ARROYO SANTA ROSA BASIN GROUNDWATER SUSTAINABILITY AGENCY

SPECIAL BOARD MEETING AGENDA

August 12, 2021

5:00 P.M.

Camrosa Water District, 7385 Santa Rosa Road, Camarillo, CA 93012

MEMBERS OF THE BOARD

JEFFREY C. BROWN, Camrosa Water District
TERRY L. FOREMAN, Camrosa Water District
AL E. FOX, Camrosa Water District
TIMOTHY H. HOAG, Camrosa Water District
JEFF PRATT, Ventura County Public Works Agency
EUGENE F. WEST, Camrosa Water District

ALL AGENDA DOCUMENTS ARE AVAILABLE AT THE CAMROSA WATER DISTRICT OFFICE AND ONLINE AT WWW.CAMROSA.COM/SRGSA

TO BE HELD REMOTELY

In light of public health responses to the threat of COVID-19 and Governor Newsom's Executive Order N-25-20, the Camrosa office is still closed to the public. Board meetings are accessible to the public **only** via web-based teleconference, as described below.

To participate via the web to see the board meeting presentation, click https://us02web.zoom.us/j/9235309144 on your computer, tablet, or smartphone. You'll need to download and install the zoom app before logging on.

If you'd like to make a comment, you'll have to log in via the app so we can identify you and invite you to participate.

To listen in via phone, call (669) 900-6833; when prompted, enter the meeting ID: 923 530 9144.

CALL TO ORDER

PUBLIC COMMENTS

At this time, the public may address the Board on any item <u>not</u> appearing on the agenda that is subject to its jurisdiction. Persons wishing to address the Board should fill out a comment card and submit it to the Board Chair prior to the meeting. All comments are subject to a <u>five-minute</u> time limit.

Matters appearing on the Consent Agenda are expected to be non-controversial and will be acted upon by the Board collectively, without discussion, unless a member of the Board or staff requests an opportunity to address a given item. Approval by the Board of Consent Items means that the recommendation of staff is approved along with the terms and conditions described in the Board Memorandum.

CONSENT AGENDA

- 1. Approve the Minutes of the January 28, 2021 meeting
- 2. Ratify Vendor Payments

PRIMARY AGENDA

3. Quarterly Results

Staff will present results of FY20-21.

4. FY2021-22 ASRGSA Budget

The Board will consider adoption a FY2021-22 budget.

5. GSP Contract

The Board will consider an agreement with Stantec to prepare a groundwater sustainability plan in compliance with the Sustainable Groundwater Management Act.

The Board of Directors may hold a closed session to discuss personnel matters or litigation, pursuant to the attorney-client privilege, as authorized by the California Government Code. Any of the above items that involve pending litigation may require discussion in closed session on the recommendation of the GSA's legal counsel.

COMMENTS BY THE EXECUTIVE DIRECTOR

COMMENTS BY THE BOARD OF DIRECTORS

ADJOURN

ARROYO SANTA ROSA BASIN

GROUNDWATER SUSTAINABILITY AGENCY

MINUTES OF THE MEETING OF THE BOARD

January 28, 2021

4:45 P.M.

Camrosa Water District, 7385 Santa Rosa Road, Camarillo, CA 93012

CALL TO ORDER The meeting was called to order at 4:45 P.M.

Present: Jeffrey C. Brown (via teleconference)

Terry L. Foreman (via teleconference)

Al E. Fox (via teleconference)

Timothy H. Hoag (via teleconference)

Kathleen Riedel (for Jeff Pratt) (via teleconference)

Eugene F. West (via teleconference)

Staff: Greg Jones, Legal Counsel (via teleconference)

Ian Prichard, Camrosa Water District (via teleconference)

Tamara Sexton, Treasurer (via teleconference)

Tony Stafford, Executive Director (via teleconference)

Guests: None

PUBLIC COMMENTS

None

SPECIAL PRESENTATIONS AND ANNOUNCEMENTS

None

CONSENT AGENDA

- 1. Approve the minutes of the September 24, 2020 meeting
- 2. Ratify vendor payments

Motion to approve the Consent Agenda: Fox. **Second:** Hoag. *A roll call vote was taken and the motion carried unanimously.*

PRIMARY AGENDA

3. FY2019-20 Final Results

Staff presented results for the first quarter of FY2020-21 budget.

MEMBERS OF THE BOARD

JEFFREY C. BROWN, Camrosa Water District

TERRY L. FOREMAN, Camrosa Water District

AL E. FOX, Camrosa Water District

TIMOTHY H. HOAG, Camrosa Water District

JEFF PRATT, Ventura County Public Works Agency

EUGENE F. WEST, Camrosa Water District

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4. **GSP Scoping Contract**

Executive Director

Arroyo Santa Rosa Basin GSA

The Board authorized the Executive Director to enter into a general services contract with Stantec Consulting Services, Inc., and issue a purchase order in the amount of \$44,583.00 for scoping meetings and additional data-collection tasks.

Motion to enter into the GSP scoping contract with Stantec: Brown. **Second:** Foreman. A roll call vote was taken and the motion carried unanimously.

Tony L. Stafford	Eugene F. West, Chair	
		(ATTEST
There being no further business, the	meeting was adjourned at 4:52 P.M.	
<u>ADJOURN</u>		
None		
COMMENTS BY THE BOARD OF DIRECTORS		
None		
COMMENTS BY THE EXECUTIVE DIRECTOR		
None		
- 		
INFORMATIONAL ITEMS		
None		
ADMINISTRATIVE ITEMS		
was taken and the motion carried unanimous	517.	
was taken and the motion carried unanimous	chu	

Board of Directors

Arroyo Santa Rosa Basin GSA

ARROYO SANTA ROSA BASIN

GROUNDWATER SUSTAINABILITY AGENCY

Camrosa Water District, 7385 Santa Rosa Road, Camarillo, CA 93012

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EUGENE F. WEST, Camrosa Water District

BOARD MEMORANDUM

DATE: August 12, 2021

TO: Board of Directors

FROM: Tony Stafford, Executive Director

OBJECTIVE: Ratify vendor payments as presented by Staff.

ACTION: Ratify accounts payable.

SUMMARY: A summary of accounts payable previously paid by the Arroyo Santa Rosa Groundwater

Sustainability Agency in the amount of \$43,380.81 is provided for Board information and

ratification.

Check			Invoice		
Number	Post Date	Vendor Name	Number	Description	Amount
28	1/20/2021	Hathaway, Perrett, Webster	111341	Legal Services	30.58
	1/31/2021	Union Bank		December 2020 Bank Fees	40
29	2/17/2021	Hathaway, Perrett, Webster	111597	Legal Services	91.73
	2/28/2021	Union Bank		January 2021 Bank Fees	40
30	3/31/2021	Stantec	1768684	GSP Scoping Services for period ending February 19, 2021	6,179.00
	3/31/2021	Union Bank		February 2021 Bank Fees	40.00
31	4/4/2021	Stantec	1774565	GSP Scoping Services for period ending March 19, 2021	16,942.50
	4/30/2021	Union Bank		March 2021 Bank Fees	40.00
	5/31/2021	Union Bank		April 2021 Bank Fees	40.00
32	6/16/2021	Stantec	1793874	GSP Scoping Services for Period Ending April 23, 2021	13,640.50
32	6/16/2021	Stantec	1796439	GSP Scoping Services for Period Ending May 21, 2021	497.50
	6/16/2021	Union Bank		May 2021 Bank Fees	40.00
	6/30/2021	Union Bank		June 2021 Bank Fees	40.00
33	6/30/2021	Stantec	1809687	GSP Scoping Services for Period Ending June 18, 2021	5,719.00
Total Ven	dor Paymen	ts			\$43,380.81

The Arroyo Santa Rosa GSA's bank account balance as of June 30, 2021, was \$66,514.97.

ARROYO SANTA ROSA BASIN

GROUNDWATER SUSTAINABILITY AGENCY

Camrosa Water District, 7385 Santa Rosa Road, Camarillo, CA 93012

BOARD MEMORANDUM

MEMBERS OF THE BOARD

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EUGENE F. WEST, Camrosa Water District

DATE: August 12, 2021

TO: Board of Directors

FROM: Tony Stafford, Executive Director

OBJECTIVE: Review FY20-21 Fourth Quarter Results.

ACTION: No action necessary; for information only.

SUMMARY: The ASRGSA's FY20-21 budget was approved at the September 24, 2020, meeting. Staff

will present fourth quarter results.

Arroyo Santa Rosa GSA	Budget FY 20-21			ctuals Unaudited FY 20-21		Variance
Transfer In						
Camrosa Water District	\$	150,000	\$	-	\$	150,000
Invoiced to County of Ventura	\$	222,075	\$	22,942	\$	199,133
	\$	372,075	\$	22,942	\$	349,133
Operating Expenses						
Outside Contracts	\$	8,000	\$	-	\$	8,000
Professional Services	\$	341,500	\$	42,979	\$	298,522
Materials & Supplies	\$	8,600	\$	-	\$	8,600
Legal Services	\$	10,000	\$	550	\$	9,450
Dues & Subscriptions	\$	350	\$	750	\$	(400)
Conference & Travel	\$	2,000	\$	-	\$	2,000
Fees & Charges	\$	500	\$	480	\$	20
Insurance	\$	1,125	\$	1,125	\$	
Total Operating Expenses	\$	\$ 372,075		\$ 45,884		326,191

Notes:

⁽¹⁾ Camrosa Water District contributed \$100,000 to the ASRGSA in FY 2016-17

⁽²⁾ The Arroyo Santa Rosa GSA's bank account balance as of June 30, 2021 was \$66,514.97

ARROYO SANTA ROSA BASIN

GROUNDWATER SUSTAINABILITY AGENCY

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EUGENE F. WEST, Camrosa Water District

BOARD MEMORANDUM

DATE: August 12, 2021

TO: Board of Directors

FROM: Tony Stafford, Executive Director

OBJECTIVE: Establish a budget for Fiscal Year (FY) 2021-22.

ACTION: Adopt a FY2021-22 budget.

SUMMARY: Planning for a groundwater sustainability plan (GSP) began in earnest last fiscal year with

the creation of an Ad Hoc committee to engage with Stantec, the ASRGSA's preferred consultant for the plan. Scoping for the plan was accomplished, as was some initial data

gathering and review. The bulk of the GSP, including stakeholder outreach and

hydrogeologic groundwater modeling, is anticipated to take place during FY2021-22. The Proposition 1 Sustainable Groundwater Planning Grant that the ASRGSA received requires that the GSP be complete by December 31, 2022. The attached budget reflects this

anticipated planning activity in the forthcoming fiscal year.

Administrative fees are being split between the members of the joint powers of authority agreement (JPA) governing the GSA, Camrosa Water District and the County of Ventura.

The County's contributions are capped at \$100,000 per year.

ARROYO SANTA ROSA BASIN

GROUNDWATER SUSTAINABILITY AGENCY

Camrosa Water District, 7385 Santa Rosa Road, Camarillo, CA 93012

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Fiscal Year 2021-22 Budget Message

Overview

This memorandum serves as a cover message for the Arroyo Santa Rosa Groundwater Sustainability Agency's (ASRGSA) Fiscal Year (FY) 2021-22 budget. It describes the governance and purpose of the ASRGSA, the plan for the FY21-22 budget, and the basis of accounting.

Agency Governance

The ASRGSA is organized under a joint powers of authority agreement (JPA) between the Camrosa Water District and the County of Ventura. Camrosa is the water purveyor for the Santa Rosa Valley and the largest producer of groundwater from the Santa Rosa Basin; the County maintains land-use jurisdiction over the unincorporated valley. The six-member Board of Directors holds meetings when necessary, usually immediately following the Camrosa Water District Board meeting. Meetings are publicly noticed.

The GSA is staffed by an Executive Director, treasurer, controller, and auditor, appointed by the Board. The GSA Board appointed Tony Stafford, the GM of the Camrosa Water District, as Executive Director, and determined that the auditor of the Camrosa Water District's finances should also audit the ASRGSA. According to the JPA, the treasurer and controller positions shall be filled by Camrosa Water District staff, and are, currently by Tamara Sexton, Manager of Finance, and Sandra Llamas, Senior Accountant, respectively. Other duties and activities necessary to accomplish the ASRGSA's business are carried out by Camrosa Water District employees.

Agency Purpose

The purpose of the ASRGSA is, as defined by the Sustainable Groundwater Management Act (SGMA), the agency's enabling legislation, to achieve sustainability within the Santa Rosa Basin by 2042. The vehicle for achieving this, and the primary focus of the agency this fiscal year, is the groundwater sustainability plan, or GSP.

The GSP is a management plan document that evaluates sustainability as it relates to six indicators of basin health: groundwater levels, groundwater storage, seawater intrusion, water quality, land subsidence, and groundwater-surface water interconnection. The GSP will set minimum thresholds for each of the applicable criteria, and develop associated management actions to avoid undesirable results and achieve sustainability.

FY21-22 Budget

While there are general guidelines for what constitutes an undesirable result, what "sustainability" of groundwater basins looks like depends on the perspectives of the producers, users, and stakeholders in a groundwater basin. Thus, much of the initial work—though not necessarily of the expenditures—of a GSP entails stakeholder engagement.

In tandem, hydrogeological modelling will be performed to understand the water budget and other ways the basin might react under various conditions and to help develop management actions and projects. Much of the stakeholder engagement work will be carried out by ASRGSA/Camrosa staff; the technical work will be supported by consulting experts. This latter comprises the bulk of the planned expenditures for FY21-22 and the first half of FY22-23; the plan is expected to be complete by December 31, 2022. The California Department of Water Resources, which is overseeing the Proposition 1 Sustainable Groundwater Planning Grant that the ASRGSA received to prepare a GSP, requires that the plan be complete prior to December 31, 2022 in order for the ASRGSA to remain eligible for grant funds.

Other expenditures include legal support and necessary general materials and supplies.

Budget Development

Much of the detailed, technical work of the GSP will be supported by consultants. The Board created an Ad Hoc committee in September 2020 to collaborate with Stantec to develop a proposal that complies with SGMA requirements and provides value to the ASRGSA and other stakeholders in the Arroyo Santa Rosa Basin. It is anticipated Stantec will be under contract to complete the GSP by the fall of 2021.

In April 2018, the California Department of Water Resources announced the final awards to 78 applicants for the Sustainable Groundwater Planning Grant program. The ASRGSA was among those applicants. Kennedy-Jenks assisted ASRGSA staff in preparing the scope of work that formed the basis of the grant application. DWR awarded the ASRGSA \$177,081 in matching grant funding. That, paired with the ASRGSA's match of an equal amount, forms the lion's share of the FY2021-22 budget.

Reference

Questions regarding this message or the budget should be directed to Ian Prichard, Assistant General Manager at Camrosa Water District, at 805.482.6562 or IanP@camrosa.com.

Santa Rosa GSA Annual Budget FY2021-22

	Object Code	FY	21-22 Budget
fer In			
JPA Member Assesssment		\$	338,01
Replenishment Fee			
TOTAL TRANSFER FEE		\$	338,01
nistrative Fees			
Communications	50210	\$	-
Outside Contracts	50220	\$	8,00
Audio/Visual (four meetings)		\$	3,0
Billing (process TBD)		\$	-
Contract Services		\$	-
Meter Calibration Program		\$	-
Meter Installation		\$	-
Room Rental (four meetings)		\$	5,0
Professional Services	50230	\$	306,3
Auditing Services		\$	1,5
Engineering Services (GSP through 12/31/2022)		\$	304,8
Materials & Supplies	50260	\$	8,6
Check stock		\$	5
General Postage		\$	1
Stakeholder supplies		\$	1,0
Printing & Mailing		\$	5,0
Public Hearing Notification		\$	1,5
Office supplies		\$	5
Legal Services	50280	\$	10,0
Dues & Subscriptions	50290	\$	1,4
ACWA		\$	1,4
Conference & Travel	50300	\$	2,0
Safety & Training	50310	\$	-
Board Expense	50330	\$	-
Fees & Charges	50350	\$	5
Banking fees		\$	5
Insurance	50360	\$	1,1
JPIA premiums		\$	1,1
TOTAL ADMINISTRATIVE FEES		\$	338,01

ARROYO SANTA ROSA BASIN

GROUNDWATER SUSTAINABILITY AGENCY

Camrosa Water District, 7385 Santa Rosa Road, Camarillo, CA 93012

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EUGENE F. WEST, Camrosa Water District

BOARD MEMORANDUM

DATE: August 12, 2021

TO: Board of Directors

FROM: Tony Stafford, Executive Director

OBJECTIVE: Proceed with the groundwater sustainability plan.

ACTION: Authorize the Executive Director to issue a purchase order to Stantec Consulting Services,

Inc., in an amount not to exceed \$365,652 with a 15% contingency of \$54,848, to complete the Arroyo Santa Rosa Basin Groundwater Sustainability Plan (GSP).

DISCUSSION: At the September 24, 2020, meeting, the Executive Director recommended creating an

Ad Hoc committee to work with staff to develop a scope for a GSP that would comply with the Sustainable Groundwater Management Act (SGMA) and met the needs of the ASRGSA. The Executive Director recommended, and the Board appointed, Director Foreman and Kathleen Riedel, of Ventura County Public Works, to serve on the committee.

Over the course of the last ten months, through five meetings, including three with Stantec, the Ad Hoc has scrutinized the work Stantec has performed and the proposals they have submitted. They have asked Stantec to demonstrate their approach to assembling the model and to fully articulate their methodology for water budget analysis. Revised proposals better align with SGMA guidelines and Department of Water Resources Best Management Practices. The Ad Hoc devoted considerable time and effort to the process and, as a result, the GSP will be in stricter conformance with SGMA standards and provide greater benefit to both the ASRGSA and all groundwater stakeholders in the Santa Rosa Valley.

The ASRGSA applied for a Proposition 1 Sustainable Groundwater Planning Grant and received approval of matching funds up to \$177,081. The Department of Water Resources has informed staff that the plan needs to be complete by December 31, 2022 for the ASRGSA to remain eligible for reimbursement.

The Stantec team has extensive pertinent groundwater experience. They completed SGMA Alternative Plans for Indio and Mission Creek Subbasins in the Coachella Valley and a GSP for the North Westside Basin in the San Francisco area, and serve as the administrator for the Bedford Coldwater GSA in the Elsinore Valley. The core team includes:

- Eric Vogler, the principal project manager: Dr. Vogler has a PhD in civil engineering, as well as an MS and BS in hydrogeology. He focuses on novel treatment technology, computational fluid dynamics, and surface water and groundwater modeling. He has consulted on basin-scale water resource management projects for State Water Project contractors and federally funded national programs. He is currently the project manager on LADWP's Eastern Sierra Water Management Program and Owens Valley Groundwater Management Plan. Prior projects include a variety of aquifer storage and recovery operations, groundwater management planning, integrated water resource management planning, groundwater modeling, and water quality investigations.
- Thomas Regan: a senior hydrogeologist and the technical lead on the ASRGSP, Mr.
 Regan performed the technical work for the Arroyo Santa Rosa Basin Boundary
 Modification in 2019. His familiarity with the region extends back to the Calleguas
 Creek Watershed Study undertaken to meet Los Angeles Regional Water Quality
 Control Board regulations.
- Victor Harris: a subconsultant to Stantec on this project, Mr. Harris was instrumental
 in the 2013 Camrosa Groundwater Management Plan and has nearly 40 years of
 experience in basin analysis, hydrogeologic characterization, groundwater modeling,
 and a variety of management plans.
- Chaoying Jiao: Stantec's principal modeler for the ASRGSP, Dr. Jiao has more than 31 years of experience, with a focus on regional groundwater resource evaluations, development, and modeling; aquifer test design, instrumentation, and analysis; and conjunctive water use studies with an emphasis on surface water recharge and aquifer storage and recovery.

