SPECIAL NOTICE REGARDING
CORONAVIRUS DISEASE 2019 (COVID-19)
AND PARTICIPATION IN PUBLIC MEETINGS

On March 4, 2020, Governor Newsom declared a State of Emergency resulting from the threat of COVID-19. On September 16, 2021, Governor Newsom signed Assembly Bill No. 361 into law. Assembly Bill No. 361 amends Government Code section 54953(e) by adding provisions for remote teleconferencing participation in meetings by members of a legislative body, without the requirements of Government Code section 54953(b)(3), subject to the existence of certain conditions. The San Bernardino Valley Municipal Water District adopted a resolution determining, by majority vote, that, as a result of the declared State of Emergency, a meeting in person would present imminent risks to the health or safety of attendees. Accordingly, it has been determined that all Board and Workshop meetings of the San Bernardino Valley Municipal Water District will be held pursuant to the Brown Act and will be conducted via teleconference. There will be no public access to the meeting venue.

BOARD OF DIRECTORS WORKSHOP - ENGINEERING
TUESDAY, APRIL 12, 2022 – 2:00 P.M.

PUBLIC PARTICIPATION

Public participation is welcome and encouraged. You may participate in the April 12, 2022, meeting of the San Bernardino Valley Municipal Water District online and by telephone as follows:

Dial-in Info: (877) 853 5247 US Toll-free
Meeting ID: 753 841 573
PASSCODE: 3802020

https://sbvmwd.zoom.us/j/753841573

If you are unable to participate online or by telephone, you may also submit your comments and questions in writing for the District's consideration by sending them to comments@sbvmwd.com with the subject line "Public Comment Item #" (insert the agenda item number relevant to your comment) or "Public Comment Non-Agenda Item". Submit your written comments by 6:00 p.m. on Monday, April 11, 2022. All public comments will be provided to the Chair and may be read into the record or compiled as part of the record.

IMPORTANT PRIVACY NOTE: Participation in the meeting via the Zoom app is strongly encouraged. Online participants MUST log in with a Zoom account. The Zoom app is a free download.
Please keep in mind: (1) This is a public meeting; as such, the virtual meeting information is published on the World Wide Web and available to everyone. (2) Should you participate remotely via telephone, your telephone number will be your "identifier" during the meeting and available to all meeting participants; there is no way to protect your privacy if you elect to call in to the meeting.

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT
380 E. Vanderbilt Way, San Bernardino, CA 92408

BOARD OF DIRECTORS WORKSHOP - ENGINEERING

AGENDA

2:00 PM Tuesday, April 12, 2022

CALL TO ORDER
Chairperson: Director Harrison
Vice-Chair: Director Hayes

1) INTRODUCTIONS

2) PUBLIC COMMENT
Any person may address the Board on matters within its jurisdiction.

3) SUMMARY OF PREVIOUS MEETING

3.1 Board of Directors' Workshop - Engineering - March 08, 2022 (Page 3)
Summary Notes BOD Workshop - Engineering 030822

4) DISCUSSION ITEMS

4.1 Consider the selection of Geoscience, Inc. and cost share to prepare the Conjunctive Use Project Plan as part of the Three-Party Agreement between the San Gorgonio Pass Water Agency, Yucaipa Valley Water District, and Valley District (Page 10)
Staff Memo - Consider the selection of Geoscience, Inc. and cost share to prepare the Conjunctive Use Project Plan as part of the Three-Party Agreement between the San Gorgonio Pass Water Agency, Yucaipa Valley Water District, and Valley District
Geoscience Proposal

4.2 Consider Three -Year Fixed Pricing Contract Terms for EarthTec Product with Earth Science Laboratories (ESL) (Page 44)
Staff Memo - Consider Three -Year Fixed Pricing Contract Terms for EarthTec Product with Earth Science Laboratories (ESL)
Three-Year Purchase Agreement for EarthTec with ESL

5) FUTURE BUSINESS

6) ADJOURNMENT

PLEASE NOTE:
Materials related to an item on this Agenda submitted to the Board after distribution of the agenda packet are available for public inspection in the District's office located at 380 E. Vanderbilt Way, San Bernardino, during normal business hours. Also, such documents are available on the District's website at www.sbvmwd.com subject to staff's ability to post the documents before the meeting. The District recognizes its obligation to provide equal access to those individuals with disabilities. Please contact Melissa Zoba at (909) 387-9228 two working days prior to the meeting with any special requests for reasonable accommodation.

SAN BERNARDINO Valley MUNICIPAL WATER DISTRICT

DATE: April 12, 2022

TO: Board of Directors Workshop – Engineering

FROM: Staff

SUBJECT: Summary of March 8, 2022 Board of Directors Workshop – Engineering

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The Engineering Workshop convened on March 8, 2022, via Zoom video-teleconference. Director Harrison chaired the meeting.

Directors Present: President Kielhold, Vice President Hayes, Director Botello, Director Harrison, and Director Longville.

Staff Present:

Heather Dyer, MS, MBA – Chief Executive Officer / General Manager
Joanna Gibson, MS – Executive Director Upper SAR Habitat Conservation Program
Wen Huang, PE, MS – Deputy General Manager / Chief Engineer
Jose Macedo, ML, CPT-P (USA Retired) – Chief of Staff/Clerk of the Board
Cindy Saks, CPA – Deputy General Manager/Chief Financial Officer
Bob Tincher, PE, MS – Deputy General Manager / Chief Water Resources Officer
Melissa Zoba, MBA, MPA – Chief Information Officer

Dan Borrell – Manager of Geospatial Services
Kristeen Farlow, MPA – Strategic Communications Manager
Anthony Flordelis – Business Systems Analyst
Matthew E. Howard, MS – Water Resources Senior Planner
Chris Jones, MESM – Preserve System Program Manager
Karen Resendez, MA – Human Resources / Risk Manager
Olivia Ramirez – Intern
Laura Torres – Intern

Members of the Public Present:

Joyce McIntire, Yucaipa Valley Water District
Melody McDonald, San Bernardino Valley Water Conservation District
Eddy Harrity, Redistricting Insights
Fabian Valdez Jr, Redistricting Insights

James Morales, East Valley Water District
Ron Coats, East Valley Water District

Pursuant to the provisions of the Brown Act, this meeting will be conducted by teleconference only.

1. Introductions

The following attendees introduced themselves:

- James Morales, East Valley Water District
- Joyce McIntire, Yucaipa Valley Water District
- Ron Coats, East Valley Water District

2. Public Hearing. Review and Discussion of Draft Redistricting Maps

Chair Harrison announced the public hearing of the San Bernardino Valley Municipal Water District Board of Directors on redistricting of the District's division boundaries.

Chief Executive Officer / General Manager Heather Dyer confirmed the agenda for this meeting was posted in accordance with the Brown Act on March 3, 2022.

Chief Information Officer Melissa Zoba acknowledged Fabian Valdez and Eddy Harrity, consultants with Redistricting Insights. She pointed out that several map scenarios have been distributed over the past few weeks and feedback has been received including two hardcopy maps not received in time for consideration in today's presentation.

This is the third public hearing and the next is scheduled for April 5, Ms. Zoba continued. She advised the Board of public outreach activities and notices and explained some confusion with the labeling of the maps.

Ms. Zoba indicated the goal to select the two most favorable maps for final revisions to be submitted for the consultant to present at the April 5 Board meeting for adoption. The new division boundary maps must be filed with the Registrar of Voters on April 17, she cautioned.

Mr. Harrity recapped input received and revisions since the last meeting and explained the new map versions, including two completely new maps per Board request for new lines.

Chair Harrison opened the public hearing at 2:19 p.m. and invited public comment. As there was none, Mr. Harrison declared the public hearing closed at 2:20 p.m.

Directors discussed the map revisions with guidance from the consultants and eliminated draft map 4. To be re-examined at the workshop:

- Draft 1 revised (changes to be made)
- Draft 2 revised
- Draft 3 revised
- Draft 5

Use of the online tool is the best and quickest resource, Ms. Zoba advised. She pointed to the District's website for public viewing of maps and submission of comments. There are also plotted copies available at the office to anybody who is interested, she stated, and reiterated that so far, no comments, feedback or questions have been received from the public.

Chair Harrison thanked everyone for their participation.

3. Public Comment

There was none.

4. Summary of Previous Meeting

The summary notes from the February 8, 2022 Board of Directors Workshop – Engineering were accepted with no comments.

5.1 Discuss Consideration of Consulting Agreement to Conduct Riparian Bird Surveys

Executive Director, Upper Santa Ana River Habitat Conservation Program Joanna Gibson presented the consulting services agreement with the Santa Ana Watershed Association (SAWA) to conduct riparian surveys during the 2022 nesting season, an important component of the Habitat Conservation Plan (HCP).

The HCP includes multiple water infrastructure projects as well as habitat restoration projects, Ms. Gibson continued. There can be both positive and negative effects on riparian species affecting those dependent on water-loving vegetation along the riparian corridor in the Santa Ana River.

There are four covered bird species, she stated. The purpose of the survey is to gather baseline data on the location and number of birds, or their territories covered by the Upper

Santa Ana River HCP. This is important moving forward because it is necessary to have a robust and defensible baseline data set, she explained.

Multiple years of data is preferred by the regulatory agencies, Ms. Gibson noted. This will provide a better data set to rely on moving forward to look at positive trends, as well as potential negative trends, she said. She explained the study area of potential HCP effects and the areas for the District's tributary restoration projects and reviewed the content of the Request for Proposal (RFP):

1. Baseline monitoring of the riparian birds
2. Baseline monitoring to measure success of the restored tributaries and management of other conservation areas
3. Amended methodology working with wildlife agencies because of safety concerns along the river in an urban landscape
4. Trapping Cowbirds, a species that lay their eggs in other species' nests
5. Mapping of encampments along the Santa Ana River

Optional tasks that would be subject to demonstrated need and approval by the Board:

1. Expanding the baseline monitoring up into San Bernardino County
2. Southwestern Willow Flycatcher surveys and reporting, should this species be detected
3. Additional Cowbird trapping as needed

Ms. Gibson reported, of the three responsive bids received, the Santa Ana Watershed Association (SAWA) was the lowest at $265,873.16 total cost with the optional three items. They have been working in the watershed over the last 20 years and have a lot of experience with the species and with the regulatory agencies, which would provide a continuity of data collection, Ms. Gibson said. The District has retained them since 2019, she added. This would also allow integration of data regionally with the ability to look at trends across southern California.

The fiscal impact for this item is not to exceed $265,875, with the three optional items included, Ms. Gibson advised. The base fee is $218,000. This is an HCP project, so the partners would reimburse Valley District 60 percent of the cost, she explained. The District's 40 percent share totals $106,349.26. This year the base cost slightly increased, and most of that differential is due to safety concerns and the need to have two surveyors working together in the field, she explained.

In response to a question from President Kielhold, Preserve System Program Manager Chris Jones clarified the original was a two-year contract from 2019 to 2020, amended to add one more year in 2021.

Vice President Hayes asked if surveys in the Tres Lagos area were included; Ms. Gibson said the survey was not going that far up in the watershed. Chair Harrison asked about the exclusion of the Yellow-billed Cuckoo. Ms. Gibson replied that species has not been found in the watershed for a very long time, and the US Fish and Wildlife service has specific survey protocols that they require for specific species.

Director Harrison then asked what happens to the captured Cowbirds. Ms. Gibson answered that there are falconers in the area who use the birds for falconry.

Director Botello and Director Harrison thanked Ms. Gibson and commended the report.

Action Item(s): The Board voted to move forward this item to the full Board of Directors for consideration at a future meeting by the following roll-call vote:

There was no motion or second.	APPROVED: 5-0
AYES:	Botello, Harrison, Hayes, Kielhold, Longville
NOES:	None
ABSTAIN:	None
ABSENT:	None

5.2 Consider Exchange Framework Agreement with Metropolitan Water District of Southern California

Deputy General Manager Bob Tincher reminded the Board of previous discussion in December of last year: the general terms for an exchange agreement with Metropolitan Water District (MWD). Staff was asked to work with MWD staff and house counsel to develop a legal agreement for consideration.

Mr. Tincher stated this is a companion agreement to the Coordinated Operating Agreement with MWD which was approved in June of 2021. That agreement generally states the desire of both boards to cooperate with each other and establishes a pricing structure for selling MWD any available surplus imported water.

This agreement is more of a mutual aid agreement, Mr. Tincher continued, filling in the details covering exchanges between the two parties, and providing a general framework and terms,

but is not an exchange. Any exchanges under this framework would be brought back to the Board for consideration with the full details, Mr. Tincher assured.

The agreement caps the exchange ratio for exchanges that are completed within the same calendar year at one for one, he noted. Mr. Tincher further explained that if either of the parties needed to return water later than the current calendar year, it would be negotiated between the parties, but then the exchange ratio could go as high as two acre-feet (af) to one. All costs would be paid by the agency requesting the exchange, he stated.

This agreement would continue through December of 2031, allowing opportunity to revisit the terms after 10 years, Mr. Tincher stated.

Mr. Tincher described the District facilities intertwined with MWD and with the State Water Project (SWP) and responded to director questions. He noted the MWD staff appreciates Valley District's action to allow connection of MWD's inland feeder to the Foothill pipeline.

This agreement lays the groundwork for the possibility of future exchanges and would speed the mutual aid process, Mr. Tincher explained. He confirmed that legal counsel has approved the agreement.

Action Item(s): The Board agreed to move forward this item to the full Board of Directors for consideration at a future meeting by consensus.

5.3 Consider 2022 Exchange Agreement with Metropolitan Water District of Southern California

Related to the framework agreement in the previous agenda item, Mr. Bob Tincher acknowledged specific exchanges were to be brought back to the Board as separate agreements. This is the first for the Board's consideration. As MWD has requested this exchange they would pay all associated costs. It would provide some assistance to the western portion of their service area and gives the District an opportunity to test some of the mutual aid scenarios delivering water back and forth between facilities, Mr. Tincher explained.

This agreement has been in process for six months, Tincher continued. By exercising some of these options this year, he proposed, there is the opportunity to set a precedent and expedite future agreements.

MWD is requesting up to 3,000 af of the District's carryover water, Mr. Tincher explained. The amount of available carryover will not be known until the State Water Project (SWP) allocation has been set. Both amounts would be returned during this calendar year, so it only helps

MWD with a short-term supply issue, Mr. Tincher stated. The carryover water comes through the SWP around Devil Canyon. The actual exchange would take place at San Luis Reservoir.

