

**R. Douglas Bartlett, R.G., C.H.G., C.P.G.**  
**Principal Hydrogeologist**

**Expertise**

Hydrogeology/Geology  
Mathematical Groundwater Modeling

**Academic Background**

M.S., Geology, Colorado State University, 1984  
B.S., Geology, Colorado State University, 1977  
Colorado School of Mines, 1986  
Hydrogeology; Well Construction and Design

**Registrations**

Registered Geologist: Arizona No. 25059  
Professional Geologist: Alaska No. 656  
Professional Geologist: California No. 8809  
Registered Geologist: Oregon No. G2305  
Professional Geologist: Pennsylvania No. PG004995  
Licensed Geologist: Washington No. 2879

**Certifications**

American Institute of Professional Geologists: Certified Professional Geologist No. 8433  
Certified Hydrogeologist: California No. HG 965

**Professional Experience**

Co-founder, Clear Creek Associates, a 35+-member groundwater consulting firm with offices in Phoenix and Tucson. Areas of specialization include construction of flow and contaminant transport models, evaluation of groundwater resources in fractured rock and unconsolidated aquifers, production well design, and groundwater remediation design and operation.

**Significant On-going Projects**

*Freeport-McMoRan Sierrita Mine, Tucson, AZ*

Oversaw the development of a large groundwater computer model of the Sierrita and Twin Buttes Mines that simulates the future development of mine pit lakes in several open pit excavations. The model utilizes the USGS model code MODFLOW and the LAK3 module to simulate the development of pit lakes. The model domain encompassed 211 square miles and included more than 1 million calculation cells. The prediction results will be incorporated in Aquifer Protection Permit applications and amendments to existing permits to demonstrate future passive containment capture zones.

*Expert Witness: Groundwater Contamination, Merced, CA*

Mr. Bartlett conducted groundwater flow and contaminant transport simulations of an industrial facility near Merced, California. Mr. Bartlett testified regarding the potential impact of known chromium releases to groundwater on a drinking water supply well located about 1600 feet from the source area. Mr. Bartlett prepared both an Expert Report and a Rebuttal report and was deposed as part of the case. A jury trial is expected to occur in 2011.



*Expert Witness: Groundwater Pumping Impacts to Verde River, AZ*

Retained by Ryley, Carlock & Applewhite to provide expert testimony regarding alleged impacts from agricultural pumping along the Verde River in Arizona. The Salt River Project had filed an injunction against certain ranchers that had groundwater wells near the Verde River. The case required groundwater modeling to assess the magnitude and impact of groundwater pumping on the Verde River. Mr. Bartlett, in support of groundwater pumping interests, prepared an Expert Report and was deposed in the case. He also testified before a Superior Court judge.

*Freeport McMoRan, Safford District*

Oversaw the drilling and testing of a pilot hole and installation of a large-diameter production well for the Dos Pobres Mine. The pilot hole was drilled to a depth of 2,000 feet and was tested by the air lift method to assure that the well location is adequate to support a large production well. The final production well design will depend on the pilot hole test results. Expected completion – May, 2012.

*Freeport McMoRan, Safford District*

Conducted pit dewatering study for the Dos Pobres Open Pit mine. Mr. Bartlett used a detailed spreadsheet to assemble the information needed to compute future groundwater inflow rates to the Dos Pobres pit. Using existing information about groundwater levels surrounding the pit, water level decline rates observed in monitor wells, testing information regarding the permeability of the rock aquifer, and information from the mining engineering department regarding the likely future pit geometry, Mr. Bartlett computed annual average pit inflow rates over time. The resulting spreadsheet can easily be modified and updated with new mine plans and information from monitor wells to re-compute future inflow rates.

