is the following:

$$\frac{\text{Revenue Requirement (\$)}}{\text{Total Extraction (AF)}} = \text{Rate (\$/AF)}$$

Including the revenue requirement and extraction data noted above, the rate (rounded to the nearest 10¢) is calculated to be \$39.20 per acre-foot per year, as shown below.

$$\frac{\$805,900}{20,574.4 \text{ AF}} = \$39.20 \text{ per AF per Year}$$

Fee Impacts

Some examples of how this fee will impact property owners are shown in Table 9. Some rural properties may include a combination of agricultural irrigation and commercial or residential uses.

Table 9 – Annual Rate Examples

<i>Annual Rate Examples</i>	
50-Acre Vineyard	30 AF = \$1,176.00
100-Acre Pasture	4 AF = \$156.80
100-Acre Grain	0.0 AF = \$0.00
Rural Residential	0.5 AF = \$19.60

A summary of fees is shown in Table 10 for large groundwater users and other users classes.

Table 10 – Rate Impacts on Large Groundwater Users and Other Classes

User / Class	Extraction	% of Total	Impact
Cal Water - Am-Larkfield	509.4 AF	2 %	\$ 19,968
City of Cotati	316.0 AF	2 %	12,388
City of Rohnert Park	2,109.7 AF	10 %	82,701
City of Santa Rosa	1,261.9 AF	6 %	49,466
City of Sebastopol	1,008.3 AF	5 %	39,524
Sonoma State	185.1 AF	1 %	7,256
Town of Windsor	50.0 AF	0 %	1,960
Sonoma County Water	591.5 AF	3 %	23,188
Small Systems	949.3 AF	5 %	37,213
Agricultural Irrigation	6,391.3 AF	31 %	250,540
Turf Irrigation	2,250.3 AF	11 %	88,212
Rural Residential	4,135.5 AF	20 %	162,112
Commercial	1,332.5 AF	6 %	52,234
Urban Wells	119.9 AF	1 %	4,700
Appeal Allowance	(636.3) AF	(3) %	(24,944)
TOTAL (before Appeals)	20,574.4 AF	100 %	\$ 806,518

Appendices

Appendices include the following:

- A. Budget Details
- B. Use Codes and Groundwater Assumptions
- C. Public Water System Extraction Data

Appendix A – Budget Details

The following tables show a greater detail for the estimated costs of operating the GSA and implementing the Groundwater Sustainability Plan.

- Table 11 is the five-year GSP Implementation costs, which also include the operational costs. Table 10 is color-coded:
- Green rows indicate costs that are likely to be eligible for grant funding
- Blue rows indicate costs that are not likely to be eligible for grant funding.
- Table 12 shows more details for the operational costs.

Table 11 – Summary Five-Year Implementation Budget

GSA Implementation Budget Category/Task (GSP Implementation Plan Section)	Year 1	Year 2	Year 3	Year 4	Year 5	5-Year Total	Average Annual Cost	Notes
	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027			
GSA Operational Budget (7.2.1, 7.2.2 & 7.2.3)	\$ 583,000	\$ 520,000	\$ 520,000	\$ 509,000	\$ 546,000	\$ 2,678,000	\$ 535,600	<i>GSA administration, finance, legal, community and stakeholder engagement, annual monitoring and reporting (see separate Summary Operational Budget spreadsheet for details)</i>
Addressing Data Gaps (7.2.4) - GSA	\$ 30,000	\$ 35,000	\$ 30,000	\$ 5,000	\$ -	\$ 100,000	\$ 20,000	
<i>Studies and Information Gathering (7.2.4.1)</i>								
Improve Data on Existing Water Wells	15,000	10,000	20,000	-	-	45,000	9,000	<i>Integration of parcel-specific information obtained through GUIDE with existing well log databases and assessment/refinement of extraction estimates.</i>
ISW/GDE Studies	10,000	10,000	10,000	5,000	-	35,000	7,000	<i>Improve mapping of surface water diversions, planning for GDE remote sensing and review of existing or new habitat studies</i>
<i>Monitoring Network Improvements (7.2.4.2)</i>								
GWL Network (voluntary wells)	5,000	15,000	-	-	-	20,000	4,000	<i>Outreach and coordination for voluntary monitoring program (assume up to 20 voluntary private wells)</i>
Addressing Data Gaps (7.2.4)- Grant or other funding	\$ 10,000	\$ 174,000	\$ 281,000	\$ 306,000	\$ 125,000	896,000	\$ 179,200	
<i>Studies and Information Gathering (7.2.4.1)</i>								
Aquifer System Properties Assessment	-	20,000	25,000	100,000	-	145,000	29,000	<i>Evaluate AEM data, perform up to 3 aquifer tests to assess aquifer properties and boundary conditions</i>
ISW/GDE Studies	-	50,000	50,000	-	125,000	225,000	45,000	<i>Perform focused surface water/groundwater interaction studies</i>
<i>Monitoring Network Improvements (7.2.4.2)</i>								
GWL Network	10,000	60,000	206,000	206,000	-	482,000	96,400	<i>Install 2 new dedicated multi-level wells and perform video logging and surveying of existing RMPs</i>
ISW Monitoring Network		44,000	-	-	-	44,000	8,800	<i>Install 2 new dedicated shallow wells</i>

Planning for Projects and Management Actions (7.2.6) - GSA funding	\$ 35,000	\$ 55,000	\$ 70,000	\$ 65,000	\$ 45,000	\$ 270,000	\$ 54,000	
Water-use efficiency/alternate water sources	10,000	20,000	25,000	20,000	15,000	90,000	18,000	<i>Perform initial assessment and implementation of WUE and other demand management projects</i>
Recycled water expansion - coordination	-	5,000	5,000	10,000	10,000	30,000	6,000	<i>Coordination with recycled water purveyors on expanding or improving recycled water use efficiency</i>
ASR - coordination	5,000	5,000	5,000	15,000	10,000	40,000	8,000	<i>Coordination with other entities on regional feasibility study and potential future ASR operations</i>
Policy options development	15,000	20,000	15,000	15,000	5,000	70,000	14,000	<i>Study and develop potential policy options for GSA consideration or recommendation</i>
Farm Plan coordination	5,000	5,000	20,000	5,000	5,000	40,000	8,000	<i>Coordinate with growers on integrating Farm Plans with GSP implementation</i>
Planning for Projects and Management Actions (7.2.6) - Grant or other funding	\$ -	\$ 40,000	\$ 115,000	\$ 120,000	\$ 15,000	\$ 290,000	\$ 58,000	
ASR - studies and investigations	-	20,000	40,000	50,000	-	110,000	22,000	<i>Co-fund update to regional groundwater banking feasibility study and perform investigations and pilot studies in favorable areas</i>
Stormwater capture and recharge	-	20,000	75,000	70,000	15,000	180,000	36,000	<i>Co-fund study of stormwater capture and recharge project opportunities and implement pilot studies</i>
Groundwater Model Updates (7.2.5)	\$ 50,000	\$ 150,000	\$ 75,000	\$ 50,000	\$ 25,000	\$ 350,000	\$ 70,000	
Five-Year GSP Update (7.2.7)	\$ -	\$ -	\$ -	\$ 100,000	\$ 200,000	\$ 300,000	\$ 60,000	
Subtotal - GSA funding	\$ 648,000	\$ 610,000	\$ 620,000	\$ 679,000	\$ 791,000	\$ 3,348,000	\$ 669,600	
<i>10% Contingency- rounded to nearest</i>	<i>65,000</i>	<i>61,000</i>	<i>62,000</i>	<i>68,000</i>	<i>79,000</i>	<i>335,000</i>	<i>67,000</i>	
Total - GSA funding	\$ 713,000	\$ 671,000	\$ 682,000	\$ 747,000	\$ 870,000	\$ 3,683,000	\$ 736,600	
Subtotal - Grants or other funding	\$ 60,000	\$ 364,000	\$ 471,000	\$ 476,000	\$ 165,000	\$ 1,536,000	\$ 307,200	
<i>10% Contingency- rounded to nearest</i>	<i>6,000</i>	<i>36,000</i>	<i>47,000</i>	<i>48,000</i>	<i>17,000</i>	<i>154,000</i>	<i>30,800</i>	
Total - Grants or other funding	\$ 66,000	\$ 400,000	\$ 518,000	\$ 524,000	\$ 182,000	\$ 1,690,000	\$ 338,000	
Grand Total	\$ 779,000	\$ 1,071,000	\$ 1,200,000	\$ 1,271,000	\$ 1,052,000	\$ 5,373,000	\$ 1,074,600	

Table 12 – Summary Five-Year Operational Budget

GSA Operational Budget Category/Task (GSP Implementation Plan Section)	Year 1	Year 2	Year 3	Year 4	Year 5	5-Year Total	Average Annual Cost	Notes
	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027			
GSA Administration Finance & Legal	\$ 285,000	\$ 255,000	\$ 250,000	\$ 240,000	\$ 255,000	\$ 1,285,000	\$ 257,000	
Administration	175,000	155,000	155,000	155,000	155,000	795,000	159,000	<i>Staffing for administrator, grant management, and fee implementation</i>
Insurance	4,000	4,000	5,000	5,000	6,000	24,000	4,800	
Accounting and auditing Services	22,000	22,000	25,000	25,000	25,000	119,000	23,800	
GUIDE program maintenance	30,000	20,000	10,000	10,000	10,000	80,000	16,000	
Office supplies, materials, misc. expenses	4,000	4,000	5,000	5,000	6,000	24,000	4,800	
Legal	50,000	50,000	50,000	40,000	53,000	243,000	48,600	
Communication & Stakeholder	\$ 100,000	\$ 95,000	\$ 95,000	\$ 95,000	\$ 110,000	495,000	\$ 99,000	
Community engagement	35,000	35,000	35,000	35,000	35,000	175,000	35,000	<i>Monthly newsletters, response to community inquiries, community meetings, press communications, etc.</i>
Advisory Committee coordination	35,000	30,000	30,000	30,000	30,000	155,000	31,000	<i>Preparation and participation in quarterly advisory committee meetings</i>
Agency coordination and consultations	30,000	30,000	30,000	30,000	45,000	165,000	33,000	<i>Consultation and coordination with land-use planning agencies, resource agencies, stakeholder interest groups</i>
Annual Monitoring, Evaluation &	\$ 170,000	\$ 145,000	\$ 150,000	\$ 150,000	\$ 155,000	\$ 770,000	\$ 154,000	
Groundwater-level data collection	50,000	40,000	45,000	45,000	50,000	230,000	46,000	<i>Field measurements and download of groundwater level data</i>
Seepage run measurements	25,000	20,000	20,000	20,000	20,000	105,000	21,000	<i>Streamflow measurements to monitor surface water and groundwater interaction</i>
Data management, compilation, evaluation	45,000	35,000	35,000	35,000	35,000	185,000	37,000	<i>Compilation and analysis of groundwater level, groundwater quality, groundwater storage, interconnected surface water, subsidence, and groundwater extraction datasets. Evaluation of SMCs.</i>
Annual reporting	50,000	50,000	50,000	50,000	50,000	250,000	50,000	<i>Preparation of draft and final versions of text, tables and figures for annual report and data uploads to DWR's SGMA Portal</i>
Subtotal	\$ 555,000	\$ 495,000	\$ 495,000	\$ 485,000	\$ 520,000	\$ 2,550,000	\$ 510,000	
Reserve - rounded to nearest \$1000	28,000	25,000	25,000	24,000	26,000	128,000	25,600	<i>3 months of operational expenses</i>
Member Agency Reimbursement						-	-	<i>TBD</i>
Total	\$ 583,000	\$ 520,000	\$ 520,000	\$ 509,000	\$ 546,000	\$ 2,678,000	\$ 535,600	

Appendix B – Use Codes and Groundwater Assumptions

The following two tables show County Tax Assessor use codes, use code descriptions, groundwater use assumptions for each use code, the number of parcels to which those assumptions apply, and the total groundwater use applied to each use code.

