CTRG_EXH_019

Name & Title:	**Project Assignment:**
Stephen Reich, Principal	Hydrogeologist / Expert Witness
Years of Experience with Firm:	**Years of Experience With Other Firms:**
25	2
Education: Degree(s) / Year / Specialization:	**Registrations / Certifications**:
M.S. / 1989 / Geophysical Engineering, Colorado School of Mines, Golden, Colorado B.S. / 1985 / Geophysical Engineering, Colorado School of Mines, Golden, Colorado	Civil Engineer No.C58713, California

Experience Record

Mr. Reich provides technical and administrative expertise required to manage multi-faceted water resource projects that require in-depth knowledge of water rights, environmental requirements, regulatory issues, and civil engineering solutions. Mr. Reich has led technical teams for both litigation and settlement purposes for issues related to water supply, water quality, wastewater, and water rights disputes. His responsibilities have included developing basin management plans for groundwater and surface water resources in legally and environmentally constrained basins. In 2017, Mr. Reich developed a comprehensive adaptive management plan that met the requirements of the project proponents, the United States Fish and Wildlife Service, the National Marine Fisheries Service, and other state and local regulators. The plan was developed through extensive consultation with various organizations through the NEPA and ESA Section 7 consultation process over a period of 3 years. Quantitative threshold values were established for various triggers so pre-established mitigation measures would be implemented, if necessary. The result of his effort is a geographical web-based system that provides database management and decision making processes tied to meeting physical, environmental, and legal constraints. Monthly reports are currently being assimilated into annual reports to assure constraints identified in two Biological Opinions for the project are met, as well as meeting state water rights reporting requirements. Similarly, in 2015 and 2016, Mr. Reich led the City of San Juan Capistrano in developing a Groundwater Management Plan to balance the use of their surface and groundwater resources while meeting environmental and physical constraints. Results from his efforts are used to meet state regulatory requirements for monitoring and reporting.

As sole arbitrator between LADWP and Inyo County, regarding groundwater pumping in Owens Valley, Mr. Reich balanced legal, physical, and environmental requirements to settle a pumping dispute between Inyo County and Los Angeles Department of Water and Power. Mr. Reich currently leading a team of engineers and biologists to determine in-stream flow requirements for southern Steelhead in southern California; the result which will be used as a basis of designing and operating a federal project. His expertise in hydrology, water quality, geomorphology, civil engineering, economics, state and federal water supply issues, and environmental concerns provides a wide range of experience for the successful completion of both small and large scale water development projects.

Mr. Reich has extensive knowledge of developing and managing large water projects in California and the southwestern U.S. Working with federal and local water agencies, he has participated in developing large water supply projects. Mr. Reich also brings experience in working with regulators and federal agencies in developing water supply projects that satisfy U.S. Fish and Wildlife, National Marines Fisheries Service, Army Corps of Engineers, the U.S. Environmental Protection Agency, and RWQCB basin management requirements.

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Conjunctive Use Groundwater Project

As lead engineer, designer, and project manager for a $52 million project, Mr. Reich developed a conjunctive use project, based on MODFLOW groundwater model, which utilizes surface flow during winter-time rainfall events to recharge a groundwater aquifer for subsequent extraction during peak summer demand months. Mr. Reich was responsible for the design of the diversion facility, conveyance systems, and recharge facilities to divert water from the Santa Margarita River. Mr. Reich oversaw the development of field investigations, including the construction of monitoring and production wells, to support the creation of a numerical groundwater model. Working with the Bureau of Reclamation and the United States Navy, Mr. Reich played a key role in the development of legislative approval of the project passed by the United States congress in public law PL 111-11 to support settlement of *U.S. v Fallbrook PUD et al*.

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As author and project manager, directed all engineering, hydrologic, hydrogeologic, environmental tasks involved in the completion of the Santa Margarita River Recharge and Recovery Enhancement Program. This project combined the complex engineering and environmental studies required to maximize the ground-water production from a ground-water basin without harming the 16 endangered species that live within the riparian corridor and associated estuary of the Santa Margarita River. He recently participated in the completion of the environmental documentation and issuance of the Record of Decision associated with this project.

Basin Management

Mr. Reich has developed and implemented basin management and adaptive management programs for multiple basins located throughout California and the southwest U.S. His responsibilities included working with various federal and non-federal stakeholders to establish goals and project constraints. Between 2010 and 2015, Mr. Reich developed a sustainable yield model for the Temecula Groundwater Basin that met streamflow and groundwater constraints. Mr. Reich has performed sustainable yield studies in the Santa Margarita Basin to meet operational, legal, and environmental requirements for various clients so operating criteria can be established. His duties included establishing pumping schedules, identifying monitoring requirements, developing web-based databases, and producing monthly and annual reports to meet environmental and legal requirements.

