Managed Aquifer Recharge and Sustainable Water Supply

Managed aquifer recharge (MAR) refers to the recharge of aquifers using infiltration basins, vadose zone wells, injection wells, and other methods, including aquifer storage and recovery (ASR) wells. Daniel B. Stephens & Associates, Inc. (DBS&A) and Clear Creek Associates are regional experts and pioneers in MAR project implementation. As affiliates of Geo-Logic Associates (GLA), an employee-owned company, DBS&A and Clear Creek have access to 250 professionals in 27 offices in the U.S. and abroad. Aquifer recharge expertise we offer includes:

- Project siting
- Permitting
- Feasibility studies
- Site characterization
- Monitoring program design and implementation
- Recharge and ASR well design
- Engineering design, bidding and contracting assistance, and construction oversight
- Hydraulic performance testing
- Water quality assessments and geochemical analysis
- Groundwater flow and water quality modeling

To stretch limited water supplies, many communities are turning to MAR, which allows storage of water below ground during times of excess supply, and later recovery to meet peak demands during the summer or times of drought. MAR is used for conjunctive management of surface water, groundwater, and recycled water resources, and can improve water quality and extend the life of groundwater resources.

DBS&A has been instrumental in developing the regulations and implementing the first MAR projects in New Mexico. The Albuquerque Bernalillo County Water Utility Authority (ABCWUA) is implementing MAR projects using imported San Juan-Chama water to recharge the Santa Fe Group aquifer system and to establish a long-term drought reserve. The Cities of Rio Rancho and Hobbs, New Mexico, are utilizing MAR projects that use treated wastewater for recharge. DBS&A has developed all of the permitted and operating recharge projects in New Mexico to date, involving extensive coordination with communities and state agencies as they interpret and apply the regulations that govern the application process and permit terms and conditions under the Ground Water Storage and Recovery Act passed in 1999.

DBS&A and Clear Creek hydrogeologists work with water suppliers to understand their water supply challenges and provide solutions for water management, including MAR. Clear Creek has implemented and refined numerous MAR projects for municipalities in Arizona. In Texas, DBS&A conducted a state-wide study on the feasibility of groundwater banking, and a detailed study for the City of El Paso on the most effective method for recharge. We have direct experience with all recharge methods.

Clients we have worked with to design, install, and/or optimize MAR projects include:

- Albuquerque Bernalillo County Water Utility Authority, NM
- U.S. Bureau of Reclamation
- City of Chandler, AZ
- City of Glendale, AZ
- City of Goodyear, AZ
- City of Hobbs, NM
- City of Las Vegas, NM
- City of Peoria, AZ
- City of Phoenix, AZ
- City of Rio Rancho, NM
- City of Surprise, AZ
- El Paso Water Utility, TX
- Metropolitan Domestic Water Improvement District, Tucson, AZ
- Town of Gilbert, AZ
- Orange County, CA

Vadose Zone Wells

Also called dry wells, vadose zone wells recharge water below ground, but above the water table.

In Arizona, Clear Creek has performed permitting, design, construction, testing, and programming support for new vadose zone wells for the City of Surprise's special planning area 2 water reclamation facility.

In the City of Phoenix, Clear Creek performed a vadose zone well assessment, rehabilitation, and new well design, and evaluated an existing vadose zone recharge facility at the City of Phoenix Cave Creek water reclamation plant, where the existing vadose zone wells had experienced significant declines in efficiency, and developed a vadose zone well rehabilitation program for the existing and new vadose zone wells.

Clear Creek provided hydrogeologic support services for the design and permitting of new vadose zone wells for recharge of reclaimed water from the City of Peoria's Jomax water reclamation facility.

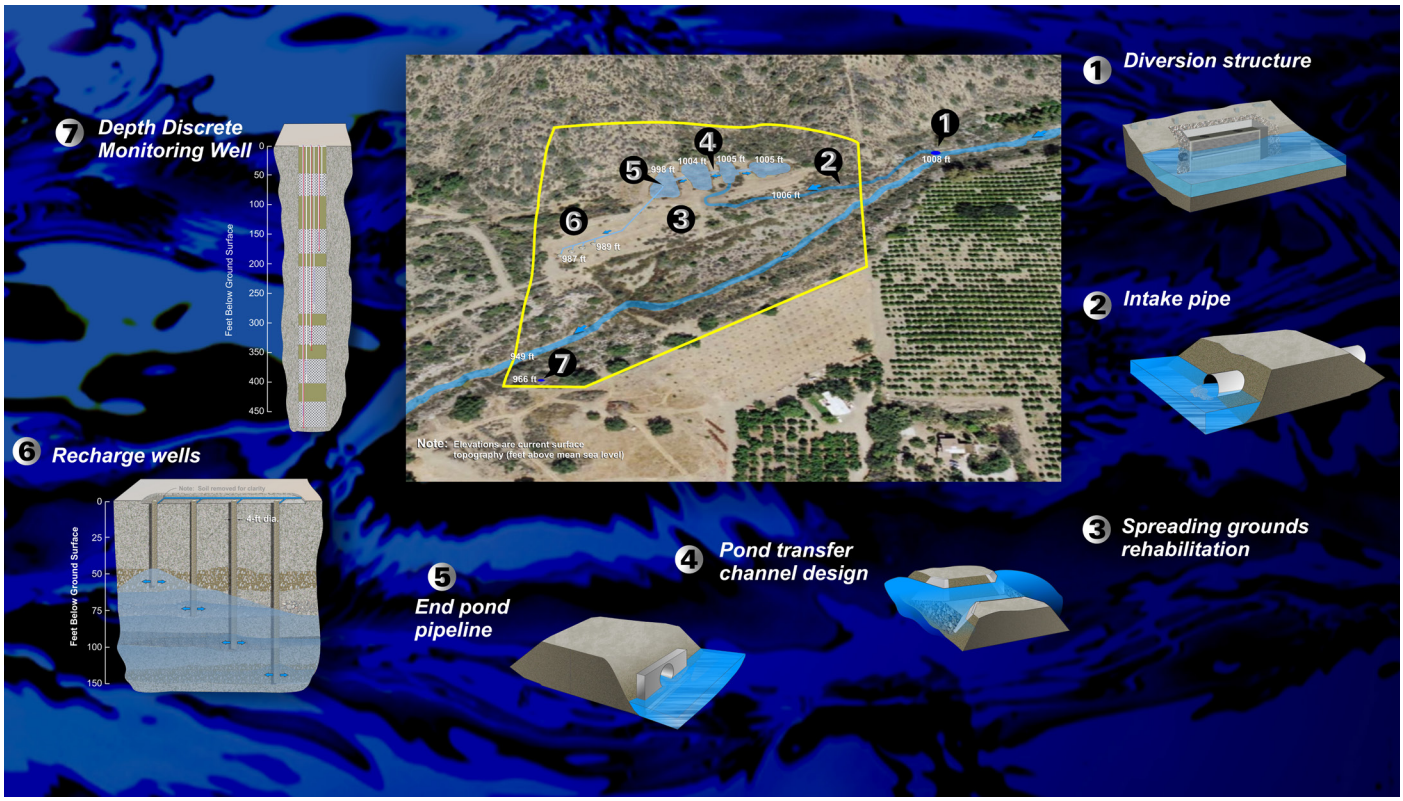
When the Town of Gilbert experienced declining recharge rates at the its existing vadose zone and basin recharge facilities, Clear Creek performed an evaluation and provided hydrogeological support for permit modifications for three existing and one new recharge sites within the Town of Gilbert in addition to siting the new recharge facility.