Some of the use codes may be duplicated. This is due to the use code descriptions being entered into the County's database using different syntax and spelling.

Table 13 is for residential groundwater use, and Table 14 is for commercial groundwater use. For use codes that indicate agricultural land uses, the agricultural groundwater use is not included; it is included in the agricultural use calculations shown in previous tables.

Table 13 – Residential Use Codes and Groundwater Assumptions

Santa Rosa Plain - Residential Use Codes and Groundwater Assumptions				
Use Code	Residential Use Code Description	Use Assumptions (AF)	Parcels	Use (AF)
TOTAL - All Categories			6,852	4,124.0
4	Wildcat subdivision lot	0.5	1	0.5
10	Single family dwelling	0.5	1767	883.5
11	Condominium unit	0.5	1	0.5
13	Sfd non-conforming use	0.5	24	12
14	Sfd secondary use	0.5	6	3
15	Attached unit	0.5	1	0.5
16	Manufactured home on urban lot	0.5	22	11
17	Detached unit in a pud	0.5	14	7
18	Duet	0.75	1	0.75
19	Enforceably restricted dwelling	0.5	2	1
21	One duplex (one structure)	0.75	25	18.75
22	Two sfd on single parcel	0.75	64	48
23	Sfd w/granny unit	0.75	66	49.5
31	Single triplex 3 units/1 structure	0.75	1	0.75
32	3 units/2 or more structures	0.75	24	18
34	Single fourplex	1	1	1
35	4 units/2 or more structures	1	42	42
41	5-10 res units/1 structure	2.5	0	0
41	5-10 residential units/1 structure	2.5	4	10
42	5-10 res units/2+ structures	2.5	0	0
42	5-10 residential units/2+ structures	2.5	26	65
43	11-20 residential unit/1 structure	5	2	10
44	11-20 res unit/2+ structures	5	0	0
44	11-20 residential unit/2+ structures	5	5	25
45	21-40 units	10	5	50
46	41-100 units	25	1	25
47	Over 100 units	25	2	50
49	Enforceably restricted apts	5	0	0
51	Rural res/single res	0.5	0	0
51	Rural res/single residence	0.5	3213	1606.5
52	Rural res/2 or more res	1	0	0
52	Rural res/2 or more residences	1	636	636
54	Rural res w/misc res imp	0.5	0	0
54	Rural residential w/misc residential imp	0.5	88	44
55	Rural res/secondary use	0.5	11	5.5
56	Rural res/manufactured home	0.5	159	79.5
57	Rural res sfd w/granny unit	0.75	0	0
57	Rural residential sfd w/granny unit	0.75	137	102.75
63	Motel/50 units or less w/kitchen	10	1	10

Use Code	Residential Use Code Description	Use Assumptions		
		(AF)	Parcels	Use (AF)
65	Motel/50 units or less w/shops	5	1	5
66	Bed & breakfast inn	2	2	4
80	Common area w/o structures	0.5	3	1.5
80	Common area without structures	0.5	0	0
90	Manufactured home park	5	8	40
92	Manufactured home park w/overnite facilities	5	2	10
93	Trailer park (resort type)	5	1	5
95	Taxable manufactured home/rented site	0.5	1	0.5
401	Land converting to vineyard/orchard w/residence	0.5	1	0.5
411	Irrigated orchard w/residence	0.5	3	1.5
421	Irrigated vineyard w/residence	0.5	53	26.5
423	Irr vineyard/premium w/res	0.5	0	0
423	Irr vineyard/premium w/residence	0.5	203	101.5
425	Irrigated vineyard w/manufactured home	0.5	4	2
426	Irr vineyard/premium w/manufactured home	0.5	6	3
441	Irrigated truck crops w/res	0.5	0	0
461	Irrigated pasture w/residence	0.5	9	4.5
471	Dairy w/residence	0.5	29	14.5
476	Dairy w/manufactured home	0.5	0	0
481	Chicken ranch w/residence	0.5	6	3
483	Other poultry ranch w/residence	0.5	1	0.5
485	Chicken ranch w/manufactured home	0.5	1	0.5
501	Horse ranch w/res	0.5	0	0
501	Horse ranch w/residence	0.5	9	4.5
502	Horse ranch w/2 or more res	0.5	0	0
502	Horse ranch w/2 or more residences	0.5	3	1.5
506	Horse ranch w/manufactured home	0.5	0	0
511	Non-irrigated orchard w/res	0.5	0	0
511	Non-irrigated orchard w/residence	0.5	4	2
521	Non-irrigated vineyard w/res	0.5	0	0
521	Non-irrigated vineyard w/residence	0.5	25	12.5
523	Non-irr vineyard/variety w/res	0.5	0	0
523	Non-irr vineyard/variety w/residence	0.5	4	2
531	Field crops w/residence	0.5	7	3.5
531	Field crops with residence	0.5	0	0
541	Pasture w/residence	0.5	100	50
541	Pasture with residence	0.5	0	0
546	Pasture w/manufactured home	0.5	9	4.5
546	Pasture with manufactured home	0.5	0	0
555	Mixture w/residence or manufactured home	0.5	1	0.5
561	Hardwoods & chaparral w/residence	0.5	4	2
561	Hardwoods and chaparral w/res	0.5	0	0
940	School district property	0	0	0

Table 14 – Commercial Use Codes and Groundwater Assumptions

Santa Rosa Plain - Commercial Use Codes and Groundwater Assumptions				
Use Code	Commercial Use Code Description	Use Assumptions (AF)	Parcels	Use (AF)
TOTAL - All Categories			639	1,333.0
110	Single story store	2	12	24
111	Multiple story store	2	1	2
112	Multiple stores in 1 structure	2	4	8
113	Store w/res unit or units	2	11	22
114	Convenience store	2	1	2
119	Alternate use stores	2	1	2
121	Multiple combo/stores & office	2	3	6
122	Single live/work unit	2	11	22
123	Live/work units	2	1	2
129	Alternate use store/off combo	2	1	2
140	Grocery store	2	2	4
141	Supermarket	2	1	2
142	Liquor store	2	1	2
150	Regional shopping center	2	1	2
151	Community shopping center	2	1	2
152	Neighborhood shopping center	2	5	10
155	Indiv parcel/neighborhd shop ctr	2	2	4
170	One story office building	2	10	20
171	Two story office building	2	9	18
172	3-or-more story office bldg	2	2	4
177	Multi-offices/residential units	2	2	4
179	Alternate use office bldgs	2	3	6
190	Medical offices	5	3	15
191	Dental offices	5	1	5
193	Veterinary hospitals	5	2	10
199	Alternate use prof bldgs	2	1	2
201	Misc multiple use/none dominat	2	11	22
201	Misc multiple use/no dominate	2	2	4
202	Com'l use/no other category	2	8	16
210	Restaurant	2	3	6
211	Drive-in restaurant	2	1	2
213	Cocktail lounge bar	2	2	4
219	Alternate use	2	1	2
250	Full service station	2	3	6
251	Self service sta/no repair facilities	2	1	2
253	Truck terminal	2	3	6
254	Bulk plant	2	0	0
255	Service station/mini-mart	2	2	4
259	Alternate use service stations	2	1	2
260	Auto sales w/service center	2	1	2
261	Auto sales w/o service center	2	4	8

Use Code	Commercial Use Code Description	Use Assumptions		
		(AF)	Parcels	Use (AF)
262	Used car lot	2	12	24
263	Other sales: trailers, mbh, rv	2	6	12
270	Farm or const mach sales/serv	2	1	2
280	Auto and truck repair & maint	2	20	40
280	Auto & truck repair & maint	2	0	0
281	Specialty shop (tires, brakes)	2	19	38
281	Specialty shop (tires,brakes)	2	0	0
290	Retail nursery	5	8	40
291	Wholesale nursery	5	15	75
310	Light manufts & industrial	2	15	30
311	Light manufctg & warehousing	2	12	24
320	Warehousing/active	0.5	61	30.5
321	Warehousing/inactive	0.5	2	1
323	Warehousing yard	0.5	21	10.5
329	Mini-warehouse	0.5	9	4.5
330	Lumber mill	2	1	2
331	Retail lumber yard	2	3	6
332	Specialty lumber products	2	1	2
351	Meat products	2	3	6
352	Winery	2	1	2
353	Winery w/vineyards	2	11	22
353	Winery with vineyards	2	0	0
354	Other food processing plants	2	3	6
360	Feed and grain mill	2	0	0
361	Retail feed and grain sales	2	0	0
370	Heavy industry	2	1	2
380	Mineral processing	10	1	10
381	Sand & gravel, shale	10	3	30
381	Sand and gravel, shale	10	0	0
390	Airport/private	2	0	0
391	Industrial common area	2	3	6
393	Industr'l in no other category	2	4	8
470	Dairy	5	11	55
471	Dairy w/residence	5	29	145
476	Dairy w/manufactured home	5	0	0
480	Chicken ranch	2	1	2
481	Chicken ranch w/residence	2	6	12
482	Other poultry ranch	2	1	2
483	Other poultry ranch w/residence	2	1	2
485	Chicken ranch w/manufactured home	2	1	2
500	Horse ranch	2	1	2
501	Horse ranch w/residence	2	9	18
501	Horse ranch w/res	2	0	0

Use Code	Commercial Use Code Description	Use Assumptions (AF)	Parcels	Use (AF)
502	Horse ranch w/2 or more residences	2	3	6
502	Horse ranch w/2 or more res	2	0	0
506	Horse ranch w/manufacturedhome	2	0	0
602	Health spa or club	2	0	0
611	Recreational center	2	1	2
631	Arcades & amusement center	2	2	4
640	Club/lodge hall	2	5	10
660	18 hole public golf course	2	2	4
662	Country club	2	1	2
690	Privately owned park	2	6	12
710	Religious building	2	14	28
711	Prop used along w/rel bldg	2	9	18
721	Parochial school	2	1	2
750	Sfd converted to residential care facility	2	3	6
750	Sfd converted to res care fac	2	0	0
751	Rest home	2	5	10
752	Home for handicapped (physical, mental, etc.)	2	6	12
753	Assisted care facility	2	1	2
770	Cemetery	0.5	14	7
771	Mortuary/funeral home	0.5	1	0.5
780	Volunteer fire department	0.5	0	0
810	Sbe-valued utility	0.5	14	7
811	Utility water company	0.5	2	1
812	Mutual water company	0.5	2	1
813	Cable tv	0.5	1	0.5
814	Radio & tv broadcast site	0.5	1	0.5
903	Miscellaneous federal property	2	10	20
911	State building	2	1	2
913	State pk/other recreation fac	2	0	0
916	Miscellaneous state property	2	21	42
921	County building	2	3	6
923	County park/other rec facility	2	3	6
924	County hospital	10	1	10
931	City building	2	6	12
933	City park/other rec facility	2	39	78
934	Municipal utility property	2	29	58
941	Fire district	2	1	2

Appendix C – Public Water System Extraction Data

The following table contains a list of all public water systems and their groundwater extraction data from 2013 to 2021. The large system providers have been tabulated in a separate 5-year average column from the small systems. The totals for all columns are shown at the bottom of the 3-page table.

Table Notes:

- Large public systems are shown with certain entries highlighted in green. These are the years that were included in the 5-year average for each system.
- Small public systems are shown with all zero entries highlighted in tan. In those cases, the 5-year average omitted those years to the extent possible.
- The Town of Windsor is not shown with a public water system identification number (PWSID) because it doesn't use groundwater for potable supply but plans to use 50 acre-feet per year for irrigation purposes.
- The Sonoma County Water Agency is not shown with a PWSID number because they are a water wholesaler and do not provide drinking water directly to customers. The data shown was obtained directly from that agency.
- No 2021 data was available for small water systems. This was also true for some of the large systems.