*Freeport McMoRan, Safford District*

Provides on-going support for compliance with environmental permits for the Dos Pobres / San Juan mine. An EIS permit requires annual review of groundwater level data to assess the potential impact of groundwater pumping for mine operations on the Gila River and Bonita Creek. Various groups of monitor wells are evaluated to assess changes in water levels and hydraulic gradients between the mine and the Gila River. Groundwater modeling is used to evaluate the potential that groundwater pumping may someday have on flows in the Gila River. As impacts are observed in monitor wells, the regional groundwater model for the site is assessed to determine how well these changes have been simulated. If certain criteria are met, the groundwater model is re-calibrated and future predictions of impacts to the Gila River are made. Based on the model results, mitigation measures could be adjusted to accommodate model-predicted future impacts.

*Arizona Land Development*

Prepared Applications for an Analysis of Adequate Water Supply for developments in Hualapai Valley and Detrital Valley north of Kingman Arizona. Hydrogeologic studies including the installation and testing of water production test wells were completed in each valley. Groundwater models were developed to demonstrate the availability of a combined total of over 19,000 AF/yr to serve 48,000 new homes.

*City of Peoria*

Retained by the City of Peoria to develop a groundwater computer model of the western portion of the Salt River Valley for the purpose of managing Peoria's groundwater resources. Managed the development of the 3D model and prepared a detailed report describing the model construction and model results. The model incorporated more than 1,000 production wells and covered several hundred square miles of the Phoenix Metropolitan area. The project required nearly a year to complete and is being used by Peoria staff to evaluate future changes in groundwater use.



*Arizona Water Company, Apache Junction*

Managed the development of a groundwater flow model of the Apache Junction area for a demonstration of physical groundwater availability needed for Certificates of Assured Water Supply. The model covers 651 square miles and includes simulation of over 300 production wells.

*Arizona Water Company, Casa Grande*

Oversaw the development of a groundwater flow model of the Casa Grande area for a demonstration of physical groundwater availability. The three-dimensional model covered an area of over 2,000 square miles and includes simulation of over 1000 production wells.

*Pacific Gas & Electric, Harquahala Valley, Central Arizona*

Oversaw the development of a basin-wide groundwater model used to demonstrate the availability of groundwater supplies for a proposed power plant. The model covered 870 square miles and included simulation of 260 production wells.

*Motorola 52<sup>nd</sup> Street Site, Phoenix*

Provides technical support to Motorola for the on-going investigation and remediation of VOC groundwater contamination. Mr. Bartlett has worked on the project for over 17 years and has acted as the Senior Hydrogeologist directing all field investigations and groundwater modeling for the past 12 years. He is responsible for design of three groundwater containment systems. The most recent system (Operable Unit 2) began operation in September 2001.

*Expert Witness – Confidential Private Arbitration*

Mr. Bartlett was retained as an expert witness to testify in a private arbitration concerning groundwater. The trial phase lasted several months and included two days of testimony. Groundwater modeling played a prominent role in the case.

*Tucson Airport Remediation Project, Tucson*

As follow-up to his 1990 design of a nine-well groundwater remediation system at the TARP Superfund Site, Mr. Bartlett recently oversaw the development of a groundwater flow and contaminant transport model used in evaluating the effect of reducing pumping requirements so as to make the TARP system less expensive to operate. Mr. Bartlett's model has been submitted to the EPA and ADEQ for review.

*Phelps Dodge Tohono Mine, South of Casa Grande*

Technical advisor for groundwater issues for the Phelps Dodge Tohono Mine, south of Casa Grande. Participate in on-going negotiations with the Tohono O'odham Nation regarding the impacts to groundwater of various mining operations at the property. In 2001, Mr. Bartlett developed a groundwater model of the site used to assess groundwater flow around an open pit lake.

*Phelps Dodge Iron King Mine, Cottonwood*

Senior technical advisor to Phelps Dodge for the implementation of acid mine drainage remedial measures. Worked with PD staff and their consultants to implement a Voluntary WQARF remedy through the ADEQ. The proposed action, batch treatment and release from underground workings, required an NPDES permit and approval from ADEQ. Permits were issued in 2001. The temporary pump-back system worked successfully for a period of 8 years after which, a passive treatment system was installed.