Staff is confident that the Stantec team has the requisite technical skills and understanding of SGMA requirements to complete a compliant and useful GSP. The GSP development process will include four meetings with the full Board and two stakeholder meetings. The GSP would be a critical tool for Camrosa Water District water resource planning and would provide the basis for Salt and Nutrient Management Planning required by the Los Angeles Regional Water Quality Control Board. Tools and processes could be added onto to the GSP created under this effort at future dates to perform additional analyses. As reflected in the attached proposal, Stantec is confident the GSP can be completed before December 31, 2022, but work needs to proceed directly.

Arroyo Santa Rosa Groundwater Sustainability Agency 7385 Santa Rosa Rd. Camarillo, CA 93012 Telephone (805) 482-4677 - FAX (805) 987-4797

Some of the important terms of this agreement are printed on pages 2 through 3. For your protection, make sure that you read and understand all provisions before signing. The terms on Page 2 through 3 are incorporated in this document and will constitute a part of the agreement between the parties when signed.

DATE:

August 12, 2021

TO:

Stantec Consulting Services Inc.

200 1	lanth Lake Avenue Cta 100			· · · · · · · · · · · · · · · · · · ·				
	North Lake Avenue, Ste. 400 dena, CA 91101	Agre	eement No.:	2022-01				
1 434	acria, 6/1 5/1 10/1	/ tgr	concre ivo	2022 01				
The undersig	ned Consultant offers to furnish	the following:						
	ineering services to Arroyo Socomplete the groundwater susta							
Contract prid	ce \$: Per attached proposal n	ot to exceed S	\$365,652.00.					
Contract Te	rm: August 12, 2021 – Dece	ember 31, 202	2					
ts authorized	Sign and return original. Upon d representative and promptly presentative(s).							
Accepted:	Arroyo Santa Rosa GSA	Consultant:	Stantec Con	sulting Services Inc.				
	Tony L. Stafford		Eric T. Vogle	er PhD				
Title:	Executive Director	Title:	Principal					
Date:		Date:						
Other autho	rized representative(s):	Other authorized representative(s):						
lan Prichard	<u> </u>							

Consultant agrees with ASRGSA that:

- a. Indemnification: To the extent permitted by law, Consultant shall hold harmless, and indemnify the ASRGSA, its directors, officers, and employees, against any and all liability, losses, damages, or expenses, including reasonable attorney's fees and costs, to the extent caused by negligent acts, errors or omissions of Consultant or its officers, agents, or employees in rendering services under this contract; excluding, however, such liability, claims, losses, damages or expenses arising from the ASRGSA's negligence or willful acts.
- b. **Minimum Insurance Requirements:** Consultant shall procure and maintain for the duration of the contract insurance against claims for injuries or death to persons or damages to property which may arise from or in connection with the performance of the work hereunder and the results of that work by the Consultant, his agents, representatives, employees or subcontractors.
- c. **Coverage:** Coverage shall be at least as broad as the following:
 - 1. Commercial General Liability (CGL): Insurance Services Office (ISO) Commercial General Liability Coverage (Occurrence Form CG 00 01) including products and completed operations, property damage, bodily injury, personal and advertising injury with limit of at least two million dollars (\$2,000,000) per occurrence or the full per occurrence limits of the policies available, whichever is greater. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location (coverage as broad as the ISO CG 25 03, or ISO CG 25 04 endorsement provided to the ASRGSA) or the general aggregate limit shall be twice the required occurrence limit.
 - 2. **Automobile Liability:** (If applicable) Insurance Services Office (ISO) Business Auto Coverage (Form CA 00 01), covering Symbol 1 (any auto) or if Consultant has no owned autos, Symbol 8 (hired) and 9 (non-owned) with limit of one million dollars (\$1,000,000) for bodily injury and property damage each accident.
 - 3. **Workers' Compensation Insurance:** as required by the State of California, with Statutory Limits, and Employer's Liability Insurance with limit of no less than \$1,000,000 per accident for bodily injury or disease.
 - 4. Waiver of Subrogation: The insurer(s) named above agree to waive all rights of subrogation against the ASRGSA, its directors, officers, employees, and authorized volunteers for losses paid under the terms of this policy which arise from work performed by the Insured for the ASRGSA; but this provision applies regardless of whether or not the ASRGSA has received a waiver of subrogation from the insurer.
 - 5. **Professional Liability** (also known as Errors & Omission) Insurance: appropriates to the Consultant profession, with limits no less than \$1,000,000 per claim, and \$2,000,000 policy aggregate.

d. If Claims Made Policies:

- 1. The Retroactive Date must be shown and must be before the date of the contract or the beginning of contract work.
- 2. Insurance must be maintained and evidence of insurance must be provided for at least five (5) years after completion of the contract of work.
- 3. If coverage is canceled or non-renewed, and not replaced with another claims-made policy form with a Retroactive Date prior to the contract effective date, the Consultant must purchase "extended reporting" coverage for a minimum of five (5) years after completion of contract work.

If the Consultant maintains broader coverage and/or higher limits than the minimums shown above, the ASRGSA requires and shall be entitled to the broader coverage and/or higher limits maintained by the Consultant. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the ASRGSA.

Other Required Provisions: The general liability policy must contain, or be endorsed to contain, the following provisions:

- a. Additional Insured Status: Except on Professional Liability and Workers' Compensation, the ASRGSA, its directors, officers, employees, and authorized volunteers are to be given insured status (at least as broad as ISO Form CG 20 10 10 01), with respect to liability arising out of work or operations performed by or on behalf of the Consultant including materials, parts, or equipment furnished in connection with such work or operations.
- b. **Primary Coverage:** For any claims related to this project, the Consultant's insurance coverage shall be primary at least as broad as ISO CG 20 01 04 13 as respects to the ASRGSA, its directors, officers, employees, and authorized volunteers.

Any insurance or self-insurance maintained by the ASRGSA, its directors, officers, employees, and authorized volunteers shall be excess of the Consultant's insurance and shall not contribute with it.

Notice of Cancellation: Each insurance policy required above shall provide that coverage shall not be canceled, except with notice to the ASRGSA.

Self-Insured Retentions: Self-insured retentions must be declared to and approved by the ASRGSA. The ASRGSA may require the Consultant to provide proof of ability to pay losses and related investigations, claim administration, and defense expenses within the retention. The policy language shall provide, or be endorsed to provide, that the self-insured retention may be satisfied by either the insured or the ASRGSA.

Acceptability of Insurers: Insurance is to be placed with insurers having a current A.M. Best rating of no less than A:VII or as otherwise approved by the ASRGSA.

Verification of Coverage: Consultant shall furnish the ASRGSA with certificates and amendatory endorsements or copies of the applicable policy language effecting coverage required by this clause. All certificates and endorsements are to be received and approved by the ASRGSA before work commences. However, failure to obtain the required documents prior to the work beginning shall not waive the Consultant's obligation to provide them. If any of the required coverages expire during the term of this agreement, the Consultant shall deliver the renewal certificate(s) including the general liability additional insured endorsement ASRGSA at least ten (10) days prior to the expiration date.

Subcontractors: Consultant shall ensure that all subcontractors maintain insurance meeting all the requirements stated herein, and Consultant shall ensure that the ASRGSA, its directors, officers, employees, and authorized volunteers are an additional insured on Commercial General Liability Coverage.

Other Requirements:

- a. Consultant shall not accept direction or orders from any person other than the Executive Director or the person(s) whose name(s) is (are) inserted on Page 1 as "other authorized representative(s)."
- b. Payment, unless otherwise specified on Page 1, is to be 30 days after receipt of invoice for services performed and acceptance by the ASRGSA.
- c. Permits required by governmental authorities will be obtained at Consultant's expense, and Consultant will comply with applicable local, state, and federal regulations and statutes including Cal/OSHA requirements.
- d. Any change in the scope of the professional services to be done, method of performance, nature of materials or price thereof, or to any other matter materially affecting the performance or nature of the professional services will not be paid for or accepted unless such change, addition or deletion is approved in advance, in writing by the ASRGSA. Consultant's "other authorized representative(s)" has/have the authority to execute such written change for Consultant.

The ASRGSA may terminate this Agreement at any time, with or without cause, giving thirty (30) days' prior written notice to Consultant, specifying the effective date of termination. The Consultant may terminate this Agreement upon seven (7) days' notice in writing in the event the ASRGSA has committed material breach of this Agreement. Non-payment of the Consultant's invoices will be considered a material breach of this Agreement.

The total amount of all claims the ASRGSA may have against the Consultant under this Agreement or arising from the performance or non-performance of the Services under any theory of law, including but not limited to claims for negligence, negligent misrepresentation and breach of contract, shall be strictly limited to the Consultant's fees. As the ASRGSA's sole and exclusive remedy under this Agreement any claim, demand or suit shall be directed and/or asserted only against the Consultant and not against any of the Consultant's employees, officers or directors.

Neither the ASRGSA nor the Consultant shall be liable to the other or shall make any claim for any incidental, indirect or consequential damages arising out of or connected to this Agreement or the performance of the services on this Project. This mutual waiver includes, but is not limited to, damages related to loss of use, loss of profits, loss of income, unrealized energy savings, diminution of property value or loss of reimbursement or credits from governmental or other agencies.

Stantec



300 N. Lake Avenue, Suite 400 Pasadena, CA 91101

August 4, 2021

Attention: Mr. Ian Prichard
Arroyo Santa Rosa Groundwater Sustainability Agency
7385 Santa Rosa Road
Camarillo, California 93012-9284

Dear Mr. Prichard,

Reference: Proposal to Complete Arroyo Santa Rosa Basin Groundwater Sustainability Plan

Stantec Consulting Services Inc. (Stantec) is pleased to provide this *Proposal to Complete Arroyo Santa Rosa Basin Groundwater Sustainability Plan* on behalf of the Arroyo Santa Rosa Groundwater Sustainability Agency (ASRGSA). This proposal outlines the tasks necessary to complete the Groundwater Sustainability Plan (GSP) for the Arroyo Santa Rosa Groundwater Basin (ASR basin; Department of Water Resources [DWR] Basin 4-007) in accordance with California's Sustainable Groundwater Management Act (SGMA - 2014).

Stantec initiated work on the GSP under a previously submitted proposal dated January 28, 2021, which was authorized by the ASRGSA Board of Directors (Board) in a January 28, 2021, Board Meeting. Stantec's authorized work scope included preliminary GSP data collection tasks and meetings with an Ad Hoc Technical Advisory Committee (Ad Hoc Committee) to further refine the GSP scope, budget, and schedule.

Meetings with the Ad Hoc Committee were held on February 19, May 4, and May 18 of 2021, and resulted in submittals of two additional proposals to move the GSP forward on a task order basis; one dated March 26, 2021, and a further refined proposal dated May 17, 2021. Ad Hoc Committee members Ms. Kathleen Riedel, Groundwater Specialist, of Ventura County Public Works Agency Watershed Protection (VCWPD) and Fox Canyon Groundwater Management Agency (FCGMA), and Mr. Terry Foreman, Board Member of Camrosa Water District (CWD), provided thorough review and critical input of these prior proposals during the Ad Hoc Committee meetings. Discussions and meeting outcomes included desired utilization of existing work performed to date to the extent practicable for efficiency and cost effectiveness, further refinement of the hydrogeologic conceptual model (HCM) and understanding of the hydraulic connection with the Pleasant Valley Basin (PVB), water budget development and methodology, and evaluation of data gaps.

The following scope of work is based on review and suggestions on previously submitted proposals and meetings with the Ad Hoc Committee.

PROPOSED SCOPE OF WORK

Stantec proposes completion of eight (8) additional tasks to complete the GSP as described below. These tasks are in addition to those already performed for GSP Refinement and Scoping Meetings as well as Data Collection and Compilation/Production Well Survey, detailed in Stantec's *Proposal for Scoping Meetings and Initial Data Collection Tasks* (Task Order 01) dated December 21, 2020. Tasks 1.0 through 5.0 also correspond to GSP Chapters 1 through 5 that comprise the GSP.

August 4, 2021 Mr. Ian Prichard Page 2 of 8

Reference: Proposal to Complete Arroyo Santa Rosa Basin Groundwater Sustainability Plan

Task 1.0 – Draft Chapter 1 (Introduction) – This task consists of Chapter 1, the Introduction of the GSP, that defines the purpose and the sustainability goal of the GSP and will be prepared in concert with ASRGSA management and stakeholders. Chapter 1 will incorporate agency information that describes the organization of management structure of the ASRGSA, its legal authority, and organization of the GSP. Estimated costs of plan implementation will not be included until the draft GSP has been completed. However, the overall goal of this initial task is to prepare a draft Chapter 1 including a table of contents that will guide the preparation of the subsequent chapters of the GSP.

Task 2.0 – Plan Area and Basin Setting – This task comprises Chapter 2 of the GSP and consists of the following subtasks:

Subtask 2.1 – Description of Plan Area – Stantec will develop administrative information as required by Article 5 of the SGMA. This will consist of a summary of jurisdictional areas and other features that will also be displayed on maps. Stantec will prepare maps that will incorporate the following:

- Area covered by the GSP
- Adjudicated areas, other agencies within the basin, and areas covered by an alternative plan
- Jurisdictional boundaries of federal or State land
- Existing land use designations
- Density of wells per square mile

The subsection will also provide a description of current monitoring and management programs and how they will be incorporated into the GSP with given input from the ASRGSA. Stantec will summarize existing general plans and other land use plans and how implementation of existing plans may affect the ability of the ASRGSA to maintain sustainable groundwater management. Stantec will incorporate ASRGSA policies, requirements and/or guidelines as required by the SGMA. It is assumed the ASRGSA will provide Stantec with a description of beneficial uses and users, public notification and communication practices employed by the ASRGSA during the GSP process, as well as documentation of public meetings and stakeholder engagement activities. Current wellhead protection, well abandonment and destruction program and well construction policies as promulgated by the VCWPD will be summarized. Efficient water management practices developed by the CWD will be described.

Subtask 2.2 – Basin Setting/Hydrogeologic Conceptual Model – Stantec will update and refine the HCM based on a review of more recent geologic and hydrogeologic data presented in the adjacent PVB by United Water Conservation District (UWCD) and a detailed assessment of State Well Completion Reports obtained from the DWR Well Completion Report Map Application and VCWPD, previously compiled data, and data from the 2013 Groundwater Management Plan (GMP; "Water Resources Setting"). These data will facilitate detailed description of regional and ASR basin geologic conditions, folds, faults, stratigraphy, soil types, aquifers, areas of recharge and discharge and impediments to groundwater flow. The HCM will also include a description of historical subsidence and subsidence monitoring in the ASR basin as well as potential or observed impacts to groundwater due to past and ongoing human activities (e.g., leaking underground storage tanks, septic tanks). A description and summary of these contaminant sources will be tabulated by contaminant source from various online databases including GeoTracker, Envirostor, Ventura County, and the Los Angeles Regional Water Quality Control Board. Various maps, tables and other graphical displays will be prepared to illustrate the information presented in the HCM. Examples include the following:

August 4, 2021 Mr. Ian Prichard Page 3 of 8

Reference: Proposal to Complete Arroyo Santa Rosa Basin Groundwater Sustainability Plan

- Topographic information,
- Surficial geology,
- Stratigraphic correlation table,
- Depth to bedrock/basin bottom,
- Soil types and characteristics, map and table,
- Delineation of recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas,
- Surface water bodies,
- Sources and points of delivery for local and imported water supplies,
- GeoTracker and Envirostor sites,
- Septic system locations or areas, and
- Waste Discharge Requirement sites

Stantec will develop the following subsections related to current and historic groundwater conditions, groundwater dependent ecosystems (GDEs), water budget estimation, and estimation of sustainable yield.

Subtask 2.2.1 – Field Reconnaissance and Data Collection – Stantec will conduct a field reconnaissance to supplement our understanding of the physical basin setting with observations of land use, geology, current and potential new monitoring sites, existing active and abandoned production wells, and field checking of potential or known areas of surface water groundwater interaction, groundwater recharge and GDEs.

Subtask 2.2.2 – Description of Physical Components of the Basin – Stantec will describe the physical components of the basin including geology, hydrogeology, structure, surface water bodies, and recharge areas. Greater attention will be given to subsurface interpretation and distribution of geologic formations and corresponding hydrostratigraphic units contained therein relative to those previously prepared. These geologic data and interpretations will be developed basin-wide on both sides of the Bailey fault and, to the extent possible, will be correlated with hydrostratigraphic interpretations near the eastern boundary of the PVB developed by UWCD (2019), as well as the groundwater model developed as part of the PVB GSP. Aquifer hydraulic and storage properties such as hydraulic conductivity, transmissivity, and specific yield or storativity, will also be compiled from available local data (e.g., pumping tests) or estimated based on a review of published or unpublished data. Lateral and vertical basin boundaries will be defined and described based on available geologic and geophysical data.

Subtask 2.2.3 – Scaled Geologic Cross Sections – Stantec will construct and/or refine five (5) scaled geologic cross sections in the ASR basin. Incorporating the area west of the Bailey Fault will require additional geologic and hydrogeologic review that was not part of the 2013 GMP or further appreciably evaluated in the 2018 Basin Boundary Modification Request (BBMR) other than cross sections A-A' and B-B' across the Bailey Fault. The description of the geology used in both the 2013 GMP and the 2018 boundary modification will be refined based on new data from wells, including available well geophysical logs, and creating a revised geologic cross-section A-A' along Santa Rosa Road that ties into UWCD (2018) cross-section R-R' for the two wells in that cross-section in the easternmost portion of the PVB, namely 2N/20W-21K01S and 2N/20W-22L06S. This will aid in the correlation of geologic formations and hydrostratigraphic units across the basin boundary in this critical western portion of the basin and provide a part of the required detail to develop a robust HCM and groundwater flow model. Stantec will also include one additional north-south cross-section near the boundary of the PVB and ASR basin which comprises the southern portion of cross-section D-D' of Turner (1975) and is presented as Figure 2-4 in the PVB GSP.

August 4, 2021 Mr. Ian Prichard Page 4 of 8

Reference: Proposal to Complete Arroyo Santa Rosa Basin Groundwater Sustainability Plan

These new cross sections will augment the three (3) existing cross sections from the 2018 basin boundary modification which will be revised and further refined based on new geologic and geophysical data.

Subtask 2.3 – Current and Historical Groundwater Conditions – Stantec will update hydrographs for all wells used in the 2013 GMP and 2018 boundary modification and create new hydrographs for new wells identified with current data, particularly wells near the western boundary of the ASR basin near the PVB boundary. Stantec will update, identify, and evaluate a number of complete wet-year-dry-year cycles in accordance with DWR guidelines and BMP 4 based on representative precipitation data at local and/or watershed area precipitation stations. Additional key wells may also be utilized to improve the hydrogeologic understanding of the ASR basin and to facilitate identification of data gaps. Stantec will also review status of data gaps west of the Conejo Well field as well as the existence or potential for collection of data from additional monitoring wells to track groundwater elevations and quality, and aid in assessing the location of GDEs. Similarly, with additional information west of the Bailey Fault, identification of groundwater quality wells to be included in the monitoring network will be investigated in this portion of the basin. As data gaps are identified, recommendations regarding the most appropriate method(s) to fill the data gaps, such as installation of new single or multiple completion monitoring wells will be incorporated in the GSP.