Water Rights Negotiations

Technical lead for the United States and the Marine Corps Camp Pendleton in the settlement of one of the longest running (90+ years) water rights disputes in California. Using technical studies prepared by experts in numerous fields, developed the technical portion of a settlement agreement that allowed for the restoration of streamflow to satisfy both ecological demands and municipal demands. A MODFLOW ground-water model, a hydrologic model, and the classification of the riparian and biological habitat were just a few of the numerous studies that were used to establish the basis for settlement of a complex river system. The negotiated agreement acknowledges the beneficial use of water for human consumption and ecological demands.

Water Treatment

Mr. Reich was responsible for the design, construction, and operation of a 1,000 gallon per minute Liquid Granular Activated Carbon (LGAC) treatment facility to remove volatile organic carbon compounds from groundwater. The purpose of the facility was to test for the removal of VOCs in the presence of high total organic carbons that could reduce the efficacy of the treatment process. The results of the LGAC facility have been used to establish long-term management goals for the continued use of groundwater from wells in a VOC contaminated aquifer.

Groundwater Development Along Coastal Zones

Mr. Reich has led investigations regarding the development of groundwater from aquifers adjacent to the Pacific Ocean. Using numerical groundwater models and hydrogeologic principles, Mr. Reich has designed barriers to saltwater intrusion through the use of injecting reclaimed wastewater. These projects have allowed for an increase in the sustainable yield of groundwater aquifers located along coastal zones.

Reclaimed Wastewater

Mr. Reich has performed numerous investigations to develop projects that use highly treated wastewater effluent. A 36-acre constructed treatment wetland in southern California was designed to “polish” wastewater for disposal through groundwater recharge. Mr. Reich also investigated the use of existing injection wells near Las Pulgas, California and the designed new injection wells near Oceanside to dispose of reclaimed wastewater in the transition zone that exists in aquifers between the fresh water and saltwater barrier.

Environmental and Fisheries

Mr. Reich recently completed a study in December 2011 that identified minimum streamflow requirements for migration passage of southern steelhead trout in a southern California river. Working jointly with fisheries biologists, Mr. Reich and his team conducted in-stream surveys, performed hydraulic analysis, calculated hydrologic requirements, and developed management scenarios to support fish passage. Riparian and estuarine habitat requirements that supported fish passage were also investigated as part of the study.

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Arbitrator
Currently serving as the sole arbitrator of a ground-water pumping dispute between the Los Angeles Department of Water and Power and Inyo County. The dispute is based on the interpretation of legal and technical agreements between the two parties regarding the amount of ground water that may be pumped from the Owens Valley, California. Review of complicated reports that discuss the impact of pumping on ground-water hydrology and ecological and biological maintenance.

Mr. Reich arbitrated a dispute between Irvine Ranch Water District and Sorrano Water District regarding the operation of a water supply lake in southern California. Mr. Reich interpreted legal and technical agreements that allocated the division of natural and imported water supplies to each party. The result of this work led to an operations model that semi-annually records and accounts for the disposition of water from the lake.

Dam Site Investigations
As a member of the Stetson technical team consulting the Ute Indian Tribe in Utah, responsible for the gathering and interpreting geological data relevant to determining the location of a future dam site. Responsibilities included identifying and describing geologic hazards at thirteen potential dam sites both on and off the Reservation.

Water Quality Oversight
Working together with The Nature Conservancy and San Diego State University riparian ecologists, biologists, and hydrologists, led efforts in monitoring the "ecological health" of a river. The purpose of these efforts has been to monitor the health of river while at the same time meeting the municipal water demands of downstream water rights holders. Other studies involved with this task include the oversight of geomorphology and hydraulic studies associated with the characterization of a river.

