



#### Assignment

*Associate Scientist II*

*Department Head, Innovative Technologies*

#### Education

*M.S., Geological Sciences, Indiana University at Bloomington, 1991*

*B.A., Geological Sciences and Environmental Studies, University of California at Santa Barbara, 1987*

#### Additional Training & Certifications

*CPR & First Aid Training*

## Andrew Malone Associate Scientist II

#### Summary

Mr. Malone has 15 years of experience in water resources and the geologic sciences. His technical expertise is in the areas of sedimentary geology, tectonics, basin characterization, hydrogeologic and hydrologic analyses, aquifer mechanics, Geographic Information Systems (GIS), and database design and implementation.

Mr. Malone received a B.A. in Geological Sciences and a B.A. in Environmental Studies from the University of California at Santa Barbara in 1987, and a M.S. in Geological Sciences from Indiana University at Bloomington in 1991. His MS thesis was published in a regional geologic journal and won the journal's Best Paper Award for 1992. His professional experience includes employment as a field geologist for the Indiana State Geological Survey, and as a geology instructor at Saddleback College in southern California. His most significant work since joining WEI has been re-defining groundwater sub-basin boundaries and re-calculating water quality objectives in the Santa Ana River watershed to support the Regional Board's revision of its Water Quality Control Plan in 2004.

Mr. Malone is an artist at WEI. He is the department head of the Innovative Technologies group at WEI whose mission is to develop pioneering software tools to support the work efforts of WEI staff and its clients. He also manages and/or conducts project work where his hydrologic and hydrogeologic expertise is required.

#### Selected Project Experience

##### **Wildermuth Environmental, Inc. – 1996 to Current**

##### **Hydraulic Control Monitoring Program, Chino Basin Watermaster**

**Principal Geologist:** Mr. Malone is the principal geologist in on-going investigations to determine the state of groundwater outflow from the Chino Basin as surface water in the Santa Ana River. Crucial groundwater management practices, such as recharge of recycled water, is dependent upon basin producers demonstrating that they are controlling this groundwater outflow as surface water. Through an extensive literature review and analysis of geologic, geophysical, and hydrologic data, Mr. Malone generated a conceptual hydrogeologic model of the Chino Basin near the river. Using this model he developed a detailed groundwater monitoring program that includes

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the construction of nine (9) nested, multiple-depth monitoring wells. Data derived from this monitoring program will characterize (1) the three-dimensional piezometric gradients in this part of the basin over time and in response to specific management practices, and (2) the hydraulic relationships between the groundwater basin and the river.

### [Land Subsidence Monitoring Programs, Chino Basin Watermaster](#)

**Principal Geologist:** Project manager in on-going investigations to determine the extent and mechanisms of land subsidence and ground fissuring in Chino Basin. A common cause of ground fissuring within alluvial basins is the removal of subsurface fluids resulting in compaction of poorly-consolidated aquifer materials and land subsidence. These investigations have included the analysis and synthesis of conventional ground-level survey data, remote sensing data, geologic and geophysical data, and groundwater level and groundwater production data. Mr. Malone supervised the construction of multiple-depth piezometers and a dual-borehole extensometer, a highly-sophisticated monitoring facility that is currently recording the necessary data to establish the relationships between pore-pressure changes

and aquifer-system compaction in an area of acute subsidence and historical ground fissuring.

The results of these investigations will be used to develop a management plan in Chino Basin that will minimize and/or abate permanent land subsidence and ground fissuring.

### [Groundwater Storage & Recovery Programs, Chino Basin Watermaster](#)

**Principal Geologist:** Conducted a study that predicted the water level and water quality impacts of various proposed groundwater storage and recovery programs in Chino Basin. The study included the construction of a three-dimensional transient groundwater flow model. Mr. Malone developed, within a GIS environment, a conceptual hydrogeologic model of Chino Basin for input to the groundwater flow model. He was part of the team at WEI that constructed, calibrated, ran, and verified the flow model.

### [Development of a Watershed Management Program, San Timoteo Watershed Management Authority](#)

**Principal Geologist:** Mr. Malone developed a watershed management program in the San Geronio Pass area. The first phase of this process required the detailed characterization of the

various groundwater basins in this region.

Mr. Malone characterized these basins with regard to geology, groundwater levels and storage, and land subsidence. These characterizations required a thorough literature review, hydrogeologic database and GIS construction from various data sources, hydrogeologic analysis using such data, and reporting via paper copy and the World Wide Web.

### [Nitrogen / Total Dissolved Solids \(N/TDS\) Task Force, Santa Ana Watershed Project Authority](#)

**Principal Geologist:** The study for this project will revise water quality objectives for groundwater sub-basins throughout the Santa Ana River Watershed. He developed revised sub-basin boundaries based on a reassessment of hydrogeology, groundwater flow paths and groundwater quality to create management zones for more effective stewardship of the health of these systems. As part of the first phase of this study,

Mr. Malone assisted in the development and testing of sophisticated statistical techniques to set objectives for TIN and TDS based on historical water quality data. As part of the second phase of the study, he has coordinated a massive water quality, water level and well construction data collec-



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tion program throughout the San Ana Watershed. The statistical techniques developed in the first phase were applied to the newly-collected data.