Table 15 – List of Public Water Providers

PWSID	Public System Name	2013	2014	2015	2016	2017	2018	2019	2020	2021	Small System 5-yr Ave	Large System 5-yr Ave
CA4901455	APERTURE CELLARS							2.07	6.03		4.05	
CA4900673	ATHENA TERRACE MUTUAL WATER COMPANY	10.74	10.74	9.85	12.06	12.40	6.89	13.67	20.14		13.03	
CA4901312	BALLETTO VINEYARDS	13.93	6.83	7.56	6.19	6.57	8.24	7.51	9.18		7.54	
CA4900693	BELLEVUE UNION SCH DIST-BELLEVUE SCHOOL	16.78	0.00	5.73	5.63	8.44	7.88	8.40	7.70		7.61	
CA4900558	BELMONT TERRACE MUTUAL WATER COMPANY	33.45	28.63	26.21	25.26	27.53	27.95	28.18	30.26		27.84	
CA4900998	BOISSET - DE LOACH WINERY	3.19	1.49	1.52	1.49	6.25	3.61	8.05	7.45		5.37	
CA4900545	BRANGER MUTUAL WATER COMPANY, INC.	41.99	29.04	27.39	31.48	33.76	36.89	35.41			32.99	
CA4901468	BRICOLEUR VINEYARDS								0.00		0.00	
CA4910023	CALIFORNIA-AMERICAN LARKFIELD (PUC)	606.54	553.52	501.70	467.93	489.57	0.00	487.10	600.69			509.40
CA4901063	CAMPOBELLO	0.49	0.30	0.34	1.13	1.21	0.06		1.30		0.81	
CA4910022	CANON MANOR WATER SYSTEM	1.20	1.19	1.38	1.23	1.64	1.29	1.14	0.94		1.25	
CA4900817	CASA DEL MAR	1.03	0.90	0.76	0.90	0.73	0.68	0.71	0.47		0.70	
CA4901439	CENTRO CHRISTIANO EVANGELISTICO CHURCH			0.03	0.00	0.04					0.03	
CA4901390	CHALK HILL WINERY	12.59	14.14	11.24	16.03	12.02	0.00	11.62	11.17		10.17	
CA4900774	CLOVERLEAF RANCH SUMMER CAMP	0.37		0.11	0.11	0.00	0.02	0.02	0.01		0.03	
CA4900721	COLONIAL PARK	39.23		49.64	30.00	34.60	37.50	34.79	37.41		34.86	
CA4901328	COPAIN WINE CELLARS	0.66	4.71	4.58	4.21	2.27	1.98	1.56	1.18		2.24	
CA4910016	COTATI, CITY OF	394.97	117.07	284.64	298.47	300.59	366.39	330.07	0.00			316.03
CA4901346	DELORES LANE WATER SYSTEM	5.41	3.93	3.52	4.15	3.82	4.00	4.56	3.44		3.99	
CA4900788	EL CRYSTAL MOBILE HOME PARK	10.10	7.86	9.01	5.44	5.34	2.85	3.86	6.31		4.76	
CA4900799	EL PORTAL MOBILE ESTATES	21.42	27.58	28.59	25.96	21.03	21.62	20.85	21.62		22.22	
CA4900728	EVERGREEN MOBILE ESTATES	5.68	4.80	4.38	4.27	5.05	5.26	5.02	5.18		4.96	
CA4900559	FIRCREST MUTUAL WATER COMPANY	12.79	18.68	19.39	17.19	17.86	16.11	20.75	19.53		18.29	
CA4901340	FOG CREST WINERY		0.24	0.21	0.22	0.24	0.26	0.24	0.16		0.22	
CA4900812	FRIEDMAN BROTHERS HARDWARE	0.82	0.11	0.11	1.56	2.04	2.05	2.10	2.20		1.99	
CA4901324	FRITSCH INDUSTRIAL PARK	0.52	0.32	0.37	0.40	0.45	0.53	0.56	0.42		0.47	
CA4900708	GRAVENSTEIN SCHOOL DISTRICT-GRAVENSTEIN	3.28	3.32	3.20	4.60	4.12	3.12	3.47	4.67		4.00	
CA4901073	GRAY WATER SYSTEM		0.00	0.42	0.11	0.11	0.13	0.10	0.10		0.11	
CA4900512	HAPPY ACRES MUTUAL BENEFIT WATER SYSTEM	51.18	42.46	43.32	47.13	45.32	37.70	41.55	47.52		43.84	
CA4900546	HAWKINS WATER CO-CAL WATER SERVICE (PUC)	9.96	8.87	8.45	8.29	10.63	12.08	0.00	13.73		8.95	
CA4901008	HESEL CHURCH	1.00	1.21	1.19	1.23	1.30	1.26	1.29	0.98		1.21	

PWSID	Public System Name	2013	2014	2015	2016	2017	2018	2019	2020	2021	Small System 5-yr Ave	Large System 5-yr Ave
CA4900548	HOLLAND HEIGHTS MUTUAL WATER COMPANY	57.36	49.01	46.52	42.11	46.49	0.00	45.39	55.96		37.99	
CA4901398	HOOK & LADDER VINEYARDS AND WINERY	3.35	4.46	4.20	4.13	3.84	4.54	0.00	4.74		3.45	
CA4901244	HUMANE SOCIETY OF SONOMA COUNTY	7.45	6.73	5.83	5.33	5.39	6.10	8.48	7.99		6.66	
CA4900904	J VINEYARDS & WINERY	12.53	11.82	13.09	10.43	10.12	1.43		7.58		8.53	
CA4901445	JAMES COURT WATER SYSTEM				3.49	9.79	10.51	10.33	10.87		9.00	
CA4901165	JEHOVAH S WITNESSES HALL	0.08	0.06	0.05	0.25	0.28	0.25	0.21	0.07		0.21	
CA4900688	JOURNEY'S END MOBILE HOME PARK	14.65	16.36	15.86	12.69						14.89	
CA4900560	KELLY MUTUAL WATER COMPANY	13.31	11.19	10.05	10.07	10.74	10.62	12.21	13.47		11.42	
CA4901086	KENDALL-JACKSON WINE CENTER		1.81	1.87	2.31	2.09	2.20	2.22	2.26		2.22	
CA4900743	LA CANTERA RACQUET CLUB	1.14		1.19	0.91	0.50	0.54	0.69	0.36		0.60	
CA4901232	LA CREMA WINERY	16.12	15.77	12.46	13.68	13.58	19.61	15.41	15.25		15.51	
CA4900832	LEISURE MOBILE HOME PARK	37.33	32.04	31.52	31.33	30.67	31.04	29.76	29.77		30.51	
CA4901298	LYNMAR WINERY	0.42	0.45	5.39	4.46	4.14	3.82	4.01	3.51		3.99	
CA4900513	MADRONE MUTUAL WATER COMPANY	10.03	7.23	6.15	7.04	7.04	7.04	9.30	10.24		8.13	
CA4901311	MARK WEST NEIGHBORHOOD CHURCH	5.39	3.28	1.32	0.78	0.94					2.34	
CA4901093	MARTINELLI RANCH	0.00	0.32	0.32	2.76	2.96	3.28	3.38	2.80		3.04	
CA4901336	MERRIAM WINERY	0.00		1.20	1.07	1.32	1.42	1.01	0.54		1.07	
CA4901170	MICHAEL ELLIS SCHOOL FOR DOG TRAINERS	0.14	0.24	0.15	0.40	0.28	0.00	0.40	0.55		0.33	
CA4901365	MICHAEL LUCAS WATER SYSTEM	13.50	14.71	13.64	11.62	11.46	1.71	0.66	0.20		5.13	
CA4900813	MIDGLEY'S COUNTRY FLEA MARKET	0.05	0.09	0.06	0.05	0.08	0.07	0.05	0.11		0.07	
CA4900720	MOBILE HOME ESTATES		35.28	35.33	34.99	16.64	16.89		18.61		24.49	
CA4901195	MOORLAND AVENUE APARTMENTS	0.54	0.54								0.54	
CA4900643	MOUNT WESKE ESTATES MUTUAL WATER COMP	14.61	9.03	7.72	4.41	3.97					7.95	
CA4900798	MOUNTAIN VIEW MOBILE ESTATES, LLC	22.64	21.72	21.56	21.25	20.97	22.34	22.80			21.78	
CA4901394	NEVES FAMILY TRUST WATER SYSTEM	0.53		0.37	1.12	1.18	0.26	0.24	0.30		0.62	
CA4900797	NORTH STAR MOBILE HOME PARK	12.76	9.75	8.22	7.81	51.67	51.67	8.32	8.37		25.57	
CA4900695	NORTHWEST PREP	0.00	1.81	1.43	1.37	1.93	1.97	1.72	2.00		1.80	
CA4901175	OAK GROVE SCHOOL DISTRICT OFFICE	0.11	0.10	0.10	0.14	0.20	0.17	0.15	0.09		0.15	
CA4900699	OLIVET ELEMENTARY SCHOOL	1.54	1.20	1.07	1.39	1.75		1.56	1.10		1.37	
CA4900853	PACK JACK BAR-B-QUE/WITHERS WATER	0.81	1.40	0.95	0.69	0.00	0.33	0.43	0.93		0.47	
CA4901191	PARADISE RIDGE WINERY	1.57	0.00	1.72	1.72		0.61	0.01	3.72		1.55	
CA4900553	PARK ROYAL MUTUAL WATER COMPANY	12.10	10.84	9.20	10.23	11.19	12.12	11.17	13.42		11.63	
CA4900787	PLAZA MOBILE HOME PARK	13.98	12.87	12.24	11.73	11.87	14.10	10.85	6.27		10.96	
CA4900913	ROBIN WAY WATER SYSTEM		10.76	11.13	6.78	6.12	6.63	6.40	7.42		6.67	
CA4900897	RODNEY STRONG VINEYARDS		52.65	51.12	56.14	60.73	60.48	59.89	52.64		57.98	
CA4910014	ROHNERT PARK, CITY OF	1,341.10	1,589.69	1,457.72	1,873.00	1,800.33	1,675.43	2,181.80	2410	2481		2,109.71
CA4900675	ROSELAND MOBILE HOME PARK	17.67	8.86	4.97	5.93	5.43	4.82	4.80	5.28		5.25	