Groundwater elevation data will also be graphically depicted in a series of groundwater contour maps of Spring (high) and Fall (low) groundwater conditions that correlate with selected historic wet and dry cycles. Groundwater contours will be created for each defined and identified aquifer in the basin to the extent sufficient aquifer-specific data are available.

Stantec will estimate the volume of groundwater in storage by two methods: 1) annual water budgets; and 2) changes in groundwater elevation data annually from 1985 to 2014 for the baseline condition and under future conditions using projected climate change conditions through 2070 as indicated in *Climate Change Data Use During Groundwater Sustainability Plan Development* (DWR, 2018). Change in storage via the change in groundwater elevation data method will utilize aquifer hydraulic properties developed as part of Subtask 2.2.2.

Although seawater intrusion is not considered a potential undesirable result in the basin due it its inland location from the Pacific Ocean, water quality degradation is a potential undesirable result due to historic and ongoing treated effluent discharges into Arroyo Conejo from the City of Thousand Oaks' Hill Canyon Wastewater Treatment Plant (HCWWTP), in-basin septic system recharge, and recharge of agricultural pesticides and herbicides derived from in-basin sources and the adjacent and upgradient Tierra Rejada Basin. In addition, land subsidence (although not presently considered to be a potential undesirable result in the basin) will be addressed.

With regard to groundwater quality, salt and nutrient characteristics (e.g., total dissolved solids [TDS], chloride [CI], and nitrate [as N]) as well as the importance of emerging contaminants, including per- and polyfluoroalkyl substances (PFAS) and 1,2,3-trichloropropane (TCP) will be considered in addition to other chemicals of concern. To the extent existing data allows, water quality constituents will be presented graphically (where concentrations will be shown versus time) as well as in map view (enabling display of potential source areas). Groundwater-surface water systems will be identified and described as well as their water quality implications. Identification of GDEs, where present, will be depicted on a map as well as implications for sustainable groundwater management described.

August 4, 2021 Mr. Ian Prichard Page 5 of 8

Reference: Proposal to Complete Arroyo Santa Rosa Basin Groundwater Sustainability Plan

Subtask 2.4 – Water Budget Analyses – Stantec will provide a description and update of inflows, outflows, and change in storage in the ASR basin. This includes a description of surface water supply used or available for use for groundwater recharge or in-lieu use. These will be based on identified flows described in DWR Bulletin 118, the 2013 GMP, and the preliminary draft historical water budgets for the period 1985 - 2014 prepared by GSI Water Solutions (April 2016). Stantec will conduct a preliminary review of the 1985 - 2014 preliminary draft water budgets prepared by GSI Water Solutions, Inc. to assess the validity of the values included in each water budget item. Stantec will identify and highlight any questionable values. In addition, Stantec will review Daniel B. Steven's "FCGMA Groundwater Balance Study, Ventura County, California", which utilized the distributed parameter watershed model to estimate groundwater recharge from precipitation and irrigation in the ASR basin. Most estimates utilized in the existing draft water budget originate from the 2013 GMP, previous modeling, and direct data.

It should be noted that average inflows and outflows from the historic water budget tables are similar to those in the 2013 GMP. Yearly and cumulative change in storage will be estimated from the annual water budgets. As noted in Subtask 2.3, estimated annual and cumulative water budget changes in groundwater in storage will be compared with groundwater elevation changes in storage.

Subtask 2.4.1 – Estimate of Sustainable Yield – Sustainable yield is defined in SGMA legislation and refers to the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin, and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result. Undesirable results may include: 1) chronic lowering of groundwater levels resulting in a significant and unreasonable depletion of supply; 2) significant and unreasonable reduction of groundwater storage; 3) significant and unreasonable seawater intrusion; 4) significant and unreasonable degraded water quality; 5) significant and unreasonable land subsidence; and 6) depletion of interconnected surface waters that have significant and unreasonable adverse impacts. As part of the basin setting, Stantec will update the groundwater model developed in the 2013 GMP with recent data and update the estimated sustainable yield for the basin in accordance with the SGMA BMP 4. The water budget will be updated from 2013 with new data and refined with assistance from numerical groundwater modeling. The following Subtask 2.4.2 describes the groundwater model update procedure.

Subtask 2.4.2 – Groundwater Model Update

Stantec will update and modify the groundwater model developed in 2013 based on updates to the HCM in Subtask 2.2, recommendations given in the 2013 GMP, and work with UWCD for cross basin boundary consistency with their Ventura regional groundwater flow model. Fundamental improvements to the model are described by the following and per the BMP 5 guidelines:

- The original model was comprised of one single layer representing the unconfined alluvial aquifer within the entire model domain. Based on improvements to the geologic cross sections and information from west of the Bailey Fault, additional model layers may be created. These layers will incorporate the shallow alluvial aquifer and Santa Margarita Aquifer to the east of the Bailey Fault with interspersed clayey layers between where observed. Similarly, to the extent possible, hydrostratigraphic correlation between the Saugus Formation Aquifer and Fox Canyon Aquifers on the west side of the Bailey Fault will be made.
- The model domain will be extended west of the Bailey Fault based on expanded and more
 detailed/refined geologic cross sections, updated HCM, and available water well data. Stantec will
 develop a data request to UWCD to obtain model layer data, aquifer parameters values, and flux

August 4, 2021 Mr. Ian Prichard Page 6 of 8

Reference: Proposal to Complete Arroyo Santa Rosa Basin Groundwater Sustainability Plan

data at the boundary. Model discretization will be extended west across the Bailey Fault to the basin boundary.

- The original steady state model will be converted to a transient model with monthly stress periods from 2009 to 2019. This will allow the model to be calibrated to transient conditions, improve effective parameter values, and allow for sensitivity analyses. These procedures will help reduce model uncertainty in performing 50-year projections.
- Further analysis of Conejo Creek flow and recharge into the ASR basin will be performed in the
 model using available stage data, interpolated creek bed elevation, and estimated creek bed
 conductance. Bed conductance values will then be calibrated to observed conditions and
 sensitivity analyses performed on best fit parameter values. After the model has been calibrated, a
 sensitivity analysis will be performed on model parameter values in terms of model error,
 groundwater elevation, and sustainable yield estimates. Uncertainty will be quantified in terms of
 sustainable yield error from the range of individual parameter uncertainties over a range of
 conditions.

Subtask 2.4.3 – Projected Water Budget – The updated model will be used to facilitate projecting future groundwater budget scenarios that can demonstrate sustainable groundwater management across a 50-year planning horizon using the most updated DWR climate change projection scenarios and a 10-year baseline period from 2009 to 2019. Stantec will develop projected water budgets using 50 years of historical precipitation, evapotranspiration, and stream flow information while taking into consideration uncertainties associated with the estimated impacts of climate change as defined in the DWR climate change guidance document (DWR, July 2018). Stantec will use the most recent water supply information as the baseline condition for estimating future surface water supply, while applying the historical surface water supply reliability identified in §354.18(c)(2) and taking into consideration the projected changes in local land use planning, population growth, and climate. Stantec will also develop a data request to UWCD to obtain pertinent aquifer hydraulic characteristics and flux data for the model cells in the modeled hydrostratigraphic layers located in the northeast PVB adjacent to the ASR basin boundary as presented in UWCD (2018).

Subtask 2.5 – Draft Chapter 2 Plan Area and Basin Setting – Stantec will prepare a draft of Chapter 2 of the GSP incorporating the analyses and graphics described in Subtasks 2.1 through 2.4. Chapter 2 provides the bulk of technical analyses for the GSP.

Task 3.0 – Sustainable Management Criteria – Chapter 3 of the ASR basin GSP will include a description of the sustainable management criteria specific to the basin. Stantec will develop a description of sustainability goals in accordance with SGMA guidelines in cooperation with the ASRGSA, Ventura County and FCGMA stakeholders. Stantec will describe potential undesirable results, groundwater conditions that would lead to undesirable results, and the criteria used to define undesirable results for each sustainability indicator. Stantec will provide a description of minimum thresholds for each sustainability indicator, how minimum thresholds may affect beneficial users of groundwater, standards related to sustainability indicators, and how each minimum threshold will be quantitatively measured. Identification of undesirable results, setting minimum thresholds, and measurable objectives will be in accordance with the SGMA regulations and BMP 6 as well as the Preparation Checklist and Outline.

Task 3.1 – Monitoring Networks – Chapter 4 of the GSP will include a description of monitoring network objectives and how the monitoring network provides adequate coverage of sustainability indicators developed in Task 3.0 and in accordance with BMP 1 and 2. The description of the monitoring network will

August 4, 2021 Mr. Ian Prichard Page 7 of 8

Reference: Proposal to Complete Arroyo Santa Rosa Basin Groundwater Sustainability Plan

include the various types of monitoring network facilities that will be used or augmented to collect and analyze and assess specific sustainability indicators including: water levels, stream flow, air temperature, precipitation, and evapotranspiration. Weather station data, including rainfall and evaporation monitoring sites, and stream flow gages used in the 2013 GMP will be updated. The frequency of measurements, data consistency and quality, reporting standards, relationship to sustainability indicators, minimum thresholds, measurable objectives, and interim milestones will inform scientific rationale for site selection in addition to previously used sites. The location and type of each monitoring site within the basin will be displayed on a map with corresponding tabular data. Stantec will identify key data gaps to be filled during implementation of the GSP, as well as the methods to fill those data gaps.

- **Task 3.2 Draft Chapter 3 Sustainable Management Criteria –** Stantec will prepare a draft of Chapter 3 of the GSP incorporating Subtasks 3.0 through 3.1. Chapter 3 establishes quantifiable sustainable management criteria and associated monitoring for the GSP.
- Task 4.0 Projects and Management Actions –Stantec will prepare Chapter 5 of the GSP by updating sustainability actions described in Section 5.4 of the 2013 GMP to include the potential impact of each or a combination of these actions on the development of measurable project objectives, and methods of implementation including public noticing, permitting, regulatory requirements, timetable for initiation and completion, estimated costs, and plans to meet these costs. In addition to the 50-year planning simulation under climate change scenarios, future groundwater conditions will also be modeled under different project and management action scenarios.
- **Task 4.1 Draft Chapter 4 Projects and Management Actions –** Stantec will prepare a draft of Chapter 4 of the GSP incorporating those projects and management actions identified or planned. Chapter 4 establishes quantifiable sustainable management actions to achieve sustainability goals for the GSP.
- Task 5.0 Plan Implementation and Interagency Agreements Stantec will prepare Chapter 5 which will describe the plan implementation and interagency agreements. Projects and Management Actions, and GSP implementation costs will be estimated and a schedule for implementation developed. Plan implementation also includes a description of the ASRGSA's plan for annual reporting and periodic evaluations. Stantec will include pertinent interagency agreements in Chapter 6 of the GSP, including points of contact, procedures for resolving conflicts between agencies including FCGMA, Calleguas Municipal Water District, City of Thousand Oaks and City of Camarillo, process for submitting plans and annual reports, and periodic evaluation. Stantec will describe the coordinated data management system used by the ASRGSA to share information with adjacent agencies.
- **Task 5.1 Draft Chapter 5 Plan Implementation and Interagency Agreements –** Stantec will prepare a draft of Chapter 5 of the GSP documenting the plan implementation and interagency agreements. Chapter 5 presents estimated costs and schedule of implementation as well as annual reporting requirements for the GSP.
- **Task 6.0 Draft GSP** Stantec will organize information from Tasks 1 through 5 to develop a fully SGMA-compliant draft GSP for public review. It is assumed the ASRGSA will distribute the draft GSP to stakeholders and provide the required minimum public comment period in accordance with California Water Code §10728.4. At the conclusion of the public comment period, Stantec will compile one set of consolidated comments from all stakeholders and meet with the ASRGSA to review comments and develop strategies to address comments. It is assumed that the draft GSP will be transmitted in electronic form and uploaded onto a Sharepoint or similar website for stakeholder access and submittal of comments.

August 4, 2021 Mr. Ian Prichard Page 8 of 8

Reference: Proposal to Complete Arroyo Santa Rosa Basin Groundwater Sustainability Plan

Task 6.1 – Final GSP – Upon incorporation comments to the draft GSP, Stantec will prepare a final GSP in electronic format to be uploaded to the DWR website. Along with the completed GSP, Stantec will develop a comment/response form that details how each comment from stakeholders was addressed.

Task 7.0 – Project Management and Meetings – Stantec will provide monthly updates on the progress of the GSP which will cover work conducted in the reporting period, anticipated efforts in the next reporting period, and updates on the project schedule and budget. The monthly reports will identify any key challenges or decisions to be made by the ASRGSA that affect budget or schedule of the project. In addition to the meetings described in Task 8.0, the Stantec project manager and/or key technical staff will also attend up to four (4) virtual or in-person meetings with the ASRGSA to discuss project progress and/or key technical issues. Similarly, the Stantec project manager will develop data request to UWCD modeling staff to obtain necessary model boundary condition data.

Task 8.0 – Stakeholder Outreach – Stantec will take primary responsibility for two (2) stakeholder outreach meetings with assistance from the ASRGSA and will provide technical information to support stakeholder outreach efforts over the duration of the project. This information may include graphs, charts, and maps utilized in the GSP. Principal investigators from Stantec will attend up to two (2) stakeholder meetings in the Camarillo area to discuss specific draft chapters (e.g., HCM and Projects and Management Actions). In addition, each chapter draft may be posted for public and stakeholder comment during the development of the entire GSP.

PROJECT SCHEDULE

The project schedule by task is shown on Attachment A and is assumed to begin on August 15, 2021, and end on or before October 1, 2022. This compression in the schedule will be accommodated by the use of professional senior Stantec staff and open communication between Stantec and the ASRGSA to facilitate smooth progress on the project critical path. The project team organizational chart and accompanying resumes are included in Attachment C for reference.

BUDGET, TERMS AND CONDITIONS

Stantec's services will be performed under the terms of an update of General Service Agreement No. 2021-01. A not-to-exceed (NTE) time and materials fee estimate by task that addresses staff hours, subconsultant hours, and other costs is presented in the attached budget (Attachment B). The NTE for completing the GSP is \$365,652 with optional 15% contingency of \$54,848 at CWD/ASRGSA's discretion for later approval if needed. Development of this budget is based on the following assumptions:

- Field work is limited to reconnaissance during production well surveys,
- Extended schedule beyond Stantec's control may lead to additional costs,
- The number of individual draft chapter revisions will be limited to one to address comments internally with the ASRGSA. Revised individual chapters shared with stakeholders and the public for comment will be revised for the draft GSP,
- The number of revisions of the draft GSP will be limited to two times, once to address comments internal with the ASRGSA, and one based on public/stakeholder comments,
- The CWD is responsible for resolving conflicting comments on draft documents (in concert with Stantec),

Reference: Proposal to Complete Arroyo Santa Rosa Basin Groundwater Sustainability Plan

- Extensive stakeholder interaction or interaction with an Ad Hoc committee is not budgeted. Two
 stakeholder meetings are scheduled. If more meetings or discussion is required, additional costs
 will be incurred,
- Efforts to resolve significant data gaps will either be the responsibility of the ASRGSA, or noted as a project or management action for GSP implementation,
- Cost estimates for projects and management actions will be "order of magnitude" similar to Association for the Advancement of Cost Engineering (AACE) Class V estimates,
- DWR grant management and associated deliverables are not a part of Stantec's scope of work,
- Although Stantec can provide suggestions, the ASRGSA will be responsible for final crafting the wording of the sustainability goal and gaining acceptance from stakeholders,
- No more than two management areas will be defined for the basin,
- Stantec will rely on information provided by The Nature Conservancy
 (https://groundwaterresourcehub.org/sgma-tools) for evaluation of GDEs, and assumes specialized biological surveys will not be required. However, detailed studies may be an outcome of implementation of the GSP,
- Detailed vadose zone modeling or historic review of remotely sensed evaporation data will not be performed.
- The ASRGSA will be responsible for uploading documents to the DWR GRanTS system and other interaction with DWR, and
- The ASRGSA will be responsible for design and maintenance of any required websites or platforms for the GSP data management system (DMS) and/or public outreach.

Eric Vogler, PhD

Principal

We would be happy to discuss any comments or questions regarding this proposal, and very much look forward to working with the CWD and the ASRGSA.

Regards,

Stantec

Gareth Roberts, PG Assistant Project Manager

Phone: 805-427-4853 Phone: 626-568-6043

Attachment: Attachment A – Schedule

Attachment B – Budget

Attachment C – Stantec Project Team Organizational Chart and Resumes



Arroyo Santa Rosa Groundwater Sustainability Agency ASRGSA General Service Agreement No. 2021-01 with Stantec Consulting Services Inc.

