



Who should attend this course?

This course was designed to be of interest to any environmental or groundwater professional, novice or experienced, who deals with projects that have a component related to groundwater quality analysis, water quality data management or groundwater modeling.

When do I register?

Register now and take advantage of the **Early Registration Special**. Register 3 months prior to the course date and receive a \$100 USD discount!

How do I register?

- Register online at www.swstechnology.com. Click on **Training** and **Register Now**.
- Or complete the registration form on the back and fax it to us!

Can't make the Course?

Contact us about our "ON-SITE Custom Training" program. We're ready to deliver any one of our popular courses or tailor the course topics to address your specific organizational needs!

Questions? Contact Us!

Schlumberger Water Services
460 Phillip Street - Suite 101
Waterloo, Ontario, Canada N2L 5J2
Tel: +1 519-746-1798 Fax: +1 519-885-5262
Email: sws-training@slb.com
www.swstechnology.com

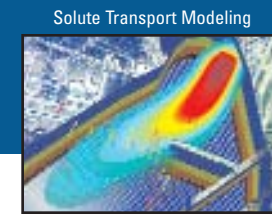
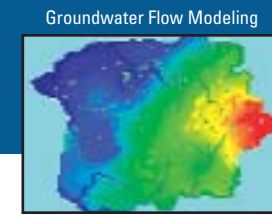
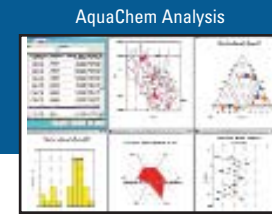
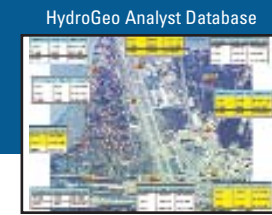
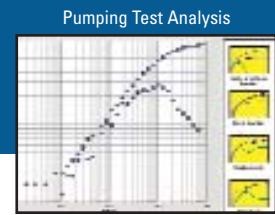
Course Objectives

From hands-on experience, you will learn...

- How to use HGA to develop a database of site information (geology, hydrology, contaminants)
- How to interpret pumping test and slug test data using AquiferTest Pro
- How to develop a water quality database using AquaChem
- How to model geochemical changes beneath the site using PHREEQC
- How to develop a groundwater model using MODFLOW to assess the site water balance
- How to simulate contaminant transport using MODFLOW and MT3D/RT3D
- How to present the results in tables, figures and animations using all of the above programs

Course Schedule Note: Breaks & lunches are not listed

Day	Activity	Topic
Day 1	Lecture	Groundwater Modeling for Mining Applications
	Lecture	Hydrogeology of a Mine Site
	Exercise	Pumping Test Analysis at a Mine Site
	Lecture	Site Characterization & Data Management for Modeling
Day 2	Lecture	Principles of Groundwater Modeling
	Exercise	Regional Groundwater Analysis using MODFLOW
Day 3	Lecture	Groundwater Quality Data Management
	Exercise	Water Quality Data Management using AquaChem
Day 4	Lecture	Principles of Contaminant Transport Modeling
	Exercise	Deadwood: Modeling Mine Tailings Leachate
Day 4	Break	Course Evaluations
	Exercise	Open Pits: Modeling Transient Groundwater Impacts



Modeling for the Mining Industry Site Characterization, Geochemistry, Groundwater Flow and Solute Transport Analysis

There are increasingly greater amounts of data available to characterize mine sites, and this is useful in the development, operation and closure of mining operations. However, it is necessary to integrate the disparate sources of data, and to understand the software tools that are available to help make decisions about how to plan and operate a mine site. This 4-day modeling course was designed to present the theory behind site characterization, database management, water quality data analysis, and groundwater flow and solute transport modeling for mine site assessment. The course starts with an introduction to the data that is available to characterize the geologic, hydrogeologic and geochemical conditions at a mine site and the benefits of hydrogeologic analysis using AquiferTest. Data storage in a referential database (using HydroGeo Analyst) makes it easy to use this data for the hydrogeologic characterization of the mine site. Water quality database management and geochemical modeling (using AquaChem) are covered to introduce the importance of water quality analysis at a mine site. Groundwater flow modeling is illustrated using Visual MODFLOW as a tool for estimating the amount of groundwater at the site, how it can be dewatered and the optimization of the dewatering process. Finally, an overview of solute transport mechanisms within the groundwater environment, and the use of reactive transport modeling to predict potential impacts from mine site waste are illustrated with Visual MODFLOW. This course is ideally suited for hydrogeologists and environmental professionals concerned with assessing mine site development, mine operations and contamination, and mine site decommissioning, who wish to advance their modeling knowledge, and whose responsibilities include model development, review, planning and project management.