To reduce water level declines, DBS&A is supporting the Cities of Rio Rancho and Hobbs, New Mexico to implement MAR projects using treated wastewater. Wastewater is a reliable, drought-proof water source that can be reclaimed for recharge and tailored to meet the needs of specific end uses.

Clear Creek provided hydrologic services for the permitting, design, and installation of new ASR wells at recharge facilities for the City of Chandler, and ASR well siting and a hydrologic feasibility study at the Butler Road Water Reclamation Facility for the City of Peoria.

ASR and Direct Injection Wells

Large storage capacity without water loss due to evaporation is an advantage of MAR over open surface reservoirs. Our hydrogeologists have designed and installed ASR and direct injection wells at sites throughout the Southwest, including the Cities of Phoenix, Chandler, and Peoria, Arizona, and Rio Rancho, New Mexico.



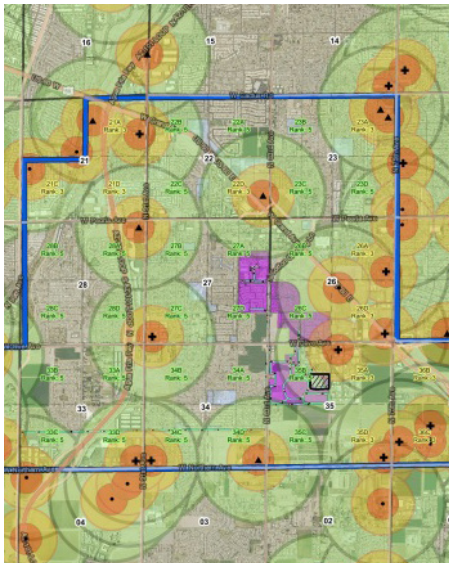
The San Antonio Creek Spreading Grounds Rehabilitation Project will increase groundwater storage and recharge in California's Ojai Valley Groundwater Basin by rebuilding abandoned diversion works, rehabilitating spreading basins, and constructing aquifer recharge wells adjacent to San Antonio Creek. DBS&A played a pivotal role in the assessment of the hydrology, geology, and design of diversion works, intake pipelines, and water conveyance as a consultant to the Ventura County Watershed Protection District. A portion of the precipitation typically lost downstream is diverted to rehabilitated spreading grounds and aquifer recharge wells. This results in greater groundwater storage and production from local water supply wells and less reliance on limited surface water supplies. Installation of a depth-discrete monitoring well near the spreading grounds will monitor project effectiveness.

Infiltration

DBS&A and Clear Creek hydrogeologists employ infiltration galleries, trenches, and basins, and utilize natural features, such as arroyos, for recharge.

Clear Creek supported the design of a new five-acre recharge basin at the Beardsley Road water reclamation facility for the City of Peoria, Arizona, including assessing whether confining and/or caliche layers would inhibit the infiltration of water.

Clear Creek completed a Master Planning Expansion project for the City of Glendale's West Area water reclamation facility in Arizona.



Clear Creek evaluated poor infiltration rates and developed recommendations for enhancement of the Avra Valley Recharge Project basins for the Metropolitan Domestic Water Improvement District in Tucson, Arizona.

DBS&A developed the Bear Canyon Arroyo recharge project in Albuquerque, New Mexico as contractor to the ABCWUA. The project included site characterization, monitor well construction, vadose zone and groundwater monitoring, groundwater flow and water quality modeling, and water rights and water quality permitting.

Using reclaimed water from the Cave Creek Water Reclamation Plant, Clear Creek performed a reclaimed water recharge and recovery study for the City of Phoenix, Arizona, to evaluate multiple recharge areas and test the feasibility and effectiveness of multiple recharge methods.

Contacts

DBS&A: James A. Kelsey, P.G.
Neil Blandford, P.G.
(505) 822-9400

Clear Creek: Marvin Glotfelty
(480) 659-7131