**Dames & Moore, Phoenix, Arizona; 1989 to 1999**

**Dames & Moore, Denver, Colorado; 1977 to 1989**

As a **Vice President/Principal Hydrogeologist**, Mr. Bartlett managed Dames & Moore's Arizona Geoscience Group with a staff of 40 geoscientists and support personnel. As a Senior Project Manager, Mr. Bartlett directed hydrogeologic and water resources projects, designed groundwater extraction systems, and developed flow and contaminant transport numerical models. During his 22-year association with Dames & Moore, Mr. Bartlett participated in hydrogeologic and geologic projects throughout the U.S. and in several foreign countries. Descriptions of major projects follow:

*Groundwater Resource Evaluations, Arizona Public Service*

Water Supply Study: Principal-in-Charge for a groundwater supply study near Gila Bend, Arizona. Two large areas were investigated through review of existing published and unpublished hydrogeologic data and by pumping tests of existing large-capacity irrigation supply wells. The results were used by APS to select the location of a proposed power generation facility.

*Confidential Mine Water Supply Investigations*

Principal-in-Charge of groundwater resource evaluations for two mines in Arizona. The projects included drilling deep test holes and pilot wells in fractured bedrock and the use of seismic, gravity, and CSAMT geophysical techniques to identify likely drilling targets. Aquifer testing was used to estimate the likely sustainable yield of future production wells drilled in the fractured rock.

*Carefree-Cave Creek Basin Water-Supply Analysis*

Project Manager for the development of a two-dimensional groundwater flow model used to evaluate various build-out alternatives in the Carefree-Cave Creek Basin. The model proved to be a useful tool to show water supply shortfalls given certain build-out assumptions.

*Remedial Investigation/Feasibility Studies*

*Broadway Pantano WQARF Site*

Developed an interim groundwater VOC containment plan and conducted a remedial investigation (RI) and Feasibility Study (FS) for the groundwater operable unit (GOU) at the Broadway Pantano WQARF Site in Tucson Arizona. Oversaw the development of a quasi three-dimensional groundwater flow model of 236 square miles of the Tucson Basin that includes over 400 production wells in the Central Well Field. The calibrated groundwater flow model was used to develop an interim containment-pumping plan that adheres to various constraints such as well field operational plans and community acceptance

*19th Avenue Landfill*

As Project Manager, Mr. Bartlett oversaw the completion of a multi-disciplinary RI/FS investigation of the 19th Avenue Landfill Superfund site for the City of Phoenix. In addition, he was responsible for development of the site groundwater flow and contaminant transport numerical model and participated in agency negotiations leading to an EPA Record-of- Decision for the site. Mr. Bartlett was called as an expert witness during cost-recovery litigation.

*Tucson Airport*

Mr. Bartlett was the Principal Investigator responsible for groundwater numerical modeling used in the design of a nine-well, 6,000 gpm groundwater extraction system intended to contain and remediate a solvent contaminant plume emanating from the airport area. The extraction system began operation in 1994 and has met or exceeded the objectives for the system as defined using modeling.



### *Phoenix-Goodyear Airport*

Mr. Bartlett was the senior hydrogeologist responsible for managing the investigation of solvent groundwater contamination originating from the northern portion of the Phoenix-Goodyear Airport Superfund site.

### *Groundwater Investigations at Mine Sites*

#### *Copper Queen Mine, Bisbee, Arizona*

Evaluated the hydrogeology of the Lavender Pit area as part of an evaluation of mining the Cochise ore body in the Warren District. The project involved the assessment of the rate of refilling of the Lavender Pit and the potential impact of leach operations proposed in the Lavender Pit on groundwater quality in the surrounding area.