Complete GSP Budget Schedule to Comlete GSP Attachment A

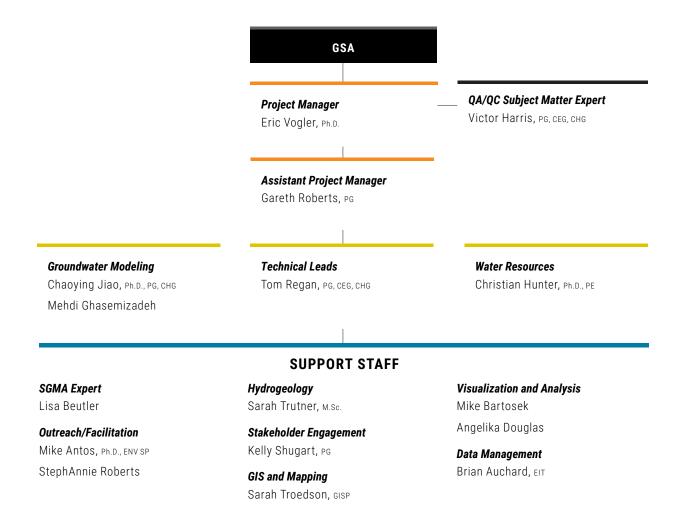
Task	Activity Description	Start	End	Days	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22
1.0	Draft Chapter 1 (Introduction)	8/15/2021	9/5/2021	21														
2.0	Plan Area and Basin Setting				11													
2.1	Description of Plan Area and Maps	8/15/2021	9/19/2021	35														
2.2	Basin Setting/Hydrogeologic Conceptual Model																	
2.2.1	Field Reconnaissance and Data Collection	8/15/2021	8/29/2021	14														
2.2.2	Description of Physical Components of the Basin	8/15/2021	9/19/2021	35									1					
2.2.3	Scaled Cross Sections (5)	8/29/2021	10/3/2021	35														
2.2.4	Basin Setting Graphical Description	8/29/2021	9/19/2021	21														
2.3	Current and Historical Groundwater Conditions	9/19/2021	11/3/2021	45														
2.4	Water Budget Analysis	9/19/2021	11/18/2021	60														
2.4.1	Estimate of Sustainable Yield	11/18/2021	12/2/2021	14														
2.4.2	Review and Update Model	9/19/2021	1/17/2022	120														
2.4.3	Projected Water Budget	1/17/2022	2/7/2022	21														
2.5	Draft Chapter 2 Plan Area and Basin Setting	11/18/2021	2/16/2022	90														
3.0	Sustainable Management Criteria	11/3/2021	12/3/2021	30														
3.1	Description of Monitoring Networks	12/3/2021	1/2/2022	30												j .		
3.2	Draft Chapter 3 Sustainable Management Criteria	1/2/2022	2/16/2022	45														
4.0	Projects and Management Actions	12/3/2021	1/17/2022	45														
4.1	Draft Chapter 4 Projects and Management Actions	1/17/2022	2/16/2022	30	0 0												0	
5.0	Plan Implementation	1/17/2022	2/16/2022	30														
5.1	Draft Chapter 5 Plan Implementation	2/16/2022	3/18/2022	30														
6.0	Draft GSP	2/16/2022	4/17/2022	60														
6.1	Final GSP	7/16/2022	9/14/2022	60												4		
7.0	Project Management	8/15/2021	9/14/2022	412												<i>"</i>		
8.0	Stakeholder Meetings (2)	1/17/2022	4/17/2022	2														

Arroyo Santa Rosa Groundwater Sustainability Agency ASRGSA General Service Agreement No. 2021-01 with Stantec Consulting Services Inc. Complete GSP Budget Labor Hours and Fee Estimate Attachment B

	Stantec	Project Manager	Technical Lead/ Sr. Hydrogeologist	Sr. Geologist/Assistant Project Manager	Sr. Engineer/ Hydrogeologist	Associate Hydrogeologist	Assistant Hydrogeologist	GIS/Graphics/ Database	Administrative/ Outreach	Total Hours	Stantec Labor Fee		Stantec Labor Fee Other Direct Costs		Direct iter Re			TOTAL FEE for SUBCONSULTANTS		OTAL TASK PROPOSAL FEE
Task	Activity Description	\$211	\$191	\$180	\$177	\$159	\$143	\$132	\$125						=			٥,		0
1.0	Draft Chapter 1 (Introduction)	4	16	8	2	12	8	4	2	56	\$	9,524			\$	-	\$	-	\$	9,524
2.0	Plan Area and Basin Setting																			
2.1	Description of Plan Area and Maps	8	24	2	4	32	4	20	16	110	\$	17,640			\$	1,500	\$	1,500	\$	19,140
2.2	Basin Setting/Hydrogeologic Conceptual Model																			
2.2.1	Field Reconnaissance and Data Collection	2	8	4	8		16	8		46	\$	7,430	\$	300	\$	-	\$	41	\$	7,730
2.2.2	Description of Physical Components of the Basin	4	12	2	4	4	16	8		50	\$	8,184	7"		\$		\$	-	\$	8,184
2.2.3	Scaled Cross Sections (5)	4	16	4	2	2	16	24		68	\$	10,748			\$	1,500	\$	1,500	\$	12,248
2.2.4	Basin Setting Graphical Description	4	16	4	6	8	8	32		78	\$	12,322			\$	-	\$		\$	12,322
2.3	Current and Historical Groundwater Conditions	8	8	2	2	24	40	12		96	\$	15,050			\$	500	\$	500	\$	15,550
2.4	Water Budget Analysis	8	4	4	8	24	4			52	\$	8,976			\$	1,000	\$	1,000	\$	9,976
2.4.1	Estimate of Sustainable Yield	6	8	2	32	24				72	\$	12,634			\$	500	\$	500	\$	13,134
2.4.2	Review and Update Model	16	4	2	100	120	24	16		282	\$	46,824	1		\$	1,500	S	1,500	\$	48,324
2.4.3	Projected Water Budget	4	2	2	16	32	4	12		72	\$	11,662			\$	1,000	\$	1,000	\$	12,662
2.5	Draft Chapter 2 Plan Area and Basin Setting	12	24	8	24	12	8	16	8	112	\$	18,968			\$	1,500	S	1,500	\$	20,468
3.0	Sustainable Management Criteria	4	12	2		16	8	4		46	\$	7,712			\$	1,000	\$	1,000	\$	8,712
3.1	Description of Monitoring Networks	2	12	2	12	4	12	16		60	\$	9,662	ì		\$	250	\$	250	\$	9,912
3.2	Draft Chapter 3 Sustainable Management Criteria	12	16	4	8	12	8	16	8	84	\$	13,888			\$	750	\$	750	\$	14,638
4.0	Projects and Management Actions	4	12	2		4	8	4		34	\$	5,804			\$	500	\$	500	\$	6,304
4.1	Draft Chapter 4 Projects and Management Actions	8	12	4	16	24	8	4	8	84	\$	14,020	Ų.		\$	500	\$	500	\$	14,520
5.0	Plan Implementation	4	12	2	16	12	8	8		62	\$	10,436			\$		\$	- 5	\$	10,436
5.1	Draft Chapter 5 Plan Implementation	12	16	4	12	8	8	2	8	70	\$	12,112			\$	750	\$	750	\$	12,862
6.0	Draft GSP	32	40	16	24	16	40	24	12	204	\$	34,452			\$	2,500	\$	2,500	\$	36,952
6.1	Final GSP	24	40	12	12	12	8	12	12	132	\$	23,124			\$	1,500	\$	1,500	\$	24,624
7.0	Project Management	24	12	40					8	84	\$	15,556	\$	500	\$		\$		\$	16,056
8.0	Stakeholder Meetings (2)	16	12	12	16	12	16	24	16	124	\$	20,024	\$	350	\$	1,000	\$	1,000	\$	21,374
	TOTAL	222	338	144	324	414	272	266	98	2078	\$	346,752	\$	1,150	\$	17,750	\$	17,750	\$	365,652
	Contingency (15%)																		\$	54,848
Į.	Total with Contingency																		\$	420,500

RESUMES

The Stantec team is led by Dr. Eric T. Vogler, who provides project management and confirmation that milestones, meetings, and deliverables are met as scheduled. Technical leadership is provided by Tom Regan, PG, CHG, and institutional knowledge, as well as quality assurance/quality control, are provided by Victor Harris PG, CHG. Dr. Chaoying Jiao, PG, CHG, our computational expert, contributes to the groundwater modeling portion of projects, once initiated. Complementing the team is Gareth Roberts, PG, who assists Dr. Vogler with project coordination and timelines, regular meetings, and monthly status reports, with Christian Hunter Ph.D., PE for water resource engineering aspects, and Kelly Shugart, PG, coordinates stakeholder engagement. Together, this core team brings more than 100 years of groundwater experience to help ensure project success.



Eric Vogler Ph.D.

Principal Project Manager

With more than 23 years of experience in water resources and hydrogeology as well as groundwater modeling, Eric brings vast experience in basin scale program management and analysis. He is the current Program Manager for LADWP for Eastern Sierra Water Resources Management.

His projects have taken him around the U.S. and abroad and include application of novel treatment technology, computation fluid dynamics analyses, and surface water and groundwater modeling where he is often tapped as an expert. His basin scale water resource management projects for California State Water contractors as well as federally funded national programs to determine susceptibility of public supply wells are just some of the examples of work benefiting from his leadership.

Eric leads a growing team of devoted high-level quantitative scientists and engineers out of Stantec's Pasadena office, focusing on new solutions to water resources development and sustainability. With a background in engineering, hydrogeology, and finance, Eric provides program level management, optimization, and financial analysis for large scale water resource projects. His experience in managing multi-disciplinary projects involving a broad range of technical specialties, provide him with an exceptional selection of tools and understanding to aid in project approach and facilitation.



Eastern Sierra Water Management Program Contract, Multiple Projects, LADWP, CA (Program Manager)

This contract included multiple projects (21) including groundwater management planning, sustainability, aguifer storage and recovery, groundwater development, and remote sensing. Concurrent with his project is active management of the development of groundwater from beneath Owens Lake while conserving dust control water and environmental mitigation. Successfully led program involving multiple disciplines, teams, and subconsultants including investigations of evapotranspiration using remote sensing as well as installation of extensometers with associated GPS to address subsidence due to groundwater development. Completed and active projects include: the Owens Valley Groundwater Management Plan, Bairs Georges Wellfield Hydrogeologic Conceptual Model involving LiDAR and AEM survey; Owens Lake Hydrogeologic Conceptual Model Update and Numerical Model Review; Bishop Wellfield Model Update; Owens Valley ETA and Vegetation Water Resource Analysis; Owens Lake Water Conservation, Salvage, and Groundwater Banking; and other projects.

Owens Valley Groundwater Management Plan, LADWP, Owens Valley, CA (Program Manager)

As part of this program, Eric incorporated multiple projects including sustainability, aguifer storage and recovery, groundwater development, and remote sensing. Concurrent with his project is active management of the development of groundwater from beneath Owens Lake while conserving dust control water and environmental mitigation. Successfully led involving multiple disciplines, teams, and subconsultants including investigations of envapotranspiration using remote sensing as well as installation of extensometers with associated GPS to address subsidence due to groundwater development.



Firm: Stantec
Years of Experience: 23
Years with Firm: 3

Education:

- Ph.D., Civil Engineering, University of California, Irvine
- MBA, Business
 Administration, University
 of New Mexico, Anderson
 School of Management
- MS and BS, Hydrogeology, California State University, San Diego



Aquifer Storage and Recovery Operations, LADWP, Indian Wells Valley and Antelope Valley, CA (Project Engineer)

Performed preliminary design and engineer's cost estimate for recharge basin and aquifer storage and recovery operations in Indian Wells Valley and Antelope Valley, California. ASR alternatives were compared in terms of property, proximity to the Los Angeles Aqueducts, and net present value of capital expense and operations and maintenance.

Indian Wells Valley Recharge Conceptual Design, LADWP, CA (Project Engineer)

Performed conceptual design of recharge alternatives for aquifer storage and recovery in Indian Wells Valley including recharge basins and in channel modifications. Analyzed various infiltration gallery design geometries as well as recovery operations and conveyance piping.

Indio Subbasin Alternative SGMA Annual Report, Coachella Valley Water District, Indio Subbasin, CA (Project Manager)

Project manager for alternative SGMA annual report for the Indio Subbasin involving multiple groundwater sustainability agencies, municipalities, and import water agencies. The basin water balance was updated to account

for groundwater production, underflow, drainage, agricultural and municipal use, imported water deliveries, spreading/recharge operations, and golf course conversions to reclaimed water.
Sustainability management goals and activities were identified, updated, and planned to meet SGMA requirements.

Integrated Water Resource Plan, San Gorgonio Pass Water Agency, CA (Project Manager)

Project manager for a three-year Integrated Water Resources Plan. As part of plan, prepared water demand forecasts for the area within the Water Agency boundary consisting of several groundwater storage units, municipalities, and eight water purveyors. Water demand forecasts were performed by relating historic groundwater production within the Water Agency boundary, water use characteristics, population forecasts, and household forecasts to 2030 starting in 2004. Managed the supply planning to meet demand by performing preliminary designs of conveyance systems to take additional State Water Project water, treatment and storage facilities, in addition to surface spreading basins and injection wells. Facilitated and led stakeholder public meetings incorporating community involvement as well as represented the Agency for SCAG planning and policy meetings.

Water Resource Supply Analysis, Southern California Edison, Santa Catalina Island, CA (Technical Lead)

Conducted a water resource supply and demand analysis based on projected development on Santa Catalina Island and available potable water supplies. Reviewed hydrogeologic information to estimate groundwater basin safe yield for effective water resource management of island resources. Developed long-term water supply scenario involving multiple groundwater basins and desalination facility expansion to sustainably meet water resource requirements.

Water Supply Assessment, Humboldt Wind, LLC, Humboldt County, CA (Project Manager)

Project managed and provided technical leadership to determine demand, source, and availability of water for a planned wind energy generation facility. Challenging project factors included ability to obtain treated non-potable water versus surface water and groundwater rights within the Pepperwood Area Groundwater Basin. Water supplies were secured for both development and continuing operation and maintenance of the wind farm.

Well Siting Survey at Reservoirs 1B, 1C and 2C Sites, Cucamonga County Water District, CA (Hydrogeologist)

Assisted with the hydrogeologic assessment for three new municipal water supply wells within the Chino Basin for the District. The study included the evaluation of the hydrogeology, water quality, and physical layout of each candidate site.

Serrano Well No. 5, Laguna Beach County Water District, Laguna Beach, CA (Technical Lead)

Provided hydrogeologic assessment to evaluate the current condition of Serrano Well No. 5 and the general hydrogeologic conditions at the well site and its immediate vicinity. The project involved assessing the local recharge conditions that affect Serrano Well No. 5 and the influence of the adjacent recharge basins on the continued operation of the well. Also included were EIR impacts and an inventory of water supply wells within two-mile radius of No. 5.

Water Treatment

Selenium and Chloride Removal from Refinery Wastewater, Cheyenne, Wyoming.

Developed a treatment process for the reduction of selenium to below 5 parts per billion. Obtained venture capital funding to design and construct an automated continuous flow treatment pilot plant. Deployed pilot plant and successfully reduced selenium to below 5 parts per billion and reduced chloride concentrations with a low pressure RO membrane system that enables the re-use of permeate in refinery boiler make up water. Designed treatment train (patent pending) to constrain all selenium laden waste as "non-hazardous".

Radium and Arsenic Removal Study, Ramah, NM

Working with Sandia National Labs, developed treatment train to remove both arsenic and radium from a municipal well. Addressed disposal options and limitations regarding radioactive waste and designed residual waste management for treatment system. Designed, constructed, and managed pilot treatment system study to balance treatment needs and radioactive residual management.

Arsenic and Fluoride Removal 30 Day TCEQ No Tweak Pilot Study, Welch, TX

Designed mobile treatment system comprised of electrocoagulation, high rate clarification, multimedia filtration, and optional UF system to run for 30 days straight per the agreement with the Texas Commission of Environmental Quality. Managed, staffed, and successfully ran for the 30 days straight. Designed floating decanter and residuals management including dewatering and disposal.

Red Mesa Uranium and Arsenic Treatment Study, Red Mesa, AZ

Designed and performed pilot study to determine design parameters for the co-removal of arsenic and uranium for a 300 gpm system. Using chlorination, pH adjustment, electrocoagulation, high rate clarification, and multimedia filtration, the target concentrations were all reduced to below their respective maximum allowed drinking water concentrations.

Arsenic and Fluoride Treatment Study, Beatty, NV

Performed pilot study to determine design parameters for the co-removal of arsenic and fluoride for a 500 gpm system. Using chlorination, pH adjustment, electrocoagulation, high rate clarification, and multimedia filtration, the target concentrations were all reduced to below their respective maximum allowed drinking water concentrations.

Green Ridge Fluoride and Arsenic Treatment Study, Green Ridge

Performed pilot study to determine design parameters for the removal of the cocontaminants fluoride and arsenic from a municipal well using a single treatment technology. Using electrocoagulation reactors and pH adjustment down to 6, fluoride was reduced from 14 parts per million to 2.6 parts per million while arsenic concentrations were at non-detectable levels after treatment. The study also addressed residual management, clarification, and filtration. Filtration included use of zeolite media as well as hollow fiber ultra-filtration membrane technology.

Town of Bernalillo—Wells 3 & 4, Town of Bernalillo, NM

Conducted filter assessment for 1 MGD facilities treating for arsenic utilizing electrocoagulation technology. The study was performed to address elevated residual aluminum from produced aluminum hydroxide floc during treatment. Several filter media were piloted to address filter efficiencies. A natural zeolite was found to provide exceptional conventional depth filtration and able to filter 0.45-micron particle sizes.

Town of Bernalillo—Well 2 Arsenic Treatment Facility, Town of Bernalillo, NM

Designed 1.2 MGD arsenic treatment facility treatment train to include pH adjustment, electrocoagulation, high rate clarification, and filtration. Design was based on pilot studies performed to reduce arsenic from approximately 41 parts per billion to a treatment goal of 6 to 8 parts per billion. Pilot studies also included pH adjustment, electrocoagulation, high rate clarification, and filtration.

Southern California Water Company Well Treatment, Norwalk, CA (Project Manager)

Project manager for a wellhead treatment expansion design, engineers cost estimate, and design build request for proposal. The project involved determining the most efficient and cost-effective treatment scenario using multiple granular activated carbon treatment reactors, located at multiple sites, to treat multiple chlorinated solvents. A total of three wells were included in the treatment system, which also incorporated system operation analysis and SCADA.

Wastewater

City of Buena Park, Sewer Master Plan, Buena Park, CA (Project Manager)

Eric managed the preparation of a sewer master plan for the City of Buena Park, California. The master plan involved the development of a computer model for the City's collection system. Actual flow measurements were obtained and used to calibrate the model. The master plan identified system deficiencies and recommended a capital improvement program.

City of Buena Park I/I, Buena Park, CA (Project manager and Lead Hydrologist)

Eric managed this I/I study, flow monitoring coordination, capacity assurance plan, and digital sewer atlas generation. Determined the site selection of 12 flow monitoring devices and 3 rain gauges to obtain dry and wet weather sewer flow data for I/I analysis. Lead hydrologic analysis of flow data. Managed sewer master plan update to accommodate wet weather flow and I/I. Used results from analysis to revise capital improvement program for sewer system.

Ontario Sewer Improvement, Ontario, CA

Performed SewerCad hydraulic modeling on several miles city sewer system to optimize sewer design for replacement and relief. Effectively sized sewer pipes to meet depth over diameter requirements for peak and average day flow. Responsible for final design review.

Rancho Las Flores, Recycled Water Management Plan, CA

Prepared a recycled water management plan utilizing current treated flows from Crestline Sanitation District and future flows from Rancho Las Flores treatment plants one and two. Determined required seasonal storage and prepared preliminary storage pond designs including treatment requirements.

Water Quality

US Department of Defense, White Sands, NM (Principal investigator)

Multi-year project involving bioremediation of RDX in a fractured groundwater system. Components of the project included: bench scale microcosm experiments; insitu biological and bio-augmented licensed microtrac devices to test RDX reduction in monitoring wells across the impacted site; push-pull tracer testing; hydraulic analysis and field instrumentation. Resulting bio-augmented treatment scheme reduced to a twelve-hour contact time where biological activity was maintained by addition of a quantified carbon source volume in well locations showing connectivity from hydraulic analysis.

Los Angeles Department of Water and Power (LADWP), Los Angeles, CA (Technical Lead)

Technical lead for an evaluation of recycled water quality in recycled water facilities using recycled water originating from the Donald C. Tillman Water Reclamation Plant and methods to maintain acceptable quality at points of use. Potential odor generation was addressed when recycled water trunk line capacities are greater than required for optimum flow characteristics. Additional water quality limitations regarding salt and sodium content were addressed based on specific customer water use characteristics. Provided technical support of the environmental documentation for the SVWRF project. Directed numerical model development to address flow and water quality changes as a function of distance from the Tillman Plant as well as various treated water quality.

Lower Duwamish Water Way, Seattle, WA

Provided expert litigation support services regarding review of multiple surface water flow and sediment transport models used for Superfund cost allocation. Determined feasibility and defensibility of bed composition model modifications based on conservation of mass and mathematical applicability. Conducted hydrograph audit to correlate different consultant model input effects on scour and deposition within the 5-mile reach of the Lower Duwamish River before it enters Elliot Bay.

Southern California Edison, Santa Catalina Island, CA (Project Manager)

For lead and copper rule compliance for the City of Avalon. Designed tap sampling protocols including frequency and statistically valid sample number for public and private points of use within the City approved by regulatory agency. Directed coupon study to determine corrosivity of water quality within the distribution system as well as effects of seasonal and intermittent use of private/public residences on water quality. Provided management plan to address lead and copper concerns for the City of Avalon.