Staff is also hoping to test the concept of pumping groundwater all the way back to Devil Canyon, which could benefit the District in a future emergency situation.

The District does not own wells in the basin near these facilities, so the District has an agreement with Redlands to utilize their unused well capacity up to 20,000 af, Mr. Tincher said. Deputy General Manager / Chief Engineer Wen Huang and his team have been doing a lot of work in the background, to set things up should the Board decide to work with MWD on this exchange, but all would be coordinated through Redlands, Mr. Tincher noted.

One of the options for getting water back from MWD is Diamond Valley Lake just south of Valley District service area, Mr. Tincher advised. In a catastrophic situation MWD could feed water back into the service area using these types of agreements.

CEO / General Manager Dyer commented on the connectivity, assistance between agencies and regional collaboration. Director Longville added some historical detail.

Action Item(s): The Board voted to move forward this item to the full Board of Directors for consideration at a future meeting by the following roll-call vote:

There was no motion or second.	APPROVED: 5-0
AYES:	Botello, Harrison, Hayes, Kielhold, Longville
NOES:	None
ABSTAIN:	None
ABSENT:	None

6. Future Business

There was none.

7. Adjournment.

The meeting was adjourned at 3:28 p.m.

Staff Recommendation

Receive and File

DATE: April 12, 2022

TO: Board of Directors' Workshop - Engineering

FROM: Heather Dyer, CEO/General Manager
Adekunle Ojo, Manager of Water Resources

SUBJECT: Consider the selection of Geoscience, Inc. and cost share to prepare the Conjunctive Use Project Plan as part of the Three-Party Agreement between the San Gorgonio Pass Water Agency, Yucaipa Valley Water District, and Valley District

Staff Recommendation

Staff recommends the award of the contract for the preparation of a San Bernardino Basin Conjunctive Use Project Plan to Geoscience, Inc. at a future regular Board of Directors meeting and an equal split of the $178,936 project cost by the three project partners for a Valley District cost share of $59,645.

Summary

Valley District is supporting the establishment of two separate 20,000-acre-foot storage accounts in the San Bernardino Basin, one for the Yucaipa Valley Water District (YVWD) and one for the San Gorgonio Pass Water Agency (Pass Agency), subject to the Terms and Conditions of the Conjunctive Use Guidelines of the Basin. The Conjunctive Use Project Plan (CUP Plan) will define the storage in details, perform groundwater modeling and project analysis, determine and mitigate impacts, and provide other pertinent information to assist the Basin Technical Advisory Committee (BTAC) and the Western-San Bernardino Watermaster to review and approve the proposal.

A Request for Proposal was issued on December 9, 2021 and two proposals were received by the deadline from Geoscience, Inc. of San Dimas, CA and Geosyntec Consultants, Inc. of Pasadena. Geoscience's proposal is approximately $18,000 lower in cost. Additionally, Geoscience has more experience and specific expertise in our basin to address key issues that may arise during the preparation of the CUP Plan than the other proposing firm. This item has been reviewed by the YVWD and Pass Agency General Managers and they will be taking the item to their respective Boards to approve their cost share. If approved by the Board at a future regular meeting, Valley

District will manage the contract on behalf of the parties and the project is expected to take 6-9 months to complete.

Background

Yucaipa Valley Water District is served imported water by both the San Gorgonio Pass Agency (Riverside County) and Valley District (San Bernardino County). Because of this geographic split, and the different water supply portfolios and rate structures of the two wholesale agencies, certain issues pertaining to reliability and equity emerged. As a result, in February 2019, a member of the YVWD Board approached both Valley District and the Pass Agency regarding these water supply reliability and financial equity concerns for the growing City of Calimesa and surrounding area in Riverside County served by YVWD. In response to this, the three agencies' Boards authorized their General Managers to participate in a facilitated process to evaluate alternatives and develop potential solutions to resolve the stated concerns. The overall goal of the collaborative process was to, first, fully understand the water supply issues in the Calimesa area and then determine how to best meet these needs. Based on the difficulties associated with jurisdictional boundary changes, facility-based and contractual alternatives to resolve the identified issues were preferred.

Tim Moore of Risk Sciences has provided the facilitation services for this process. Mr. Moore has been involved in resolving complex water issues within the Santa Ana River Watershed for over 25 years and has also provided facilitation services to Valley District in the past on Watermaster and other water supply issues. The Board participated in a Joint meeting with the YVWD and Pass Agency Boards in September 2019. In December 2019, Tim Moore presented a verbal status update of the facilitated process at a Board Workshop. The Principles of Agreement were presented at a Board of Directors Workshop – Resources on July 2, 2020. On October 20, 2020, the Valley District Board also approved the agreement to facilitate water deliveries by Valley District for the Pass Agency in the Calimesa area, thereby resolving some procedural issues.

The commitment to store additional imported water in the San Bernardino Basin establishes a strong foundation for long-term interagency collaboration to meet common goals while resolving longstanding issues related to reliability and equity of water supply in the east end of our service area. Some of the imported water under this arrangement will come from the State Water Project purchased by Yucaipa and the Pass Agency and some will be "Nickel Water" acquired pursuant to the Pass Agency's 2017 contract with the Antelope Valley-East Kern Water Agency (AVEK), which allows the annual delivery of up to 1,700 acre-feet of non-SWP water to the Pass Agency through December 31, 2036 with the option for an additional twenty (20) years extension.

Fiscal Impact

The recommended three-way cost split is consistent with the cost share on other regional collaboration efforts that Valley District leads. The Pass Agency and YVWD will each reimburse Valley District a third of the project cost. Valley District's cost share of $59,645 will be included in the Fiscal Year 2022-2023 General Fund Budget; funding is available in the current budget under Budget Line 6360 (Consultants) to pay for any contractual expenses that may occur in the remaining days of the current fiscal year.

Attachment

Geoscience Proposal

GEOSCIENCE

January 31, 2022

Proposal for

Preparation of a Conjunctive Use Project Project Plan and Related Groundwater Modeling

Johnson Yeh, PhD, PG, CHG
Principal Groundwater Modeler

main office
160 Via Verde, Suite 150, San Dimas, CA 91773

main | 909.451.6650

jyeh@geoscience-water.com

Project Understanding

Meet CUP Guidelines

San Gorgonio Pass Water Agency (Pass Agency) and the Yucaipa Valley Water District (Yucaipa), (collectively Project Proponents) are working with the San Bernardino Valley Municipal Water District (Valley District), a San Bernardino Basin Watermaster, to store up to 20,000 acre-feet each, or 40,000 acre-feet total, of imported water in the San Bernardino Basin as part of a Joint Water Supply Agreement for the Calimesa Area. To use the basin for conjunctive use, the Project Proponents require approval from the Western-San Bernardino Watermaster (Watermaster). The purpose of this project is to assist the Project Proponents to prepare and submit the Conjunctive Use Project (CUP) plan, per the CUP Guidelines developed by the Basin Technical Advisory Committee (BTAC), to the BTAC for consideration. The BTAC will then make its recommendation to the Watermaster. Per the CUP Guidelines, the CUP Plan will define the project, consider basin losses during high groundwater conditions, perform groundwater modeling and project analysis, determine and mitigate impacts and provide other pertinent information to assist the BTAC and the Watermaster to review and approve the proposal.

Project Approach

Proven approach

Geoscience has worked extensively in the San Bernardino Basin and Upper Santa Ana River Basin to develop advanced modeling tools, including the Integrated Santa Ana River (SAR) Model, to better understand the effects of artificial recharge projects on surface and groundwater systems. Geoscience has the experience and expertise in this basin to thoroughly and efficiently address all the key issues that may arise during preparation of the Conjunctive Use Plan.

Key issues to develop this Conjunctive Use Plan include verifying that State Water Project water is stored efficiently and avoids losses to rejected recharge, evapotranspiration, and underflow outflow and storing water does not adversely impact the movement of existing contaminate plumes. We will work closely with Pass Agency, Yucaipa, and Valley District to prepare a description of the means and schedule of recharge and recovery and develop the assumptions for the model predictive scenarios. The Upper Santa Ana River Integrated Model will be used to develop the CUP Plan. We will work with our sub-consultant partner, Kennedy Jenks Consultants (Kennedy Jenks), to estimate and provide anticipated costs associated with the project, including capital costs for possible new facilities, operational costs, energy costs, and administrative and other costs. The following sections discuss our proposed scope of work and deliverables.

Task 1: Define the Project

Subtask 1.1 Prepare A Description of the Means of Recharge and Recovery

We will work closely with the Project Proponents to prepare a project description of the means of recharge and recovery including any new required facilities. Geoscience has worked extensively in the San Bernardino Basin, and developed the previous Bunker Hill Conjunctive Use Plan and the Integrated SAR Model. We have carefully reviewed and complied existing geohydrologic data including the recharge capacity of existing spreading grounds, production capacity of the existing wells, and contaminant plumes (e.g., perchlorate and TCE) that may potentially impact recharge and extraction operations from the CUP. Our team will work closely with Pass Agency, Yucaipa and Valley District to prepare a thorough project plan based on our understanding of the existing geohydrologic conditions in the basin.

Subtask 1.2 Develop CUP Recharge and Extraction Schedules

To assess potential impacts on groundwater levels and water quality from the CUP, we will develop recharge and extraction schedules for project scenarios and compare them with the Baseline

Scenario (i.e., No Project Scenario). We will then use the Integrated SAR Model to evaluate CUP project scenarios. The proposed project scenarios, including recharge and extraction schedules, will be based on recharge water availability and future planned water demands. As part of developing the Integrated SAR Model, Geoscience has already developed future hydrologic assumptions based on an analysis of historical hydrologic conditions in the basin. We will evaluate both "No Project" and "Project" conditions under average hydrologic conditions (including wet and dry climatic cycles). We will work closely with the Project Proponents to develop recharge and extraction schedules.

Subtask 1.3 Estimate CUP Cost

1.3.1 Cost Estimates without New Extraction Wells

We will prepare the capital and O&M costs (including energy costs) for the facilities proposed under Task 1.1. We will review as-built drawings and the current status of the recharge and recovery facilities. The costs will assume that the 20,000 AF of recharge for Pass Agency and Yucaipa (40,000 AF total) in the San Bernardino Basin is achieved through existing recharge basins and the recovery is through exchange(s).

1.3.2 (Optional) Cost Estimates for New Extraction Wells

Should one or more of the Project Proponents require new extraction wells, Geoscience will prepare locations and drilling cost estimates, and Kennedy Jenks will prepare the equipping and conveyance cost estimates. Estimates will be an American Society of Professional Estimators (AACC) level 5 estimate based on conceptual design data.

Task 2: Determine and Mitigate Impacts (Groundwater Modeling and Project Analysis)

Subtask 2.1 Develop Assumptions for Baseline (No Project) and CUP Predictive Model Scenarios

Geoscience has already developed rigorous future scenario assumptions as part of previous development of the Integrated SAR Model. This will lower the cost and expedite scenario assumption development needed for this project. We will work closely with Project Proponents to develop the major assumptions for Baseline (No Project) predictive model scenarios including the hydrologic base period, groundwater pumping, surface water diversion, and groundwater replenishment.

CUP predictive model scenarios will be identical to the Baseline scenario, but with the additional CUP recharge and pumping developed for Subtask 1.2, as well as any mitigation measures, if necessary. The modeling analysis will include evaporation loss occurring in the spreading grounds, and a one-time, leave-behind for the benefit of the San Bernardino Basin (equal to 5% of the water stored) for agencies mostly, or completely, outside of Valley District's service area. In developing the budget for this work, we have assumed that four model scenarios will be required, including one Baseline scenario (No Project) and three CUP scenarios.

Subtask 2.2 Run and Analyze Predictive Model Scenarios

We will prepare model input data, run model scenarios, and analyze model results. Various modeling computer codes will be used for this study including MODFLOW-NWT, MODPATH and MT3D-USGS.

The MODFLOW Groundwater Flow Model of the Upper Santa Ana River Integrated Model will be used to evaluate evaporation loss, changes in groundwater levels, underflow outflow to the Rialto-Colton Basin from the San Bernardino Basin, groundwater storage for various project scenarios, and potential liquefaction.

MODPATH is a particle-tracking software that will develop flow path lines and travel times in the vicinity of artificial recharge areas and contaminant plumes in the San Bernadino Basin using the results of groundwater flow model simulations.

The MT3D-USGS groundwater solute transport model of the Upper Santa Ana River Integrated Model will be required to simulate groundwater quality (e.g., TCE (Norton and Redlands-Crafton plumes) and perchlorate) in the San Bernardino Basin.

By running the MODFLOW, MODPATH, and MT3D- USGS components of the Upper Santa Ana River Integrated Model, we will determine the optimal location and amounts of recharge and recovery to confirm that the CUP will operate efficiently.

Task 3: Prepare the Conjunctive Use Project Plan

Subtask 3.1 Prepare a Draft Conjunctive Use Project Plan

We will prepare a draft Conjunctive Use Project Plan summarizing the work results from Tasks 1 and 2, as discussed above, for Project Proponent review. This draft CUP Plan will include information required per CUP Guidelines including project definition, potential groundwater impacts, and mitigation measures. We will also include model descriptions, assumptions, and results in the report.

Subtask 3.2 Prepare a Final Conjunctive Use Project Plan

A Final Conjunctive Use Project Plan will be prepared incorporating comments on the draft Conjunctive Use Project Plan.

Deliverables for Task 3:

- Draft Conjunctive Use Project Plan
- Final Conjunctive Use Project Plan

Task 4: Meetings and Project Management

Subtask 4.1 Prepare for and Attend Meetings

We will prepare for and attend four meetings including:

- Kickoff meeting to discuss the project goals and objectives, scope of work, work product, and schedule.
- Status update meetings (assumes four meetings) to discuss project locations, recharge and extraction schedule, major assumptions for predictive model scenarios, and modeling results
- BTAC meetings (assumes two meetings) to provide overview modeling assumptions, modeling results, and Conjunctive Use Project Plan.

Subtask 4.2 Project Management

We will coordinate project activities throughout the project. Project management includes any additional hours and costs to cover tasks related to any unforeseen issues or requests that arise during the Project.