In addition, as part of this study, Mr. Malone has assessed the impact of reclaimed water projects on groundwater and surface water quality and has developed first-order nitrogen loss coefficients for several recharge facilities in Southern California (Hidden Valley Wetlands Enhancement Project (City of Riverside), Rapid Infiltration-Extraction (RIX) Regional Tertiary Treatment System (Cities of San Bernardino and Colton), and Anaheim Lake (Orange County Water District)). Working with the Regional Water Quality Control Board, Santa Ana Region, this study has developed watershed and facility-specific nitrogen loss coefficients that can then be used to develop total inorganic nitrogen limitations on discharges from wastewater treatment plants.

#### Water Level Monitoring Programs, Chino Basin Watermaster

**Principal Geologist:** Developed monitoring programs for groundwater levels in Chino Basin. He also developed the database to store and retrieve these data in support of the following tasks: estima-

tion of changes in groundwater storage over time; establishment of groundwater-level and groundwater storage baseline for future storage and recovery programs; estimation of desalter well field impacts on surrounding producers, and assistance in computer simulations of groundwater flow, subsidence, and other phenomena.

#### Groundwater Contamination Superfund Site, Confidential Client

**Principal Geologist:** Assisted in a study to determine the potential source or sources of a groundwater plume containing volatile organic compounds (VOCs), primarily trichloroethene (TCE) and tetrachloroethene (PCE).

Mr. Malone's main contributions to the study have been in the construction of groundwater level contour maps, the refinement of the effective bottom of the freshwater aquifer contour map, velocity flow field definition and the volumetric calculation of VOCs in the groundwater plume.

He has performed an extensive review and collection of literature, geophysical and well construction data in the study area. He has developed a comprehensive GIS and database (water level and

water quality) for the production and monitoring wells overlying the plume.

#### Trabuco Creek Study, Santa Margarita Water District

**Principal Geologist:** Characterized and analyzed the hydrogeology of narrow alluvial aquifers underlying Trabuco and San Juan Creeks as a possible water supply source. The main tasks of this investigation were to determine the longitudinal volumetric flow rate of groundwater through the aquifers under equilibrium conditions and to determine the continuity between sub-basins along the creeks.

#### Recharge Monitoring Program, Chino Basin Water Conservation District

**Principal Geologist:** Assisted in the design of a monitoring program to track inflows, outflows and groundwater recharge at seven spreading basins owned by Chino Basin Water Conservation District. Pressure-sensitive transducers were installed below the basin floors and were calibrated and set to record water level elevation within the basins on a ten-minute interval. Combining this water level information with accurate storage elevation-outflow curves enabled the estimation of percolation rates and volume of water recharged to the groundwater aquifer at each basin. These estimates will be used in existing and future groundwater models of the Chino groundwater basin.

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### Hayfield Lake Recharge Feasibility Study, URS Greiner Woodward Clyde

**Principal Geologist:** Assisted in an investigation of the gross recharge capability of the Hayfield Lake area. Hayfield Lake was flooded with Colorado River water for a nine-month period in 1999 and 2000. Mr. Malone installed and maintained a temporary weather station adjacent to the lake to monitor pan evaporation, rainfall, wind speed, wind direction, solar radiation and relative humidity. Weather data and time histories of lake level and Colorado River water discharge to the lake were analyzed to determine percolation rates and volume of Colorado River water recharged to the regional aquifer. To conduct this analysis, Mr. Malone designed and constructed a GIS of the Hayfield Lake area, which included a digital elevation model (DEM) of Hayfield Lake, and geographic coverages of geology and measured lake extents over time. The digital elevation model was constructed by combining data from various sources, including USGS DEMs, USGS digital line graphics, and topographic survey data. This three-dimensional model of Hayfield Lake, combined with a time history of lake level, allowed for estimation of lake extent and lake

volume over time. Using selective period analysis, Mr. Malone calculated gross percolation rates, changes in percolation rates relative to lake level, changes in percolation rates over time, percolation rates for specific lake bottom sediments, total volume of Colorado River water recharged to the regional aquifer, and volumetric losses to evaporation.

### Other Experience (pre-1996)

#### Saddleback College, Mission Viejo, California

**Geology Teacher:** At Saddleback College, Mr. Malone taught introductory geology courses and laboratories. He was responsible for creating all lecture and laboratory materials and exams. The courses would culminate in a one-day field trip to sites of local geologic interest, which Mr. Malone would lead. Class size varied between 25-30 students per semester.

#### Indiana Department of Natural Resources, Geological Survey, Bloomington, Indiana

**Field Geologist:** Mr. Malone's work as a field geologist for the Indiana State Geological Survey centered on a geologic mapping project sponsored by a United States Geological Survey (USGS) grant. He compiled a 7.5-minute quadrangle geologic map of Pennsylvanian

sandstone, shale and limestone outcrops in western Indiana. Through this work, he observed and documented primary sedimentary features within the rocks which supported an estuarine depositional environment with tidal influences.

#### Shell Offshore, Inc., New Orleans, Louisiana

**Exploration Geologist:** Mr. Malone was employed as an exploration geologist by Shell Offshore, Inc. in New Orleans as an intern during his graduate work at Indiana University. He was given the task of identifying LSG (low saturation gas) within Mississippi River deltaic sediments in the Gulf of Mexico, and finding a pattern to its occurrence. This work required the analysis and comparison of high-density, 3-D seismic profiles and well log data.

### Affiliations / Organizations

International Association of Hydrogeologists  
National Ground Water Association  
American Water Resources Association  
Inland Geological Society  
Groundwater Resources Association of California