PWSID	Public System Name	2013	2014	2015	2016	2017	2018	2019	2020	2021	Small System 5-yr Ave	Large System 5-yr Ave
CA4900949	SAINTS PETER & PAUL RUSSIAN CHURCH	0.14	0.06	0.00	0.10	0.10	0.10	0.09	0.09		0.10	
CA4900878	SANTA ROSA GOLF & COUNTRY CLUB	4.60	4.53	3.56	4.56	0.00	4.70	3.92	2.61		3.16	
CA4901407	SANTA ROSA LIQUOR AND DELI	1.27		0.78	0.47	0.77	0.79	0.76	0.89		0.74	
CA4900796	SANTA ROSA MOBILE ESTATES	35.65	38.19	34.50	40.29	35.40	35.06	34.15	32.71		35.52	
CA4910009	SANTA ROSA, CITY OF	1,129.35	1,138.56	1,196.87	1,227.56	1,309.00	0.00	665.95	1,253.00	1,323.00		1,261.88
CA4901431	SARALEE 3575 SLUSSER ROAD				2.47	1.22	3.58	1.39	0.69		1.87	
CA4910011	SEBASTOPOL, CITY OF	1,153.90	1,021.02	907.16	932.02	1,021.94	1,006.60	993.40	1,071.61	947.74		1,008.26
CA4900723	SHAMROCK MOBILE HOME PARK	34.49	26.25	24.80	28.41	32.32	34.06	30.45	36.98		32.44	
CA4901387	SONOMA CUTRER	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00	
CA4900580	SONOMA MOUNTAIN COUNTY WATER DISTRICT	13.28	17.56	16.43	19.84	22.80	22.30	19.17	21.95		21.21	
CA4910027	SONOMA STATE UNIVERSITY	212.07	217.95	184.66	0.00	225.53	187.23	168.18	159.89			185.10
CA4901250	SONOMA WEST HOLDINGS INDUSTRIAL PARK	7.70	9.42	10.41	10.61	9.58	10.85	8.37	4.71		8.83	
CA4900934	SONOMA WINE SHOP	0.66	0.61	0.56	0.51	0.53	1.17	0.06	0.62		0.58	
CA4901451	SPIDER WEB RANCH						1.02	2.66	2.76		2.15	
CA4900795	STONEGATE MOBILE HOME PARK	34.39	29.43	24.47	0.00	22.22	21.79	21.08	20.92		17.20	
CA4901362	STRIPE N SEAL						0.20	0.76	0.59		0.52	
CA4900907	SUMMERFIELD WALDORF SCHOOL	1.10	0.11	0.89	0.89	0.89	1.62	2.03	1.55		1.39	
CA4901321	SUNCE WINERY	0.48	0.36	0.35	0.23	0.29	0.28	0.42	0.46		0.33	
CA4900794	SUNSET PARK COMMUNITY	7.73	7.39	7.35	8.32	7.07	6.68	7.20	7.04		7.26	
CA4901370	SUTTER SANTA ROSA REGIONAL HOSPITAL		57.44	55.42	62.72	55.96	58.11	51.85	52.65		56.26	
CA4901269	UNITED RENTALS	0.28	0.06	0.06	0.08	0.16	0.14	0.10	0.43		0.18	
CA4901236	VINO FARMS, INC. - PRESTON RANCH	11.73	10.22	9.96	8.82	9.72	9.73	9.29			9.50	
CA4900033	WASHOE HOUSE	0.65		0.79	1.68	1.82	2.05	0.93	0.55		1.41	
CA4900792	WAYSIDE GARDENS MOBILE HOME PARK	10.28	18.39	12.04	9.26	9.46	10.55	12.03	11.54		10.57	
CA4900669	WENDELL LANE MUTUAL WATER COMPANY	7.13	8.68	6.38	3.87	3.96	4.21	4.02	4.76		4.16	
CA4900791	WESTERN MOBILE HOME PARK	1.19	10.45	11.20	10.57	11.05	9.76	10.27	11.61		10.65	
CA4900561	WILLOWSIDE MUTUAL WATER COMPANY	145.35	107.44	107.64	96.77	110.38	109.69	108.71	117.39		108.59	
CA4901156	WILLOWSIDE SCHOOL	1.67	1.35	1.20	1.47	1.47	1.73	1.66	13.53		3.97	
	WINDSOR, TOWN OF	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00		50.00
CA4900694	WRIGHT ELEMENTARY SCHOOL	2.79	3.71	3.56	3.32	3.33	3.29	4.89	1.77		3.32	
	SONOMA COUNTY WATER AGENCY	756.96	1,271.80	829.13	72.63	27.15	2.08	0.00	0.00	10.00		591.53
	TOTALS	6,556.94	6,880.99	6,350.77	5,823.77	6,184.78	4,177.74	5,742.07	6,439.50	4,811.74	949.31	6,031.92

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UKIAH VALLEY BASIN GROUNDWATER SUSTAINABILITY AGENCY

FUNDING OPTIONS TECHNICAL MEMORANDUM

DECEMBER 2021

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TABLE OF CONTENTS

INTRODUCTION AND EXECUTIVE SUMMARY	1
INTRODUCTION AND GOALS	1
EXECUTIVE SUMMARY	1
I. DETAILED REVENUE NEEDS	4
II. EVALUATION OF POTENTIAL FUNDING MECHANISMS	6
BACKGROUND OF FUNDING STRATEGIES FOR UVBGS	6
INTRODUCTION TO AVAILABLE POTENTIAL FUNDING MECHANISMS OPTIONS IN CALIFORNIA ...	6
EXISTING REVENUE SOURCES	8
GRANTS AND LOANS	9
REGULATORY FEES	12
IF ADDITIONAL REVENUE IS NEEDED	15
PROPERTY-RELATED FEE – (NON- BALLOTTED) ON WELL OWNERS	15
A NOTE ON REGULATORY AND PROPERTY RELATED FEES	19
SPECIAL TAX ON ALL PROPERTY OWNERS IN THE BASIN	20
OTHER APPROACHES – LESS OPTIMAL	23
OTHER CONSIDERATIONS	23
III. RECOMMENDATIONS FOR IMPLEMENTATION OF FUNDING MECHANISMS	26
GAME PLAN	26
CONSIDER A PUBLIC OPINION SURVEY	26
COMMUNITY SUPPORT AND ENGAGEMENT	27

LIST OF TABLES

TABLE 1 – SUMMARY OF TOTAL ESTIMATED ANNUAL COSTS	2
TABLE 2 – DETAILED SUMMARY OF ESTIMATED MAINTENANCE AND OPERATIONS COSTS.....	4
TABLE 3 – DETAILED SUMMARY OF ESTIMATED MAINTENANCE AND OPERATIONS COSTS.....	5
TABLE 4 –SUMMARY OF TOTAL ESTIMATED COSTS	5
TABLE 5 — MODEL OF ESTIMATED USAGE RATE AND REVENUE FOR REGULATORY FEE ON WELLS	14
TABLE 6 — MODEL OF USAGE RATE AND REVENUE FOR REGULATORY FEE ON ACRE-FEET	15
TABLE 7 — MODEL OF ESTIMATED USAGE RATE AND REVENUE FOR PROPERTY RELATED FEE ON WELLS	18
TABLE 8 — MODEL OF USAGE RATE AND REVENUE FOR PROPERTY RELATED FEE ON ACRE-FEET	18
TABLE 9 — PARCEL ATTRIBUTES WITHIN THE UKIAH VALLEY BASIN.....	21
TABLE 10 — MODEL OF TAX RATE AND REVENUES FOR SPECIAL TAX.....	22

INTRODUCTION AND EXECUTIVE SUMMARY

INTRODUCTION AND GOALS

The Ukiah Valley Basin Groundwater Sustainability Agency (UVBGSA or Agency) was created by a Joint Powers Agreement to serve as the official Groundwater Sustainability Agency (GSA) for the Ukiah Valley Basin, as required by the Sustainable Groundwater Management (SGMA) Act of 2014. The members of Joint Powers Agreement are the County of Mendocino, City of Ukiah, Russian River Flood Control and Water Conservation Improvement District and Upper Russian River Water Agency.

In the Winter of 2018, the Agency engaged a consultant team led by Larry Walker Associates (LWA Team) to develop the Phase 2 of the Ukiah Valley Basin Groundwater Sustainability Plan in compliance with the SGMA. The Agency directed the LWA Team to develop a plan with four functional work elements and eighteen total tasks. This Funding Options Technical Memorandum is the specified deliverable for Task 16 - Financial Evaluation.

The Ukiah Valley Basin Groundwater Sustainability Plan (GSP) includes goals and recommendations, as well as the associated costs, required for its implementation. Accordingly, the purpose of this technical memorandum is to describe a path forward to fund the GSP's implementation. It should be noted that SGMA, and its associated requirements and goals, are quite new, and there is not a clear, well-tested path forward to fund GSP implementations. Rather, the funding efforts for GSP implementation in the Ukiah Valley Basin need to be carefully crafted for the local conditions, preferences, and politics – as well as being flexible, creative, and reactive.

The Agency's Joint Powers Agreement indicates that the GSA is to initially be funded by a contribution from each of the initial Members, and subsequently funded by additional contributions, and as per the applicable sections in the California Water Code. The general direction from the GSA Board of Directors in regard to funding the GSP implementation can be summarized as:

- GSA expenses should be well-controlled
- Funding strategy needs to be locally viable and right-sized
- Metering of wells is not desired
- Revenue generated should be in relationship to water use

EXECUTIVE SUMMARY

Following is a brief summary of the findings and recommendations contained within this Technical Memo, including a summary of the GSP implementation costs, potential funding mechanisms, and recommendations for funding of the implementation.

REVENUE NEEDED FOR GROUNDWATER SUSTAINABILITY PLAN IMPLEMENTATION

The GSP makes numerous implementation recommendations, including annual operations and maintenance as well as capital projects. The associated costs for these tasks, including the low range and high range, are summarized in Table 1, below.

TABLE 1 – SUMMARY OF TOTAL ESTIMATED ANNUAL COSTS

	Summary	Preliminary Annual Budget	
		Low Range	High Range
Operations and Maintenance		\$110,000	\$190,000
Capital Projects		\$25,000	\$45,000
Total		\$135,000	\$235,000

It is anticipated that capital projects will be primarily grant-funded. More detail is provided in Section II., below.

FUNDING APPROACHES AND OPTIONS FOR GSP IMPLEMENTATION

There are a variety of funding approaches, each with pros and cons, and most likely a portfolio of various approaches will prove optimal. The likely most optimal funding mechanisms are listed below:

Best Options

- Existing Revenue Sources
- Grants and Loans
- Regulatory Fees

If additional revenue is needed:

- Property Related Fees – non-Balloted (*allocated to well owners*)
- Special Taxes – Balloted (allocated to all property owners within the basin)

Less optimal

- Property Related Fees – Balloted
- Benefit Assessments

Selection of the optimal approach or, more likely, portfolio of approaches, requires consideration of the key attributes of each.

Each funding mechanism and approach has key attributes - each of which should be considered to select the optimal funding portfolio, including:

- Flexibility of Methodology (per acre, per acre-feet pumped, per well, etc.)

- Costs of Implementation
- Revenue Potential
- Political Viability / Community Acceptance
- Legal Rigor
- Administration

ALLOCATING IMPLEMENTATION COSTS TO WELL OWNERS VERSUS PROPERTY OWNERS

If funding beyond use of existing sources, grants and regulatory fees is needed, then one of the most important considerations for the UVBGSP is the allocation of the GSP implementation cost between the well owners and the larger group of all property owners within the Ukiah Valley Basin. Conventional wisdom suggests that the costs of the implementation of groundwater mitigation policies should be directly borne by the immediate users of the groundwater – the well owners. However, there are clear benefits to all properties and residents within a well-managed groundwater basin that provides additional, lower cost water resources. It can be argued that a community-wide funding mechanism in which all properties and/or residents pay their fair share is a more optimal approach. Both types of approaches are discussed in Section II of this technical memo.

ROADMAP FORWARD AND RECOMMENDATIONS

A summary of this Technical Memo's major recommendations for implementation includes a step sequential roadmap as summarized below:

1. Conduct community outreach regarding the GSP and its implementation
2. Pursue use of existing revenue sources, grants, and regulatory fees to fund implementation

If additional revenue is needed:

3. Conduct a public opinion survey and focused community outreach
4. Implement a property related fee or special tax

The process of establishing long-term, sustainable, comprehensive funding for GSP implementation will likely take at least 18 months to complete. More detail is provided in Section III., below.

I. DETAILED REVENUE NEEDS

ANNUAL OPERATIONS AND MAINTENANCE COSTS

The GSP includes numerous recommendations for annual operations and maintenance in support of the long-term sustainability of the Ukiah Valley basin. The costs of these recommendations have been developed and bracketed with a low range of \$110,000 per year and a high range of \$190,000 per year, and are detailed in Table 2, below:

TABLE 2 – DETAILED SUMMARY OF ESTIMATED MAINTENANCE AND OPERATIONS COSTS

Operations and Maintenance

	Preliminary Annual Budget	
	Low Range	High Range
General GSA Operations	\$10,000	\$25,000
Annual Reporting	\$15,000	\$25,000
Model Maintenance	\$40,000	\$80,000
Monitoring	\$45,000	\$60,000
Mediation Fund	TBD	TBD
Total	\$110,000	\$190,000

Where:

General GSA Operations includes costs to operate the GSA including supporting and facilitating Board and committee meetings, disseminating information, satisfying existing grant administrative requirements, managing contracts for tasks listed below, maintaining the website, etc.

Annual Reporting: includes costs to draft and submit all required annual reports.

Model Maintenance: includes the annual installment costs to update the model every 5 years.

Monitoring includes:

- Monitoring – Interconnected Surface Water: includes the periodic (likely semi-annual) inspection and maintenance at 3 sites - approximately 6 visits per year.
- Monitoring - Water Level: includes the periodic (likely semi-annual) inspection of water level monitoring equipment at Includes CASGEM and DWR well sites and 10-15 additional well sites – approximately 40 visits per year.
- Monitoring - Water Quality: includes the periodic sampling of water quality – approximately 10-15 samples per year.