Organizational Chart

Experienced Staff

Johnson Yeh, PhD, PG, CHG
Principal Modeler
jyeh@geoscience-water.com

David Barnes, MEng
Senior Modeler
dbarnes@geoscience-water.com

Chris Coppinger, PG, CHG
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Leo Liu, MS, EIT
Senior Associate Modeler
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Si Si, MS, EIT
Senior Associate Modeler
ssi@geoscience-water.com

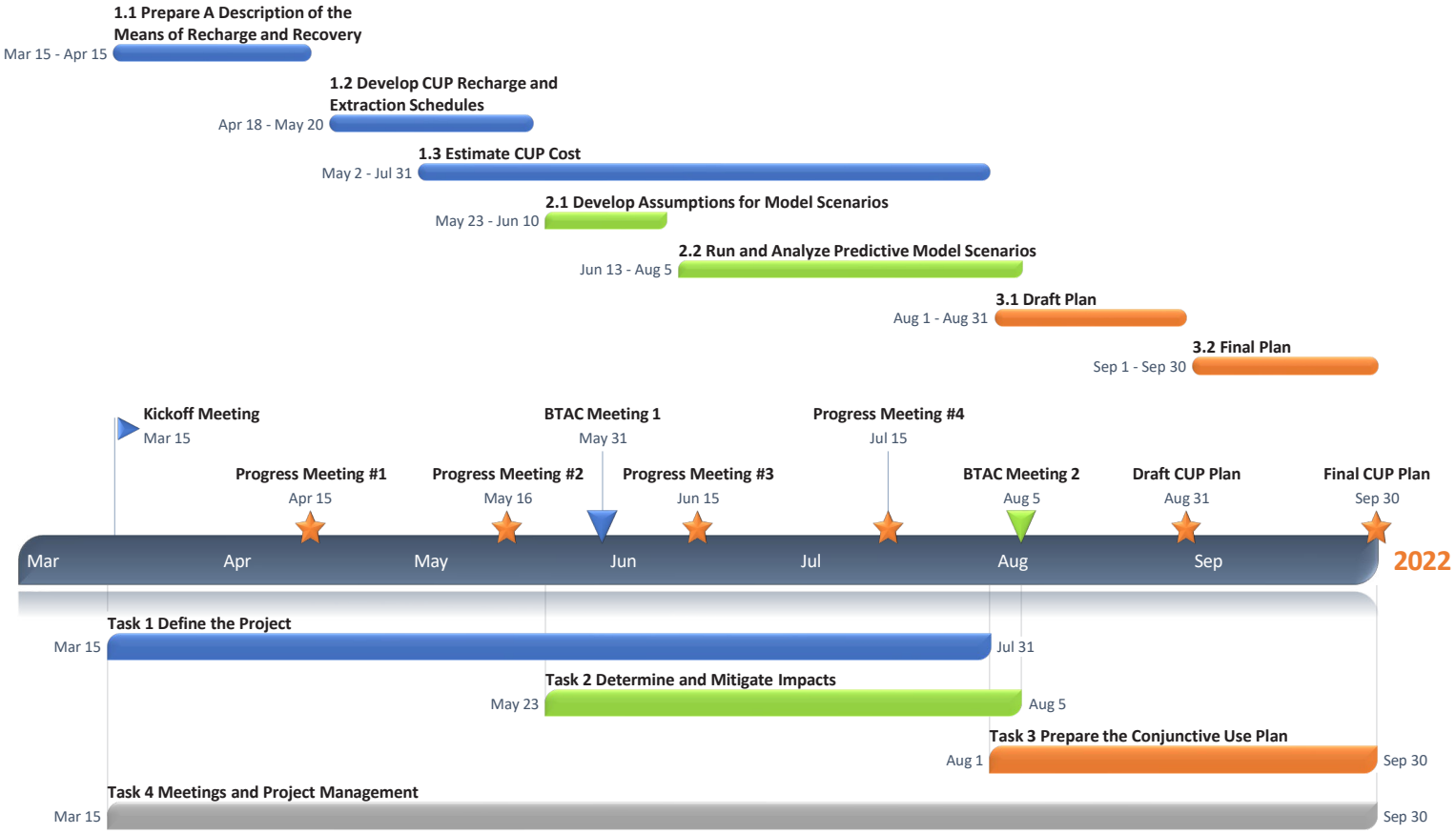
Kennedy Jenks

Harold Galser, PE - *Technical Advisor*
David Ferguson, PhD, PE - *Recharge & Recovery*
Paul Chau, PE, CEM - *Groundwater Recovery*
Connor Rutten, PE - *Hydraulic Modeling*
Janet Hoffman, PE, CEM - *Cost Estimator*

Team contact information is provided in Appendix A

Project Schedule

Expedite Plan Completion



Other Relevant Information

Proven Team and Performance

Project Challenge	Approach to Meet Challenge	Benefit	Past Performance
Comply with cooperative agreement	• Same team that worked on the Bunker Hill Conjunctive Use Project • Use existing and most up to date groundwater models	• Expedite plan development • Provide accurate and thorough data to inform decisions • Comply wiht CUP Guidelines	• Develop efficient recharge and extraction schedules without water quality impacts for the Bunker Hill CUP • Developed and possess groundwater models used to develop plan in-house

GEOSCIENCE

Fee Schedule

Task Description		Principal Modeler	Senior Modoler	Senior Geohydro.	Project Modeler	Senior Associate Modeler	Associate Modeler	GSI/CAD Specialist	Clerical	GEOSCIENCE Labor	GEOSCIENCE Reimbursable Expenses	GEOSCIENCE Sub-Total	Sub-Consultant KJ: Eng-Sci-9	Eng-Sci-6	Eng-Sci-3	Project Admin.	Admin. Assist.	KJ Labor	KJ Reimbursable Expenses	KJ Sub-Total	Totals: GEOSCIENCE	Sub-Consultant KJ	Sub-Consultant Markup	Total Cost
	Hourly Rate:	$289	$264	$235	$244	$210	$196	$155	$107				$310	$245	$190	$130	$110						10%	
	Task 1 - Define the Project																							
1.1	Prepare A Description of the Means of Recharge and Recovery	2	8			20				$ 6,890.00		$ 6,890.00						$ -		$ -	$ 6,890.00	$ -	$ -	$ 6,890
1.2	Develop CUP Recharge and Extraction Schedules	2	8			20				$ 6,890.00		$ 6,890.00						$ -		$ -	$ 6,890.00	$ -	$ -	$ 6,890
1.3	Estimate CUP Cost																							
1.3.1	Cost Estimates without New Extraction Wells									$ -		$ -	8	26	14		2	$ 11,730.00		$ 11,730.00		$ 11,730.00	$ 1,173.00	$ 12,903
1.3.2 (Optional)	Cost Estimates for New Extraction Wells			52						$ 12,220.00		$ 12,220.00	12	36	16	2	2	$ 16,060.00		$ 16,060.00	$ 12,220.00	$ 16,060.00	$ 1,606.00	$ 29,886
	Subtotal wiouth Optional Tasks (Task 1.1, 1.2 and 1.3.1):	**4**	**16**	**0**	**0**	**40**	**0**	**0**	**0**	**$ 13,780**	**$ -**	**$ 13,780**	**8**	**26**	**14**	**0**	**2**	**$ 11,730**	**$ -**	**$ 11,730**	**$ 13,780**	**$ 11,730**	**$ 1,173**	**$ 26,683**
	Subtotal with Optional Tasks (Task 1.1, 1.2, 1.3.1 and 1.3.2):	**4**	**16**	**52**	**0**	**40**	**0**	**0**	**0**	**$ 26,000**	**$ -**	**$ 26,000**	**$ 20**	**$ 62**	**$ 30**	**$ 2**	**$ 4**	**$ 27,790**	**$ -**	**$ 27,790**	**$ 26,000**	**$ 27,790**	**$ 2,779**	**$ 56,569**
	Task 2 - Determine and Mitigate Impacts (Groundwater Modeling and Project Analysis)																							
2.1	Develop Assumptions for Baseline (No Project) and CUP Predictive Model Scenarios (Assuming 3 Project Scenarios)	4	24			40	16			$ 19,028.00		$ 19,028.00						$ -		$ -	$ 19,028.00	$ -	$ -	$ 19,028
2.2	Run and Analyze Predictive Model Scenarios (Assuming 3 Project Scenarios)	8	64			64	80			$ 48,328.00		$ 48,328.00						$ -		$ -	$ 48,328.00	$ -	$ -	$ 48,328
	Subtotal:	**12**	**88**	**0**	**0**	**104**	**96**	**0**	**0**	**$ 67,356**	**$ -**	**$ 67,356**	**0**	**0**	**0**	**0**	**0**	**$ -**	**$ -**	**$ -**	**$ 67,356**	**$ -**	**$ -**	**$ 67,356**
	Task 3 - Prepare the Conjunctive Use Project Plan																							
3.1	Prepare a Draft Conjunctive Use Plan	4	24			24		24		$ 16,252.00		$ 16,252.00						$ -		$ -	$ 16,252.00	$ -	$ -	$ 16,252
3.2	Prepare a Final Conjunctive Use Plan	2	8			12		8		$ 6,450.00		$ 6,450.00						$ -		$ -	$ 6,450.00	$ -	$ -	$ 6,450
	Subtotal:	**6**	**32**	**0**	**0**	**36**	**0**	**32**	**0**	**$ 22,702**	**$ -**	**$ 22,702**	**0**	**0**	**0**	**0**	**0**	**$ -**	**$ -**	**$ -**	**$ 22,702**	**$ -**	**$ -**	**$ 22,702**
	Task 4 - Meetings and Project Management																							
4.1	Prepare for and Attend Meetings (Assuming 1 Kickoff meeting, 4 project team meetings, and 2 BTAC meetings)	8	40			8				$ 14,552.00		$ 14,552.00	12	4		2		$ 4,960.00	$ 252.00	$ 5,212.00	$ 14,552.00	$ 5,212.00	$ 521.20	$ 20,285
4.2	Project Management	8	24			12			8	$ 12,024.00		$ 12,024.00						$ -		$ -	$ 12,024.00	$ -	$ -	$ 12,024
	Subtotal:	**16**	**64**	**0**	**0**	**20**	**0**	**0**	**8**	**$ 26,576**	**$ -**	**$ 26,576**	**12**	**4**	**0**	**2**	**0**	**$ 4,960**	**$ 252**	**$ 5,212**	**$ 26,576**	**$ 5,212**	**$ 521**	**$ 32,309**
	TOTAL HOURS AND COST without Optional Task 1.3.2:	**38**	**200**	**0**	**0**	**200**	**96**	**32**	**8**	**$ 130,414**	**$ -**	**$ 130,414**	**20**	**30**	**14**	**2**	**2**	**$ 16,690**	**$ 252**	**$ 16,942**	**$ 130,414**	**$ 16,942**	**$ 1,694**	**$ 149,050**
	TOTAL HOURS AND COST with Optional Task 1.3.2:	**38**	**200**	**52**	**0**	**200**	**96**	**32**	**8**	**$ 142,634**	**$ -**	**$ 142,634**	**32**	**66**	**30**	**4**	**4**	**$ 32,750**	**$ 252**	**$ 33,002**	**$ 142,634**	**$ 33,002**	**$ 3,300**	**$ 178,936**

Notes:

1 Reimbursable Expenses Include Subconsultant Fees, Mileage, and report reproduction costs.
GEOSCIENCE is aware of the requirements of California Labor Code Sections 1720 et seq. and 1770 et seq., which require the payment of prevailing wage rates and the performance of other requirements on certain “public works” and “maintenance” projects. The work GEOSCIENCE performs does not fall under prevailing wage rate categories.

2 Geoscience's Schedule and Consultants Fee included with this bid are valid for a period of 6 months assuming the starting date shown in the baseline Schedule.

3 Geoscience will manage work hours between employee classifications or utilize other employee classifications provided that the total project fee is not exceeded without prior approval of the Owner. Geoscience will first request approval from the Owner before work hours are managed between Tasks as listed in the Consultants Fee Schedule.

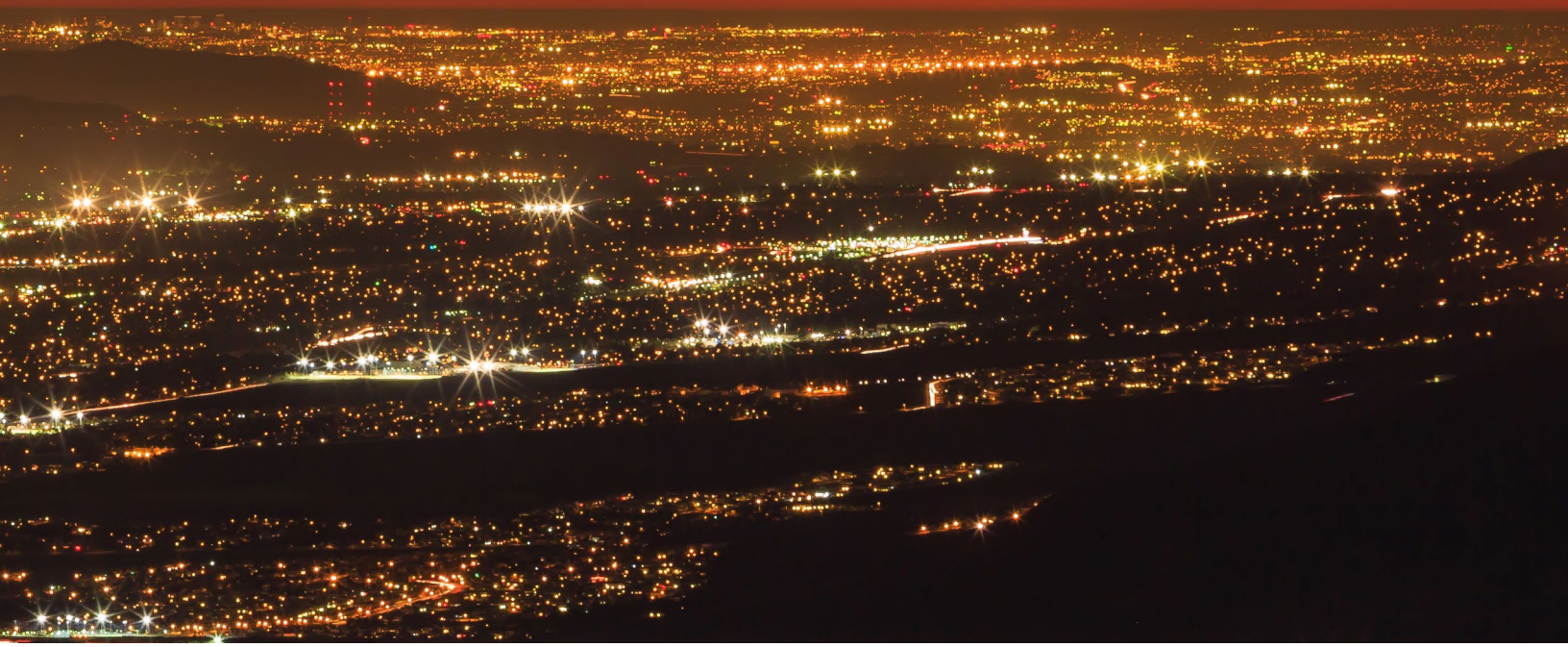
4 Services not Specifically Identified in the Scope of Work are not included in this Agreement for Professional Services.