Course Topics

- Introduction to groundwater modeling for mining applications
- The hydrogeology of a mine site
- Pumping test analysis for hydrogeologic characterization
- Site characterization and data management using HGA
- Principles of groundwater modeling
- Developing MODFLOW models to assess regional water balances
- Using MODFLOW to assess mining operations (tunneling, open pits)
- Groundwater quality data management at a mine site
- The use of AquaChem and PHREEQC for water quality assessment
- Contaminant transport modeling using MODFLOW and MT3D/RT3D
- Creating model results for client presentations using all course software

Aquifer Performance Test Analysis

Part of site characterization is the determination of the hydrogeologic parameters that represent the geology at the site. Most commonly, pumping tests are completed at test wells around the site to estimate hydraulic conductivity and storativity of aquifers and aquitard beneath the site. AquiferTest Pro is a graphic user interface that allows you to analyse field data from pumping tests and slug tests to determine aquifer parameter for hydrogeologic analysis and groundwater modeling.

Site Characterization and Data Management

There is potentially a great deal of information on the hydrogeology, hydrology and geochemistry at a mine site. Site characterization, which integrates this disparate information, is an integral part of the development of a solution for assessing the impacts of mine operations on the surrounding natural environment. HydroGeo analyst is comprehensive data management software designed to efficiently manage all sources of environmental data. HGA is ideal for compiling data, analyzing borehole logs, developing cross-sections of the subsurface environment, mapping spatial data and providing input files for groundwater modeling when assessing the environmental impact of a mine.

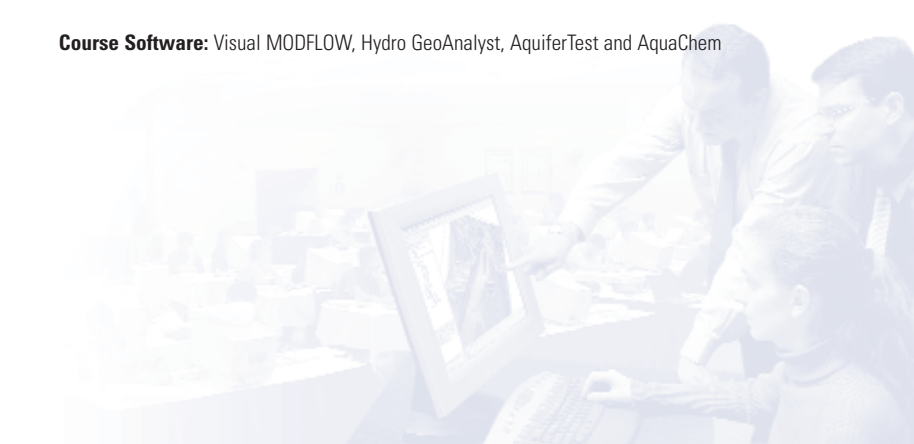
Water Quality Data Management

The storage and management of large volumes of water quality data in a suitable format is a major challenge in geochemical interpretation and analysis. This is important in the environmental impact assessment of mine tailings leachate production from waste rock. AquaChem provides a database environment for the storage, analysis and reporting of water quality data at a mine site, and the analysis of geochemical evolution mine tailings leachate using PHREEQC to model dissolved concentrations in groundwater.

Groundwater Modeling

There are numerous applications of groundwater modeling software for the environmental impact assessment of a mine site. Groundwater models can be used to predict the regional groundwater budget for a mine site, the impact of dewatering on surrounding natural features (wetlands, rivers, ...), and to determine the time history and volume of groundwater extracted during dewatering operation. Groundwater models can also be used for contaminant transport analysis to predict the evolution of the contaminant plume that may migrate from the mine tailings pond. Visual MODFLOW is a graphical user interface that allows you to develop a groundwater flow and solute transport model of the hydrogeologic environment beneath a mine site.

Course Software: Visual MODFLOW, Hydro GeoAnalyst, AquiferTest and AquaChem



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