

SPECIALIZATION

Mr. Frank is an Associate Hydrogeologist with Whetstone Associates who specializes in ground and surface water studies, State, Federal, and International permitting, and multi-disciplinary environmental project management. In his 25 years of international professional experience, he has published geologic maps with the U.S. Geological Survey, worked as a professional geologist for the mineral industry, and for the last 14 years has been a professional hydrogeologist and hydrologist. Mr. Frank has completed and managed numerous ground and surface water technical studies, water supply projects, water resource pre-feasibility and feasibility level studies for industry and financial institutions and environmental and permitting documents under the jurisdiction of various domestic and international regulatory agencies. He has provided expert testimony for industry to government regulatory agencies and for several legal cases.

EDUCATION

Master of Science, Hydrogeological Science, University of Colorado	1987
Bachelor of Arts, Geological Science, University of Colorado	1979

PROFESSIONAL AFFILIATIONS AND CERTIFICATION

Environmental Manager Certified by the Nevada Division of Environmental Protection
Association of Ground Water Scientists and Engineers, NWWA
Colorado Ground Water Association
Geological Society of America
International Mine Water Association

WORK HISTORY

Whetstone Associates, Associate Hydrogeologist and Project Manager, 2001 – present
HydroGeo Inc, Principal, 2001 - present
TRC Hydro-Geo, Inc., Senior Project Manager / Hydrogeologist, 1988 – 2001
Independent Consultant, Hydrogeologist, 1979-1988
U.S. Geological Survey, Geologist, 1976-1979

REPRESENTATIVE PROJECT EXPERIENCE

- *Coeur Rochester, Rochester Mine, Nevada* - Ground water supply study, including installation of deep bedrock wells, repair of existing wells, and evaluation of entire project supply system.
- *Hecla Mining Company, Rosebud Gold Mine, Nevada* - Ground water supply study, including TDEM geophysical survey, installation, and testing deep bedrock wells.
- *Glacier Lily Estates* – Completed a water supply evaluation study for Glacier Lily Estates Subdivision, Crested Butte, Colorado.
- *Smith Hill Estates* – Completed a water supply evaluation study for the proposed Smith Hill Estates Subdivision, Crested Butte, Colorado.
- *Mountain Coal Company, West Elk Mine, Colorado* – Perform hydrologic monitoring program for the project including routine ground and surface water monitoring, database management. Complete Annual Hydrologic Reports as part of the mine’s permit requirements for the Colorado Division of Minerals and Geology. Perform special technical hydrologic studies for the West Elk Mine.
- *Dudley And Associates, Llc, Seminoe Road Project* – Perform hydrologic monitoring program for the project including baseline ground and surface water studies, NPDES monitoring, database management, and completion of NPDES Monitoring Reports for the Wyoming Department of Environmental Quality.