5 One (1) round of comments and resulting deliverable revision is budgeted for the Draft Conjunctive Use Project Plan (Task 4.1). Reasonable efforts within this budget will be made to address responsive comments. If comments or suggested revisions require additional effort outside of the proposed scope of work, then the revisions will only be performed upon consultation with the Owner and through a contract modification. The Final/100% Document Review will not incorporate any new comments.

6 Budget for Task 2.0 is an allowance only and represents a credible scope and budget based on the known information and Consultant’s experience with similar projects. Effort for these tasks is limited to the budget identified in the Consultant Fee Estimate.
Additional effort required for model scenario runs that is a result of change in initial scenario assumptions, or other unforeseen conditions and/or model assumption changes, will only be provided as authorized by the Client through a contract modification.

7 Consultant will use existing, owner-furnished model(s) as-is. Consultant assumes that the existing model has clear documentation of pertinent files required for running the model and that model files will be provided in an editable electronic format.

8 Groundwater model input files and model output files that were used to generate the deliverables provided in this scope of services will be made available to the client in .txt file format if requested. Specialized spreadsheets, software, or other electronic tools used to expedite the processing of model input and output files are the intellectual property of Geoscience Support Services Inc. and will not be provided.



Appendix A

Resumes

Resumes are provided on the following pages for all staff assigned to the project including:

Geoscience

- Johnson Yeh
- David Barnes
- Chris Coppinger
- Leo Liu
- Si Si

Kennedy Jenks

- Harold Glaser
- David Ferguson
- Paul Chau
- Connor Rutten
- Janet Hoffman

All team members can be reached at:

Geoscience Support Services, Inc.
160 Via Verde, Suite 150
San Dimas, CA 91773
p. (909) 451-6650 | f. (909) 451-6638

Kennedy Jenks
300 N. Lake Avenue, Suite 1020
Pasadena, CA 91101
p. (626) 568-4302

Johnson Yeh, PhD, PG, CHG
Principal Modeler

Years of Experience: 30
Years with Geoscience: 30

Education:
BS, Geology, National Taiwan University
MS, Geology National Taiwan University
PhD, Sedimentology, University of Southern California

Professional Registrations:
California Professional Geologist (No. 6371)
Certified California Hydrogeologist (No. 422)

Key qualifications...

- Specializes in groundwater modeling
- Assists USGS in testing GSFLOW model code
- Experience supporting 30+ groundwater-related litigation cases

San Bernardino Valley Municipal Water District: Santa Ana River Integrated Model
Johnson is leading our team in an effort to use existing groundwater and surface water models to develop an integrated groundwater model using MODFLOW for the upper Santa Ana River. The resulting Upper SAR Integrated Model (or Integrated SAR Model), will be used to determine what factors may contribute to declines SAR flows, and assess cumulative effects on SAR surface flows and groundwater levels.

San Bernardino Valley Municipal Water District: Initial Report of Recharge Parties - Bunker Hill-A, Bunker Hill-B, Lytle, Colton, Rialto, and Yucaipa Management Zones
In 2008, the Regional Water Quality Control Board adopted a resolution that required that participating agencies in the Upper Santa Ana River Watershed to produce reports detailing a 20-year water quality projection that accounts for planned recharge. Johnson led our team to complete the initial report for Bunker Hill A & B, Lytle Creek, Colton, Rialto, and Yucaipa Management zones. Our team calculated the average TDS and nitrate-nitrogen concentrations for each of the management zones and predicted underflow to downgradient management zones.

San Bernardino Valley Municipal Water District: Second Report of Recharge Parties - Bunker Hill-A, Bunker Hill-B, Lytle, Colton, and Rialto Management Zones
Johnson led efforts to complete the second 20-year water quality projection report required by the cooperative agreement established by the 2008 RWQC resolution. Johnson led efforts to calculate the average TDS and nitrate-nitrogen concentrations for each of the management zones and predicted underflow to downgradient management zones.

San Bernardino Valley Municipal Water District: Second Report of Recharge Parties - Yucaipa and San Timoteo Management Zones
Johnson led efforts to complete the second 20-year water quality projection report required by the cooperative agreement established by the 2008 RWQC resolution. Johnson led efforts to calculate the average TDS and nitrate-nitrogen concentrations for each of the management zones and predicted underflow to downgradient management zones.

Western Municipal Water District, San Bernardino Valley Municipal Water District, City of Riverside, and City of San Bernardino, Development of a TDS and Nitrate Lumped-Parameter Model for the Riverside and Arlington Groundwater Basins

Johnson led efforts to develop the Riverside-Arlington Lumped-Parameter Salt Balance Model (RALPSBM) for the parties involved in the Cooperative Agreement managing the Riverside and Arlington Groundwater Basins including Western Municipal Water District, City of Riverside, San Bernardino Valley Municipal Water District and the City of San Bernardino. The purpose of the TDS and nitrate lumped-parameter model is to meet the monitoring and reporting requirements of the cooperative agreement and to assess compliance with the Salinity Objectives projected for a 20-year predictive period.

Western Municipal Water District: Riverside-Arlington Basin Groundwater Sustainability Plan (GSP)

Johnson is overseeing modeling efforts to develop a GSP for the Riverside-Arlington Basin. The Basin is classified by DWR as a medium priority basin and is one of the district's primary sources of local water supply. Johnson is working in conjunction with our team and the district to complete all models necessary to complete a compliant GSP.

Yucaipa Valley Water District: Recycled Water Use Evaluation using the Gateway Sub-basin Focused Groundwater Model

Johnson was the senior modeler overseeing the construction of a groundwater model used to predict the impacts of recycled water spreading on groundwater quality and to downstream municipal wells.

Western Municipal Water District: Impact of Recharge on Contaminant Plumes and Modeling

Johnson was the project manager and lead ground water modeler to assess and model the area around the Riverside-Corona Feeder, to show the potential future impact of an initial operation scenario on the ground water levels and ground water quality in the San Bernardino Basin Area.

Jurupa Community Services District: Chino Basin Artificial Recharge Evaluation

Johnson led modeling efforts to modify a previously established groundwater flow model of the Chino Basin to incorporate solute transport and assess the impact of artificial recharge operations planned by the Chino Basin Watermaster on Nitrate and TDS concentrations in the southern Chino Basin.

Santa Ana Watershed Project Authority: Chino Desalter System Projects

Johnson developed a detailed analysis of the Chino Ground Water Basin that included a three-dimensional numerical ground water flow model (MODFLOW). A separate analysis was also conducted to assess potential water quality changes in project and existing wells as a result of the project.

San Bernardino Valley Municipal Water District: Remediation Strategies for Ground Water Contamination

Johnson was the project manager and lead ground water modeler to refine previous USGS models to better understand, analyze, and evaluate remediation alternatives related to ground water contamination problems.

California American Water, Monterey Peninsula Water Supply Project (MPWSP)

Johnson led efforts to update a three-dimensional variable density flow and solute transport model for the North Marina Area in 2008 and constructed a focused groundwater model near the CEMEX gravel plant in Marina, CA. Johnson helped revise and update the Salinas Valley Integrated Surface Water and Ground Water Model (SVIGSM) which are currently being used to evaluate local and regional impacts on groundwater levels and quality from MPSWP operations.

David Barnes, M.Eng.
Senior Modeler

Years of Experience: 11
Years with Geoscience: 3

Education:

BS, Hydrology and Water Resources
University of Arizona

M.Eng., Civil and Environmental Engineering, Massachusetts Institute of Technology

Key qualifications...

- Experience with groundwater studies and well design and construction—help identify and address potential issues in the field

David has more than eight years of experience performing groundwater modeling and studies for several municipal clients and public agencies. He has expertise in developing groundwater and hydrogeologic models, data processing and GIS to support modeling efforts. Additionally, David is experienced in well design and construction processes with wide-ranging experience in field hydrology, aquifer testing, and characterization methods.

Selected Project Experience

San Bernardino Valley Municipal Water District: Santa Ana River Integrated Model
David helped develop a regional groundwater model to support a Habitat Conservation Plan in the Upper Santa Ana River Basin. He assessed the impacts of water management decisions on shallow groundwater, streamflow and riparian areas. David also presented key results and coordinated with stakeholders and members of the project's technical advisory committee.

Western Municipal Water District: Arlington Basin Groundwater Sustainability Plan
David constructed a groundwater model, analyzed historic and current water budgets, and assessed the basin's sustainable yield. He then prepared report on findings to include in the basin's Groundwater Sustainability Plan.

South Coast Water District (GHD): Geophysical Survey and Subsurface Intake Design at Doheny Beach
David updated a groundwater model using results from a geophysical survey and mapping of the coastal aquifer. He then assessed the feasibility and performance of various subsurface intakes designs including simulating subsurface intake influent water quality in various configurations using a solute transport model.

Jurupa Community Services District: Geohydrologic Analysis of Future Groundwater Production
David assessed future proposed pumping operations for a municipal wellfield. To complete the assessment, he developed a local groundwater flow model for Chino Basin using the larger regional Integrated Santa Ana River Model. David also developed a solute transport model to assess water quality including Total Dissolved Solids and nitrate in the wellfield.

San Bernardino Valley Municipal Water District: Big Bear Overflow Modeling and Assessment
David oversaw the development of a watershed model for the Seven Oaks Watershed to assess the affect of the Replenish Big Bear project on recharge activities in the lower watershed. David also prepared reports and presented key findings.

San Bernardino Valley Municipal Water District: Evaluate Recharge Capacity of Wildwood Creek Basins
David developed a groundwater model to assess the operations of a stormwater recharge basin

project. He also prepared reports and gave a presentation to stakeholders on the facility's performance and operation.

Kingdom of Saudi Arabia: Detailed Study of the Western Coastal Plain*

David developed basin-scale hydrologic models for thirty nine basins in Saudi Arabia. Gathered meteorologic data, delineated basins, constructed a database, performed statistical analysis of basin meteorology/hydrology. Utilized remotely-sensed rainfall data from NASA's Tropical Rainfall
Measurement Mission. Developed customized programs (shell, Fortran) to integrate HEC-HMS hydrologic models with MODFLOW groundwater models. Developed HECRAS hydraulic models. Developed regional groundwater models. Prepared hydrologic, hydraulic and groundwater models and prepared reports.

Big Cypress Seminole Indian Reservation: Review of S-190 Control Structure Operations*

David analyzed historical operating data from a control structure on the L-28 Interceptor Canal on the Big Cypress Seminole Reservation. Investigated the impact of lower operating stages on adjacent groundwater levels. Prepared a technical report and presented the findings to stakeholders. Reviewed proposed changes to operating rules in advance of significant storms (pre-storm draw down criteria).

Big Cypress Seminole Indian Reservation: Surface Water/ Groundwater Interaction Study*

David analyzed hydrologic data from monitoring wells, piezometers, weirs and control structures. Developed a site water budget and assessed interaction of surface water and groundwater. Prepared report summarizing site hydrology.

Lee County: Groundwater Flow Modeling to Support Land Use Permitting*

David developed MODFLOW models for a number of proposed mines in Lee County to assess the influence of shallow excavation in the surficial aquifer on the water budget and on groundwater levels in the area. Developed utility programs to edit model files and process results binaries. Prepared modeling reports.

Seminole Tribe Environmental Resource Management Department: Groundwater Model Review*

David provided expert review of groundwater modeling submitted to ERMD. Prepared a detailed report documenting the model, and issues identified in the review. Presented the findings of the report to the Tribe and stakeholders.

City of Hialeah: RO Deep Injection Well and Production Well Construction*

David supervised the simultaneous drilling of two 3500 ft. deep Class I injection wells and a dual-zone monitor well. Provided construction oversight during drilling of eight Floridan Aquifer production wells for raw water supply. Sampled cuttings, described lithology, performed core sampling and description, packer testing, injection testing, report writing, and ensured compliance with the FDEP permit conditions. Analyzed packer and injection test data for characterization of aquifer properties.

City of Cape Coral: Injection Well Construction*

David supervised the drilling of an additional deep Class I injection well at the City of Cape Coral Southwest Water Treatment Plant. Provided construction oversight during drilling. Sampled cuttings, described lithology, performed core sampling and description, packer testing, injection testing, report writing, and ensured compliance with the FDEP permit conditions.

Brighton Seminole Reservation: Biscayne Well Design and Construction*

David oversaw design and construction of two Upper Floridan Aquifer production wells. Supervised drilling operations, well construction and pump testing. Sampled cuttings and described lithology. Prepared well completion report.

*** Project completed prior to employment by Geoscience**

Chris Coppinger, PG, CHG
Senior Geohydrologist

Years of Experience: 16
Years with Geoscience: 15

Education:

BS, Geology, College of William & Mary

Professional Registrations:

California Professional Geologist (No. 9093)

Certified California Hydrogeologist (No. 1040)

Key qualifications...

- 16 years of well design and inspection experience—increase project efficiency
- Experience with supply, injection, water banking, and monitoring wells—identify and resolve issues
- Experience on multiple-well projects—help manage schedule and budget and identify project efficiencies

Chris has 16 years of professional experience in ground water and well investigations for numerous municipal and private clients. His expertise includes groundwater basin evaluations, well siting investigations, and artificial recharge and conjunctive use studies. He also manages a number of well drilling and rehabilitation activities including coordinating with project stakeholders. Chris' experience with artificial recharge and monitoring well studies can help OCWD install monitoring wells in coastal aquifers.