Mediation Fund: is a placeholder for funds in support of mediation. For example, a grant program could be established for local well-owners to access capital to address compliance issues.

ANNUAL CAPITAL COSTS

The GSP includes numerous recommendations for capital improvements in support of the long-term sustainability of the Ukiah Valley basin. Most likely, these capital improvements will be implemented if and only if significant grant funding is available. However, there are often associated costs with grants including grants writing and grants administration.

The costs of these recommendations have been developed and bracketed with a low range of \$25,000 per year and a high range of \$45,000 per year, and are detailed in Table 3, below:

TABLE 3 – DETAILED SUMMARY OF ESTIMATED MAINTENANCE AND OPERATIONS COSTS

Capital Projects		Preliminary Annual Budget	
		Low Range	High Range
Grant Writing		\$15,000	\$20,000
Annual Grant Administration		\$10,000	\$25,000
Capital Projects Costs		Grant Funded	
Total		\$25,000	\$45,000

Where:

Grant Writing: includes periodic grant writing primarily for capital projects.

Annual Grant Administration: includes costs satisfying annual grant administrative requirements including reporting and budget management.

TOTAL ANNUAL IMPLEMENTATION COSTS

The total costs of these recommendations have been developed and bracketed with a low range of \$135,000 per year and a high range of \$235,000 per year, and are detailed in Table 4, below:

TABLE 4 – SUMMARY OF TOTAL ESTIMATED COSTS

Summary		Preliminary Annual Budget	
		Low Range	High Range
Operations and Maintenance		\$110,000	\$190,000
Capital Projects		\$25,000	\$45,000
Total		\$135,000	\$235,000

II. EVALUATION OF POTENTIAL FUNDING MECHANISMS

BACKGROUND OF FUNDING STRATEGIES FOR UVBGSA

Since the inception of the Agency, the leadership has discussed and considered the short term and long-term challenges associated with funding. In fact, from Page 12 of the Joint Powers Agreement April 5, 2017:

"Article 15 Budget and Expenses

15.2 Agency Funding and Contributions *In order to provide the needed capital to initially fund the Agency, the Agency shall be initially funded by a contribution for the initial Members in the amount establish in the bylaws, which contribution shall be set at an equal dollar amount for initial Members. In subsequent years, the Agency may be funded through additional voluntary contributions by all Member, and as otherwise provided in Chapter 8 of SGMA (commencing with Section 10730 of the Water Code.)"*

And the November 9, 2017 adopted Bylaws includes the same language.

The general direction from the GSA Board of Directors in regard to funding the GSP implementation can be summarized as:

- GSA expenses should be well-controlled
- Funding strategy needs to be locally viable and right-sized
- Metering of wells is not desired
- Revenue generated should be in relationship to water use

These basic principles were reinforced at the March 11, 2021, General Board meeting.

Hence, the GSA formation documents indicates a preference for the use of resources as contributions from member agencies initially and going forward, and also acknowledges the potential use of property-related fees on well owners as described in Section 10730 of the Water Code.

INTRODUCTION TO AVAILABLE POTENTIAL FUNDING MECHANISMS OPTIONS IN CALIFORNIA

Existing California law provides a relatively finite number of mechanisms for local public agencies to reliably generate revenue to provide services. In many cases, a portfolio approach of several of these mechanisms will be optimal. Also, it is crucial to work closely with legal counsel on the implementation of all funding mechanisms to ensure legal compliance. This section provides a discussion of the mechanisms best suited to provide funding for groundwater management services recommended in the Agency GSP, including, but not limited to, the following:

Best Options

- Existing Revenue Sources
- Grants and Loans
- Regulatory Fees

If Additional Revenue is Needed

- Property Related Fees – non-Balloted (*allocated to well owners*)
- Special Taxes – Balloted (allocated to all property owners within the basin)

Less Optimal

- Property Related Fees – Balloted
- Benefit Assessments

Existing Revenue Sources and Grants Are Likely the Preferred Approach

Of course, it is recommended that the Agency rigorously explore all opportunities to fund the recommended groundwater management services through existing revenue sources and grants, eliminating the need for an additional allocation for well owners or all basin property owners. However, there are likely not sufficient available existing revenue sources to support GSP implementation, especially over the long term. See the discussion “Grants and Loans” below.

Regulatory Fee Should Be Imposed

Regulatory fees are an excellent source of reimbursement of actual costs for inspections, plan checks, etc., and should be imposed.

However, If Additional Revenue is Needed

If additional revenue is need beyond the amount that can be generated by existing revenue sources, there are two primary approaches:

Revenue Generated from

Well Owners

All Property Owners

Optimal Revenue Mechanism

Property Related Fee (non-balloted)

Special Tax (balloting is required)

Additional Funding from Well Owners or Community Property Owners

One unique challenge, and opportunity, associated with implementation of a funding mechanism for groundwater sustainability management is the decision regarding how costs will be allocated between well owners and the overall community of property owners. Generally speaking, the development of the Sustainable Groundwater Management Act was based upon the assumption that the allocation of costs would be primarily, perhaps exclusively, assigned to well owners, with some consideration of *de minimis* ground water users. However, there are clear benefits to all properties and residents within a basin with well managed groundwater resources. It can be argued that a community-wide funding mechanism in which all properties and/or residents pay their fair share is a more optimal approach.

Local political forces, often times concentrated with well owners, may dictate a preference for allocating the GSP implementation costs more broadly to all property owners within the basin, but it should be noted that California law requires that special taxes, which would be the mechanism required for an allocation on all basin property owners, requires a balloting. Balloted revenue mechanisms are arguably more legally rigorous, and legal challenges to voter-approved fees have rarely been successful. However, the balloting requirement significantly limits the total revenue that may be generated, as it is limited by the political "willingness to pay" of the local voters or property owners. Ballotings are also expensive and politically risky. For that reason, non-balloted approaches are typically preferable, and do not have the same apparent political limitation on the amount of revenue that can be generated, but political realities and influences are still significant.

As the Agency determines its funding strategy, it should take an in-depth look at many attributes, including flexibility of methodology (per acres, per water quantity, per well, per parcel, etc.), costs of implementation, revenue generation potential, political viability, legal rigor, administrative burden, etc., as described below.

EXISTING REVENUE SOURCES

If the Agency can fund the groundwater management services with existing revenue sources, that is certainly optimal. However, even if this is possible in the short term, it is likely not possible very far into the future.

Again, the JPA and Bylaws associated the formation of the GSA state:

"In order to provide the needed capital to initially fund the Agency, the Agency shall be initially funded by a contribution for the initial Members in the amount establish in the bylaws, which contribution shall be set at an equal dollar amount for initial Members. In subsequent years, the Agency may be funded through additional voluntary contributions by all Member, and as otherwise provided in Chapter 8 of SGMA (commencing with Section 10730 of the Water Code.)"

The GSA is currently still funded by the initial "equal dollar amount" contribution from each of the initial members. In 2017, each of the four members contributed an initial \$5,000 for a total of \$20,000. This was augmented in 2020 with an additional contribution of \$3,000 each for a total of an additional \$12,000. The GSA's current fund balance (April 2021) is approximately \$12,000 which does not include \$1,000 to \$2,000 expenses so far this year.

Mendocino County, as the administering agency, performs all the administrative tasks for the UVBGSA and charges back the GSA for major costs including basic salaries and benefits. However, there are significant additional miscellaneous costs including phone calls, correspondence, or internal conversations; as well as office space, office supplies, utilities that are not charged back to the GSA.

A brief summary of GSA spending is shown below.

Non-Grant Expenses

FY	Admin Expenses
2020/21	\$1,355.77
2019/20	\$7,597.77
2018/19	\$6,706.56
2017/18	\$4,308.53
	<u>\$19,968.63</u>

Grant-Reimbursed Expenses

FY	Prop 1 Spending	Prop 68 Spending
2020/21	\$10,894.60	\$441,247.24 (Q3 (1/1/21-3/30/21) not included)
2019/20	\$483,362.21	\$110,556.25
2018/19	\$266,840.54	\$0.00
	<u>\$761,097.35</u>	<u>\$551,803.49</u>
Total Grant Spending		\$1,312,900.84

FUTURE ALLOCATIONS FROM MEMBER AGENCIES

Direct “volunteer” funding from each agency remains a very attractive approach. However, the GSA should consider variations on this including varying the contribution from each agency based upon some other attribute(s) (ability to pay, % of revenue, % of total budget, etc.) in order to optimize the GSA budget.

GRANTS AND LOANS

Grant funding is highly desirable, as it eliminates/lessens the need to generate revenue directly from well owners and/or the broader community of property owners. Grant funding is typically available for capital projects but can be available for other programmatic activities, including maintenance and operations. It is worth noting that grants often come with other funding requirements such as matching funds or requirements for post-project maintenance. For these reasons, an underlying revenue stream is very important to have access to leverage these opportunities.

California has a limited number of State grants and programs which provide funding opportunities for groundwater sustainability. The primary grants in support of SGMA are described below (from <https://water.ca.gov/Work-With-Us/Grants-And-Loans/Sustainable-Groundwater>):

“The SGMA Grant Program is funded by Proposition 68 and Proposition 1. To date, the California Department of Water resources (DWR) has awarded \$139.5 million in three rounds of planning grants for development of Groundwater Sustainability Plans (GSPs) and related projects. All Proposition 1 funds have been awarded, with about \$103 million now remaining to be awarded using Proposition 68 funds. Additional information can be found below.

PROPOSITION 1, CHAPTER 10: GROUNDWATER SUSTAINABILITY

On November 4, 2014, California voters approved Proposition 1, which authorized \$100 million be made available for competitive grants for projects that develop and implement groundwater plans and projects in accordance with groundwater planning requirements established under Division 6, commencing with \$10000, Water Code §79775. DWR completed two grant solicitations for planning grants.

PROPOSITION 68, CHAPTER 11.6: REGIONAL SUSTAINABILITY FOR DROUGHT AND GROUNDWATER, AND WATER RECYCLING

On June 5, 2018, California voters approved Proposition 68, which amended the Water Code to add, among other articles, §80146, authorizing the Legislature to appropriate funds for competitive grants for proposals that:

- Develop and implement groundwater plans and projects in accordance with groundwater planning requirements.
- Address drought and groundwater investments to achieve regional sustainability for investments in groundwater recharge with surface water, stormwater, recycled water, and other conjunctive use projects, and projects to prevent or cleanup contamination of groundwater that serves as a source of drinking water.”

The Agency should plan to submit an application for the next round of Proposition 68 funding.

FUTURE STATE GRANT OPPORTUNITIES

Since all of Proposition 1 funding has been awarded and the remaining portion of Proposition 68 funding (just over \$100 million) will be awarded over the next several years, there will likely be a shortfall of grant funding for GSP implementation in the near future. Unfortunately, there are not any large statewide bond measures (with grant opportunities) on the political horizon, but the Agency should continue to track such efforts. Also, future bond measures will likely emphasize funding for multi-benefit projects and programs that cross traditional organizational structures, and the Agency should also consider coordinating with other affected local agencies to put forth larger and potentially more competitive grant applications.