- *Dudley And Associates, Seminoe Road Cbm Project, Wyoming* – Completed the developed the project’s surface and ground water monitoring program, Water Management Plan, assisted with the NPDES permitting, completed the surface and ground water sections of the Seminoe Road Pilot Project EA, and designed and installed water treatment system.
- *Echo Bay Minerals Company, K2 Mine, Washington* – Mine water inflow investigation for the K2 gold mine. The study involved drilling underground boreholes, performing packer permeability tests, and evaluating complex mine geology, hydrogeology, and future mine development plans.
- *Echo Bay Minerals Company, Key West Mine, Washington* - Developed a predictive geochemical model for the Key West Pit Lake. Equilibrium methods were used to identify and constrain geochemical controls of pit lake water quality. The study incorporated humidity cell, acid-base accounting, and whole rock geochemical data.
- *Echo Bay Minerals Company, Key Mill And Tailing Facility, Washington* - Developed a predictive geochemical model for the Key Mill and Tailings Facility. The study incorporated seepage and attenuation tests and modeling to determine the transport and fate of cyanide in the case of leaks or spills at the facility. Results of the study were incorporated into the record of decision from the BLM and WDOE.
- *Echo Bay Minerals Company, Key Mill And Tailing Facility, Washington* – Hydrochemical analysis and impact assessment of expansion of the Kettle River Tailings Facility and other potential sources of contamination at the Key Mill Site.
- *Echo Bay Minerals, Lamefoot Mine, Washington* - Statistical analysis and characterization of ground water quality.
- *Echo Bay Minerals Company. North Lamefoot Mine Expansion; Republic, Washington.* Surface and ground water characterization and impact study and sections of the Environmental Assessment.
- *Echo Bay Minerals Company. Lamefoot Mine Expansion; Republic, Washington.* Surface and ground water Characterization And Impact Study And Sections Of The Environmental Assessment.
- *Echo Bay Exploration, Inc., And Acz Inc. Kettle River and Lookout Mountain Underground Gold Mines; Curlew, Washington.* Surface and ground water baseline study, and sections of the EIS.
- *Hecla Mining Company, Rosebud Mine, Nevada* - Performed a hydrogeologic characterization of the project area, and evaluated the potential impacts to ground water quality from underground mining. Predictions for post-mining water quality were made based on equilibrium modeling and kinetic data. The final report was included as an appendix to the Environmental Assessment (EA).
- *Hecla Mining Company And U.S.B.L.M., Rosebud Gold Mine, Pershing County, Nevada.* EIA for the proposed underground gold mine. Study included surface, ground water, and geochemical sections.
- *Hecla Mining Company, Rosebud Gold Mine, Pershing County, Nevada.* Final Closure Plan for the underground gold mine. Study included ground water modeling to predict potential environmental impacts due to mine filling.
- *Minera Alumbreira, Alumbreira Project, Argentina* – Developed predictive geochemical model for post-mining flooding of the Alumbreira Open Pit.
- *Minera Alumbreira, Ltd, Alumbreira Project, Argentina* – Reviewed a regional MODFLOW model developed by an Argentine consulting company for the project.
- *Minera Alumbreira, Ltd, Alumbreira Project, Argentina* - Completed a MODFLOW model to the Campo Arenal well field. The model was used to design the well field, and assess potential impact from long term pumping on local and regional water resources. The model was used in support of the projects’ EIA (environmental impact assessment) and permitting.
- *Minera Alumbreira, Ltd, Alumbreira Project, Argentina* - Completed a regional ground water flow and contaminant transport model (MODFLOW and MT3D) for the Alumbreira mine facilities, including the open pit, plant site, and tailings impoundment. The model was used to assess potential impacts of the project and was used in support of the projects’ EIA (environmental impact assessment) and permitting.

- *Newmont Gold Company, Gold Quarry Mine South Operations Area Project Area Expansion, Elko and Eureka Counties, Nevada.* Draft and Final surface and ground water sections of the EIS. The Bureau of Land Management and Greystone manage the project.
- *Newmont Gold Company And Blm, Soapa Mine Expansion Project, , Elko Nevada* – Reviewed and verified a complex regional 3D ground water flow model and code (MINEDW) and completed surface and ground water sections of the environmental impact statement for the project.
- *Newmont Gold Company And Blm, Cummulative Impact Study, Humboldt River System, Blm, Elko Nevada* - Reviewed and verified a complex regional 3D ground water flow model and code (MINEDW) and completed hydrogeology sections of the document. This document was used in support of Newmont’s the West Leesville Mine and SOAPA EIS’s, and Barrick’s Post-Betze Mine EIS.
- *Fluor Daniel, Batu Hijau Project, Indonesia* – Developed a finite difference (MODFLOW) ground water model to simulate a pumping well field in a shoestring alluvial aquifer. Model results were used to design a water supply well field for the mine and to predict the effects of pumping on surface water resources. The potential for seawater incursion into the aquifer was also evaluated. Model results were in good agreement with the installed well field.
- *Fluor Daniel, Minera Alumbrera Project, Argentina* – Performed ground water flow modeling (MODFLOW) for the Tailings Impoundment Pump Back System. Project work also included the design, installation, and testing of the well field. Nine large diameter extraction wells were installed to depths of 200 meters.
- *Southern Perú Copper Corporation, Perú* – Reviewed and audited surface and ground water monitoring network for Toquapala and Cuajone mines, and SPCC smelter and port facilities. Presented short courses for design of ground water monitoring networks, ground water modeling, and geochemical modeling.
- *Zambia Consolidated Copper Mines, Ltd, Konkola Mine, Zambia* – Developed and calibrated a 3D finite element MODFLOW model for mine dewatering and provided recommendations for future dewatering strategies for the Konkola underground copper mine. The Konkola mine is one of the wettest mines in the world and dewatering is a major cost consideration. The mine is located on the Zambian Copperbelt.
- *Lac Minerals U.S.A., Ortiz Mine, New Mexico* - Developed a predictive geochemical model for the Ortiz Pit Lake. Equilibrium methods were used to identify and constrain geochemical controls of the pit lake water composition. The model incorporated humidity cell, acid-base accounting, XRD, microprobe and limnologic data to estimate the long-term water quality. Chemical profiles were developed from samples collected at various depths to investigate the potential for stratification of the lake.
- *Lac Minerals U.S.A., Coliseum Mine, California* - Developed a predictive geochemical model for closure of the Coliseum Pit Lake. The model used equilibrium methods to identify and constrain geochemical controls of pit lake water quality, and incorporated humidity cell, acid-base accounting, and whole rock geochemical data. Chemical profiles were developed to investigate the potential for stratification of the lake.
- *North Fork Coal Mines, Delta And Gunnison Counties, Colorado.* Draft and Final surface and ground water sections of the EIS. The U.S.D.I Bureau of Land Management and U.S.D.A. Forest Service managed this recently completed project, and project was completed within schedule and on budget.
- *U.S. Forest Service, Energy West Mining Company, And David Evan And Associates.* Surface water sections of an EIS, including a study of the mining related impacts, including subsidence, on surface water quality and quantity for the Cottonwood Coal Lease Tract, Emery County, Utah. The on-going project involves preparation of preliminary and final EISs and extensive coordination with the U.S.F.S., U.S.B.L.M., and Utah State Agencies.
- *U.S. Forest Service And Battle Mountain Gold Company.* Surface and ground water portions of an extensive EIS including a study of the mining impacts on surface water quality and quantity, pit-lake filling, water quality, and overflow for the Crown Jewel Gold Project, Okanogan County, Washington. The project involved preparation of preliminary and final EISs and extensive coordination with the U.S.F.S., WA Department of Ecology, U.S.B.L.M., U.S.F.&W.L., EPA, and COE.
- *Usmx Inc., And Science Applications International Corporation. Thunder Mountain Project; Valley County, Idaho.* Surface and ground water parts of an EIS for the proposed Dewey Open Pit Gold Mine.