Selected Project Experience

Alamitos Barrier Improvement Project – Los Angeles / Orange Counties, CA, Orange County Water District

This project will construct 17 new injection wells, four (4) nested monitoring wells, and two (2) piezometers. The injection wells will serve to increase the capacity and effectiveness of the existing seawater barrier system. Chris maintained effective control of project scope, schedule, and budget while providing construction management services.

City of Oceanside, Oceanside Seawater Desalination Feasibility

Chris provided technical support on a four phased project that evaluated an ocean desalination well. Phase I work included siting and installing nested monitoring well and a test well to evaluate alluvial thickness, potential aquifer yield, and ground water quality. Phase II included a one-year pilot-scale pumping and RO treatment test. Phase III included installing monitoring wells using sonic drilling techniques and long-term monitoring of background conditions for regulatory compliance. Phase IV included installing a larger scale test well and a short-term pumping test.

City of Riverside: Well Rehabilitation and Groundwater Monitoring Program

Chris managed efforts to compile and review historical well data for 60 potable water supply wells owned and operated by the city. The project developed a well ranking system to prioritize well rehabilitation and repair. To complete the assessment, Chris reviewed video surveys, driller's logs, construction information, historical pumping, performance, ground water elevations, and past rehabilitation/ redevelopment measures. Chris helped develop a priority ranking matrix for well rehabilitations/ replacement that included the well's estimated

remaining useful life , and estimated rehabilitation costs over five, ten and twenty years. At the conclusion of the review Chris developed presentations and attended project workshops to present and discuss findings to key project personnel.

California Water Service Company: Groundwater Supply Study

Chris developed a strategy to maximize groundwater production to fully utilize pumping allotment across two adjudicated basins. He compiled and reviewed historical pumping and water level data in district wells, and located data from other nearby wells. Chris then developed rehabilitation schedules, long term average flow rates, and provided areas to target for future well siting.

Confidential Client: Deep Completion Monitoring Well Network

Chris worked closely with Orange County Water District and California Division of Oil Gas and Geothermal Resources to site, drill, and install deep (up to 1,400 ft) monitoring wells. The wells are currently monitored monthly to determine if water-flood injection stimulated oil production is affecting groundwater gradient and quality in the upper aquifers.

City of Banning: Rehabilitation of Well NP-1

Chris reviewed and evaluated video survey, production and pumping performance, hydrographs, water quality data, and side wall scraping results for Well NP 1. He helped prepare technical rehabilitation specifications that included well casing and screen cleaning by brushing, dispersing agent application, airlifting and swabbing, pumping and surging, aquifer pump tests, flowmeter survey, post-development video survey, and final well disinfection.

City of Tustin: Rehabilitation of 17th Street Well No. 4

Chris performed field inspection during pre- and post-redevelopment video surveys, mechanical redevelopment steps, and well performance tests. Rehabilitation efforts included initial cleaning of well casing and screen by brushing, airlifting and swabbing, pumping and surging, step drawdown and constant rate pumping tests, and chemical treatment. He also helped develop methodology for locating sand producing zones and provided field inspection during patching.

Southern California Edison: Rehabilitation of Quarry Seawater Source Wells and Cottonwood Area Wells, Santa Catalina Island

Chris reviewed data necessary to develop detailed technical specifications for well rehabilitation, including review of downhole video surveys to determine the physical condition and types of encrustation visible on the intake areas (i.e., screen interval) for each well. He provided contractor bid support for the well rehabilitation work, which included answering contractor requests for information, and providing support for interaction between client and contractor. Chris also performed field inspection services during the rehabilitation process, which included cleaning of well casing and screen by brushing, application of biocide and dispersing agents, airlifting and swabbing, pumping and surging, aquifer pump tests, post-development video survey, and final well disinfection. At the conclusion of the project, Chris helped prepare draft and final summary reports.

Big Bear Area Regional Wastewater Agency: Bear Valley Ground Water Replenishment Study

Chris helped collect water quality samples for sulfur hexafluoride (SF6) analysis used for seepage velocity calculations in the spreading basin test site.

City of Riverside: 2015 Well Rehabilitation

Upon completion of the Well Rehabilitation and Groundwater Monitoring Program, the city selected 4 wells for rehabilitation. Chris led efforts to, repair, rehabilitate, and return to service, a well drilled in 1927. He also provided recommendations to modify existing technical specifications to allow needed repairs, and oversaw field inspection during repair. All wells were successfully rehabilitated with two achieving major increases in efficiency.

Leo Liu, MS, EIT

Senior Associate Modeler

Years of Experience: 7
Years with Geoscience: 6

Education:

BS, Environmental Engineering, Tianjin Institute of Urban Construction, China

MS, Environmental Engineering, University of Southern California

Professional Registrations:

Engineer-in-Training

Key qualifications...

- Experience supporting groundwater models, sustainable yield studies, and calculating water budgets—help provide more accurate and thorough models and studies

Leo has more than five years of experience with ground water and environmental investigations performed for numerous municipalities, state agencies, and private clients throughout California. He routinely performs ground water flow and solute transport modeling, hydrogeologic investigations, ground water basin and water quality studies, watershed modeling and management, artificial recharge projects, and has experience in GIS applications, database development and management, and well design.

Selected Project Experience

San Bernardino Valley Municipal Water District: Santa Ana River Integrated Model

Leo is supporting efforts to use existing groundwater and surface water models to develop an integrated watershed model for the upper Santa Ana River. The resulting Upper SAR Integrated Model (or Integrated SAR Model), will be used to determine what factors may contribute to declines SAR flows, and assess cumulative effects on SAR surface flows and groundwater levels.

Western Municipal Water District, San Bernardino Valley Municipal Water District, City of Riverside, and City of San Bernardino, Development of a TDS and Nitrate Lumped-Parameter Model for the Riverside and Arlington Groundwater Basins

Leo updated Groundwater Flow Model input packages to incorporate recharge and discharge components (i.e., flux terms) measured during the period from January 1965 through December 2007. He developed a lumped-parameter model for the period from 1965 to 2007 and calibrated through varying the anthropogenic return flow mass loading and initial TDS and nitrate concentration. Leo then developed and ran predictive model runs for the period of 2015 through 2034 under four different scenarios.

San Bernardino Valley Municipal Water District: Yucaipa Groundwater Basin Annual Storage Change Calculation

Leo measured ground water level and collected pumping, spreading data, and climatological data annually. He also digitized water level data from 2005 to 2013 for the Yucaipa area using GIS software. Leo then used groundwater elevation contours from each year to calculate groundwater storage capacity.

City of San Bernardino: US EPA Model

Leo prepared the SBBA HSPF watershed model input data including land use, channel type and evapotranspiration data and run model.

San Bernardino Valley Municipal Water District: Rialto Colton Model

Leo collected and digitized water data from 1945, and 2011 using GIS software. He calculated the

water budget including underflow from Lytle Basin, underflow from Bunker Hill Basin, artificial recharge of imported water, ungaged runoff and subsurface inflow from the San Gabriel Mountains and Badlands, stream bed percolation from the Santa Ana River and Warm Creek, groundwater pumping, and evapotranspiration.

Los Angeles County: Raymond Basin Ground Water Flow Model

Leo performed a regression analysis on Arroyo Seco spreading based on annual and monthly flow data from City of Pasadena, Devils' Gate Dam, and precipitation.

Castaic Lake Water Agency: Santa Clara River Valley East Sub-basin Salt and Nutrient Management Plan

Leo developed and calibrated for the salt loading model for the period from 2001 to 2011. He provided assistant with determining surface water, groundwater and salt balance and incorporating proposed mitigation projects for the salt and nutrient management plant. Leo then ran predictive model runs for the period of 2012 through 2035, and analyzed modeling results under No Project, Single Project and, All Project conditions.

East Valley Water District: Sterling Natural Resource Center Study

Leo developed a surface flow spreadsheet model to quantify recycled water percolation. He also ran a solute transport model to evaluate predicted recycled water travel distance, distribution of percent recycled water, retention time, and recycled water concentration at the nearest active municipal wells.

Jurupa Community Services District: Geohydrologic Analysis of Future Groundwater Production

Leo supported efforts to complete a geohydrologic study to help determine future groundwater production. He exported the Chino Basin Groundwater Model from the recently-completed Integrated Santa Ana River Model, and ran model scenarios to analyze the groundwater balance.

Mojave Water Agency: Groundwater Model

Leo supported efforts to update a groundwater flow model and analyze water balance for a planned groundwater recharge project. To complete the model, he extended the MODFLOW-NWT model with data from 2005 to 2017.

Santa Ana Watershed Project Authority - Santa Ana River Waste Load Allocation Model Update

Leo helped update the Santa Ana River Waste Load Allocation Model, which is used by multiple agencies to assess water quality throughout the watershed. Leo collected and analyzed wastewater flow, water quality, and precipitation data to update and calibrate the model. Once completed, he then ran and evaluated waste load allocation scenarios in major stream segments in the watershed.

Rancho California Water District (Kennedy Jenks): Recycled Water Project

Leo ran groundwater flow modeling scenarios to evaluate potential recycled water recharge locations and determine recycled water retention time. He also helped prepare the draft and final project report.

Rancho California Water District: Safe Yield Calculation in the Northern Murrieta Valley Area

Leo helped calculate the amount of groundwater that could safely be pumped from the Northern Murrieta Valley Area. He updated the safe yield calculation using Zero Net Draft and developed a water balance for the basin. At the conclusion of the project, Leo prepared the draft and final report.

Rancho California Water District: Upper Valle De Los Caballos Recovery Wells

Rancho California Water District has operated a groundwater recharge facility in the Upper Valle De Los Caballos (UVDC) basin for more than two decades. The aquifer is relatively shallow, limiting the district's ability to recover recharge water. Leo helped complete modeling to evaluate additional recovery wells and placement. He developed and calibrated the UVDC focused model and ran model scenarios to evaluate potential slant well and vertical well locations.

Si Si, MS, EIT
Senior Associate Modeler

Years of Experience: 8
Years with Geoscience: 6

Education:

BS, Environmental Science, Ocean University of China

MS, Environmental Engineering, University of Southern California

Professional Registrations:

Engineer-in-Training

Key qualifications...

- Experience supporting groundwater models, sustainable yield studies, and calculating water budgets—help provide more accurate and thorough models and studies

Si Si has more than eight years of experience in groundwater and environmental investigations performed for numerous municipalities, state agencies, and private clients throughout California. She regularly performs ground water flow and solute transport modeling, hydrogeologic investigations, ground water basin and water quality studies, watershed modeling and management, groundwater waste discharge permitting, GIS mapping, and database development and management.

Selected Project Experience

San Bernardino Valley Municipal Water District: Santa Ana River Integrated Model

Si is supporting efforts to combine existing groundwater and surface water models to develop an integrated watershed model for the upper Santa Ana River. The resulting integrated model will be used to determine what factors may contribute to declines river flows and assess cumulative effects on surface flows and groundwater levels. Si developed the watershed model component of the integrated model. She also calibrated the watershed model using data from 1966 through 2016 to simulate runoff generated within the watershed and quantify runoff inputs for the integrated model.

City of Oceanside: Feasibility of Seawater Desalination in the Mission Narrows

Si incorporated two previous developed models, the Mission Basin Model and the Camp Pendleton Desalination Groundwater Model, the Oceanside Harbor Groundwater Flow Model was developed to assess desalination impacts on coastal and inland areas. Used SEAWAT solute transport model for predictive scenarios to evaluate percentage of ocean water pumped during the Project, in terms of the concentration of TDS, and salinity changes at various locations in the model area.

City of San Bernardino: US EPA Model

Si prepared the SBBA HSPF watershed model input data and run model; prepared recharge packages regarding stream bed percolation, mountain front runoff and areal recharge for Groundwater Flow Model based on water balance analysis from HSPF.

Elsinore Valley Municipal Water District: Hydrogeologic Study of the Warm Springs Groundwater Basin

Si developed HSPF model based upon the available data of precipitation, land use and soil types, calibrated HSPF model with adjacent or nearby streamflow gages, quantify the groundwater storage and safe yield of the Warm Springs Basin.

California American Water: Monterey Peninsula Water Supply Project

Si, prepared cross-sections based on well logs, revised NMGWM and CEMEX Model layers, calculated and summarized hydraulic conductivity form grading analysis in CEMEX and Moss Landing Sites, mapped soil size distribution in dune sand aquifer and 180-foot aquifer equivalent, prepared weekly/monthly monitoring reports for Test Slant Well and surrounding monitoring wells, analyzed groundwater elevation changes and calibrated CEMEX focused groundwater model, calculated slant well feed-water supply, impacts and mitigation approaches.

Yucaipa Valley Water District: Recycled Water Use Evaluation - Gateway Subbasin of Yucaipa GW Basin

Si developed focused groundwater model for the unconsolidated sediments of the Gateway Subbasin and solute transport model MT3DMS, evaluated the effects, including travel times and percent contribution, of recharging recycled water at the Wilson Creek Spreading Basin under various recharge scenarios.

City of Oceanside: Mission Basin Model Update and Evaluation of Indirect Potable Reuse (IPR) for the City of Oceanside

Si is supporting efforts to update the Mission Basin Model to evaluate a planned IPR project. She updated the model to add a solute transport component and performed model calibration. Si then used the model to help evaluate potential recharge locations and determine recycled water travel time and concentrations in groundwater at selected locations.

Elsinore Valley Municipal Water District: Hydrogeologic Study of The Warm Springs Groundwater Subbasin

Si helped complete a hydrogeologic study in the Warm Springs Groundwater Subbasin to asses future production potential. She developed a watershed model of the subbasin to quantify basin inflow and outflow.

Yucaipa Valley Water District: Calculation of Annual Water Budgets and Validation of Annual Change in Storage Using the Yucaipa Watershed and Groundwater Models

Si helped update the existing Yucaipa Valley Watershed Model by adding additional recharge terms including areal recharge, mountain front runoff, and streamflow.

Imperial Irrigation District: Seepage Recovery Investigation

Si supported a seepage recovery investigation along the All-American Canal. She collected and analyzed historic hydrogeologic data to help build and calibrate a groundwater model. She then used the model to estimate water loss caused by canal seepage at different locations and assessed various seepage recovery scenarios.