Wells 1, 4 and 5, Irvine Ranch Water District, Irvine, CA

Wells 1, 4, and 5 are currently used as a source of supply to supplement reclaimed water in the non-potable system in the former Los Alisos Water District (LAWD). Wells 4 and 5 are currently permitted for domestic water use. The purpose of the project was to determine the feasibility of converting the wells to domestic use based upon treatment requirements to bring the wells into compliance with Title 22 Primary and Secondary Drinking Water Standards. Conducted well reliability assessments, evaluated water quality, established treatment and facility requirements.

Southern California Edison, Santa Catalina Island, CA

Eric reviewed groundwater under the influence of surface water technical reports to determine necessary steps to meet regulatory requirements. Performed regulatory review of required physical, chemical, biological, and radioactive testing of source waters for use in management of the island's water resources. Performed on-site field review of well field located at Middle Ranch and associated seasonally dependent effects of surface water reservoir located there. Addressed biological issues related to presence of bison and physical mitigation required to restrict their access to potable water sources.

Kern County Water District, Kern County, CA

Performed chemical modeling of surface and groundwater chemistry. Determined feasibility of blending surface water and groundwater for increased potable use and the necessary treatment that would be needed. Assessed blended water chemical characteristics by determining calcium carbonate precipitation potential, pH changes, alkalinity, Langelier Saturation index, Ryznar Stability index, Aggressiveness index, and other parameters.

Santa Margarita Water Watershed TMDL, USBR

Performed technical basin total maximum daily load (TMDL) model (WARMF) review. Provided insight into further model refinement and parameter estimation/determination to include surface water sampling and groundwater/surface water interaction.

City of Barstow, Barstow, CA

Project manager for a site investigation to determine extent of elevated nitrate concentrations in groundwater surrounding the City's Wastewater Reclamation Facility. The site investigation involved managing the installation of additional monitoring wells, and the sampling of City wells in addition to wells located on the Marine Corps Logistics Base Barstow. Further refinement to the groundwater flow and transport was made and used to provide a basis for future effluent discharge practices from the Wastewater Reclamation Facility. Established background nitrate concentrations in the area. Conducted a hydrologic analysis of Mojave River flow and its effect on groundwater flow. Investigated impact of local septic systems on overall groundwater quality.

City of Barstow Wastewater Reclamation Facility, Barstow, CA

Directed a surface water and groundwater study to determine the nature, source, and extent of elevated nitrate and TDS concentrations in the groundwater associated with application of secondary treated sewage to irrigated fields and percolation ponds. Lead a hydrology investigation as part of the overall study to quantify water flow into and out of the Barstow vicinity and its effect on mixing/diluting TDS and nitrate concentrations.

City of Barstow, Barstow, CA

Project managed the preparation of a work plan for the city to address action items requested by the Regional Water Quality Control Board–Lahontan. These items included descriptions and schedules for monitoring well installation and monitoring plan, lysimeter monitoring, groundwater quality modeling, off-site source determination, wastewater treatment plant nitrate reduction strategy, and off-site biosolids disposal.

Computational Fluid Dynamics Modeling

Raw Sewage Force Main CFD, Salt Lake City, UT

Performed finite element computational fluid dynamic (CFD) modeling to determine range of fluid velocities within a sewage force main. Qualitatively assessed the effect of several flow scenarios incorporating different inflow pipe pumping configurations to show resulting fluid velocities along the inside PCV

manifold lining. Addressed the potential effect of flow scenarios on reported manifold lining failure and determined if wall shear stress was a factor.

Pinellas County Blending Facility CFD, Pinellas County, FL

Designed and performed computational fluid dynamic (CFD) modeling experiments on a nine million gallon blending tank to determine operating relationship between flow rate and mixing time. To incorporate turbulent flow in the three-dimensional model, the algebraic mixing length or zero equation model was used in conjunction with the Navier-Stokes equations. A simulated tracer test, using a mass transport model, was performed to determine the coefficient of variation for several sample locations within the tank. Results suggested that for higher operating flows, mechanical mixing is not required, providing substantial cost savings to the client.

Encina Pumping Station CFD, Carlsbad, CA

Conducted flow analyses for two desalinated water inlet designs.
Computational fluid dynamic (CFD) modeling was performed to determine the effect of inlet design on vorticity within a forebay leading to approach channels and pump bays. The effect of inlet design on flow effects within the pump bays and fluid flow over adjacent pump bays was also investigated. Results from the modeling provided guidance in selecting an inlet design that reduces vorticity and the mean flow path from the inlet to the multiple vertical pumps.

Baffled Chlorine Contact Clearwell CFD, Keith Company, Victor Valley, CA

Assisted in the design of a baffled chlorine contact tank by performing finite element computation fluid dynamic (CFD) modeling. Modeling was performed using k-epsilon turbulent flow equations in two-dimensions. After the solution to the flow equations was solved, simulations were performed to minimize fluid dead volumes where carcinogenic trihalomethanes are known to form. The solution to the flow equations was then used to model the mass transport of a simulated tracer test to determine a quantitative resident time, assuring adequate disinfection.

Chlorine Contact Tank Tracer Test, Keith Company, Victor Valley, CA

Technical leader for a chlorine contact tracer test to determine compliance with the California Department of Health Services (CDHS) disinfection requirements for the Surface Water Treatment Rule. Developed tracer study protocol acceptable to CDHS.

Groundwater Modeling

Northrop Grumman, Canoga Park, CA (Principal Modeler)

Principal modeler for an ongoing 2-mile long chlorinated solvent plume remedial alternatives investigation in the San Fernando Valley. Conceptualized subset of San Fernando Valley Basin model and ported regional hydrology and hydraulic parameters to calibrate to seasonal groundwater elevation variations. Coordinated the collection of data and assembly of model GIS database from a three-dimensional electronic geologic model to update site hydrogeologic conceptual model. Solute transport modeling utilizing the resulting groundwater velocities and soil properties will be used simulate resulting chemical degradation based on selected remedial alternatives.

Middle Rio Grande Basin, NM (Principal Modeler)

Modeled over 2,300 square mile basin, including the Rio Grande, reservoirs, and several hundred miles of drains and canals. Created and coded automated ARC GIS based model database to assemble, run, and post process groundwater model using AML and Fortran scripts. Utilized groundwater model to assess flow and transport of various anthropogenic contaminants while calibrating to over 100 years of surface and groundwater level data as well as isotopic groundwater age data. Performed work as part of the federally funded program Transport of Anthropogenic and Natural Contaminants (TANC) that is a subgroup of the National Water Quality Assessment (NAWQA) program.

Army Corps of Engineers, Albuquerque, NM (Principal investigator)

Eric designed and managed hydraulic and hydrogeologic data collection adjacent to the Rio Grande River using slug tests in a large number of piezometers and

nested multi-depth piezometers as well as surface facie descriptions using LiDAR. Developed a numerical code to address river loss to groundwater as a function of river stage and groundwater flow resulting in an operating curve to be used in the Upper Rio Grande Water Operations Model (URGWOM) to address interstate river compact. Numerical code was stochastically based and included the utilization of developed transition probabilities based on collected facie descriptions. The resulting operating curve, being stochastically based, provide a representative range of river loss based on river stage that accounted for quantified uncertainty.

US Department of Defense, Confidential

Modeled PCE plume using MODFLOW and MT3DMS to investigate and assess abiotic degradation rates from magnetic susceptibility data and degradation rate correlation. The steady state flow solution was used in transient solute transport simulations that addressed transport times and steady plume concentrations for the case of with and without degradation. Results indicated that, even though site magnetic susceptibilities were found to agree with published correlations with magnetite content, site degradation estimates were over-estimated resulting in erroneous conclusions for the fate and transport of the PCE plume on site.

InfraSUR, LLC, Albuquerque, NM

Provided technical expertise for development of analytical and digital model-based design tool for use in scoping and designing biogeochemical reductive dechlorination (BiRD) pilot and full-scale in-situ groundwater treatment applications.

City of Barstow-Modeling, Barstow, CA (Project Manager/Lead Technical Modeler)

Groundwater/vadose zone/solute transport modeling project involving nitrate fate and transport in the vicinity of the City's Wastewater Treatment Facility WTF. Flow modeling, using MODFLOW, was developed based on a USGS regional flow model of the Mojave River Basin in California. Using telescopic mesh refinement, vadose zone flow analyses, and further flow

discretization of the USGS model in the vicinity of the City's WTF, groundwater flow patterns were established to effectively simulate discharges to agricultural fields and percolation ponds. Nitrate fate and transport was modeled using MT3D and accounted for nitrification in the vadose zone and groundwater.

Tijuana River Valley, CA

Designed and modeled the groundwater flow using MODFLOW for use in water resource management of the San Diego Formation within the Tijuana Valley. Determined recharge areas to the formation and reviewed its water quality. Managed field personnel in regard to water resource development in deep drilling and aguifer characterization of a portion of the San Diego Formation located in Tijuana River Valley. Due to hydrogeologic complexities of the various aguifers beneath the valley floor, deep nested piezometers were also completed to depths corresponding to the main production well. Analyzed aguifer characteristics by several methods of aquifer testing using data from the production well, all piezometers, and proximal USGS. Reviewed geophysical gravity surveys conducted within the valley to determine depth of the bedrock and the location of faults/ barriers to groundwater flow.

Firestone, Noblesville, IN

Designed and modeled polychlorinated biphenol (PCB) solute transport in response to overall risk to human health under current remediation well field design. Directed the collection of aquifer test data to populate model database. Evaluated fate and transport of PCB in regard to its environmental and health impact on the White River and future contaminant levels. Modeling component involved groundwater surface water interaction and transport of PCB.

Kearney-KPF, Stockton, CA

Modeled fate and transport of groundwater contamination at Superfund site for VOCs in response to health risks due to proximity of municipal production well using MODFLOW and MT3D. Determined pump and treatment system well field optimization for economic and time efficient remediation

standards. Modeled hydraulic groundwater barrier between municipal pumping well and contaminated site to minimize risk of domestic water supply contamination by designing a reinjection well at the treatment system.

Huffy/Price, Azusa, CA

Developed remedial well field for Baldwin Park Operable Unit Superfund site in response to VOC contaminants from site and other principal responsible parties (PRPs) involved in super fund cleanup. Remedial well field design was performed by basin modeling and well capture zone analysis, using finite element numerical code DYN. Generated GIS based system for analysis of source and extent of soil and groundwater contamination from PRPs. Sited multiport monitoring wells to effectively delineate vertical extent of contamination in regard to impacted groundwater municipal production wells. Generated GIS based system for analysis of source and extent of soil and groundwater contamination from PRPs. Developed and modeled vapor phase transport from former degreasing activities to determine magnitude of possible groundwater contamination pathways.

Marley Cooling Towers, Stockton, CA

Designed and modeled chromium contaminant migration to determine impact on municipal pumping wells at Superfund site using MODFLOW. Assembled model database and directed the collection of aquifer test data. Assessed risk to human health from exposure to chromium contaminated groundwater and irrigation.

Paso Robles, CA

Analyzed and interpreted aquifer tests to assess additional discharge effects on the basin water budget to satisfy CEQA documentation. Remotely coordinated data collection and procedures to facilitate analyses. Performed modeling of groundwater flow and impact due to additional discharges based on analysis and estimation of hydraulic parameters affecting groundwater storage and flow.

PUBLICATIONS

Publications in Peer Review Journals:

Bexfield, Laura M., Heywood Charles E., Kauffman, Leon J., Rattray, Gordon W., and Vogler, Eric T., 2011, Hydrogeologic setting and groundwater flow simulation of the middle Rio Grande Basin regional study area, New Mexico, Section 2 in Eberts, Sandra M., ed., Hydrogeologic settings and groundwater-flow simulations for regional investigations of the transport of anthropogenic and natural contaminants to public-supply wells—Investigations begun in 2004: U.S. Geological Survey Professional Paper 1737-B, Section 2, p. 2-1 to 2-61, 2011.

Engdahl, N. B., E. T. Vogler, and G. S. Weissmann (2010), Evaluation of aquifer heterogeneity effects on river flow loss using a transition probability framework, Water Resour. Res., 46, W01506, doi:10.1029/2009WR007903

Chrysikopoulos, C. V., and E. T. Vogler, Acoustically Enhanced Ganglia Dissolution and Mobilization in a Monolayer of Glass Beads, Transport in Porous Media, 64, 103-121, 10.1007/s11242-005-1525-8, 2006.

Vogler, E. T., and C. V. Chrysikopoulos, An experimental study of acoustically enhanced NAPL dissolution in porous media, AIChE Journal, 50(12), 3271-3280, 10.1002/aic.10221, 2004.

Chrysikopoulos, C. V., and E. T. Vogler, Acoustically enhanced multicomponent NAPL ganglia dissolution in water saturated packed columns, Environmental Science and Technology, 38(10), 2940-2945, 2004.

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Other Publications (Patents and Technical Reports):

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Chrysikopoulos, C. V., and E. T. Vogler, Application of acoustic pressure waves in aquifer remediation and mobilization of entrapped organic liquids, Technical Completion Report, Water Resources Center, Project UCAL–WRC–W–938, 20 pp., University of California, Davis, 2002.

Gareth Roberts PG

Principal Geologist

Gareth has more than 25 years of experience in the field of environmental consulting. His experience has focused primarily on the management, assessment and characterization, remediation, and regulatory closure of numerous southern California properties impacted with petroleum hydrocarbons, chlorinated hydrocarbons, volatiles, and metals. Gareth's primary areas of experience include subsurface soil and groundwater investigations; UST removal and related facility demolition and upgrade operations; tankpit de-watering and groundwater treatment and disposal; excavation of contaminated soil and associated characterization and disposal; remedial technology feasibility evaluations and remediation system installations (soil vapor extraction, air sparge, dual-phase extraction, groundwater pump and treatment, in-situ chemical oxidation, oxygen diffusion); preparation and review of technical reports, project management, and regulatory interaction



Gareth has managed more than 200 individual underground storage tank investigation and cleanup projects in southern California area throughout Los Angeles, Ventura, Kern, and Riverside Counties, and has worked with and interacted with numerous regulatory agencies and local oversight programs. His project management responsibilities included preparation of subsurface investigation work plans, health and safety plans, oversight of staff during performance of fieldwork, interpretation of soil, groundwater, and vapor analytical data, submittal of assessment reports and remedial action plans, remedial system design and installation, preparation of site specific budgets, and interaction with the client and regulatory personnel.

Fuel Distribution Terminal and Former Refinery, South Gate, CA (Project Manager)

Managed remediation and monitoring efforts at a large scale fuel distribution terminal. The site maintained over 250 monitoring wells used for recovery of floating product, hydrocarbon vapors, and groundwater monitoring. Remediation efforts consist of multiple soil vapor extraction systems, vapor enhanced liquid product recovery, product recovery via pneumatic pumps, and oxygen diffusion. Remediation was performed under a Title V South Coast Air Quality Management Permit and a cleanup and

abatement (CAO) order issued by the Los Angeles Water Quality Control Board.

Subsurface Soil and Groundwater Investigations Various Sites, Southern CA

Gareth has conducted or overseen more than 200 remedial investigations for sites impacted by various chemicals of concern at gasoline stations, fuel terminals, refineries, dry cleaners, and chemical facilities. Drilling methods included hollow-stem auger, mud rotary, air rotary, sonic, direct-push, cone penetrometer testing, rapid optical screening tool (ROS), ultra-violet optical screening tool (UVOST), membrane-interface probe (MIP), and hydraulic profiling tool (HPT) techniques. Investigations focused on assessment of soil, soil vapor, and groundwater, and included the installation of soil borings, groundwater monitoring wells, and remediation wells (soil vapor extraction, air sparge, groundwater extraction, chemical injection etc.), and also abandonment of wells pending site closure. Gareth has designed and implemented remedial pilot testing including soil vapor extraction, air sparging, dual-phase extraction, in-situ chemical oxidation, and groundwater pump testing. Investigative data was used to interpret subsurface geologic and hydrogeological conditions through the preparation of detailed cross-sectional diagrams and contaminant concentrations maps, and to make recommendations on further proposed actions (best applicable remedial technologies, monitored

natural attenuation, site closure).



Firm: Stantec
Years of Experience: 26
Years with Firm: 25

Registrations/Certifications:

- Professional Geologist #7442, State of California
- 40-Hour OSHA Hazardous Waste Operations and Emergency Response Training
- 8-Hour Supervisor's Certification, OSHA
- 8-Hour Hazwoper Refresher

Education:

- BS, Geology, California State University, Northridge

Memberships:

- American Association of Petroleum Geologists
- South Coast Geological Society

High-Profile Site Investigation and Remediation Impacted Municipal Supply Wells, Southern CA (Project Manager)

Gareth was the project manager for a site located within the vicinity of drinking water supply wells belonging to the Crescenta Valley Water District (CVWD) which had identified low levels of MTBE. A detailed subsurface investigation was conducted to determine if the client property was possibly a source of the MTBE identified in the drinking water supply wells. A total of 23 groundwater monitoring wells were installed using air rotary, mud rotary, and sonic drilling techniques due to a combination of bedrock and alluvial subsurface materials. Data collected during site related subsurface investigations was used in conjunction with regional basin exploration geophysical data to determine the site was located in a separate groundwater basin from the municipal supply wells, isolated by a bedrock ridge, and that impacts beneath the site were not contributing to MTBE contamination in the supply wells. Findings were presented to the LARWQCB and CVWD MTBE investigation task force, which included the Upper Los Angeles River Area Watermaster. Data obtained from the investigation indicated the groundwater flow direction in the portion of the basin where the project was located flowed in an opposite direction than what had previously been assumed. Gareth conducted field protocol for an investigation of a municipal drinking water well field impacted with MTBE in Santa Monica, California, All work was completed under a Unilateral Administrative Order issued jointly by the Los Angeles Regional Water Quality Control Board and the United States Environmental Protection Agency.

Underground Storage Tank Removal/Replacement Various Projects, Southern CA

Gareth managed environmental compliance issues and performed field work at more than 80 sites upgraded with new USTs, product lines, or dispensers. He oversaw or performed the collection of samples for laboratory analyses, characterization and disposal of excavated materials, and submittal of technical reports to the regulatory agencies. Gareth was able to negotiate a reduction in samples collected at many sites and also reduce the number of required analyses where feasible.

Where technically cost effective and warranted, remedial excavation was performed to remove elevated petroleum hydrocarbon concentrations in shallow soils (dispenser and product line areas). This led to expedited closure of 13 sites, of which 5 were closed without any required additional assessment borings providing a significant long term cost savings to the client.

Chemical Injection and Monitoring Various Sites, Southern CA (Project Manager)

Gareth performed pilot testing and in-situ chemical oxidation (ISCO) remediation activities at several retail petroleum facilities in southern California. Pilot testing included the installation of conepenetrometer test (CPT) borings equipped with a membrane-interface probe and hydraulic profiling tool (MiHPT) for detailed hydrogeological characterization, performance of freshwater injection testing with tracer dye to confirm radius of influence and injection volumes, and depth-discrete soil and groundwater sample analyses for data verification. ISCO was implemented using hydrogen peroxide or alkaline activated sodium persulfate for remediation of petroleum hydrocarbons. All work was performed in accordance with approved Waste Discharge Requirements issued by the Los Angeles Regional Water Quality Control Board.