The final Proposition 68 Implementation Proposal contains \$103 million in available funding. DWR has released Round 1 draft funding recommendations, allocating \$26 million to high priority basins.¹ Of the remaining \$77 million, \$15 million will be reserved for Underrepresented Communities, leaving \$62 million available for general awards in Round 2 Implementation.²

Round 2 Grant Solicitation will open in spring of 2022, with final awards disbursed in fall of that year. Awards will be allocated to medium and high priority basins that have adopted a

¹ Proposition 68 SGM Grant Program's Implementation – Round 1 Draft Award List (ca.gov)

² <https://www.grants.ca.gov/grants/sustainable-groundwater-management-sgm-grant-programs-proposition-68-implementation-round-2/>

GSP that has been deemed complete by DWR. Grant amounts must be between \$2 million and \$5 million, with a 25% locally matched cost share requirement. A cost share waiver is available for eligible projects proportionate to the degree that they serve Underrepresented Communities. Any local cost share cannot have contributed to other grant awarded projects. Project expenses must be incurred after January 31, 2022, the due date for medium and high priority basin GSPs. The state encourages applicants to work with the stakeholders and other non-member agencies in their basin that have potential activities and tasks that are complimentary to the overall project. Eligible projects are defined by Proposition 68 Chapter 11.6 and include sustainability measures such as groundwater recharge and contamination prevention.³

OTHER TYPES OF GRANTS

The Agency should work to identify applicable Federal grants, if any, and compete, in coordination with other affected local agencies for funding. Also, the Agency should consider working with local elected officials to pursue provisions that direct approved funds to be spent on specific projects, often called earmarks.

Grants from non-profits, foundations, high-net-worth individuals, and other stakeholders should be considered, especially with an emphasis on environmental sustainability.

REQUIRED DOCUMENTS FOR GRANTS

- Grant applications meeting specific requirements.

FLEXIBILITY OF METHODOLOGY

Use of grant funding is well-specific in the specific grant.

REVENUE GENERATION POTENTIAL

Amount of grant funding is well-specific in the specific grant.

ADVANTAGES

- Does not require cost to be allocated to local well owners or property owners.
- Revenue generation can be sufficient to offset significant costs of certain key activities.
- Legally rigorous as long as grants are expended on eligible activities.

CHALLENGES

- Provides funding for a limited time period only – difficult for long term planning solution.
- Awarded through a highly competitive process.

³ Sustainable Groundwater Management Grant Program Implementation Grants Proposal Solicitation Package (ca.gov)

- Often requires matching local funds, tends to be focused on capital expenses, and are often narrowly focused in terms of scope and services.

REGULATORY FEES

Public agencies throughout California often reimburse themselves for the costs of site inspections, permits, plan checks, plan reviews, and associated administrative and enforcement activities using regulatory fees. These fees are often approved and published as part of a "Master Fee Schedule," and are often collected as part of review for approval process. This approach can assist in significantly reducing the GSA's financial burden.

Proposition 26, approved by California voters in 2010, tightened the definition of regulatory fees. It defined a special tax to be *"any levy, charge, or exaction of any kind imposed by a local government"* with certain exceptions. Pursuant to law, all special taxes must be approved by a two-thirds vote of the electorate.

Regulatory fees are thus defined through the cited exceptions. The pertinent exception is, "a charge imposed for the reasonable regulatory costs to a local government for issuing licenses and permits, performing investigations, inspections, and audits, enforcing agricultural marketing orders, and the administrative enforcement and adjudication thereof." The other pertinent exception is, "assessments and property-related fees imposed in accordance with the provisions of Article XIID."

The Proposition goes on to state that, "the local government bears the burden of proving by a preponderance of the evidence that a levy, charge, or other exaction is not a tax, that the amount is no more than necessary to cover the reasonable costs of the governmental activity, and that the manner in which those costs are allocated to a payor bear a fair or reasonable relationship to the payor's burdens on, or benefits received from, the governmental activity."

Proposition 26 provides the primary guidance for the funding of the Agency's plan review and inspection fees as regulatory fees. Moreover, Section 10730 of the California Water Code, (which corresponds well with Proposition 26 guidance) stipulates that these fees can be used "to fund the costs of a groundwater sustainability program, including, but not limited to, preparation, adoption, and amendment of a groundwater sustainability plan, and investigations, inspections, compliance assistance, enforcement, and program administration, including a prudent reserve." Hence, it seems that the intent of this section is that the development of the plan can be financed through regulatory fees (and this has been widely agreed upon) as well as some, but not all, GSP implementation activities. In any case, Water Code Section 10730 includes several unique requirements that should be carefully followed when implementing regulatory fees for GSP implementation.

REGULATORY FEE IMPLEMENTATION PROCESS

Regulatory fees are relatively easy and straightforward to implement. Neither a public noticing nor a balloting is required. Typically, a public agency will engage a specialized

consultant to conduct a Fee Study. This Study will present findings to meet the procedural requirements of Proposition 26, which require analysis and support that:

1. The levy, charge, or other exaction is not a tax; and
2. The amount is not more than necessary to cover the reasonable cost of the governmental activity; and
3. The way those costs are allocated to a payor bears a fair or reasonable relationship to the payor's burden on, or benefits received from, the governmental activity.

Additionally, case law has provided further clarification of these substantive requirements, that:

1. The costs need not be "finely calibrated to the precise benefit each individual fee payor might derive."
2. The payor's burden or benefit from the program is not measured on an individual basis. Rather, it is measured collectively, considering all fee payors.
3. That the amount collected is no more than is necessary to cover the reasonable costs of the program is satisfied by estimating the approximate cost of the activity and demonstrating that this cost is equal to or greater than the fee revenue to be received. Reasonable costs associated with the creation of the regulatory program may be recovered by the regulatory fee.

REQUIRED DOCUMENTS FOR REGULATORY FEES

- A Fee Study, reviewed by legal counsel and adopted by the governing authority.

FLEXIBILITY OF METHODOLOGY

Legal requirements and industry practice limit these fees to recovery of costs associated with eligible activities (e.g., inspections, permits, etc.) The Agency is advised to work closely with legal counsel and review Proposition 26 and Water Code Section 10730 requirements.

SGMA and Regulatory Fees

Section 10730 of the California Water Code dictates that regulatory fees can be used to fund the costs of a groundwater sustainability program, including, but not limited to:

- (1) Preparation, adoption, and amendment of a groundwater sustainability plan
- (2) Investigations, inspections, compliance assistance, enforcement
- (3) Program administration
- (4) A prudent reserve

While the framers of SGMA seem to have intended that regulatory fees be used for program administration concurrently with the development of a GSP, Section 10730 of the Water Code does not dictate that this authority is lost once a GSP is submitted to the Department of Water Resources. There are examples of GSAs utilizing regulatory fees for general program administration both before and after GSP submittal. Although there are questions regarding whether the cost of items such as groundwater monitoring and groundwater model maintenance can be paid for by funds from regulatory fees, one can make the argument that

they can be included in the cost of “program administration.” It is imperative that legal counsel be consulted to ensure that the methodology and implementation of a regulatory fee aligns with California law.

In reference to regulatory fees, Section 10730 also specifies that “a groundwater sustainability agency may impose fees, including, but not limited to, permit fees and fees on groundwater extraction or other regulated activity.”

Other ideas to consider include:

- Parcel-based Administration Fee,
- Water Company Service Fee
- Irrigated Acres Fee
- Remediation Fee for over-pumping.
- Augmentation Fee on over users to pay to import water.

REVENUE GENERATION POTENTIAL

Traditionally, regulatory fees have been used to obtain full recovery of costs associated with eligible activities such as inspections and permits. Various other costs associated with GSP implementation, such as groundwater monitoring, annual reporting, and model maintenance are likely also eligible to be funded by regulatory fees. Table 5 below models rates and revenue generated using a hypothetical flat annual rate for each type of well.

Note: de minimis users are not charged in this model. (Number and types of wells is an approximate count for the Ukiah Valley Basin)

TABLE 5 — MODEL OF ESTIMATED USAGE RATE AND REVENUE FOR REGULATORY FEE ON WELLS

Basin Wells					
	Approx. Number	Low Range		High Range	
		Rate	Revenue	Rate	Revenue
Agricultural	117	\$685.00	\$80,145	\$1,200.00	\$140,400
Industrial	11	\$685.00	\$7,535	\$1,200.00	\$13,200
Municipal	70	\$685.00	\$47,950	\$1,200.00	\$84,000
Domestic	1,058	\$0.00	\$0	\$0.00	\$0
Other (Monitoring, injection, etc.)	1,606	\$0.00	\$0	\$0.00	\$0
Total	2,862		\$135,630		\$237,600
Revenue Goals:			\$135,000		\$235,000

Also, a regulatory fee could be established based upon water drawn out of the basin (which would require of measuring of flow), as modelled in Table 6, below.

Note: de minimis users are not charged in this model. (Acre feet based on estimates for The Ukiah Valley Basin)

TABLE 6 — MODEL OF USAGE RATE AND REVENUE FOR REGULATORY FEE ON ACRE-FEET

Basin Wells					
	Approx. Acre Feet	Low Range		High Range	
		Rate	Revenue	Rate	Revenue
Agricultural	5,000	\$21.00	\$105,000	\$36.00	\$180,000
Industrial	500	\$21.00	\$10,500	\$36.00	\$18,000
Municipal	1,000	\$21.00	\$21,000	\$36.00	\$36,000
Domestic	500	\$0.00	\$0	\$0.00	\$0
Other (Monitoring, injection, etc.)	100	\$0.00	\$0	\$0.00	\$0
Total	7,100		\$136,500		\$234,000
Revenue Goals:			\$135,000		\$235,000

ADVANTAGES

- Quick and inexpensive to implement. No noticing nor balloting is required.
- Revenue generation is sufficient to offset significant costs of certain key activities.
- Legally rigorous as long as fees are for eligible activities.
- Efficient administration.

CHALLENGES

- Potential for “push back” from affected well owners against fees.
- Potential legal scrutiny if fee covers non-eligible activities.
- Do not typically apply to infrastructure operations and capital costs.

IF ADDITIONAL REVENUE IS NEEDED

To be clear, this technical memorandum is recommending that (if the costs of GSP implementation necessitate it) the Agency consider either a Non-balloted Property Related Fee on Well Owner parcels or a Special Tax on all property owners in the basin, but likely not both, unless the financial need is very significant.

PROPERTY-RELATED FEE – (NON- BALLOTTED) ON WELL OWNERS

Property-related fees were first described in 1996’s Proposition 218, (which is manifested as Section 6 of Article XIII D of the California Constitution) and are commonly used today to

fund water, sewer, solid waste and even storm drainage. They are most commonly referred to as a “water charge or a “sewer charge,” etc., but are technically a property-related fee.

Proposition 218 imposes certain procedural requirements for imposing or increasing property related fees. There are two distinct steps: 1.) a mailed noticing of all affected property owners (well owners in this case) and 2.) a mailed balloting on all affected property owners requiring a 50% approval for adoption.

A REALLY IMPORTANT EXEMPTION ELIMINATES THE BALLOTING REQUIREMENT

Proposition 218 goes on to exempt fees for water, sewer and refuse collection from the second step – the balloting. Hence, a property-related fee imposed on well owners’ properties would be exempt from the balloting requirement. This is very significant because it reduces costs and political risk and lessens willingness-to-pay limitations.

California Water Code Provides Additional Clarity in 10730.2

California Water Code, Division 6., Part 2.74., Chapter 8. Financial Authority [10730 - 10731] provides considerable direction and authority to local governments tasked with groundwater sustainability regarding property-related fees.

In particular, Section 10730.2 (c) in the water code states:

“Fees imposed pursuant to this section shall be adopted in accordance with subdivisions (a) and (b) of Section 6 of Article XIII D of the California Constitution.”

Section 6 of Article XIII of the California Constitution describes the specific requirements of the implementation of a property related fee, and most importantly, refers to subdivision (a) as the noticing requirement, (b) as the limitations on fees and services, and subdivision (c) as the balloting requirement. Hence, by omission of (c) in Section 10730.2, balloting is not required for property related fees for groundwater sustainability.

PROPERTY RELATED FEE IMPLEMENTATION PROCESS

As described above, only the first step of the two-step process applies to property related fees in this context. That step is the noticed public hearing. Once the Agency has determined the fees they wish to impose, they must mail a written notice to each affected property owner at least 45 days prior to the public hearing. During that time, and up until the conclusion of the hearing, any affected property owner may file a written protest opposing the proposed fees. If the owners of a majority of the affected parcels file a written protest, the agency cannot impose the fee (known as a “majority protest”). If a majority protest is not formed, the agency may impose the fees.