Santa Ana Watershed Project Authority: Santa Ana River Waste Load Allocation Model Update

Si helped update and recalibrate the existing Waste Load Allocation Model. She then evaluated waste load allocation scenarios for major stream segments and estimated off-channel recharge from natural precipitation. She then ran the updated model using historic discharge data to estimate the quantity and quality of the recharge that actually occurred. Si also compiled the waste load allocation model into a run-time software simulation package.

San Bernardino Valley Municipal Water District: Big Bear Overflow Modeling and Assessment

Si developed and calibrated the Seven Oaks Watershed model to estimate additional releases from Big Bear Lake and the resulting amount of additional water available for recharge projects.

Newport Pacific Land: Floriani Ranch Safe Yield and Hydrogeological Study

Si supported efforts to complete a safe yield and hydrogeological study by characterizing current and historic hydrogeologic conditions at the Strata Verde Innovation Park. Si also developed surface and groundwater flow models to help evaluate the basin's sustainable yield including historic and future water budgets. She then conducted modeling scenarios to assess project impacts on Sustainable Groundwater Management Act sustainability indicators.

Harold T. Glaser, P.E.

Chief Operating Officer

Education
BS, Civil and Environmental Engineering, Clarkson University, 1976
MS, Civil and Environmental Engineering, Clarkson University, 1978

Registrations
Professional Civil Engineer, California (30437)

Memberships/Affiliations
American Society of Civil Engineers
American Water Works Association
Association of Metropolitan Water Agencies
Colorado River Water Users Association
Association of California Water Agencies
Tau Beta Pi, Engineering Honor Society
Chi Epsilon, Civil Engineering Honor Society

Years of Experience
42 years

Professional Summary

Harold has extensive experience in civil and environmental engineering, information technology, and management consulting. Emphasis is on projects related to planning; design; construction management; and evaluation of water, wastewater, storm water, and flood control facilities; computer aided design; automated mapping and facilities management; geographic information systems; and analysis, design, and development of engineering and scientific computing systems. He recently served as Client Service Manager simultaneously for the Metropolitan Water District of Southern California, and the Los Angeles Department of Water and Power, and was responsible for client service, project management, delivery, and performance of all technical assignments for these clients. Harold is currently serving as the firm's Business Development Director.

Project Experience

PALMDALE GROUNDWATER RECHARGE AND RECOVERY PROJECT, PALMDALE WATER DISTRICT, PALMDALE, CA | PRINCIPAL-IN-CHARGE | Palmdale Water District (PWD) is implementing the first phase of the Palmdale Regional Groundwater Recharge and Recover Project, a $55 million surface spreading indirect potable reuse (IPR) water bank in Antelope Valley, CA. The project will provide up to 50,000 ac-ft/year of recharge capacity and initially 7,500 ac-ft/year of extraction capacity.

HIGH DESERT WATER BANK, ANTELOPE VALLEY-EAST KERN WATER AGENCY, PALMDALE, CA | PRINCIPAL-IN-CHARGE | AVEK is partnering with Metropolitan Water District of Southern California for financing, development and operation of the Project. AVEK proposes the implementation of a 280,000-acre foot capacity groundwater bank that will store State Water Project (SWP) water for future recovery. The Project goal is to store approximately 70,000-acre feet per year (AFY) of SWP surface water conveyed to the site via the adjoining California Aqueduct.

FEASIBILITY OF DEVELOPING THE SANTA MONICA AND HOLLYWOOD BASINS AS SOURCES OF GROUNDWATER SUPPLY, CITY OF LOS ANGELES, DEPARTMENT OF WATER AND POWER, LOS ANGELES, CA | PRINCIPAL-IN-CHARGE | For the feasibility of developing the Santa Monica and Hollywood groundwater basins as potable groundwater supply sources for the City of Los Angeles. For each groundwater basin, the study included: hydrogeologic characterization, basin governance, groundwater quality, treatment evaluations, and siting studies.

BUNKER HILL CONJUNCTIVE USE PROJECT, SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT, REDLANDS, CA | PRINCIPAL-IN-CHARGE | Kennedy Jenks performed the preliminary design of the Bunker Hill Basin Conjunctive Use Project (CUP) to determine the physical systems necessary to enhance water supply reliability for the region, and performed a cost allocation study to determine the equitable cost allocation of the CUP based on potential benefits received by the stakeholders and consisting of the following; evaluating various pipeline alignment alternatives to convey up to 80,000 AFY of extracted groundwater from the Bunker Hill Basin to the Texas Grove reservoir site, determining the project facilities and capital and operating costs of the CUP in accordance with the results of the hydrogeological analysis, developing a phasing plan for an initial production of 40,000 AFY and an ultimate production of 80,000 AFY, and consisting of up to 12 production wells, evaluating alternative cost allocation methodologies, and providing the framework for how the proposed CUP project costs will be allocated amongst the participants.

OTAY MESA AND CENTRAL AREA INTERCONNECTION PROJECT, OTAY WATER DISTRICT, SPRING VALLEY, CA | PRINCIPAL-IN-CHARGE | Responsible for a pioneering, innovative contract to act as a Construction Manager/Constructor for a project to transfer water between Otay Mesa and the District's Central Area, deliver water from the City of San Diego Lower Otay Filtration Plant to both areas, and deliver raw/recycled water to the Otay Mesa. By connecting two existing large storage reservoirs, the project will defer the construction of additional storage. Raw water will be transferred from the San Diego County Water Authority for use by the County Jail and State Prison. The project includes 46,000 feet of 30-inch steel pipeline for the potable water, 16,000 feet of 16-inch steel pipeline for the raw/recycled water, and 5,200 feet of tunnel. The estimated construction cost is $20 million.

David W. Ferguson, Ph.D., P.E.

Recharge and Recovery Facilities

Education
BS, Environmental Science, University of Massachusetts, 1977
BS, Civil Engineering, University of Massachusetts, 1980
MS, Civil Engineering, University of Massachusetts, 1980
MBA, Business Management, California State University, San Bernardino, 1985
PhD, Executive Management, Claremont Graduate University, 1993

Registrations
Professional Civil Engineer, California (34626)

Certifications
Board Certified Environmental Engineer, American Academy of Environmental Engineers & Scientists (AAEES)

Memberships/Affiliations
American Water Works Association (AWWA)
Design-Build Institute of America (DBIA)
American Academy of Environmental Engineers & Scientists (AAEES)

Years of Experience
42 years

Professional Summary

David Ferguson, Ph.D. has extensive experience in the planning, design, construction, and operation of water supply, infrastructure, and treatment projects. His background includes project and program management, as well as management of engineering and/or operations for three large water utilities in Southern California. David has been responsible for the evaluation and/or design of upgrades, rehabilitation, retrofit, and/or replacement for over 40 water treatment plants, 30 reservoirs, and 20 pumping stations for 15 different water utilities.

Project Experience

BUNKER HILL CONJUNCTIVE USE PROJECT, SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT, REDLANDS, CA | TECHNICAL ADVISOR | Kennedy Jenks performed the preliminary design of the Bunker Hill Basin Conjunctive Use Project (CUP) to determine the physical systems necessary to enhance water supply reliability for the region, and performed a cost allocation study to determine the equitable cost allocation of the CUP based on potential benefits received by the stakeholders and consisting of the following; evaluating various pipeline alignment alternatives to convey up to 80,000 AFY of extracted groundwater from the Bunker Hill Basin to the Texas Grove reservoir site, determining the project facilities and capital and operating costs of the CUP in accordance with the results of the hydrogeological analysis, developing a phasing plan for an initial production of 40,000 AFY and an ultimate production of 80,000 AFY, and consisting of up to 12 production wells, evaluating alternative cost allocation methodologies, and providing the framework for how the proposed CUP project costs will be allocated amongst the participants.

UPPER VDC OPTIMIZED CONJUNCTIVE USE PROGRAM, RANCHO CALIFORNIA WATER DISTRICT, TEMECULA, CA | CIVIL ENGINEER | Kennedy Jenks developed an optimized recharge recovery strategy to allow for increased production and improved operations at the Upper VDC. Kennedy Jenks evaluated alternative conveyance facility plan scenarios to convey this increased production of potable water supply from the Upper VDC to the distribution system, developed a disinfection improvement plan, evaluated economics of project alternatives, and a capital improvement program. Kennedy Jenks designed the Phase 1 improvements which included new berms, re-grading

of pond bottoms, three new pond discharge outlets, 1,900 LF of 36-inch diameter raw water pipeline, and 1,000 LF of 24-inch diameter treated water pipeline.

HIGH DESERT WATER BANK, ANTELOPE VALLEY-EAST KERN WATER AGENCY, PALMDALE, CA | OWNER'S TECHNICAL ADVISOR | AVEK is currently implementing a $131M groundwater bank in partnership with Metropolitan Water District (Metropolitan). The objectives of the project are to store up to 280,000 AF of Metropolitan's SWP water supply with water recovery of up to 70,000 AFY over four consecutive years. The project is located on a 1,500-acre site in unincorporated Los Angeles County, adjacent to the East Branch of the California Aqueduct. KJ is providing program management services for AVEK, including support with implementation strategies, value engineering, technical oversight and support, and cost and schedule management.

GROUNDWATER BANKING - WATER SUPPLY STABILIZATION PROGRAM, ANTELOPE VALLEY-EAST KERN WATER AGENCY, PALMDALE, CA | PROJECT MANAGER | AVEK is implementing an $80 million water banking program with two separate water banks, the 1,475-acre Westside Water Bank and the 80-acre Eastside Water Bank. The Westside site can recharge up to 50,000 ac-ft/year over 500 acres of agricultural land and currently can extract 25 mgd with 11 potable recovery wells. The Eastside site can recharge up to 1,500 ac-ft/year in three 2-acre recharge ponds and extract up to 6 mgd with 3 potable recovery wells. Over the course of 5 years, KJ managed seven subconsultants with 15 sub agreements, and prepared eight design packages for $50 million in construction.

FEASIBILITY OF DEVELOPING THE SANTA MONICA AND HOLLYWOOD BASINS AS SOURCES OF GROUNDWATER SUPPLY, CITY OF LOS ANGELES, DEPARTMENT OF WATER AND POWER, LOS ANGELES, CA | PROJECT MANAGER | For the feasibility of developing the Santa Monica and Hollywood groundwater basins as potable groundwater supply sources for the City of Los Angeles. For each groundwater basin, the study included: hydrogeologic characterization, basin governance, groundwater quality, treatment evaluations, and siting studies. Seven alternative sites and a total of 14 alternatives were identified. Kennedy Jenks recommended a treatment process of green sand pressure filters followed by granular activated carbon (GAC) for the Hollywood Basin, and reverse osmosis (RO) for the Santa Monica Coastal Subbasin.

LAS POSAS REPLACEMENT WATER STUDY, CALLEGUAS MUNICIPAL WATER DISTRICT, MOORPARK, CA | PROJECT MANAGER | Kennedy Jenks provided CMWD and Fox Canyon Groundwater Management Agency engineering services to perform the Study, which comprised fourteen individual studies each evaluating a water supply alternative. Kennedy Jenks developed key criteria to assess each project alternative. Results of this Study found that opportunities to diversify the Basin's water supply are regionally accessible within supply types including stormwater, treated brackish water, imported water, and recycled water, as well as invasive vegetation removal. Factors impacting the overall feasibility of an evaluated alternative include capacity and capital costs per project, and potential limitations on supply availability such as water rights, agency terms, hydrological availability, drought, and other limitations. The results also found advantages and disadvantages for each project, which are similar within a specific supply type. Use of recycled water was ranked as one of the three highest ranked projects for implementation.

VAIL LAKE TRANSMISSION MAIN AND PUMP STATION CONSTRUCTION SUPPORT SERVICES, RANCHO CALIFORNIA WATER DISTRICT, TEMECULA, CA | OPERATIONS SPECIALIST | Assisted with Operations Manual and Start-up and training for the 80-cfs Vail Lake Pump Station at the VDC Recharge Ponds site and over 14,000 feet of 48-inch CML&C steel pipe to convey raw water from EM-21 through the proposed Vail Lake Pump Station to Vail Lake.

Paul H. Chau, P.E., CEM

Groundwater Recharge

Education
BS, Environmental Engineering and Science, University of California, Los Angeles, 2006
MS, Civil and Environmental Engineering, Stanford University, 2007

Registrations
Professional Civil Engineer, California (C75784)

Certifications
Certified Energy Manager, Association of Energy Engineers

Years of Experience
12 years

Professional Summary

Paul Chau is a civil and environmental engineer with extensive experience in recycled water and potable reuse projects. He has produced feasibility studies and designs for non-potable reuse systems, surface spreading groundwater recharge, injection groundwater recharge, and surface water augmentation. In addition, he has extensive master planning and hydraulic modeling experience for recycled water, water distribution, and sewer collection systems.

Project Experience

ADVANCED WATER PURIFICATION FACILITY (AWPF) AND PUMP STATION PROJECT, MONTEREY ONE WATER, MONTEREY, CA | PROJECT ENGINEER | Monterey Regional Water Pollution Control Agency (MRWPCA) and Monterey Peninsula Water Management District have partnered to create Pure Water Monterey, a $115M groundwater replenishment project. This is a first-of-its-kind potable reuse project because it utilizes six different sources of water, including municipal wastewater, impaired agricultural drainage, food processing wastewater, surface water and storm water runoff. KJ and our teaming partners have been involved in the planning, CEQA compliance, pilot testing, regulatory compliance and final design of Pure Water Monterey and have been working closely with MRWPCA, regulators, funding agencies, and stakeholders since 2012. KJ recently completed an Alternative Project Delivery Analysis for all of the project components and is currently leading the fast-track design of the Advanced Water Purification Facility (AWPF), Pump Station and Injection Well Facilities. The overall program objective is to deliver purified water into the ground by the end of 2017. In just 12 weeks, KJ successfully delivered the 30% design for the AWPF and prepared a procurement RFP for major treatment equipment. Successful bids were obtained for the major equipment and the final design was completed in late 2016.