Senate Bill 4 Related Geologic Evaluation, Kern County, CA

Oversaw SB4 related groundwater investigative work including the installation of deep soil borings in an active oil field using air rotary casing hammer drilling techniques. Performed geologic field mapping to evaluate relation of structural geology to hydrogeological conditions.

Litigation Support and Expert Testimony Various Litigation Support Property Projects, Southern CA

Gareth assisted the legal department of a major oil company by providing interpretations of spikes in groundwater analytical data that were attributed to new releases. Based on data analyses and familiarity with environmental sampling techniques, he was able to determine that large fluctuations/spikes in groundwater concentrations were attributed to varied sampling techniques and did not reflect new releases.

Impacted Municipal Well Field, Southern CA

Gareth was deposed as the expert witness to defend conclusions made regarding subsurface geologic and hydrogeological associated with a property claimed to be contributing to groundwater impacts for a major municipal well field in the Crescenta Valley Water District. Previous interpretations of the subsurface by Gareth concluded that the subject property was located in a separate groundwater basin from the impacted supply wells, divided by subsurface ridges of bedrock, and that the groundwater flow direction in the subject property area was away from the impacted supply wells.

Emergency Planning/Response Tanker Trailer Accidents, Southern CA

Gareth assisted with emergency response actions associated with two gasoline tanker trailer driving accidents. These included detailed sampling and analysis of affected media; oversight of restoration activities including grading and re-vegetation; and subsequent compliance report submittal.

Brownfield Redevelopment, Former Refinery, Southern CA

Gareth performed field oversight during decommissioning activities that included the cleanout and removal of four 115,000 barrel floating-roof above ground storage tanks, approximately 5,000 feet of above and below ground piping, and multiple manifolds and pumping stations. He oversaw remedial excavations involving crude oil/ acid sludge, and re-use of approximately 7,864 tons of lead-impacted soil by placement into an on-site repository. Gareth utilized SW-846 statistical analysis to characterize all waste streams. He also chemically fixated approximately 1,000 tons of RCRA lead impacted soil prior to offsite disposal as non-RCRA. Gareth's responsibilities also included enforcement of health and safety regulations for all subcontractors. Fieldwork was conducted under DTSC and RWQCB guidance. Following completion of the project, site closure was obtained and the property was re-developed into a commercial strip mall and entertainment complex.

Victor Harris PG, CEG, CHG

QA/QC Subject Matter Expert/Strategic

Advisor/Stakeholder Outreach

Victor brings more than 36 years of experience in the Owens Valley and other locations related to hydrology, hydrogeology, and plant/ soil water interaction. His responsibilities have included California Environmental Quality Act (CEQA) environmental impact evaluations, groundwater basin analysis, geotechnical investigations, dust mitigation studies, environmental studies, groundwater resource development, engineering design, construction management, and construction, and water banking projects. Victor has had extensive experience in hydrogeologic characterization and groundwater modeling in the Owens Valley, western United States, Europe, and the Middle East. His experience also includes the design and implementation of drilling, soil sampling, aquifer testing, and field testing programs. Victor began working in the Owens Lake area in 1983, when he conducted field studies funded by the US Navy to investigate dust generation from Owens Lake and various means to control mobilization of particulates.

LADWP, Eastern Sierra Water Resources Management Assistance, Owens Valley, CA (Project Manager)

Victor managed various Task Orders under this on-going contract and has recently transitioned from project manager to project technical advisor. He has managed a variety of Task Orders including updating and improvement of the Bishop/Laws wellfield model utilizing the unstructured grid (USG) platform of MODFLOW, implementation of remote sensing at Owens Lake and Bishop to evaluated evapotranspiration and vegetation, providing technical resources support to the Bishop office, and development of an automated cross section tool. He was managed components of the Owens Lake Groundwater Development Program, including siting and design of monitoring and testing wells, isotope studies, detailed fault studies, and improvement and updating of the Owen Lake groundwater model.

LADWP, Owens Lake Groundwater Evaluation Project, Owens Lake, CA (Project Manager)

Victor oversaw the conceptual and numerical groundwater model development for the Owens Lake. The project involved review and compilation of over 20 years of detailed hydrologic studies performed by others, and construction of 28 deep monitoring wells for the purposes of gathering data to support a detailed groundwater

model of this saline lake. The model development was overseen by several stakeholder agencies and a blue-ribbon committee of modeling and ecological experts from around the country. Upon completion of the model, it was utilized to evaluate the potential to use Owens Lake groundwater for dust control. Over 90 simulations were completed. Victor was also charged with the presentation of results to stakeholders and the Owens Lake Master Planning Group.

LADWP, Owens Valley Natural Resources Management, Owens Valley, CA (Project Manager)

Victor managed extensive studies to manage groundwater recharge and extraction and to assist the Department in compliance with the Long Term Water Agreement in the Owens Valley. This 9-year project has involved assisting the Department in a variety of subject areas, including vegetation monitoring, CEQA studies associated with the Lower Owens River Project (LORP), annual reporting on enhancement and mitigation projects, Mono Basin studies and update of the LAASM model, review and analysis of surface water hydrology, modular groundwater flow (MODFLOW) modeling coupled with Ecological Dynamics Simulation (EDYS) modeling at six separate well fields to evaluate various management techniques for extraction of groundwater augmented by



Firm: H&H Water Resources,

Years of Experience: 36

Registrations/Certifications:

- Professional Geologist #4364, CA
- Certified Engineering Geologist #1363, CA
- Certified Hydrogeologist #848, CA
- Professional Geologist #10177 Nationwide

- MS, Hydrogeology
- BS, Geology



surface spreading. The project involved determination of optimal groundwater recharge, storage, and extraction methods. The project also involved detailed studies of the confining layer prevalent in the valley, including aquifer test design and analysis, and field drilling and soil sampling. Victor also participated in a cooperative between Department staff and key stakeholders regarding cultural resources.

Anheuser Busch Companies, Owens Valley Environmental Investigations, Owens Valley, CA (Project Manager)

Victor managed comprehensive Environmental Impact Report (EIR) and Environmental Assessment (EA). He also directed an extensive five-year field investigation of hydrogeologic conditions in the Southern Owens Valley and Owens Lake. The project included the construction of test production facilities and 20 monitoring wells and piezometers. A long-term aquifer test was performed to evaluate the aquifer response to well field pumping. This analysis was used to develop pumping scenarios that would optimize production and

minimize adverse environmental impacts of groundwater extraction. Movement of contaminants from Owens Lake was modeled using three separate analytical models and a MODFLOW numerical model that incorporated three aquifer layers over a 10 square mile area. The MODFLOW model was calibrated using historical groundwater levels, climatic monitoring, and results of the long-term constant-rate aquifer test. Victor acted as the project liaison to numerous federal, state, and local agencies, and conducted public information meetings

Thomas Regan PG, CEG, CHG

Senior Hydrogeologist/Technical Lead

Tom has 39 years of experience in groundwater resources management, development, and protection. His responsibilities have included groundwater resources development, feasibility of groundwater development, groundwater basin analysis, aquifer characterization, development of regional and basin-wide hydrologic inventories/ water balances, development of hydrogeologic conceptual models, analysis of groundwater contamination impacting water supply wells, evaluation of coastal seawater barriers and seawater intrusion, well siting feasibility, well and well field siting, well design and construction oversight, well evaluation, well rehabilitation design and oversight, hydrogeologic and geochemical investigations related to the siting of new and expansion of existing groundwater recharge facilities, analysis of recycled water travel times from groundwater recharge operations using storm water, imported water and recycled water, analysis of pumping test data and well interference effects. Tom's experience also includes the design and implementation of drilling, soil sampling, aquifer testing, and field-testing programs related to groundwater recharge and development.



Completed data collection related to development of the Hydrogeologic Conceptual Model. Currently preparing representative geologic cross-sections and the Hydrogeologic Conceptual Model section of the GSP.

Basin Boundary Modification Request, Sustainable Groundwater Management Act Camrosa Water District, Ventura County, CA (Hydrogeologist)

Prepared geologic cross-sections and recommended basin boundary modifications of the Arroyo Santa Rosa groundwater basin in support of a basin boundary modification request (BBMR) in support of a forthcoming Groundwater Sustainability Plan. The BBMR was submitted to DWR and approved.

Sustainable Groundwater Management Act Technical Support, Chevron, Kern, Kings and Monterey Counties,CA (Hydrogeologist)

Provided technical support reviewing draft chapters of numerous Groundwater Sustainability Plans prepared by a variety of Groundwater Sustainability Agencies in Kern County, southern Monterey County and western Kings County. Reviews focused on those chapters describing Hydrogeologic Conceptual

Models, Undesirable Results, Minimum Thresholds and Measurable Objectives.

Verdugo Basin Groundwater Evaluation and Monitoring, Los Angeles County, CA (Project Hydrogeologist)

Managed and performed a groundwater evaluation and monitoring project under the Department of Water Resources administered AB 303 Local Groundwater Assistance Funding Program for small water systems to identify potential new production well sites, provide information to stakeholders regarding the Verdugo groundwater basin to enhance balanced management of local groundwater and imported water supplies, provide additional geologic and hydrogeologic data to DWR to update DWR Bulletin 118, and provide new groundwater level and quality data to optimize groundwater resources development in the Verdugo basin.. The study entailed the drilling and installation of three monitoring wells to crystalline bedrock, nine months of groundwater level and quality monitoring, a preliminary estimate of safe yield, data analysis, and preparation of a final report.

Calleguas Creek Watershed Study, Ventura County, CA (Project Hydrogeologist)

Managed and conducted hydrogeologic studies and subsurface investigations on behalf of the Calleguas Municipal Water District related to the planning



Firm: Stantec
Years of Experience: 39
Years with Firm: 5

Registrations/Certifications:

- Professional Geologist #5203, California
- Certified Engineering Geologist, #1655
- California Certified Hydrogeologist #327, California

Education:

 BA, Geological Sciences, UC Santa Barbara

and implementation of the LARWQCBmandated Calleguas Creek Watershed Study in southeastern Ventura County. As project manager for the Groundwater Element, conducted and managed a variety of planning and investigative studies related to groundwater supply in the seven groundwater basins comprising the watershed as well as the hydraulic and water quality impacts of treated wastewater effluent flows and excess irrigation runoff on groundwater in these basins. Developed and implemented a groundwater monitoring program in accordance with a study area-specific work plan prepared by the writer. Prepared and submitted various reports to Calleguas MWD and LARWQCB and provided presentations regarding the work performed and results therein to Calleguas MWD staff and other interested parties, specifically, local wastewater treatment plant managers (i.e., dischargers in the watershed basins).

Groundwater Recharge Feasibility Study, White Wolf Basin, Wheeler Ridge-Maricopa Water Storage District, Kern County, CA (Project Manager)

Managed a multi-disciplinary preliminary groundwater banking study under the Department of Water Resources administered Proposition 13 Grant Funding Program to determine the technical feasibility of developing a full-scale conjunctive use project in the White Wolf Basin in the southern San Joaquin Valley. The study involved seven tasks as described below. Task 1 involved detailed review of available published and unpublished geologic and hydrogeologic data as well as the review of oil field geologic and geophysical data from the nearby Tejon Oil Field. Task 2 involved a preliminary geotechnical investigation including surficial soil mapping followed by shallow subsurface drilling and laboratory soil testing and percolation tests to identify potential groundwater recharge areas. A pilot recharge basin was then constructed in a representative area and equipped with various climate and vadose zone monitoring equipment, the latter, to track the wetting front as raw State Water Project water percolated in the pilot recharge basin. The pilot recharge basin was tested using various wet and dry cycles to determine optimum

recharge rates. Task 3 involved the drilling of three deep exploratory borings to maximum depths of 1700 feet to characterize subsurface geologic and hydrogeologic conditions. As part of this work, a number of fine grained sedimentary layers (potential aquitards) were identified in the subsurface which may impede recharge in certain areas. In addition, methane gas from the nearby Tejon Oil Field was observed in certain portions of the underlying aquifer. Task 4 involved the creation and calibration of a MODFLOW groundwater flow model of the eastern half of the White Wolf basin, the area of interest, followed by the development of several groundwater recharge/recovery scenarios to estimate potential hydraulic impacts to the underlying aquifer. Task 5 involved the development of a reverse flow hydraulic model of the 850 Canal to assess potential pump-back scenarios from groundwater recovery activities to the California Aqueduct. As part of this work, an evaluation of the types of improvements required to allow the 850 Canal to operate in a reverse flow fashion were also developed. Task 6 involved the development of a conceptual project layout showing groundwater basins, recovery wells, pipelines, pumping plants and other facilities required to operate a full-scale groundwater banking operation. Also included in this task was a detailed cost estimate to design and construct the facilities. Task 7 involved the preparation of a final report summarizing the work performed in Tasks 1-6 with each task technical memorandum included in appendices.

Well Drilling and Construction Support Services, LADWP, South Central Los Angeles/Eastern San Fernando Valley, CA (Project Hydrogeologist)

Provided field hydrogeologic services in support of the drilling, construction and development of five high-capacity municipal water wells in South Los Angeles as part of the Manhattan Well Improvement Project. Services provided included pilot hole reaming lithologic sampling and logging to depths of 1580 feet, geophysical and caliper log review, well construction oversight, airlift/swabbing development and airlift testing oversight. Also provided field hydrogeologic services for the Groundwater System Improvement Study

in the eastern San Fernando Groundwater Basin. Services performed included pilot hole drilling and pilot hole reaming oversight including lithologic sampling and logging, collection of discretedepth Simulprobe groundwater and soil samples, recording penetration rates and drilling fluid properties, monitoring and reviewing geophysical logging of the pilot hole and reamed borehole, and construction oversight of 15 triple completion monitoring wells to depths of 880 feet, well development, monitoring of bio-fouling treatment and redevelopment of most wells, groundwater sampling, and ZIST pump installation, optimization and compliance testing activities. Additional field work involved groundwater sampling from a variety of production and monitoring wells in Burbank, Pacoima and San Fernando using submersible pumps and ZIST purging methods.

Geologic and Groundwater Resources Evaluations, Diamond Valley Reservoir, Hemet, CA (Project Hydrogeologist)

Performed geologic and groundwater resources evaluations of three separate groups of undeveloped properties on behalf of the Metropolitan Water District of Southern California in support of condemnation proceedings respecting the construction of Diamond Valley Reservoir in Riverside County. Reviewed existing published and unpublished geologic maps, identified areas for subsurface exploration for on-site septic systems, supervised percolation testing where warranted by subsurface conditions. identified potential domestic water well sites and, on one group of properties, retained County of Riverside Department of Environmental Health personnel to conduct an environmental assessment of potential asbestos-containing materials in a former magnesite mine. Prepared technical reports regarding the evaluations and analyses performed for each group of properties and provided expert witness testimony, via depositions, all of which resulted in plaintiff settlements prior to trial.

Chaoying Jiao Ph.D., PG, CHG

Groundwater Modeling

Chaoying is an accomplished, multifaceted hydrogeologist and groundwater modeler with more than 31 years of experience. His professional focus is on regional groundwater resource evaluations, development, and modeling. He has extensive experience in basin-wide studies, wellfield exploration, siting, design, and construction management of high capacity water supply wells and monitoring wells. Chaoying has hands on experience in aquifer test design, instrumentation, and analysis. His recent project experience includes conjunctive water use studies with an emphasis on surface water recharge and aquifer storage and recovery.



Camrosa Water District has contracted Stantec to provide hydrogeologic services to characterize the Santa Rosa Groundwater Basin hydrogeology, to develop a water budget and an estimate of perennial yield, to analyze water quality characteristics and trend, to develop a groundwater model, to evaluate artificial recharge using recharge ponds and direct injection and to develop a groundwater monitoring program.

Dr. Jiao is conducting hydrogeologic analysis of the basin and in the process of estimating perennial safe yield.

Owens Lake Groundwater Evaluation, Los Angeles Owens Lake, CA (Project Hydrogeologist)

The project involved review and compilation of over 20 years of detailed hydrologic studies, development of a preliminary conceptual model, identification of data gaps, installation of 30 clustered deep monitoring wells and collection of additional field data to fill data gaps, revision of the conceptual model, as well as development and application of a numerical groundwater model. The study area was approximately 35 miles by 13 miles. Chaoying assisted in the preparation of the technical specification and the review of the bid document for the monitoring well design and construction. In addition to evaluating geophysical and lithologic data and the water budgeting to characterize geologic setting, aguifer and groundwater flow

underneath the Owens Dry Lake, Chaoying was also responsible for numerical groundwater model development and applying the calibrated model to optimize groundwater development alternatives. The model has 12 model layers and a number of 268,180 cells.

Development of Independence-Symmes-Bairs and Lone Pine Management Model (Southern Model), LADWP, Owens Valley, CA (Project Hydrogeologist)

Chaoying analyzed geologic setting, aquifer and groundwater flow characteristics of the Independence-Symmes-Bairs-Lone Pine area, based on which, he developed a conceptual model. In collaborating with team members, Chaoying developed a comprehensive three-dimensional groundwater flow model using GMS MODFLOW to predict drawdown (depth to water) at permanent vegetation monitoring sites within the model domain. The model was calibrated to steady state and transient state from 1985 up to 2010.

Santa Ana River Groundwater Recharge Optimization Study, San Bernardino Valley Water Conservation District/Municipal Water District, Santa Ana, CA (Hydrogeologist)

Chaoying was responsible for the hydrogeological study for the evaluation and conceptual design to optimize Santa Ana River groundwater recharge facilities and operations. He oversaw soil investigation including excavation of 15 trenches; collection of 72 surface soil samples; drilling, sampling, and



Firm: Stantec
Years of Experience: 31
Years with Firm: 11

Registrations/Certifications:

- Certified Hydrogeologist #971, State of California
- Professional Geologist #8367, State of California

Education:

- Ph.D., Hydrogeology,
 University of Karlsruhe,
 Germany
- MS, Hydrogeology, Nanjing University, Nanging, China
- BS, Hydrogeology & Engineering Geology, Nanjing University, Nanging, China

Memberships:

 Member, Association of Water Agencies of Ventura County lithologic logging of 7 borings to a maximum depth of 157 feet; construction of 6 monitoring wells and installation of automated monitoring equipment; laboratory analysis of 75 samples for grain size analysis, and 16 of these samples for analysis of hydraulic conductivity.

LADWP Water Resource Evaluation, Groundwater Flow Model Development and Update in Owens Valley and Owens Lake, CA (Technical Support)

From 2008 to 2018, Chaoying provided technical support to LADWP's Owens Valley Natural Resources Project (Contract No. 47026), Owens Lake Groundwater Evaluation Project, Eastern Sierra Water Resources, Management Assistance Specialized Hydrologic Study to Support the Owens Lake Master Project Environmental Impact Report – Owens Lake Model Update Implementation and Owens Lake Groundwater Development Program Assistance. The above included planning, coordinating, and implementing field tests; data collection and analysis; conceptual and numerical model development and update. A brief description highlighting some relevant projects include the following:

- Owens Lake Model Update Implementation. Under Agreement 47446E Task No. 30 between Stantec and LADWP, Stantec conducted the Owens Lake Model Update Implementation Project.
- Owens Lake Groundwater Development Program Assistance. Among 11 subtasks of Agreement 47381-2 Task Order 003 Owens Lake Groundwater Development Program Assistance Amendment No. 1, Chaoying is spearheading Task 3.10 Evaluate Conservation of Applied Water to Ponds, Task 3.11 Evaluate Managed Aquifer Recharge near Owens Lake and Task 3.4 Development of Operational Testing/ Monitoring Plan. The improved model was utilized to simulate long-term pumping alternatives.