Watershed Studies
- As project manager, oversee all hydrologic and hydrogeologic tasks relating to the adjudication of the Santa Margarita River Watershed. As the lead engineering firm for the U.S. Department of Justice, work directly with the U.S. Marine Corps Base Camp Pendleton, various Indian Reservations, the federal Watermaster, the U.S. Geological Survey, and Rancho California Water District personnel to develop solutions relating to all water resources in the Santa Margarita River Watershed.
  (U.S. Department of Justice, Santa Margarita River Watershed, 1993 - ongoing).
- Analyzed numerous well logs in Riverside and San Diego Counties. Analysis of these data sets was used to delineate between underflow and percolating ground water under unconfined or confined conditions as well as determining hydrogeologic characteristics of the aquifers
  (U.S. Department of Justice, Southern California Ground-water Studies, 1993).
- Designed an integrated geophysical survey in the San Pedro River Basin in Arizona to delineate between underflow and percolating ground water. Using various DC electrical techniques as well as bore hole data, defined the lateral boundaries of the San Pedro River stream system
  (U.S. Department of Justice, San Pedro River Basin, 1994).

Water Rights Studies
As a member of the Stetson technical team consulting the Pyramid Lake Paiute Tribe, prepared documents on irrigation and land use status using aerial photographs and historic documents. Additionally involved with a cooperative effort between the Tribe, the U.S. Department of Justice, and the U.S. Bureau of Reclamation in identifying the transfer of water rights. Coordinated GIS data and other databases with relevance to legal and illegal irrigated lands.
(Pyramid Lake Paiute Tribe, Pyramid Lake Land Use Study, 1992 - present).

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Municipal Water Systems Analysis

Participating as a member of a Technical Committee, Mr. Reich worked directly with private developers and the Contra Costa Water District in analyzing AB1600 buy-in charges for new customers. As an expert witness, Mr. Reich has testified on the use and division of raw and treated water infrastructure by new and existing customers, including pipe network systems, reservoir, pumping plant, and canal structures. He has coordinated data acquisition of available documents and maps in order to perform hydraulic, civil, and economic analyses to support cost allocation of facilities.

Mr. Reich has authored Urban Water Management, Capital Improvement, Water Supply Plans and other supporting documents to support various water districts throughout California. Responsibilities have included supervising pipe network models, economic rate models, water rights, and water supply tasks that support the development of these plans. Additional responsibilities have included participation in presentations to water/wastewater boards and technical involvement in negotiation discussions.

Expert Witness Experience

Mr. Reich has provided expert witness testimony in numerous state and federal cases involving water rights and watershed analysis. Mr. Reich has also provided testimony in state hearings in support of water rights applications and changes. His clients have included the Unites States Department of Justice, Indian Tribes, Municipal water agencies, mutual water companies, and private developers.

Water Wells/Drilling Expertise

- Supervised mud rotary, reverse rotary, air drilling, and sonic drilling of numerous monitoring and production wells throughout California, Utah, and Arizona. Designed and developed nested wells for monitoring vertical groundwater gradients from multiple aquifers.
- Responsible for the drilling and completion of a 1,300-foot water well on the Pechanga Indian Reservation, CA including the geological and geophysical logging of the well, determination of the screened interval, and pump testing of the well.
  (U.S. Department of Justice, Pechanga Reservation Ground-water Study, 1996).
- Responsible for the design, acquisition and interpretation of a seismic refraction survey to determine the suitability of a shallow ground-water supply on the Shivwitz Indian Reservation in Southwestern Utah. Additionally, five shallow bore-holes were drilled and incorporated in the interpretation of the final results.
  (U.S. Department of Justice, Shivwitz Reservation Ground-water Study, 1995).
- Designed and implemented both geophysical and hydrogeologic studies for the Southern California Water Company (SCWC). Working directly with their chief hydrogeologist, coordinated both field and office studies concerned with the design and location of new water wells within numerous ground-water basins throughout California. Additionally, analyzed some of SCWC's existing water wells in Edna Valley and Barstow for the determination of surface water influences and their pertinence to drinking water standards.
  (SCWC Water Well Studies, 1993-94)

Prior Experience

As an independent consultant, specialized in electrical methods applied to oil fields. Responsibilities included the design, implementation, processing, interpretation and presentation of transient electromagnetic data, as well as recommendations to the personnel responsible for choosing well site locations. While with the Western Geophysical Company of Houston, Texas, supervised 120-person field crews in Turkey for the acquisition of reflection and refraction seismic data. During this time in Turkey, drilled and logged over 200 shallow exploration holes. In London, England, processed and interpreted a three-dimensional survey used for the development of an existing oil field. Applied electromagnetic techniques to define alluvial and bedrock structures outside both Ely and Carlin, Nevada. Performed studies for theoretical modeling of electromagnetic data and its applications and supervised data acquisition for deep structural gas studies. Also worked as an on-site geologist for Exlog Inc. during the exploration of a 13,000-foot well in the Bering Sea.