- *Kensington Venture Partners, And U.S. Forest Service. Kensington Underground Gold Mine; located in the Tongass National Forest, North of Juneau, Alaska.* Surface and ground water sections of the EIS for the proposed Kensington underground gold mine.
- *U.S. Forest Service, Stibnite Mine Inc., And Dakota Mining Corporation. Stibnite Open Pit Gold Mines; Valley County, Idaho.* Surface and ground water study for the completion of EIS involving detailed surface water hydrologic and geomorphic investigations and extensive coordination with the USFS, COE, USF&WL, and state agencies.
- *U.S. Blm And Santa Fe Pacific Gold Corporation.* Surface and ground water portions of an EIS for the Mule Canyon Project, Lander County, Nevada.
- *Meridian Minerals, Inc, U.S. Forest Service (Salmon National Forest). Beartrack Open Pit Gold Mine; Lemhi County, Idaho.* Surface and ground water sections of the EIS including sediment yield modeling for the EIS.
- *Sei, U.S. Bureau Of Land Management, And U.S. Forest Service, Bowie and Oxbow Coal Mines, Delta and Gunnison Counties, Colorado.* Completed ground and surface water sections of the North Fork Coal EIS resulting in the issuance of a Record of Decision in only 18 months.
- *Cyprus Twentymile Coal Mine Company, Twentymile Coal Mine, Routt County, Colorado.* Hydrogeologic study for the Eastern Mining District. Study included calculations of ground water inflow in the mine and the potential impacts of subsidence due to longwall mining operations on surface and ground water resources.
- *Cyprus Coal Company, Foidel Creek Coal Mine, Routt County, Colorado.* Study of the potential impacts of a longwall mining operation on surface and ground water resources, including a permit to mine under an alluvial valley floor.
- *Arco Coal Company, Mt. Gunnison Mine, Gunnison County, Colorado.* Geotechnical and hydrological study with mine water inflow calculations and recommendations on how to alleviate hydrologic problems.
- *Marston And Marston, Inc., Bengalon Coal Mine, Kalimantan, Indonesia* Coal resource evaluation for a due diligence study for an independent power company.
- *Southern Ohio Coal Company And American Electric Power Service Corporation, Meigs Coal Mine, Benton County, Ohio.* Hydrologic study of the potential impacts of longwall mining operations on surface and ground water resources.
- *Windsor Coal Mine And American Electric Power And Service Corporation, Windsor Coal Mine, Ohio County, West Virginia.* Probable hydrologic consequences study of mining at the Windsor Coal Mine.
- *Windsor Coal Mine And American Electric Power And Service Corporation, Huff Run Acid Water Treatment Plant, Ohio County, West Virginia.* Hydrogeologic study of the potential impacts of the acid water treatment plant on surface and ground water resources.
- *Windsor Coal Mine And American Electric Power And Service Corporation, West Virginia-* Installation and testing of a water supply well for the underground coal mine.
- *Southern Ohio Coal Company And American Electric Power And Service Corporation, Martinka No. 1 Mine, Marion County, West Virginia.* Hydrogeologic study for mine permits, assistance on completion of annual reports and various studies of mine impacts on surface and ground water resources.
- *Cyprus Shoshone Coal Company, Shoshone Coal Mine, Carbon County, Wyoming.* Hydrogeologic study for the mine permits, assistance on completion of annual reports and various studies of mine impacts on surface and ground water resources.
- *Gulf Mineral Resources Company, Wildcat Mine, Campbell County, Wyoming.* Hydrogeologic studies for the proposed open pit coal mine.
- *Mountain Coal Company And Agapito Associates, West Elk Coal Mine, Gunnison County, Colorado.* Hydrogeologic study including packer permeability testing and calculations of ground water inflow into a proposed ventilation shaft.