Also, Section 10730.2 of the California Water Code includes several unique requirements that should be carefully followed when implementing property related fees for GSP implementation.

REQUIRED DOCUMENTS FOR A PROPERTY RELATED FEE

- Mailed Notices of Rate Proposal/Opportunity to Protest/Public Hearing.
- Fee Report and Presentation for Public Hearing.
- Report to Governing Board (assumes < 50% protest).
- Ordinance or Resolution Adopting Fees (assumes >50% support).

FLEXIBILITY OF METHODOLOGY

Long standing use of property related fees for water charges support relatively flexible use of this approach to fund a wide range of GSP implementation activities.

SGMA and Property Related Fees

Section 10730.2 (a) of the California Water Code dictates that once a GSA adopts a GSP, it “may impose fees on the extraction of groundwater from the basin to fund costs of groundwater management, including, but not limited to, the costs of the following:”

- (1) Administration, operation, and maintenance, including a prudent reserve.
- (2) Acquisition of lands or other property, facilities, and services.
- (3) Supply, production, treatment, or distribution of water.
- (4) Other activities necessary or convenient to implement the plan.

Section 10730.2 (c) states that “fees imposed pursuant to this section shall be adopted in accordance with subdivisions (a) and (b) of Section 6 of Article XIII D of the California Constitution,” which refers to the legal framework for property related fees. This reference to property related fees, along with the stipulation that such fees be imposed after GSP submittal, would seem to indicate that the framers of SGMA intended for property related fees to fund GSA costs after GSP submittal. Given the flexibility of their use, property related fees align well with near and long-term GSP implementation.

This section also specifies that “fees imposed pursuant to this section may include fixed fees and fees charged on a volumetric basis, including, but not limited to, fees that increase based on the quantity of groundwater produced annually, the year in which the production of groundwater commenced from a groundwater extraction facility, and impacts to the basin.”

Other ideas to consider include:

- Parcel-based Administration Fee.
- Water Company Service Fee
- Irrigated Acres Fee
- Remediation Fee for over-pumping.
- Augmentation Fee on over users to pay to import water.

REVENUE GENERATION POTENTIAL

Two potential revenue methodologies are modelled below based upon the use of a property related fee. Table 7 models rates meeting revenue goals generated using a hypothetical flat annual rate of between \$685.00 and \$825.00 per year per well for agricultural, industrial and municipal wells, and \$0.00 to \$27.50 per year for domestic and other wells. (Number and types of wells is approximate for the Ukiah Valley Basin)

TABLE 7 — MODEL OF ESTIMATED USAGE RATE AND REVENUE FOR PROPERTY RELATED FEE ON WELLS

Basin Wells					
	<u>Approx. Number</u>	<u>Low Range</u>		<u>High Range</u>	
		Rate	Revenue	Rate	Revenue
Agricultural	117	\$685.00	\$80,145	\$825.00	\$96,525
Industrial	11	\$685.00	\$7,535	\$825.00	\$9,075
Municipal	70	\$685.00	\$47,950	\$825.00	\$57,750
Domestic	1,058	\$0.00	\$0	\$27.50	\$29,095
Other (Monitoring, injection,etc.)	1,606	\$0.00	\$0	\$27.50	\$44,165
Total	2,862		\$135,630		\$236,610
Revenue Goals:			\$135,000		\$235,000

Also, a property related fee could be established meeting revenue goals based upon water drawn out of the basin (which would require of estimating or measuring of flow), ranging from \$19.00 to \$33.00 per acre foot per year, as modelled in Table 8, below:

TABLE 8 — MODEL OF USAGE RATE AND REVENUE FOR PROPERTY RELATED FEE ON ACRE- FEET

Model of Usage Rate and Revenue for Property Related Fee on Acre-Feet

Basin Wells					
	<u>Approx. Acre Feet</u>	<u>Low Range</u>		<u>High Range</u>	
		Rate	Revenue	Rate	Revenue
Agricultural	5,000	\$19.00	\$95,000	\$33.00	\$165,000
Industrial	500	\$19.00	\$9,500	\$33.00	\$16,500
Municipal	1,000	\$19.00	\$19,000	\$33.00	\$33,000
Domestic	500	\$19.00	\$9,500	\$33.00	\$16,500
Other (Monitoring, injection,etc.)	100	\$19.00	\$1,900	\$33.00	\$3,300
Total	7,100		\$134,900		\$234,300
Revenue Goals:			\$135,000		\$235,000

ADVANTAGES

- Revenue generation is likely sufficient to fund all GSP implementation costs.
- Legally rigorous. Property related fees are the described in the Water Code for funding groundwater sustainability.
- Process is exempt from a balloting, and the likelihood of a 50% protest is not likely.

- Cost of implementation is relatively low and includes a fee study, a mailing and additional outreach.
- Efficient administration.

CHALLENGES

- Politically challenging. Many well owners within the Ukiah Valley Basin have made it clear that they prefer the costs be allocated to all properties within the basin and not just the well owners. Well owners exert significant political influence within the basin. Although a balloting is not required, well owners may be able to stop the process legislatively or possibly could attain a 50% protest, which would force a balloting.
- Unfamiliar Process. One potential criticism of the property-related fee is that property owners are generally unfamiliar with the process, and opponents can exploit this. However, with the recent dramatic increase in voting by mail in California, this is less of a major issue. Nonetheless, political opponents can exploit this unfamiliarity and focus the public's attention on the Proposition 218 process, and away from the proposed groundwater sustainability goals and messaging.

A NOTE ON REGULATORY AND PROPERTY RELATED FEES

As noted in the sections above, regulatory fees and property related fees share some similarities as well as some important distinctions. Overall advantages and disadvantages of each are reviewed below for comparison:

Regulatory Fees

There are more limitations on what regulatory fees can be used to fund. Although many aspects of GSP implementation have not been legally tested under the laws surrounding regulatory fees, there are GSAs currently using them to fund general program administration. However, it is clear that regulatory fees *cannot* fund capital projects or grant writing, both of which may be crucial to GSP implementation. The need for alternative funding for such endeavors should be evaluated by the Agency.

Implementation of regulatory fees is somewhat faster, having no requirement of 45 days' notice or protest hearing. It should be noted, however, that the lack of a protest hearing lessens opportunity for community input. This may place more political pressure on the Agency. Additionally, the fee report for regulatory fees is slightly less comprehensive, requiring only that a fair and reasonable relationship to use be established.

Property Related Fees

Property related fees are far less limited in what they can pay for- virtually all aspects of GSP implementation would be eligible. There is ample case law supporting the use of property related fees for all activities related to groundwater management including operations, maintain and capital improvements.

Implementation of property related fees requires a 45-day notice and protest hearing, which adds more time to the process. It should be noted that the protest hearing provides more opportunity for community input, which also lends itself to political legitimacy. Additionally, property related fees require a more comprehensive fee report, one that establishes a nexus between the fee and its use.

SPECIAL TAX ON ALL PROPERTY OWNERS IN THE BASIN

Special taxes are decided by registered voters and almost always require a two-thirds majority for approval. Traditionally, special taxes have been decided at polling places corresponding with general and special elections. Special taxes are well known to Californians but are not as common as property related fees for funding of water-related services and infrastructure activities.

As a reminder, this technical memorandum is recommending that (only if the costs of GSP implementation requires it) the Agency consider either a Non-balloted Property Related Fee on Well Owner parcels or a Special Tax (described below) on all property owners in the basin, but likely not both, unless the financial need is very significant.

PARCEL BASED TAXES

Many special taxes are conducted on a parcel basis with a uniform “flat” rate across all parcels, or varied rates based upon property attributes such as use and/or size. Parcel taxes based upon the assessed value of a property are not allowed. Parcel based taxes (as opposed to sales taxes, etc.) are the most viable type of special tax for funding water-related activities. As such, most discussion of special taxes in this report will focus on parcel taxes.

SPECIAL TAX IMPLEMENTATION PROCESS

Public agencies typically work with special consultants familiar with the administrative and political aspects of proposing a special tax to a community. Special tax elections held at polling places are conducted on the statutorily designated dates (typically in November for the general election and either March or June for the primary).

If the Agency ultimately decides to pursue a special tax, it is highly recommended that a special all-mail election be considered. Special all-mail ballot elections are often less expensive and allow for more optimization of the election date, as well as having the advantage of presenting a single issue to the voters.

REQUIRED DOCUMENTS FOR A PARCEL BASED SPECIAL TAX

- Ordinance or Resolution stating: tax type, tax rates, collection method, election date and services provided
- Notice to the Registrar of Voters of measure submitted to voters
- Measure Text including:
 - Ballot question (75 words or less)
 - Full ballot text (300 words or less) including rate structure
 - Arguments in favor or against and independent analysis

- Tax Report

FLEXIBILITY OF METHODOLOGY

There is considerable flexibility in tax methodology. The Agency could propose a flat tax rate in which all parcels are charged the same or a “tiered approach” where, for example larger, and/or commercial parcels may be taxed more than vacant lots. If a tiered approach is considered, the Agency should consider using existing Community Facilities District (“CFD”) law and practice which better defends the use of a tiered structure.

REVENUE GENERATION POTENTIAL

A detail breakdown of the parcel attributes including number of parcels, number of residential units (for multi-family parcels) and acres for agricultural parcels in the Ukiah Valley Basin is shown in Table 9, below:

TABLE 9 — PARCEL ATTRIBUTES WITHIN THE UKIAH VALLEY BASIN

Use	Residential		
	Parcels	Units	Acres
Single Family	6,746	6,746	7,659
Multi: 2 - 4 units	233	466	120
Mobile Home	500	500	879
Commercial/Industrial	922	NA	1,929
Vacant	651	NA	1,379
Parking & Storage	85	NA	168
Multi: 5+ units	251	1,255	208
Agricultural	796	NA	16,864
Timber & Pasture	115	NA	3,252
Mobile Home Park	47	NA	174
Totals	10,346	8,967	32,632

Next, we have modelled hypothetical rates to generate the revenue goals in Table 10, below. This model shows that revenue goals could be met based upon taxes ranging from \$9.50 to \$17.50 per parcel per year for most parcel uses, and \$1.75 to \$4.00 per acres for agricultural and timber/pasture uses.

TABLE 10 — MODEL OF TAX RATE AND REVENUES FOR SPECIAL TAX

	Residential			Low Range		High Range		Units
	Parcels	Units	Acres					
Single Family	6,746	6,746	7,659	\$9.50	\$64,087	\$17.50	\$118,055	<i>per residential unit</i>
Multi: 2 - 4 units	233	466	120	\$9.50	\$4,427	\$17.50	\$8,155	<i>per residential unit</i>
Mobile Home	500	500	879	\$9.50	\$4,750	\$17.50	\$8,750	<i>per residential unit</i>
Commercial/Industrial	922	NA	1,929	\$9.50	\$8,759	\$17.50	\$16,135	<i>per parcel</i>
Vacant	651	NA	1,379	\$9.50	\$6,185	\$17.50	\$11,393	<i>per parcel</i>
Parking & Storage	85	NA	168	\$9.50	\$808	\$17.50	\$1,488	<i>per parcel</i>
Multi: 5+ units	251	1,255	208	\$9.50	\$11,923	\$17.50	\$4,393	<i>per residential unit</i>
Agricultural	796	NA	16,864	\$1.75	\$29,513	\$4.00	\$67,457	<i>per acre</i>
Timber & Pasture	115	NA	3,252	\$1.75	\$5,691	\$4.00	\$13,007	<i>per acre</i>
Mobile Home Park	47	NA	174	\$9.50	\$447	\$17.50	\$823	<i>per parcel</i>
Totals	10,346	8,967	32,632		\$136,587		\$249,655	
Revenue Goals:				\$135,000		\$235,000		

ADVANTAGES

- Revenue generation is likely sufficient to fund all GSP implementation costs if voter approved.
- Legally rigorous. Special taxes, if approved by two-thirds of the registered voters within a community, are very reliable and very rarely legally challenged successfully. Special tax revenue has not been subject to state level "take-aways" like ERAF.
- Well known. Most property owners are aware and comfortable with (but not necessarily supportive of) the special taxes and the special tax process.
- Efficient administration

CHALLENGES

- Political support at required rate and revenue may be difficult. Generally speaking, the two-thirds majority threshold for approval is very politically challenging. Special taxes are subject to significant outside influence from media and opposition groups during voting and are more vulnerable to other measures and candidates that share the ballot. (However, a recent California Supreme Court decision called the "Upland Case" allows for certain types of special taxes to be approved with a more easily achievable 50% threshold. The Agency should evaluate the pros and cons of the effectiveness of an "Upland Tax.")