WATER AND WASTEWATER INFRASTRUCTURE DESIGN FOR THE TESORO VIEJO COMMUNITY DEVELOPMENT, TESORO VIEJO, INC., MADERA, CA | PROJECT ENGINEER | Engineering support for design of water, wastewater, and recycled water pumping facilities and pipelines. These facilities include a 6,500 gpm vertical turbine raw water pump station, a multiple screening unit river intake system and multiple control valve stations for pressure sustaining, flow control, pressure relief and pressure reducing. This work is part of a larger design-build effort for which KJ provided water, wastewater, and recycled water infrastructure to support a new development north of Fresno California, known as Tesoro Viejo. Facilities include a 6-mgd microfiltration water treatment plant, and a 2.4-mgd MBR water reclamation facility. The water reclamation facility will produce recycled water meeting Title 22 requirements for unrestricted irrigation reuse, and it will produce 0.5 mgd of

advanced treated water for groundwater recharge and reuse. The water reuse strategy developed by KJ will enable the development to achieve zero liquid discharge. Paul developed the conceptual design for the water reclamation facility.

LAS POSAS REPLACEMENT WATER STUDY, CALLEGUAS MUNICIPAL WATER DISTRICT, MOORPARK, CA | PROJECT ENGINEER | KJ provided CMWD and Fox Canyon Groundwater Management Agency engineering services to perform the Study, which comprised fourteen individual studies each evaluating a water supply alternative. KJ developed key criteria to assess each project alternative. Results of this Study found that opportunities to diversify the Basin's water supply are regionally accessible within supply types including stormwater, treated brackish water, imported water, and recycled water, as well as invasive vegetation removal. Factors impacting the overall feasibility of an evaluated alternative include capacity and capital costs per project, and potential limitations on supply availability such as water rights, agency terms, hydrological availability, drought, and other limitations. Project also included stakeholder engagement for criteria development and analysis review.

BUNKER HILL CONJUNCTIVE USE PROJECT, SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT, REDLANDS, CA | PROJECT ENGINEER | Kennedy Jenks performed the preliminary design of the Bunker Hill Basin Conjunctive Use Project (CUP) to determine the physical systems necessary to enhance water supply reliability for the region, and performed a cost allocation study to determine the equitable cost allocation of the CUP based on potential benefits received by the stakeholders and consisting of the following; evaluating various pipeline alignment alternatives to convey up to 80,000 AFY of extracted groundwater from the Bunker Hill Basin to the Texas Grove reservoir site, determining the project facilities and capital and operating costs of the CUP in accordance with the results of the hydrogeological analysis, developing a phasing plan for an initial production of 40,000 AFY and an ultimate production of 80,000 AFY, and consisting of up to 12 production wells, evaluating alternative cost allocation methodologies, and providing the framework for how the proposed CUP project costs will be allocated amongst the participants.

HIGH DESERT WATER BANK, ANTELOPE VALLEY-EAST KERN WATER AGENCY, PALMDALE, CA | PROJECT MANAGER | AVEK is currently implementing a $131M groundwater bank in partnership with Metropolitan Water District (Metropolitan). The objectives of the project are to store up to 280,000 AF of Metropolitan's SWP water supply with water recovery of up to 70,000 AFY over four consecutive years. The project is located on a 1,500-acre site in unincorporated Los Angeles County, adjacent to the East Branch of the California Aqueduct. KJ is providing program management services for AVEK, including support with implementation strategies, value engineering, technical oversight and support, and cost and schedule management.

Connor J. Rutten, P.E.

Hydraulic Modeling

Education
BS, Civil Engineering, University of California, Los Angeles, 2016
MS, Civil and Environmental Engineering, Stanford University, 2017

Registrations
Professional Engineer, Virginia (0402060970)
Professional Engineer, California (C92734)

Memberships/Affiliations
American Water Works Association

Years of Experience
4 years

Professional Summary

Connor Rutten is a civil engineer with project experience in water/wastewater pump station and pipeline design, hydraulic modeling, master planning, and resiliency planning. He has developed, calibrated, and analyzed hydraulic water and wastewater models using WaterGEMS/SewerGEMS as well as InfoWater/InfoSewer. He has experience developing population/demand projections, identifying and evaluating Capital Improvement Program (CIP) projects, and developing both high-level as well as detailed cost estimates.

Project Experience

FOCUSED WATER MASTER PLAN, RIVERSIDE PUBLIC UTILITIES, CITY OF RIVERSIDE, CA | HYDRAULIC MODELING **|** KJ is currently working with Riverside Public Utilities (RPU) to evaluate potential improvements that can be made to their water distribution system in the Downtown Riverside area to improve fire flow capacity and overall system pressures. Additionally, KJ is evaluating the capacities of potential interties between RPU and other potential neighboring retailers. Connor is the task lead for updating RPU's Infowater model to identify and evaluate potential CIP projects that will be incorporated in RPU's Focused Water Master Plan.

CALAVERAS CONVEYANCE FEASIBILITY STUDY PROJECT, SAN FRANCISCO PUBLIC UTILITIES COMMISSION, SAN FRANSCISCO CA | HYDRAULIC MODELING **|** KJ is currently evaluating several alternatives to capture and store surplus water in San Francisco Public Utilities Commission's (SFPUC) Calaveras Reservoir in order to improve supply reliability during prolonged droughts. SFPUC currently spills surplus water at Moccasin Reservoir due to a lack of downstream system storage. This feasibility study examines how the existing conveyance system from Moccasin Reservoir can be used to redirect the surplus flow to Calaveras Reservoir, or if any new and/or modified conveyance and treatment infrastructure will be needed to convey the surplus flow. Connor is responsible for updating the existing InfoWater hydraulic model and evaluating each of the proposed alternatives.

ELEVATED TANK REPLACEMENT STUDY, CITY OF DAVIS, DAVIS, CA | HYDRAULIC MODELING **|** The City of Davis (City) is looking to demolish the existing elevated tank and replace it with a new elevated tank since the existing tank does not comply with current seismic standards. Connor is leading the modeling effort to use the City's existing hydraulic model to evaluate: (1) six potential locations for a new elevated tank; (2) the feasibility of increasing the storage volume of the new elevated tank up to 0.5 MG; and (3) increasing the water level operating range in the elevated tank to increase the hydraulic grade line of the system by 15 feet. The outcome of this study will be to

identify the preferred location for the new elevated tank, based primarily on operational functionality. This study uses extended periods simulations to examine well pump and tank cycling patterns to ensure that the new proposed tank and control strategies do not have any negative impacts to the distribution system.

WATER DISTRIBUTION SYSTEM MODELING & CIP PLANNING, CITY OF CRESCENT CITY, CRESCENT CITY, CA | HYDRAULIC MODELING | KJ is currently updating Crescent City's (City) existing Infowater hydraulic model to be an all-pipe hydraulic model. Connor is the task lead for updating the model, which includes water meter geocoding, demand allocation, and model calibration based on available SCADA data. The updated model will be used to inform the City on how to optimally operate their system to minimize wear and tear on the City's facilities. A storage evaluation of the system will also be performed to verify that the City has adequate fire flow storage and peak hour storage. Based on the findings of the hydraulic and storage analyses, KJ will develop CIP projects for the City.

ON-CALL HYDRAULIC MODELING, NORTH MARIN WATER DISTRICT, MARIN COUNTY, CA | HYDRAULIC MODELING | KJ is currently performing multiple hydraulic analyses for North Marin Water District (District) using the District's InfoWater model, which KJ developed and currently maintains. Connor is currently in charge of a system fire flow capacity study for new developments coming online in the District's system, as well a hydraulic evaluation of the Kastania Pump Station that will be rehabilitated and used to make deliveries to the District's downstream neighbor, Marin Municipal Water District.

WATERSTONE DEVELOPMENT HYDRAULIC MODELING ASSISTANCE, CITY OF VALLEJO WATER DEPARTMENT, VALLEJO, CA | HYDRAULIC MODELING | KJ is currently assisting the City of Vallejo Water Department (City) with a pressure zone and fire flow availability study for a new development that is being constructed by Tri Pointe Homes. The development requires new water distribution infrastructure as well as pressure reducing stations due to the large changes in elevation within the development. KJ currently maintains the City's InfoWater model and completed the City's most recent Water System Master Plan in 2015.

4.5 MG RESERVOIR PROJECT, MCKINLEYVILLE COMMUNITY SERVICES DISTRICT, MCKINLEYVILLE, CA | HYDRAULIC MODELING | As part of the new reservoir design project, KJ served as the lead hydraulic modeler for a water system operational evaluation analysis that evaluated the impact of the new reservoir on water age within the distribution system and potential solutions for reducing water age. KJ calibrated the District's existing hydraulic model and utilized the updated model to produce recommendations that may reduce water age by 25% for the District.

SOUTH GATE ON-CALL SYSTEM MODELING, CITY OF SOUTH GATE PUBLIC WORKS, SOUTH GATE, CA | HYDRAULIC MODELING | KJ is an on-call hydraulic modeling consultant for the City of South Gate Public Works (CSGPW). Connor has performed several types of system analyses for CSGPW, including extended period simulations to examine well capacities and tank cycling, "brown-event" pipe flow direction and velocity analysis, and fire flow capacity analysis.

HYDRAULIC MODELING AND ENGINEERING SERVICES FOR ANALYSIS OF FUTURE DEVELOPMENT PROJECTS, CARLSBAD MUNICIPAL WATER DISTRICT, CARLSBAD, CA | HYDRAULIC MODELING | KJ provided hydraulic modeling services to evaluate the effects of future developments on their existing water distribution system. The analysis examined system pressures and fire flow capacities for proposed developments under average and max day demand scenarios. Additionally, the analysis evaluated the impacts of taking certain pipelines offline because of nearby construction activities.

Janet L. Hoffman, P.E., CEP

Cost Estimator

Education
BS, Mechanical Engineering, University of Southern California, 1994

Registrations
Professional Mechanical Engineer, Washington (36133)

Certifications
AACE International / Certified Estimating Professional (CEP), AACE International

Memberships/Affiliations
AACE International

Years of Experience
25 years

Professional Summary

Janet Hoffman is a mechanical engineer and Certified Estimating Professional (CEP) with experience in design and construction of public, industrial, and institutional facilities. She regularly provides detailed construction cost estimates at planning level, conceptual, preliminary, interim, and final design levels design for municipal and industrial wastewater, stormwater, and railroad fueling projects. She is able to provide clear Basis of Estimate reports and assessment and inclusion of appropriate level of detail for allowances and contingency factors at differing design levels. Janet also has extensive experience in the construction industry, leading the mechanical work on a variety of building, process, and industrial projects. Her construction experience includes preparing bids, scheduling, budgeting and cost forecasting, piping layouts, coordinating subcontractors, preparing submittals and O&M manuals, negotiating change orders and disputes, and starting up and commissioning systems using both the traditional design-bid-build and GC/CM contracting methods and has the unique perspective of having experience working both on the side of the contractor and as the engineer.

Project Experience

BUNKER HILL CONJUNCTIVE USE PROJECT, SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT, REDLANDS, CA | COST ENGINEER/ESTIMATOR | Kennedy Jenks performed the preliminary design of the Bunker Hill Basin Conjunctive Use Project (CUP) to determine the physical systems necessary to enhance water supply reliability for the region, and performed a cost allocation study to determine the equitable cost allocation of the CUP based on potential benefits received by the stakeholders and consisting of the following: evaluating various pipeline alignment alternatives to convey up to 80,000 AFY of extracted groundwater from the Bunker Hill Basin to the Texas Grove reservoir site, determining the project facilities and capital and operating costs of the CUP in accordance with the results of the hydrogeological analysis, developing a phasing plan for an initial production of 40,000 AFY and an ultimate production of 80,000 AFY, and consisting of up to 12 production wells, evaluating alternative cost allocation methodologies, and providing the framework for how the proposed CUP project costs will be allocated amongst the participants.

PFAS GROUNDWATER TREATMENT PLANT FINAL DESIGN N WELLS, SANTA CLARITA VALLEY WATER AGENCY, SANTA CLARITA, CA | COST ENGINEER/ESTIMATOR | Prepare cost estimates for 6,000 gpm PFAS wellhead treatment facility at the 0.5-acre N Well Site, Preparation of a pre-purchase technical specification for a PFAS IX treatment system with pre-filters and three trains (6

lead-lag 12-foot diameter vessels), hypochlorite generation system, Associated A 1200 SF CMU Chemical Building associated sitework and yard piping, electrical and controls.

CENTRATE EQUALIZATION DESIGN, EASTERN MUNICIPAL WATER DISTRICT, PERRIS, CA | COST ENGINEER/ESTIMATOR | Prepare cost estimates for well equipping and treatment project.

WELL 59 WELLHEAD TREATMENT FACILITY, EASTERN MUNICIPAL WATER DISTRICT, PERRIS, CA | COST ENGINEER/ESTIMATOR | The scope of work for this project includes: Construction of treatment systems for existing well facility consisting of (4) 20,000 lb GAC Vessels, Backwash System including 30,000 gal tank and pumps, associated site work, interconnecting inlet & outlet piping, electrical and controls and addition of an automated entrance gate. Janet prepared engineers cost estimate for the project at the interim and final design submittals.

CHROMIUM-6 (CR6) COMPLIANCE DESIGN, NEWMAN, CITY OF, NEWMAN, CA | COST ENGINEER/ESTIMATOR | Provided cost estimating services for the predesign and design of a new groundwater well, storage tank, booster tank, chlorine disinfection, security, masonry wall, and transmission piping for the City. The initial well testing shows the ability to construct a 2,500 gallon per minute well that will avoid the necessity of constructing groundwater treatment for Cr6. This project is being completed using Drinking Water SRF Planning Grant for the predesign and design.

BLUFFS WELL REPLACEMENT DESIGN AND CONSTRUCTION MANAGEMENT, CLALLAM COUNTY PUBLIC UTILITIES DISTRICT NO. 1, CLALLAM COUNTY, WA | COST ENGINEER/ESTIMATOR | Prepared detailed cost estimate for design and construction of new groundwater wells and pumping, storage, and treatment facilities. The team's collaboration with the client throughout the project resulted in a very low construction change order rate of 1.1% of the project cost.

WELLFIELD EMERGENCY GENERATORS, CALLEGUAS MUNICIPAL WATER DISTRICT, THOUSAND OAKS, CA | COST ESTIMATOR | KJ provided planning, preliminary design, final design and construction support services for a 10 megawatt emergency power facility including diesel generators, fuel tanks, building, site grading, and electrical improvements for the Calleguas Wellfields 1 and 2 which include 18 groundwater wells and disinfection facilities.

GROUNDWATER TREATMENT SYSTEM TECHNICAL EVALUATIONS, PASADENA WATER AND POWER, PASADENA, CA | COST ENGINEER/ESTIMATOR | Prepare cost estimates for groundwater treatment project evaluations.