- *Amax Coal West, Inc. And Marston And Marston, Inc., Belle Ayr Mine, Campbell County, Wyoming.* Assistance in installation and testing of open pit dewatering wells.
- *Idemitsu Alaska, Inc. And Mckinley Mining Consultants, Inc., Wishbone Hill Coal Mine, Palmer Alaska.* Preliminary hydrogeologic study for the open pit coal mine.
- *Sun Energy Development Company, Long Canyon Coal Project, Rock Springs, Wyoming.* Supervision of coal exploration drilling project and compilation of geologic maps and sections.
- *Sun Energy Development Company, Maysdorf Coal Project, Campbell County, Wyoming.* Supervision of coal exploration drilling project and compilation of geologic maps and sections.
- *Sun Energy Development Company, Sage Point Coal Project, Emery County, Utah.* Supervision of coal exploration drilling project.
- *Sun Energy Development Company, Ferron Canyon Coal Project, Emery County, Utah.* Supervision of coal exploration drilling project and coal outcrop field mapping.
- *U.S. Geological Survey, Conservation Division, Coal Resource Evaluation Project, Wasatch Plateau, Utah.* Field mapping, supervision of exploration drilling, and compilation of the geologic maps and coal sections of the Mahogany Point, Red Point, Ferron Canyon, Joe's Valley, The Cap, East Mountain, Trail Mountain, Miller Flat, Huntington Canyon, and Gentry Mountain quadrangles.
- *Bcr Industries, Phase I And Ii Site Investigation Studies For Hydrocarbon Contamination Of Ground Water, Colorado* – Performed hydrogeologic site investigation studies and developed monitoring programs for numerous projects concerning volatile organic hydrocarbon (including BTEX) contamination of ground water systems. Clients included Bold Petroleum, Amoco, Texaco, Cheyenne Mountain School District, and other independent operators.
- *Barritt Resources, Hanna Draw Cbm Project, Wyoming* – Completed a hydrogeochemical study and stable isotope analysis to characterize and age date ground and surface water resources in the project area.
- *Energy Red Willow Company (Southern Ute Tribe Energy Resource Division), Ground Water Monitoring System, Colorado* – Designed, installed a ground water monitoring system for the Southern Ute Tribe Energy Resource Division Coal Bed Methane Field, located in the San Juan Basin, Southwestern Colorado. The project included the installation of deep monitoring wells to monitoring the performance of dewatering operations and generation and pressure of methane and hydrogen sulfide gases near the outcrops.
- *Groundwater Technology Inc. (Gti), Phase I And II Site Investigation Studies For Hydrocarbon Contamination Of Ground Water, Colorado And Masseurachusetts* – Performed phase I and II site investigation studies and developed monitoring programs for numerous projects concerning volatile organic hydrocarbon (including BTEX) contamination of ground water systems. Clients included Amoco, Chevron, Shell, Public Service Company of Colorado, and other independent operators.
- *Park Envirotech* – Hydrogeologic site investigation and installation of monitoring system for gas and diesel contaminated ground water for St. Anthony's Hospital, Denver, Colorado.
- *Duke Energy Company With Trc Drc* – Hydrogeologic site investigation studies and implementation of monitoring programs at various projects in Wyoming, Texas, and Utah.

PUBLICATIONS

Alumbrera Mine Water Resource Evaluation and Environmental Program, Catamarca Argentina. Latin American Geological Congress, 1998

Impacts of Longwall Mining on the Local Hydrology and Water Resources, West Virginia. IMWA, 1993.

A Study of the High Resolution Stratigraphy of the Dakota Group Aquifer in the NW Denver and Laramie Basins.

Geologic Maps and Coal Sections of the Mahogany Point and Red Point Quadrangles, Emery County, Utah.