GENERAL OBLIGATION BONDS SUPPORTED BY A SPECIAL TAX

In California, special taxes can be linked directly to the sale of general obligation bonds to finance the construction of infrastructure. In 2004, the City of Los Angeles successfully passed "Measure O" which provided funding for a variety of capital improvements related to water quality. Arguably, voters are more likely to support general obligation bond special taxes than parcel-based taxes at equivalent rates.

However, since special taxes for general obligations bonds can only be used for the financing of capital improvements, this mechanism could only be used to fund the CIP portion of the needs – not the operating costs of the groundwater management infrastructure.

In other words, the passage of a G.O. Bond would not satisfy the Agency's overall groundwater management funding goals, because this source could not fund ongoing operations and maintenance. However, it is possible that community priorities and a revised funding strategy could dictate that pursuit of a G.O. bond measure is optimal to fund any significant groundwater management capital projects. Results of the public opinion survey should help guide this decision.

OTHER APPROACHES – LESS OPTIMAL

BALLOTTED PROPERTY-RELATED FEE OR BENEFIT ASSESSMENTS ON ALL PROPERTY OWNERS IN THE BASIN

If the Agency decides to pursue a revenue mechanism applied to well owners, a non-balloted property related fee is optimal, and if the Agency decides to pursue a revenue mechanism applied to all property owners in the basin, a special tax is most likely the best choice. However, there are two other approaches described in Proposition 218 worthy of discussion, especially if voter support is marginal: 1.) a balloted property related fee or 2.) a benefit assessment. Both of these are more expensive to implement and administer and are considerably less legally rigorous (especially with no current precedent) than a special tax. Nonetheless, both require only a 50% approval for implementation. Further research and evaluation would need to be pursued.

OTHER CONSIDERATIONS

CONDUCT A SURVEY IF CONSIDERING A PROPERTY-RELATED FEE OR SPECIAL TAX

See a full discussion in the next section.

IMPLEMENT RIGOROUS COMMUNITY OUTREACH IF CONSIDERING A PROPERTY-RELATED FEE OR SPECIAL TAX

See a full discussion in the next section.

TIMING AND SCHEDULE

The selection of the balloting date is one of the most important factors affecting the success of any measure. Potential competition with other measures, income and property tax due dates, seasons, and holidays, etc. should all be evaluated when choosing a balloting date.

A COST ESCALATOR IS RECOMMENDED FOR BALLOTTED MECHANISMS

Non-balloted funding mechanisms can be updated periodically using the noticed public hearing procedure described above. This is the typical method of keeping revenues aligned with costs through the years as in the case for retail water and sewer fees. Accordingly, the rates can be kept updated for inflationary forces and other cost increases on a five-year recurrence cycle.

However, for balloted mechanisms, any increase or change in rate structures requires a re-balloting unless the original balloting included a pre-determined formula for escalation – such as the Consumer Price Index (CPI). Infrastructure-intensive utilities are driven by many different forces than those that drive the CPI, including the need for capital investment programs, regulatory programs, and the economics of sustainability, conservation, and commodity constraints. Due, in part, to these other drivers, rates for utilities have not traditionally been tied to a straightforward CPI, but rather have been expressed as a specific rate amount for a given year based on actual projected costs. Nonetheless, costs do increase over time and a cost escalator is recommended to reimburse the Agency for this increase. The simplest to explain to property owners and to administer annually is a CPI, based upon a readily available index such as the U.S. Department of Labor, which would allow for annual rate increases without annual balloting. A CPI escalator is legally defensible with property related fees, regulatory fees, and special taxes.

However, a CPI approach may make it difficult to accommodate infrastructure-driven cost increases in coming years. An alternative approach would be to include a rate adjustment schedule that would include specific increases in future years that meet the UVBGAS's needs. (This approach, commonly used by water and sewer providers, often communicates to the property owner in table form with the proposed rate corresponding to each year for the next four or five years.)

At this point in the process, it is difficult to make a concise recommendation for the escalator mechanism. It would depend on the escalating costs and how they affect the proposed rates in the foreseeable future. It would also depend in part on the proposed rate structure itself, as some structures may be based on variables that intrinsically accommodate increasing groundwater management needs. Finally, it would depend on the political considerations that come with any ballot measure. Historically, the majority of survey data supports the fact that a CPI escalator introduces minimal decay in overall support.

A SUNSET PROVISION IS NOT RECOMMENDED, BUT SHOULD BE CONSIDERED

A "Sunset Provision" is a mechanism used to increase political support by setting an expiration date for a measure, and can be used with a property related fee, regulatory fee, or tax. Sunset provisions typically range from five years to as much as 20 years in some rare cases. However, the political advantage may be slight and does not outweigh the negative aspect of the increased costs and political risk of having to re-ballot at the termination of the sunset period.

One variation is the “sundown” clause. This is the name given to a tax or fee that would reduce after a specific date – leaving a portion of the tax or fee to continue indefinitely. This tactic is useful for programs that have a one-time capital need and then would reduce to fund only operations and maintenance beyond that. If the one-time capital need is debt financed, the “sundown” period would need to be at least as long as the debt repayment period.

A “DISCOUNT MECHANISM” SHOULD BE CONSIDERED, BUT MAY NOT BE COST-EFFECTIVE

Consistent with the efforts of obtaining higher quality groundwater, a discount or “rate reduction” program should be considered which rewards well owners implementing groundwater sustainability management measures on their properties with a lower fee, based on the reduced cost of providing groundwater service. Any such program would need to be coordinated with whatever rate structure the Agency decides on to ensure that it fits with the rationale and is compliant with Proposition 218.

The advantages of such a program include improved water quality, improved engagement by the community, as well as a rate more tailored to individual usage. Also, discount programs tend to be well received by the electorate, although most people do not participate. The downside of such a program is that the benefit may not justify the cost of administering this program, because the inspection of property-specific improvements is expensive and time consuming. Nonetheless, a couple of public agencies including the cities of Portland, Oregon, South Lake Tahoe, and Palo Alto have successfully implemented discount programs on their storm drainage fees. The community's interest level for a discount mechanism will be evaluated as part of the mail survey opinion research.

III. RECOMMENDATIONS FOR IMPLEMENTATION OF FUNDING MECHANISMS

Following is a “Game Plan” outline of the recommended steps for implementation of funding for the UVBGAS’ GSP implementation. Most of the steps have been discussed above – a discussion of community public opinion surveying and community outreach is included below.

GAME PLAN

1. Conduct community outreach regarding the Plan and its implementation.
2. Pursue use of existing revenue sources to fund implementation.
3. Pursue Grants and Loan Opportunities to fund implementation.
4. Implement Regulatory Fees to offset eligible implementation costs.

If additional revenue is needed:

5. Conduct a survey and stakeholder outreach to better evaluate:
 - a. Community priorities and associated messaging.
 - b. Optimal rate.
 - c. Preference of non-balloted property related fee versus special tax.
6. Use results of surveys, stakeholder input and other analyses to develop a community outreach plan.
7. Implement the community outreach.
8. Implement a property related fee or special tax balloting:
 - a. Include a cost escalator schedule or mechanism.
 - b. Include the use of rate zones or other distinguishing factors.
 - c. Do not include a rate expiration date (also known as a “Sunset Clause”).
 - d. Include a Discount Program to encourage better groundwater management by well owners.

CONSIDER A PUBLIC OPINION SURVEY

The primary purpose of the public opinion survey is to produce an unbiased, statistically reliable evaluation of voters’ and property owners’ interest in supporting a local revenue measure. Should the Agency decide to move forward with a revenue measure (property-related fee or special tax), the survey data provides guidance as to how to structure the measure so that it is consistent with the community's priorities and expressed needs. Agencies typically engage specialized survey firms to conduct surveys.

Specifically, the survey should:

- Gauge current, baseline support for a local revenue measure associated with specific dollar amounts. (How much are well owners/property owners willing to pay?)
- Identify the types of services and projects that voters and property owners are most interested in funding.
- Identify the issues voters and property owners are most responsive to (e.g., preventing subsidence, maintaining water availability, reducing pumping costs, protecting water quality, etc.).

- Expose respondents to arguments in favor of—and against—the proposed revenue measure to gauge how information affects support for the measure.
- Identify whether local residents prefer the measure as a property related fee or a special tax.

As the nation struggles with the COVID-19 pandemic, it is more important than ever to measure a community's position on all of these elements. What community leaders thought they knew about public opinion may no longer be accurate in a post-COVID world. And while a survey can provide the Agency with valuable information, it will also be an opportunity to begin getting the groundwater “brand” out into the community – a valuable early step in this process.

COMMUNITY SUPPORT AND ENGAGEMENT

Clear, concise, and appropriate community outreach is one of the most important elements for successful implementation of a funding mechanism. The basic message components need to be simple, clear, and transparent, and need to be well supported with detailed and substantive information. Credibility is the most important factor in this outreach.

Agencies often, but not always, will engage specialized consultants to assist with community outreach in support of implementation of funding mechanisms. A community outreach plan should be developed and implemented. Three major steps are described below.

Develop Communication Infrastructure

The UVBGSA should carefully evaluate and develop potential communication infrastructure, ultimately coordinating with existing communication infrastructure, including stakeholder contacts, print media, website, social media, print publications, neighborhood groups, and newsletters, etc. Use of e-mail contacts (with HOA, neighborhood and stakeholder groups and leaders, and web-based platforms like nextdoor.com is encouraged). Develop a schedule of community stakeholder meetings, due dates for local group newsletters, etc.

In most cases, the most effective communication mechanisms for this type of infrastructure are small, local, and neighborhood-based, with personal communication or face-to-face (as appropriate in COVID-19 environment). This approach is not expensive, but it is a significant amount of work and is very effective when well-executed.

Develop Communication Messaging

The development of the messaging and supporting information is an iterative process with staff, consultant, and community members. (If a community survey is conducted, it can be extremely helpful in developing the most effective messaging.) Throughout this process, the Agency and consultant will analyze and refine messaging associated with groundwater sustainability management benefits. In this task, the Agency should develop draft communications of various types, including Frequently Asked Questions documents, social media content, mailers and brochures, PowerPoint presentations, and e-mails, scripts, and other adaptable messages.

Communications Rollout and Implementation

Once the outreach plan is well-vetted, reviewed, and refined, the Agency should coordinate the plan's rollout and implementation.

Agenda Item #10

Cosumnes Groundwater Authority Board of Directors Meeting

Agenda Date: June 20, 2022

Agenda Item #: 10

Agenda Item Subject: City of Sacramento and Sacramento County Water Agency
Transfer Determination

To: CGA Board of Directors

From: CGA Staff

Background

The City of Sacramento and the Sacramento County Water Agency (SCWA) have identified an opportunity to participate in a regional groundwater substitution transfer over the period of July 1st, 2022, to November 30th, 2022. SCWA will deliver approximately 2,800 acre-feet of groundwater to the City of Sacramento through the Franklin Intertie, thereby allowing the City to reduce surface water diversions from the Lower American River. The City will preferentially increase municipal pumping by up to 1,700 acre-feet, further reducing surface water diversion. In total, 4,500 acre-feet of groundwater are proposed to be extracted.

Attachments

- [Agreement between the City of Sacramento and the Sacramento County Water Agency for a Joint Groundwater Substitution Transfer - DRAFT](#)
- [City of Sacramento Notification Letter to the Sacramento Central Groundwater Authority](#)
- [Sacramento Central Groundwater Authority Findings](#)