Appendix B

Similar Projects

Project descriptions and reference information is provided on the following pages for the following projects:

- San Bernardino Valley Municipal Water District, Upper Santa Ana River Integrated River Model
- San Bernardino Valley Municipal Water District, Bunker Hill Conjunctive Use Project
- Rancho California Water District, Upper VDC Recharge and Recovery

San Bernardino Valley Municipal Water District, Upper Santa Ana River Integrated River Model

San Bernardino and Riverside Counties, CA

The Santa Ana River (SAR) watershed is the largest in Southern California and home to some of the fastest population growth in the country. The communities in the upper watershed from the Seven Oaks Dam upstream, to the Prado Dam downstream, rely on groundwater for much of their water supply. San Bernardino Valley Municipal Water District formed a joint effort with multiple agencies to develop a integrated model for the Upper SAR Valley to determine baseline hydrological conditions and the potential effects of proposed projects. Our team was tasked with constructing a groundwater model for the Upper Santa Ana Valley Groundwater Basin by integrating existing groundwater and surface water models.

The goals of the project are:

- Help riparian habitat and endangered
- species protection efforts
- Identify how areas of shallow groundwater are affected by current and proposed projects
- Enhance the Habitat Conservation Plan (HCP) baseline condition to include both streamflow and groundwater levels
- Better understand how current projects impact flow in the SAR and groundwater levels
- Predict how proposed projects will impact flow in the SAR and groundwater levels in the area

The Integrated SAR Flow Model was completed in September 2020. The resulting Upper SAR Integrated Groundwater Flow Model (or Integrated Flow Model), was used to determine what factors may contribute to declines SAR flows, and assess cumulative effects on SAR surface flows and groundwater levels from approved, outstanding, and proposed projects, including Upper SAR Habitat Conservation Plan Covered Activities. We are currently in the process of completing the Upper SAR Integrated Water Quality Model (or Integrated WQ Model). The Integrated WQ Model combined with the Integrated Flow Model has been used for the 20-Year Water Quality Projections and will be used for the San Bernardino Basin Salt and Nutrient Management Plan Project for the San Bernardino, Rialto- Colton, Riverside-Arlington Basins.

Details at a Glance:

Client: San Bernardino Valley Municipal Water District
Client Contact: Bob Tincher, Chief Water Resources Officer/Deputy GM
Phone: (909) 387-9215
Email: btincher@sbvmwd.com
Date: 2017 to 2020

Staff Assigned:

- Johnson Yeh
- David Barnes
- Leo Liu
- Si Si

San Bernardino Valley Municipal Water District, Bunker Hill Conjunctive Use Project

San Bernardino, CA

Geoscience completed a study including cost estimates and modeling scenarios to provide the necessary information to prepare a Conjunctive Use Project (CUP) plan, meeting guidelines established by the Basin Technical Advisory Committee (BTAC). The goal of the CUP is to enable the District to recharge and extract on average between 10,000 and 20,000 acre-feet per year (af/y) from the Bunker Hill Subbasin.

To complete the project, we used the San Bernardino Basin Area Groundwater Model to evaluate three project scenarios and provide cost estimates to design and construct several high-capacity wells that would be required to achieve project goals.

Our study required that our team complete the following key tasks:

- Evaluate planned extraction well siting and spreading grounds
- Update assumptions for baseline conditions
- Develop CUP extraction and recharge schedules
- Prepare and run baseline and CUP model scenarios including using MODFLOW, MODPATH, and MT3DMS computer codes
- Prepare and present modeling work at the BTAC meetings

Based on modeling scenarios, we found that the initial average annual rechange would likely range between 10,000 and 16,000 af/y, with water losses of 400-800 af/y due to evapotransporation and rejected streambed recharge.

Kennedy Jenks Participation

Kennedy Jenks supported the project by providing capital, O&M, and energy costs for proposed future wells, well collection pipelines, and raw water transmission pipelines.

Details at a Glance:

Client: San Bernardino Valley Municipal Water District
Client Contact: Wen Huang, Chief Engineer/ Deputy General Manager
Phone: (909) 387-9223
Email: wenh@sbvmwd.com
Date: 2014-2017

Staff Assigned:

- Johnson Yeh
- Christopher Coppinger
- Leo Liu
- Harold Glaser (Kennedy Jenks)
- David Ferguson (Kennedy Jenks)
- Paul Chau (Kennedy Jenks)
- Janet Hoffman (Kennedy Jenks)

Rancho California Water District, Upper VDC Recharge and Recovery

Riverside County, CA

The Rancho California Water District (RCWD) overlies the Murrieta-Temecula Ground Water Basin and encompasses an area of approximately 90 square miles in Riverside County of Southern California. Most water is produced in the Pauba Valley portion of the District which contains the coarsest alluvial deposits and the highest yielding aquifers. The Valle De Los Caballos (VDC) in the upper Pauba Valley has historically been used to recharge the basin's aquifers. The VDC area was identified on maps as early as 1917 as "spreading grounds" and was continuously used for that purpose without improvements until the mid 1970's. In 1978, RCWD acquired the VDC property for a conjunctive use project utilizing recharge from Vail Lake and imported water from the Metropolitan Water District of Southern California's system.

As a part the conjunctive use project, pilot-scale field investigation and testing was made on a portion of RCWD's VDC artificial recharge facilities in the upper Pauba Valley. The pilot-scale testing was completed to meet Surface Water Filtration and Disinfection Treatment Regulations as required by State of California Department of Health Services Office of Drinking Water.

To support the project Geoscience performed the following:

- Background research to determine optimum methods and facilities for artificial recharge
- Designed the pilot recharge test including monitoring wells, lysimeter, and recovery well construction
- Inspected the pilot basin construction
- Performed tracer tests to determine virus removal rates, and vertical and horizontal travel times
- Performed ground water level and water quality monitoring
- Prepared a report documenting the results from the pilot test

Once completed, the VDC basins recharged up to 15,000 acre-ft/yr. Several new extraction wells were also installed to recovery the recharged water. Our team also conducts annual audits to assess recharge effectiveness.

Subsequently, Geoscience began assessing ways to increase water recovery potential. A challenge in this area is the relatively narrow water bearing zone, requiring a series of shallow recovery wells. Our team is currently conducting an assessment and modeling to determine if shallow vertical wells, or fewer angled wells would be most cost effective. The assessment is currently on-going.

Details at a Glance:

Client: Rancho California Water District
Client Contact: Eva Plajzer, Assistant General Manager
Phone: (951) 296-6900
Email: eplajzere@ranchowater.com
Date: 1990 to Present and On-going

Staff Assigned:

- Johnson Yeh
- Christopher Coppinger
- David Barnes
- Leo Liu
- Si Si

SAN BERNARDINO Valley MUNICIPAL WATER DISTRICT

DATE: April 12, 2022

TO: Board of Directors' Workshop - Engineering

FROM: Wen Huang, Chief Engineer/Deputy General Manager

SUBJECT: Consider Three -Year Fixed Pricing Contract Terms for EarthTec Product with Earth Science Laboratories (ESL)

Staff Recommendation

Forward the 3-yr purchase contract terms with Earth Science Laboratories (ESL) at a fixed unit cost of $18 per gallon for EarthTec, plus freight charges and tax, to the next Board of Directors' meeting for consideration.

Summary

Subsequent to the successful testing of the EarthTec product throughout the Valley District delivery system for treating algae growth in State Water Project (SWP) water in 2017-2019, installation of two permanent injection systems was completed at the Sweetwater Turnout and Line Valve No. 2 of the Foothill Pipeline in 2019. To secure the best and lowest pricing, the Board of Directors entered into a 3-year purchasing agreement with ATS Innova on May 21, 2019. Similar to the approach that the Board took in 2019, Staff recommends that the Board of Directors consider a new 3-year purchase contract terms with ESL to secure a fixed unit cost of $18 per gallon for EarthTec, plus freight charges and tax.

Background

EarthTec is a highly soluble, low pH algaecide/bactericide designed for use in lakes, ponds, reservoirs, sedimentation basins, irrigation canals, treatment lagoons and water systems. The active ingredient in EarthTec is a highly biologically active form of the cupric ion (Cu++), which is the only form of copper that is useful in controlling algae and bacteria. EarthTec is registered by the U.S. EPA as an algaecide/bactericide and is certified to NSF Certified Standard 60 as an

additive to drinking water. In addition, the Regional Water Quality Control Board has reviewed the EarthTec product for Valley District and approved of its application.

Due to increased algae growth throughout our delivery system in recent years, Valley District staff conducted a study to investigate ways to effectively treat algae. Algae tends to reduce groundwater recharge rates due to clogging, causes increased pre-treatment costs in surface water treatment plants served by SWP water, and can result in taste and odor problems in drinking water. From 2017 through 2019, staff conducted multiple tests with EarthTec to evaluate its effectiveness in mitigating algae growth in District facilities. The results from the tests proved to be very successful and have shown EarthTec product to be a viable option for treating algae growth.

Based on these results and the need to have a robust method to treat algae growth in the future, the District completed installation of two permanent injection systems that feed into the Foothill Pipeline. The two locations were strategically selected at the Sweetwater Turnout and Line Valve 2 along the Foothill Pipeline. The facilities in place now include liquid containment (i.e. tanks), protective structures (pre-engineered and fabricated buildings), metered dispensing equipment (feed pumps), and an injection quill.

To secure the best and lowest pricing, the Board of Directors entered into a 3-year purchasing agreement with ATS Innova, an EarthTec distributor, on May 21, 2019. Under this arrangement, the District was required to purchase an annual minimum amount of 13,500 gallons in exchange for a discounted, fixed price of $18.50/gallon plus applicable taxes during the term of the agreement. As the contract is near at the end of term, ATS Innova recently informed Staff that they are no longer a distributor for EarthTec. Instead, Staff recommends that the Board of Directors consider a new 3-year purchase contract terms with ESL to secure a fixed unit cost of $18 per gallon for EarthTec, plus freight charges and tax, with an annual minimum quantity commitment of only 4,500 gallons. ESL, or Earth Science Laboratories, is the manufacturer of EarthTec. Like the previous arrangement, the product will be delivered by a bulk tanker with 4,500 gallons each, with the most recent estimated freight charges of $7,425 per load (or approximately $1.65/gallon) in March 2022.

The proposed purchase agreement was drafted by House Counsel and approved as to legal form.

Fiscal Impact

The estimated average annual cost, based on three (3) loads of 4,500 gallons each, or 13,500 gallons of EarthTec, at $18/gallon plus freight and taxes, would be approximately $270,000, which is currently included in the approved State Project Fund budget for this year. San Gorgonio Pass Water Agency (SQPWA) will share 18.33% of the total cost, based on the actual quantities. Staff will include an appropriate amount in the respective State Project Fund Budgets for the next 2 years based on our projection of SWP deliveries at the time.

Attachment

- Three-year Purchase Agreement for EarthTec with ESL

April 6, 2022

TO:
Wen B. Huang, PE, MS
Chief Engineer / Deputy General Manager

Tom Holcombe
Operations Manager

David McArthur
Senior Instrumentation / Control Technician

San Bernardino Valley Municipal Water District
380 East Vanderbilt Way, San Bernardino, CA 92408

Reference: Three-year contract for EarthTec supply by Earth Science Labs

PROPOSAL FOR SUPPLY OF EARTHTEC

Earth Science Laboratories (ESL) proposes a three-year sole supplier contract for EarthTec for San Bernadino Valley Municipal Water District (SBV). Earth Science Labs will sell EarthTec directly to SBV with deliveries by a 4500-gallon tanker truck. The product price will be fixed at $18.00 per gallon for the entire Term, with SBV responsible for freight costs and the California mill tax.

To allow for flexibility due to water supply fluctuations for SBV, Earth Science Labs proposes that SBV orders a minimum of one tanker load each year.

SBV will also be responsible for the tanker truck access to the fill sites during deliveries as well as product storage.

A description of the proposed terms is listed in the CONTRACT TERMS below.

CONTRACT PROVISIONS

I. ORDER TERMS

The following is a summary for the proposed terms.

1 Product: EarthTec

1.1 4500-gallon tanker truck delivery to San Bernadino Valley Municipal Water District at a fixed price of $18.00 per gallon for the contract term of three years (Term) ($81,000.00).

1.2 Freight is additional at market rate. ESL will arrange for freight deliveries at the "best rate" then-available and will pass through such freight costs to SBV without markup. The most recent estimate in March is at a cost of $ 7,425.00 (average $1.65 per gallon)

1.3 SBV shall be responsible for California Mill Tax (2.175%), which will be added to all invoices as applicable ($1,761.75)

II. CLIENT'S RESPONSIBILITY

2.1 A minimum order of one (1) tanker truck per year of EarthTec.

2.2 Provide reasonable access for the EarthTec tanker truck to the application sites.

III. GENERAL PROVISIONS

3.1 ESL warrants that all EarthTec shipments have been produced in accordance with and comply with all applicable federal, state, and local laws, orders, rules, and regulations.

3.2 This Agreement contains the entire understanding between the parties, and supersedes any prior understanding and/or written or oral agreements between them, respecting the subject matter of this Agreement. Any modification of the terms of this agreement must be signed by ESL and SBV. This Agreement may be executed in any number of counterparts, each of which shall be deemed an original and all of which when taken together shall constitute one and the same instrument. Signatures may be delivered electronically or by facsimile and shall be binding upon the parties as if they were originals.

We look forward to your response. If you accept the proposed contract terms, please forward an executed copy of this Agreement to the contacts below.

Tafadzwa “Tee” Mariga
West Regional Manager
Earth Science Laboratories, Inc.
(817) 875-3665
tmariga@earthsciencelabs.com

Customer Service
Administrative Assistant
Earth Science Laboratories, Inc.
(479) 278 - 2499 ext. 110
CustomerService@earthsciencelabs.com

Amber Allen
CFO – www.earthsciencelabs.com
Earth Science Laboratories, Inc.
479-278-2499 Ext: 111
atalley@earthsciencelabs.com

Dated: _____, 2022.

EARTH SCIENCE LABORATORIES

By: _____

Name: _____

Its: _____

THE ABOVE PROPOSAL IS HEREBY ACCEPTED ON BEHALF OF SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT.

Dated: _____, 2022.

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT

By: _____
Heather P. Dyer
CEO/General Manager