- Owens Valley Groundwater Management Plan. Stantec has been assisting LADWP with its decisions regarding where to produce groundwater within the Owens Valley, and how to maintain infrastructure to manage both surface and groundwater. Stantec has developed a roadmap for the overall Owens Valley groundwater management strategy (Task Order No. 016–Owens Valley Groundwater Management Plan) under Agreement No. 47381-6 between LADWP and Stantec.
- Owens Lake Groundwater Evaluation Project. Under Agreement 47830 between MWH (now part of Stantec) and LADWP, Stantec conducted the Owens Lake Groundwater Evaluation Project (OLGEP).
- Feasibility Evaluation of the Storage of Excess Los Angeles Aqueduct Water South of Owens Valley. Chaoying provided technical support to develop the basic information necessary to proceed with implementation of water storage facilities along the LAA between the Owens Valley and the northern border of the City of Los Angeles.
- Bishop/Laws Model Update Implementation. Stantec assisted LADWP with development of a Bishop/Laws wellfield groundwater flow model in 2003.

Hydrogeologic Services for Updating the Santa Rosa Basin Groundwater Management Plan & Evaluation of Maximum Perennial Yield, Camrosa Water District, CA

Chaoying provided hydrogeologic services to characterize the Santa Rosa Groundwater Basin hydrogeology, to develop a water budget and an estimate of perennial yield, to analyze water quality characteristics and trend, to develop a groundwater model, to evaluate artificial recharge using recharge ponds and direct injection and to develop a groundwater monitoring program. He conducted hydrogeologic analysis of the basin and in the process of estimating perennial safe yield.

Well Site Feasibility Study and Focused Study of Well Site Locations in the West Coast Basin, Long Beach Water Department, CA

Chaoying tabulated and assessed basic construction data and pumping information for existing wells with the objective of evaluating trends in the capacity of existing wells; characterizing the subsurface hydrogeology in the Central Groundwater Basin and analyzing available groundwater data to help identify key aquifer parameters in this study area and locate hydrogeologically favorable well sites. He evaluated 50 deep, nested monitoring wells and 38 municipal water supply wells in the West Coast Basin.

Mehdi Ghasemizade Ph.D.

Groundwater Modeling

Dr. Mehdi Ghasemizade is a water resources engineer in Stantec's Pasadena office and an affiliated researcher with the University of California, Davis. He specializes in mathematical modeling and simulation of water resources, with an emphasis on integrated models. Dr. Ghasemizade has extensive experience with the use of models for scenario analyses and optimum management of water resources. He has published in scientific and peer reviewed journals on topics such as groundwater banking, water budget analyses due to uncertain futures, uncertainty analyses of highly parameterized models, global sensitivity analysis, among many. His focus is on the application of numerical models such as MODFLOW, MT3D, IWFM, HGS. Dr. Ghasemizade is also proficient in programming with R, MATLAB, and Visual Basic.

Water Quality Databases for GSAs, North American, Tracy, Big Valley, San Luis Obispo, and Santa Ynez, CA (Technical Lead)

Dr. Ghasemizade created and maintained databases to host and update water quality constituents and provide the ability to graph the trends to compare with the thresholds.

Groundwater Model for GSAs of East Kaweah, Mid Kaweah, and Greater Kaweah (Advisor)

Dr. Ghasemizade contributed to developing a unique groundwater model for all three GSAs. The purpose of the model was to analyze the water budget for each zone (GSA) and to use the tool for scenario analysis due to an uncertain future.

Groundwater Mapping for GSAs of North American, Tracy, Big Valley, CA (Technical Lead)

Comparing three interpolation methods for the visualization of the counter lines of groundwater head and solutes.

Aquifer Storage and Recovery (ASR) Feasibility Study, City of Davis, CA (Data Manager)

This is an ongoing feasibility study to be completed in early 2020. This study includes evaluation of ASR via water quality analyses, hydrogeochemical simulations, and groundwater modeling. If shown to be feasible, this study will then develop and rank alternative locations for ASR within the City of Davis and exploratory drilling and monitoring well construction will be completed at the top 2 or 3 locations.

Managed Aquifer Recharge in Tulare River Basin, University of California at Davis, Tulare County, CA (Project Manager)

Dr. Ghasemizade investigated the possibility of aquifer recharge via spreading flood water on agricultural lands during wet years. The project included evaluation of three different spatial patterns of agricultural lands, each chosen based on different thresholds of surface recharge suitability. The project investigated the stream-aquifer interaction and the change in the streamflow due to groundwater recharge in the Tulare basin.

Stochastic Simulation of Radioactive Contaminants, Canadian National Lab: Chalk River Laboratories, Ontario, Canada (Technical Lead)

Automatic calibration, stochastic simulations and uncertainty analysis of a highly parameterized groundwater flow and transport model developed to determine cleanup concentration targets for radionuclides in the soil and groundwater. This work was performed with MODFLOW and MT3D using the Groundwater Vistas platform.

ACADEMIC BACKGROUND

Postdoctoral Research, University of California, Davis

Postdoctoral researcher focusing on the use of integrated models for the purpose of groundwater banking at a regional scale with an emphasis on streamaquifer interactions. Responsible for supervising masters and Ph.D. students and writing reports and research papers.

Firm: Stantec
Years of Experience: 6
Years with Firm: <1

- Ph.D., Hydrogeology, ETH Zurich Aquatic Centre (EA WAG), Zurich, Switzerland
- M.Sc., Water Resource Engineering, Tarbiat Modares University, Tehran, Iran
- B.Sc., Environmental Engineering, Isfahan University of Technology, Isfahan, Iran

Research Assistant, The Swiss Federal Institute of Aquatic Science and Technology, Switzerland

Research assistant responsible for field campaigns involving tracer injections, geophysical measurements, and slug test analyses. Responsible for simulations including recharge estimation, modeling surface and subsurface flow interactions, linear and non-linear (stochastic) uncertainty analyses, and global sensitivity analysis. Also, responsible for publishing research results, giving presentations to the public and the department, and attending conferences and workshops.

PRESENTATIONS

"Necessity and feasibility of managed aquifer recharge via recharging the agricultural lands, Tulare basin, California", 2019, invited talk by the Water Boards, CalEPA, Sacramento.

"An integrated approach toward groundwater banking in the southern Central Valley, California", Ghasemizade, M., Dogrul, E. C., Asante, K., Petersen, C., Haretr, T. 16th Biennial Symposium on Managed Aquifer Recharge, San Diego, (2018)

"Integrated surface-subsurface models for managed aquifer recharge", Ghasemizade, M. Dahlke, H., and Harter, T. Annual California Water and Environmental Modeling Forum, Lake Natoma Inn, Folsom, California, (2017)

"Catchment scale modeling of surface-subsurface interaction in a pre-alpine watershed", 3rd International HydroGeo-Sphere User Conference, Neuchatel, Switzerland, (2013)

PUBLICATIONS

"An integrated approach toward sustainability via groundwater banking in the southern Central Valley, California", Ghasemizade, M., Asante, K., Petersen, C., Kocis, T., Dahlke, H., Haretr, T., Water Resources Research, 2019.

"Combined Analysis of Time-Varying Sensitivity and Identifiability Indices to Diagnose the Response of a Complex Environmental Model," Ghasemizade, M., Baroni, G., Abbaspour, K., Schirmer, M. Journal of Environmental Modeling & Software 88, 22-34 (2017) 88: 22. https://doi.org/10.1016/j.envsoft.2016.10.011

"Model complexity and diagnostic-tool based analyses of integrated and physically based models", PhD thesis, (2016)

"The Effect of Model Complexity in Simulating Unsaturated Zone Flow Processes on Recharge Estimation at Varying Time Scales," Ghasemizade, M., Moeck, C., Schirmer, M. Journal of Hydrology (2015) 529: 1173. https://doi.org/10.1016/j.jhydrol.2015.09.027

Christian Hunter Ph.D., PE

Senior Water Resource Engineer

Dr. Christian Hunter is a water resource engineer with 10 years of experience specializing in resource planning, sustainability evaluation, environmental remediation, and impact analysis. Dr. Hunter has experience working in sustainability evaluation, water reuse and recycling planning, and environmental risk assessment. His published research has included aspects of sustainable water use under resource scarcity, the water footprint and its impact on environmental economic decision-making, desalination and the water/energy nexus, and multicriteria decision making for environmental resources. Dr. Hunter is also fluent in Spanish.



Water Resource Sustainability and Planning, COROADO Project, Copiapó Chile

Conducted a field study and built a hydrogeologic MODFLOW-WEAP model to quantify current levels of water resource scarcity in a desert basin with conflicting urban, mining, and agricultural demands. Performed stakeholder outreach to identify possible improvements in efficiency and the potential for implementation of water reuse and recycling technologies. Projected future environmental risk under varying downscaled future climate models and an economic-based demand growth model to evaluate the benefits of water reuse optimization.

Sustainable Groundwater Management Act, Groundwater Sustainability Plan co-author, Santa Monica Subbasin, CA

Drafted the Basin Setting chapter for the Santa Monica Subbasin's Groundwater Sustainability Plan in accordance with SGMA requirements. This chapter contains an in-depth description of the physical, political and demographic state of the subbasin, including sections on the underlying geology, groundwater dependent ecosystems, surface hydrology, land use, regional precipitation, water use efficiency rules and jurisdiction boundaries, amongst others.

Maximum Benefits Monitoring and Reporting, Upper Santa Ana River Watershed, Riverside/San Bernardino Counties, CA

Monitored surface water flow and water quality on a bi-weekly basis, and groundwater elevations and water quality on a semi-annual basis for the Upper Santa Ana Watershed's annual Maximum Benefits program under the Santa Ana RWQCB. Utilized this data to evaluate the current state of water levels and quality to determine the maximum amount of water that might be sustainably withdrawn from the watershed and underlying basin. These annual figures for the upper watershed were compiled in a triennial review of the entire San Ana Watershed to conduct similar calculations.

San Jacinto Enhanced Recovery Groundwater Banking Project, San Jacinto, CA

Evaluated, designed and implemented a medium-scaled groundwater banking project in Riverside County. Planning included review of existing geologic documentation and previous studies, the implementation of scaled percolation pond recharge testing, and geologic investigations using Cone Penetrometer Testing (CPT). Additionally, continuous coring soil logging was performed to identify any potential aguitards that might increase liquefaction potential at this side adjacent to a residential neighborhood. Designed and permitted a series of recovery and monitoring wells around the perimeter of the full-scaled project.

Firm: Stantec
Years of Experience: 10
Years with Firm: 1

Registrations/Certifications:

- Professional Engineer,
 #92652, California
- Qualified SWPPP Practitioner, #25984, California
- Certified Erosion, Sediment and Storm Water Inspector, #4702, California

- Ph.D., Hydraulic
 Engineering, Universidad
 Católica de Chile
- Ph.D., Civil and Environmental Engineering, University of Notre Dame
- MA, Education, Wheaton College, Illinois
- BS, Physics, Wheaton College, Illinois

Kelly Shugart PG

Associate Hydrogeologist/Stakeholder Engagement

As an associate hydrogeologist with six years of experience, Kelly has worked on a variety of groundwater projects, including indirect potable reuse studies, groundwater modeling, stormwater monitoring, groundwater basin analysis, documentation of hydrogeologic conditions, well condition assessment, and lithologic log interpretation. She also writes and edits reports, performs data collection, groundwater elevation contour mapping, and fieldwork.

SGMA Compliance, Bedford Coldwater Groundwater Sustainability Authority (BCGSA), Lake Elsinore, CA (SGMA Compliance and Facilitator)

The BCGSA is comprised of the City of Corona, Elsinore Valley Municipal Water District, and Temescal Vallev Water District. Stantec was awarded the position of administrator to the BCGSA. and to assist with compliance with SGMA and development of a GSP. Kelly stays current with the DWR regulations and any updates to SGMA. Kelly follows DWR and SGMA requirements and regulations governing the use of grant money, preparing quarterly grant progress reports, facilitating Groundwater Sustainability Plan development, and public outreach. Kelly provides support for day-to-day activities including scheduling, keeping meeting records, budgeting, invoicing, website development and maintenance. and SharePoint organization.

Groundwater Monitoring Program, Santa Susana Field Laboratory (SSFL), Boeing, Simi Valley, CA (Geological Support)

Kelly assists in the quarterly fieldwork oversight and reporting for the Groundwater Monitoring Program for SSFL. Field oversight involves managing sampling technicians, planning sampling/gauging daily activities, and working with the chemist and other team members to ensure each well is sampled for the correct constituents and sent to the appropriate lab for analysis. Kelly also assists in completion and review of the quarterly and annual reports analyzing the sampling and/or gauging results.

Arsenic Evaluation, Elsinore Valley Municipal Water District (EVMWD), Lake Elsinore, CA

Kelly assisted in the preparation of a technical memorandum discussing arsenic concentrations in groundwater production wells around Lake Elsinore. Kelly analyzed arsenic concentration data provided by EVMWD and assisted in identifying trends in arsenic concentrations and provided conclusions on potential connections to aquifer storage and recovery injections.

Owens Lake Groundwater Development Program, LADWP, Owens Valley, CA (Geological Support)

LADWP is currently implementing the Owens Lake Dust Mitigation Program (OLDMP) on Owens Lake in order to reduce emissions of particulate matter. Kelly completed the lithologic logging for two 1,500-ft test wells on the lake bed to evaluate the potential for using groundwater in deep aquifers under the lake for dust mitigation instead of potable water.

Groundwater Modeling for IPR Feasibility Study, Elsinore Valley Municipal Water District (EVMWD), Lake Elsinore, CA (Geological Support)

Kelly assisted in refining an existing groundwater flow model (MODFLOW) of the Elsinore Basin. The purpose of the study was to evaluate the suitability of sites throughout the Basin for subsurface injection. Kelly developed the current conceptual model to reflect updated data and wells to better represent groundwater conditions in the Basin. The next step will be to calibrate the numerical model using GMS to further refine aguifer parameters. The goal of the model results was to represent groundwater hydraulic response, travel times between recharge sites/injection wells and production wells, and make estimates of potential impacts on groundwater quality. In addition to groundwater modeling, Kelly also assisted in evaluating potential surface recharge sites in Elsinore Basin and surrounding basins using ArcGIS, soil maps, and other historical data.

Firm: Stantec
Years of Experience: 6
Years with Firm: 6

Registrations/Certifications:

- Professional Geologist #15016, State of Texas
- HAZWOPER Training, 40-Hour Hazardous Waste Operations and Emergency Response, HAZWOPER
- Refresher Training, 8-Hour, HAZWOPER
- Certified as per 29 CFR 1910.146 & 1926.1207, Confined Space Entry (CSE), CSE, California
- UPRR, e-RAILSAFE,
 California
- American Red Cross, CPR-First Aid-AED Certified, California
- Supervisor Training, 8-Hour, HAZWOPER, California

Education:

- MS, Geological Sciences (Environmental Hydrogeology), California State University Los Angeles
- BA, English, University of Texas at Austin

Stantec

Mike Bartosek

Visualization and Analysis

Mike has more than 23 years of professional experience in the environmental consulting industry and has a strong technical background in geographic information systems, environmental visualization software, environmental modeling, geology and hydrogeology. His expertise includes groundwater modeling, GIS, geologic modeling, field mapping, data compilation and analysis and hydrogeologic characterization.

Los Angeles County Department of Public Works, Los Angeles County, CA (Assistant Engineering Geologist)

Michael performed drilling oversight of barrier injection wells (flooded reverse circulation) and geophysical borehole logging.

Newmark-Muscoy EPA Superfund San Bernardino, CA (Geologic Consultant)

Michael operated Environmental Visualization System Software (EVS): 3D modeling and visualizations of lithology, groundwater level data, groundwater contaminants, soil contaminants, and CPT data for several sites in southern California. Analysis was completed with both EVS-Pro and EVS for Arcview. Hydrogeologic Investigation: Related to site. He held a technical support role in the design, construction and reporting of a basin-wide groundwater model. ArcGIS was used to compile all data, analyze data for spatial and time trends, process data for import into groundwater modeling software, and present publication quality figures for final report. MapWindowGIS and KT3D was used for particle tracking analysis and water level elevation calculations of pumping wells. Aerial image included review, land use estimates, and siting surveys. Wellhead Protection Plans included modeling with Groundwater Vistas and MODFLOW 2000/96 Aguifer Tests and Slug tests at various locations, data analysis using AQTESOLV. Retail petroleum site work included well drilling oversight, well abandonment oversight, well permitting, pumping test, and pumping test analysis.

Newmark-Muscoy EPA Superfund, San Bernardino, CA (Senior Project Geologist)

Michael performed aquifer pumping tests and analysis (step-drawdown and constant rate) using manual levels and transducer data. Data analysis was performed

with AOTESOLV. Michael conducted hydrogeologic Investigation: Related to an EPA Superfund Site in San Bernardino, California. His technical support role included the design, construction, and reporting of a basin-wide groundwater model. ArcGIS was used to compile all data, analyze data for spatial and time trends, process data for import into groundwater modeling software, and present publication quality figures for final report. Aerial image review included land use estimates and siting surveys. Retail petroleum site work included well drilling oversight, well abandonment oversight, well permitting, pumping test, and pumping test analysis.

Various Projects (Staff Geologist)

Michael generated well specifications and drilling bids. He performed geological and hydrological fieldwork, testhole drilling oversight (Flooded Reverse Circulation, Bucket Auger, Air Rotary) and sample collection, sieve analysis and lithologic log interpretation, and well construction and development oversight. He also tested pumping oversight and data interpretation, performed geophysical log interpretation, well design, and groundwater resource assessment (Darcy's Law and water budget calculations). Michael interpreted water quality data with respect to MCLs, client needs, and groundwater sources. He also served as contact with clients, agencies, contractors, and vendors. In addition, Michael led temperature probe surveys, geospatial, GIS and visualization applications (ArcView, Global Mapper, ENVI, Surfer).

He is familiar with state and federal well and water quality standards and permitting, solving logistical problems, aerial photo interpretation, and video log interpretation. Firm: Stantec
Years of Experience: 23
Years with Firm: 17

Education:

- BS, Geological Sciences, Edinboro University

Awards:

- 1997 The W.A. TARR
 Award: Meritorious Work
 in the Earth Sciences,
 Edinboro University, Sigma
 Gamma Epsilon
- 1997 Outstanding Graduate Student, The University of Akron
- 1996 Field Camp Geologist Award, Lehigh University
- 1996 Ramsay's Memorial Scholarship, Edinboro University
- 1996 Vic Johnson Summer Field Camp Scholarship, Lehigh University

Angelika Douglas

Visualization and Analysis

Angelika has more than 18 years of professional experience in the environmental consulting field. She is experienced in the management of field data, with experience in database management, and electronic reporting. Angelika has been actively involved with data management efforts throughout the country, with particular emphasis in California with the GeoTracker electronic reporting requirements.

Environmental Assessment and Remediation, GeoTracker Compliance, Various, CA, (Data Management)

Angelika conducts the daily operations of a program for Stantec's compliance with California Senate Bill AB 2886 (GeoTracker), which requires electronic submittal of data to the State of California. She performs compliance management, data management, and data quality control; and coordinates with laboratories, project managers, and the State of California to help ensure that electronic data is delivered to the state in a timely and accurate manner for hundreds of sites in California.