#### *Questa Mine, New Mexico*

Molycorp, Inc. retained Dames & Moore to investigate the feasibility of disposing of mine tailings to a site on Guadalupe Mountain. As part of the project, Mr. Bartlett developed a two-dimensional groundwater computer model of the proposed tailings facility and used the model to demonstrate that seepage from the tailings facility would not cause groundwater quality to exceed New Mexico state water standards. The rock beneath the proposed tailings facility consisted of volcanic andesite and basalt flows. The model results demonstrated that seepage takes approximately 5 years to travel to the water table and that it becomes fully mixed in the 200-foot thick saturated zone.

#### *Morenci Mine, Arizona*

Project Manager for preparation of an Aquifer Protection Permit for the Morenci District for Phelps Dodge Morenci, Inc. The project included evaluation of the hydrogeology of a 100 square mile area, definition of the discharge impact of more than 300 facilities, and demonstration of BADCT for facilities shown to have potential for discharge to groundwater. Field investigations included the installation of more than 70 monitor wells and piezometers, the sampling and testing of soil, ponded water, and miscellaneous discharges, and aquifer testing of monitor wells. The application and a draft permit were prepared over a two-year period for final submittal on March 30, 1996. The ADEQ issued a notice of intent to issue a permit in July 2000.

#### *Dos Pobres/San Juan Mine, Safford, Arizona*

Oversaw the development of a groundwater model for the Phelps Dodge Dos Pobres/San Juan Mine in support of the EIS for the project. The model was used to show the potential impacts of the mine and groundwater production well field on surrounding surface streams and rivers. The BLM and BIA reviewed the model.

#### *Eagle Mine, Minturn Colorado*

Project hydrogeologist responsible for underground mine investigations of the leakage of acidic, metal-bearing water to the Eagle River. The project included extensive investigation of underground mine workings, groundwater flow paths through the workings, and the interrelationship of the mine workings to surface discharge points. These studies were used to identify key adits for bulkhead placement. Mr. Bartlett also assisted in the development of two- and three-dimensional groundwater models of tailings pile areas near the mine complex used to evaluate groundwater remedial alternatives.

#### *Bunker Hill, Kellogg, Idaho*

Prepared Field Operations Plans for an RI/FS investigation of mining waste contamination at a large mill/mine complex. Developed a groundwater model of mine tailings pile area for evaluation of remediation alternatives.



*Serrana Mine, near Sao Paulo, Brazil*

Developed a 2-D groundwater flow model used to evaluate future requirements for mine dewatering. The Serrana phosphate mine was preparing to expand operations by deepening an open pit operation to below the water table. Mr. Bartlett evaluated the future pumping requirements as the open pit was expanded and deepened.

*Lihir Mine, Papua, New Guinea*

Assisted in the development of a 3-D groundwater flow and transport model used to evaluate dewatering of a proposed open-pit gold mine. The proposed mine is located within 1000 meters of the Pacific Ocean and within an active geothermal field. Groundwater modeling was used to assess the pumping requirements for dewatering the mine as well as the influence of dense salt water on the aquifer system as pumping continued.

*Mine tailings pile evaluations*

Mr. Bartlett has participated in the development of tailings pile groundwater flow and contaminant transport models at several mine sites in the western U.S. including: Eagle Mine, Colorado; Bingham Canyon Mine, Utah; Questa Mine, New Mexico; Hidalgo Smelter, New Mexico; Bunker Hill Mine, Idaho. These models were used to assess current groundwater conditions and to evaluate remedial alternatives.

**Other Aquifer Protection Permit Projects**

*23rd Avenue Wastewater Treatment Plant*

Project manager for preparation of the APP application for the City of Phoenix. The project included a groundwater investigation and compilation of water quality data, engineering designs for the treatment plant expansion, and supplementary information. The application has been accepted and an APP permit was issued.

*Yuma Cogeneration Plant*

Senior hydrogeologist responsible for preparation of an APP application for a cogeneration power plant in Yuma, Arizona. The APP has been issued by ADEQ. Mr. Bartlett successfully argued that monitor wells were not needed for the APP.