Major Oil Companies, Environmental Assessment and Remediation, CA (Data Management)

Angelika conducts data management and reporting for hundreds of sites. Her responsibilities have included laboratory data (hard copy and electronic) quality control checks, and maintaining the database efforts for report table generation.

Environmental Assessment and Remediation, Data Management, Various, United States (Data Management)

Angelika has completed the organization and implementation of standardization of historical data for several of sites (many of which were in litigation), so that efficiencies of standardized database management can be realized. This process has included the review of historic data tables, reports, laboratory reports, and field notes to help ensure that data is accurately and effectively summarized. She also has then helped efforts to manage ongoing data.

Denver Federal Center Monitoring and Remediation Project, Denver, CO (Data Management)

Angelika conducts data management and data reporting for Stantec's ongoing efforts related to the operation of a groundwater pump and treat facility for a chlorinated solvent site. She is performing laboratory data quality control checks, and generating deliverables in a client-specified format, including analytical data tables for import into a client GIS-based system.

Environmental Assessment and Remediation | Various, United States (Data Management)

Angelika conducts data research by reviewing historical documents for various goals based on the sites' issues. Her responsibilities have included reviewing laboratory data hard copy for inclusion in databases previously set-up, and reading through decades worth of documents from Army Corp of Engineers regarding site for evidence of certain chemical used.

BP Program Management, Various Sites, Various States (Compliance and Accounting Coordinator)

Angelika has supported the National Account Managers and the Safety Program Managers since 2013. These efforts have included ensuring that the program complies with various client-specific reporting requirements. These have included various reports, including health and safety, budget, and site research.

Firm: Stantec
Years of Experience: 18
Years with Firm: 12

Education:

- BA, Psychology, Purdue University, West Lafayette, Indiana

Sarah Troedson MGIS, GISP

GIS and Mapping

Sarah is a Geographic Information Systems Professional (GISP) with a background in geology and more than 20 years of experience in Geographic Information Science and Technology (GIS&T). She is skilled in the application of GIS technology to a wide variety of practice areas including planning, water resources, emergency management and geology. Her project highlights include regional water management plans, suitability and constraints analysis, large data collection and management efforts, design and implementation of complex cartographic information products, statewide/regional scale spatial analysis, dam-break and flood inundation studies, and other applications of GIS to real-world problems. Sarah created and oversaw the production of the vast majority of maps and information products in the Statewide Flood Management Plan for the California Department of Water Resources (DWR), as well as assisting with the analysis driving those maps.

SGMA, San Diego Formation, City of San Diego, CA (GIS Support, QA/QC)

Created multiple maps of groundwater basins and SGMA components to assist the Project Hydrogeologist, including basin priority rankings by DWR. Performed QA/ QC on all project maps and datasets.

Recharge Siting Study and SGMA Support, South San Joaquin Municipal Utilities District (Assistant Project Manager and Lead GIS Analyst)

Assisted with development of the project approach, trained junior staff in GIS concepts and applications, provided QA/QC on project maps and spatial analysis, assisted with client and stakeholder meetings, reviewed project reports. This project analyzed site factors that determine the potential of areas of the district to be used for groundwater recharge projects. Assisted with development of land use data and groundwater monitoring databases for use in GSP development.

Lassen County and Modoc County Groundwater Sustainability Agency Filings, Lassen and Modoc Counties

Created multiple maps to assist with visualizing groundwater basin for the filing materials for both Counties to file as the GSA for each County's portion of the Big Valley Groundwater Basin.

Santa Ynez Groundwater Sustainability Agency Formation Support. Santa Ynez River Water Conservation District (Lead GIS Analyst)

Worked with the assistant project manager to map the basin's three major areas. Assisted with visually and spatially identifying SGMA components within the basin. Performed QA/QC on all project maps and datasets.

Paso Robles Groundwater Basin, San Luis Obispo County, San Luis Obispo, CA (GIS Analyst)

Provided GIS Analysis and modeling of changes in groundwater levels, updates to previous analysis, as well as creating maps and figures to visualize the differences in groundwater levels over time in the basin. These were then used to assist decision makers in educating their stakeholders about the basin and assist with creating or modifying water management practices.

Paso Robles Groundwater Basin Management Plan, City of Paso Robles, San Luis Obispo County, CA (Lead GIS Analyst)

Sarah was responsible for all maps, figures and GIS data sets to support the Basin Management Plan. This included maps illustrating the difference in groundwater levels between seasons with pumping and recharge.

Eastern San Joaquin County Integrated Regional Water Management Plan Update, San Joaquin County Public Works, Stockton, CA (GIS Support)

Assisted in the production of multiple maps in support of the IRWMP update report. Processed and oversaw geospatial analysis related to water usage, crop distribution, population distribution, groundwater elevation changes, distribution and staging of water-related projects, and other spatial data relevant to the IRWMP update.

Firm: Stantec
Years of Experience: 23
Years with Firm: 3

Registrations:

 Certified Geographic Information Systems Professional (GISP) #58500

Education:

- MGIS, Geographic Information Science & Technology, Penn State
- BS, Geology, California State University, Sacramento

Memberships:

North American
 Cartographic Information
 Society

Lisa Beutler

SGMA Expert

Lisa specializes in helping organizations and communities make decisions and plan for the future. She serves as executive facilitator on numerous complex, high profile, collaborative projects. Her extensive experience in outreach and engagement, strategic planning, leadership development, change management, executive consulting, public policy development, and conflict resolution, spans a broad spectrum of clients and subjects. Recent projects have focused on topics as diverse as water supply and quality, flood management, land use, energy, recreation, financing planning, and technology (including collaboration related to Geographical Information Systems). Her professional background, covering more than 34 years, includes organizational development, law enforcement, resources planning, and experience in local and state government. In recent years she has specialized in strategic planning and directing a water management portfolio.

Sustainable Groundwater Management Act Projects, Sacramento, CA (Executive Facilitator and Project Manager)

Lisa serves as the executive facilitator and project manager for multiple statewide facilitation teams working on the Sustainable Groundwater Management Act (SGMA). In this role Lisa provides on-call Facilitation Services and serves as the project leader for initiatives in 24 groundwater basins/ subbasins. In some basins she provides direct services including: preparing initial assessments and communications plans, facilitating meetings, and serving as a strategic advisor. As the SGMA project team leader she monitors progress, provides for quality reviews, offers strategic advice, and provides coordination among the multiple SGMA facilitators and researchers. She also serves as the facilitation team point of contract, and with the Department of Water Resources and the State Water Resources Control Board. She recently served as the co-convener, with the University of California Davis, for the first ever SGMA Researchers Summit.

California State Water Plan (CWP) Updates 2005, 2009, 2013 and 2018, Statewide, CA (Executive Facilitator/ Program Manager)

The CWP is a collaborative strategic plan that allows elected officials, agencies, tribes, resource managers, businesses, academia, NGO's, water stakeholders, and the public to develop findings and recommendations, and make informed decisions for California's water future. Updated every five years, this plan considers the full range of water-

dependent natural resources and water supplies, as well as agricultural, urban, and environmental water demands for a range of plausible future scenarios. Lisa has been the executive facilitator and a program manager for the planning process since 2000. She has supported multiple 50+ member Public Advisory Committees, a 28-member State Agency Steering Committee, and multiple caucuses and workshops. She has additionally prepared the Update Process guides and served as principal editor/author for several resource management strategies.

Delta Protection Commission, Strategic Planning and Delta Leadership Program, Sacramento-San Joaquin Delta, CA (Executive Facilitator, Program Manager)

Lisa assisted the Commission in the crafting of their highly regarded Vision 2030 (Strategic) Plan. In this role she facilitated public meetings, met with the Commission and assisted with drafting text and briefing materials. A significant outcome of the planning process was the creation of the Delta Leadership Program, a 5-month training program, now in its 4th year, that introduces emerging regional leaders to Delta Topics and leadership topics. Lisa developed the course curriculum design and has served as the class facilitator, alongside the Commission Executive Director. As requested, she also assists the Commission in other activities, such as the update of the Land Use and Resource Management Plan.

Firm: Stantec
Years of Experience: 36
Years with Firm: 11

Registrations/Certifications:

 Quality Management Instructor, California State University in Facilitation and Management

Education:

- BS, Human Relations and Organizational Behavior, University of San Francisco

Memberships:

- 2019 President American Water Resources Association
- Director, American Society for Public Administration, Sacramento
- Member, Association for Conflict Resolution
- Sustaining Member,
 National Coalition for
 Dialogue and Deliberation

Mike Antos Ph.D., ENV SP

Outreach/Facilitation

Mike has 18 years supporting integrated watershed management and planning in southern California, including project and program management, facilitation of inter-agency collaboration, as well as community and stakeholder engagement. He holds a Ph.D. in Geography from UCLA where he remains an affiliate of the Institute of the Environment and Sustainability's Water Resources Group. He is also a Visiting Scholar at the University of California, Irvine department of Anthropology, and a fellow of the Robert & Patricia Switzer Foundation. Mike serves as co-chair of the American Water Resources Association Integrated Water Resources Management Technical Committee, and co-chair of the People and Water Research Theme for the California Department of Water Resources Flood-MAR (managed aquifer recharge) initiative. His work has spanned the watersheds of the Los Angeles, San Gabriel, and Santa Ana rivers, with a focus on facilitating collaborative planning and community engagement in pursuit of equitable watershed health and climate adaptation.

Disadvantaged Communities Involvement Program, Santa Ana Watershed Project Authority, Riverside, CA (Program Manager)

Leading the DWR Proposition-1 grant-funded program to help ensure the involvement of members of disadvantaged communities in water and watershed planning, development and implementation of project concepts, and the facilitation of education.

Assessing Ecosystem Values of Watersheds in Southern California, DWR, Los Angeles, CA (Project Manager/Lead Researcher)

Led staff, academic partners, and consultants at the Los Angeles and San Gabriel Rivers Watershed Council in a grant-funded research program to establish indicators of watershed health for use in assessing sustainability of watersheds in Southern California.

Integrated Climate Adaptation and Resilience Program, Governor's Office of Planning and Research, Sacramento, CA (Technical Advisory Council Member)

Selected for membership on the TAC in its inaugural year, supporting establishment of the ICARP program, established by the California Legislature. The TAC "facilitates the development of holistic, complementary strategies that increase California's resilience to climate change, advance equity and environmental justice, and benefit both greenhouse gas emissions reductions and adaptation efforts."

San Gabriel River Regional Monitoring Program, Sanitation Districts of Southern California, Whittier, CA (Project Manager)

Led staff and consultants at the Council for Watershed Health completing annual water quality monitoring to help ensure beneficial use attainment throughout the watershed of the San Gabriel River.

Los Angeles River Watershed Monitoring Program, City of Los Angeles Bureau of Sanitation, Los Angeles, CA (Programs Director

Supervised staff and consultants at the Council for Watershed Health completing a watershed-wide monitoring program focused on ensuring attainment of beneficial uses.

Stormwater Recharge Feasibility and Pilot Project Development Study, Water Replenishment District of Southern California, Los Angeles, CA (Project Manager/Researcher)

Lead staff and consultants analyzing service area of the Water Replenishment District of Southern California for high-priority locations for the District to support the installation of stormwater capture for groundwater recharge. Planning study resulted in the City of Los Angeles Project "Broadway Stormwater Greenway", developed and funded by the Bureau of Sanitation.

Firm: Stantec
Years of Experience: 18
Years with Firm: 2

Certifications/Training:

- Envision Sustainability
 Professional, Institute for
 Sustainable Infrastructure
- Riverine & Estuarine,
 California Rapid
 Assessment Method
 for Wetlands, Southern
 California Coastal
 Water Research Project,
 California, 2009

Education:

- Ph.D., Geography,
 University of California, Los
 Angeles
- MA, Geography, California
 State University, Northridge
- BA, Art History, Ithaca College

Awards:

- 2013 Fellow, Robert & Patricia Switzer Foundation

StephAnnie Roberts

Outreach/Facilitation

StephAnnie has 27 years of professional experience in environmental consulting. She has supported many clients and municipalities in public outreach, stakeholder meetings, and hearings across several business lines (water, oil and gas, power, recreation, mining). These activities have range from presentation, demonstrations, one on one discussions, explaining technical findings, for communities, concerned citizens, boards of directors, commission, and supervisors, and many agencies.

Environmental Groundwater Regulatory Compliance, CA (Project Manager)

StephAnnie managed environmental groundwater regulatory compliance issues for more than 100 retail gasoline stations, dry cleaner facilities, multiple refineries, tank farms, and terminals throughout southern California via micro purge, quickie bail, and vacuum enhanced purging techniques, as well as removal of liquid phase hydrocarbons. Her responsibilities included the coordination of subcontractors and management of multiple staff personnel in performing subsurface groundwater assessment investigations, management of environmental related fieldwork, and making certain that regulatory compliance issues were adhered to. Additional responsibilities included collection and analyses of samples for a variety of constituents including petroleum hydrocarbons, chlorinated solvents, and natural attenuation parameters, submitting technical reports within agency deadlines, and interfacing with regulatory and client personnel.

Tier 1 Release Assessment Investigation and Report, Santa Monica, CA (Environmental Specialist)

This project involved a Tier 1 release assessment investigation of a municipal drinking water well field impacted with MTBE. All work was completed under a Unilateral Administrative Order issued iointly by the Los Angeles RWOCB and USEPA. StephAnnie provided oversight of the installation of more than 242 soil borings and 14 groundwater monitoring wells totaling approximately 23,000 linear feet of drilling. The Project utilized innovative sampling techniques including SimulprobeTM and EncoreTM sampling devices to collect depth-discrete soil and groundwater samples. StephAnnie also participated in the generation of a detailed Tier 1 Release Assessment Report that

totaled 136 volumes. The report included interpretation of subsurface hydrogeology utilizing geophysical logs, lithologic logs, and detailed geologic cross-sections.

Well 21 Equipping and Pipeline Project, Orange County, CA, Yorba Linda Water District (Project Manager)

The project evaluated the potential impacts of completing a new potable water well and installing a one-mile long water conveyance pipeline to connect the well to existing water conveyance infrastructure. StephAnnie managed the Initial Study Mitigated Negative Declaration (ISMND) for the Yorba Linda Water District's CEQA compliance and provided client support during the Planning Commission hearing for certification of the ISMND.

Oilfield Shallow Groundwater Investigation Program, Kern County, CA, California Resource Corporation (Assistant Project Manager, Environmental Specialist)

StephAnnie provided project and field support during the implementation of an Underground Sources of Drinking Water Investigation in shallow geologic formations across the Elk Hills Oil Field. StephAnnie supported technical material preparation to support concurrence requests from the California State Water Resources Control Board that sections of land did not contain Underground Sources of Drinking Water and were therefore exempt from groundwater monitoring requirements. The exemption concurrences lead to well stimulation treatment insurance permits from the Division of Oil. Gas and Geothermal Resources after new regulatory requirements caused substantial industrywide delays in permit processing.

Firm: Stantec
Years of Experience: 27
Years with Firm: 23

Certifications:

- OSHA 8-Hour HAZWOPER Supervisor Course, Los Angeles, California, 2009
- OSHA Medical Surveillance (29 CFR 1910.120) Los Angeles, California, 2010

Brian Auchard EIT

Data Management

Brian has more than 26 years of professional experience in the environmental consulting field. He is experienced in the collection, management, and interpretation of field data, with particular experience in computer modeling, data visualization, database design and management, electronic reporting, and risk assessment. Brain has been actively involved with data management efforts throughout the country, with particular emphasis in California with the GeoTracker electronic reporting requirements.

Environmental Assessment and Remediation, GeoTracker Compliance, CA (Program Manager)

Brian manages a program for Stantec's compliance with California Senate Bill AB 2886 (GeoTracker), which requires electronic submittal of data to the State of California. He developed and implemented a web portal-based compliance management system; oversees compliance management, data management, and data quality control analyses performed by staff in multiple offices; and coordinates with laboratories, project managers, and the State of California to help ensure that electronic data is delivered to the state in a timely and accurate manner for hundreds of sites in California. Role: Program Manager | Dates involved: 2001-Present

Major Oil Companies, Environmental Data Management, Various Sites, CA (Lead Data Manager)

Brian oversees data management and reporting for hundreds of sites. He developed and implemented of a web portal-based database system, oversees groundwater sampling activities, coordinates with laboratories, oversees laboratory data (hard copy and electronic) quality control checks, oversees database population and queries, and coordinates the report table generation.

Computer Modeling and Visualizations, United States and Canada, (Data Manager)

Brian is part of a team that performs 2D and 3D site visualizations and modeling using geologic, hydrogeologic, and analytical data. He is responsible for data acquisition, analysis, and management to facilitate these efforts. He also develops tools for the team

and clients to use in order to perform ongoing analysis and reporting. The projects have ranged from small sites to areas spanning hundreds of miles.

Environmental Assessment, Data Management, United States (Data Manager)

Brian has overseen the organization and standardization of historical data for hundreds of sites (many of which were in litigation), so that efficiencies of standardized database management can be realized. This process has included the review of historic data tables, reports, laboratory reports, and field notes to help ensure that data is not only accurately and effectively summarized. He has then coordinated efforts to manage ongoing data. Brian has also overseen the development and on going utilization of tools for reporting, graphing, risk assessments, modeling, and additional analysis.

Denver Federal Center Monitoring and Remediation Project, Denver, CO (Data Manager)

Brian oversees the data management and data reporting program for Stantec's ongoing efforts related to the operation of a groundwater pump and treat facility for a chlorinated solvent site. He is performing laboratory data quality control checks, validating data, and importing laboratory and field data into a client GIS-based system. Brian is also generating a variety of deliverables in a client-specified format, including analytical data tables, activity summaries, and hydrograph.

Caltrans Database Management, CA (Lead Data Manager)

Brian creates databases for the State of California at sites where Stantec performs assessment activities. Responsibilities **Firm:** Stantec Years of Experience: 26 Years with Firm: 20

Registrations/Certifications:

- Engineer-in-Training,
 California
- 40-Hour OSHA Health and Safety Training (29 CFR 1910.120)
- 8-Hour OSHA Health and Safety Annual Update Certification

- MS, Engineering, Harvey Mudd College, Claremont, California
- BS, Engineering, Harvey Mudd College, Claremont, California
- BA, Government (Dual Major), Claremont
 McKenna College and Harvey Mudd College, Claremont, California

include generating databases with very quick turn-around-time, so that the client can review the data generated by Stantec in a custom GIS system.

Environmental Assessment and Remediation, CA (Project Engineer)

Brian performed a variety of field activities including regulatory investigation coordination, site management, sampling (water, soil, free product, and vapor), treatment system operations and maintenance, drilling oversight, and property assessments. He also coordinated field work planning, data assessment (including Phase I and II), and reporting activities. Chemicals of concern at these sites included petroleum compounds, VOCs, SVOCs, PCBs, metals, pesticides, herbicides, 1,4 dioxane, and perchlorate.

California Aqueduct Water Quality Modeling, CA (Project Manager)

For his Master's Degree thesis, Brian led a team of students in the development of a user friendly computer modeling program to predict water quality in the California Aqueduct, which accounted for the impact to water quality of the pump ins of groundwater from various points along the Aqueduct, as well as seasonal variations, various pumping scenarios, and changes in Aqueduct volume. He developed a modeling algorithm, created a database of California Aqueduct water quality information, and developed an extensive online help system and user's manual for the application.