*Tatum Ranch Reclamation Project*

Project manager responsible for oversight of hydrogeologic investigation as part of an APP application prepared by the City of Phoenix. The application has been accepted by the ADEQ.

*Maricopa County Cave Creek and New River Landfills*

Project manager responsible for conducting a hydrogeologic investigation and preparation of an APP application for each landfill. Several deep monitor wells were installed as part of the investigation. Groundwater modeling was used to demonstrate no significant impact from the landfill to the regional aquifer.

*City of Phoenix, 27th Avenue Landfill*

Project manager for hydrogeologic investigation of the landfill and preparation of a Remedial Action Plan and hydrogeologic report for the APP application submitted by the City of Phoenix.

*Aquifer Protection Permit*

Project Manager, prepared permit application for 23rd Avenue Wastewater Treatment Plant Expansion and Upgrade. The ADEQ have accepted the permit and intend to issue an APP for the facility.



## Professional History

Anaconda Minerals Co., Denver, Colorado; 1984  
Precious metals Exploration Geologist

## Publications

- Burnell, D.K, Mercer, J.W., Van Oort, M., Suriano, T.R., and **Bartlett, R.D.**, 2011, Stochastic Model to Estimate Travel Times from the 52nd Street Facility in Phoenix, AZ; Journal of Earth Science and Engineering, v. 1, no. 2, November 2011, p. 73-81.
- Reynolds, S.J., and **Bartlett, R.D.**, 2002, Subsurface geology of the easternmost Phoenix Basin - Implications for groundwater flow: Arizona Geological Survey Contributed Report CR-02-A, 72 p.
- Moreno, J.L., Sinton, P.O., **Bartlett, R.D.**, Williamson, A.L., 2002, A Method for Simulating Pit Lake Development and Passive Containment Resulting from Complex Geometry Pit Lakes; Presented at the EPA Hardrock Mining Conference, Denver, Colorado, May 7-9, 2002.
- Bartlett, R.D.**, Moreno, J.L., Williamson, A.L., 1999, Demonstrating Passive Hydraulic Containment for an Open Pit Copper Mine; in Proceedings of the Society of Mining Engineers Annual Meeting, Denver, Colorado, March 1-3, 1999.
- Gailey, R.M., and **Bartlett, R.D.**, 1998, A Linear Programming Application for Water Resource Management at a Mining Operation, in Proceedings of the 25th Annual Conference on Water Resources Planning and Management, ASCE Water Resources Planning and Management Division, Chicago, Illinois, June 7-10, 1998.
- Moreno, J.L., **Bartlett, R.D.**, and Townsend, P.H., 1997, Using Groundwater Models in Remediation Decisions, Invited Paper presented at the ASCE Water Resources Planning and Management Conference, Houston, Texas, April 7-10, 1997.
- Bartlett, R.D.**, and Cruse, L.T., 1996, Groundwater Supply in the Carefree/Cave Creek Basin; in Proceedings of the Ninth Annual Symposium of the Arizona Hydrological Society, Prescott, Arizona, September 12-14, 1996, p. 149-151.
- Bartlett, R.D.**, Fisher, G., Hussey, J.R., Cruse, L.T., Weitzman, M.J., 1993, Performance Evaluation of the Motorola 52nd Street Operable Unit Extraction Well System; in Proceedings of the Sixth Annual Symposium, Arizona Hydrological Society, Casa Grande, Arizona, September 23-24, 1993, p. 31-43.
- Moreno, J.L., and **R.D. Bartlett**, 1987. Ground-Water Model Planning: The Limitations of Data; Proceedings: Waste Management Conference; Focus on the West, Colorado State University, June 1-3, 1987.

## Professional Affiliations

American Society of Civil Engineers; Member, Managed Aquifer Recharge Standards Committee  
National Ground Water Association  
Arizona Hydrological Society (past Phoenix Chapter President)  
American Institute of Professional Geologists; President-Elect, Arizona Section  
International Association of Hydrogeologists  
Society of Mining Engineers

