

WHI E-News Topics

2003 November Edition

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Waterloo Hydrogeologic, Inc. is a recognized leader in the development and application of environmental software and services.



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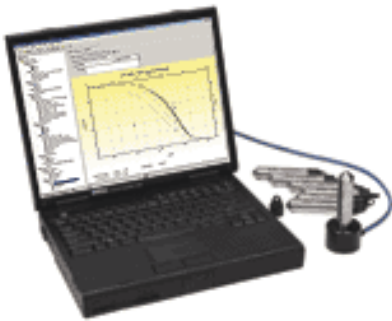
[Download](#) a demo now!

Collection, Analysis, and Reporting of Pumping Test & Slug Test Data

Pumping tests and slug tests are among the most common field methods for characterizing aquifer properties (K, T, S). With the introduction of dataloggers, collecting water level measurements is becoming an automated process. However, the issue of importing field-measured values into computer analysis programs has proven to be challenging - until now!

WHI has developed a direct import feature allowing all Solinst Levellogger™ .LEV files to be imported directly into AquiferTest Pro 3.5. This reduces the potential for errors typically associated with data transcription, and gets the hydrogeologist analyzing their data faster.

Solinst Levelloggers use a direct-read cable, providing the user with One-step connectivity from their Levellogger to their computer's Serial port. Once the Levellogger information has been imported into AquiferTest Pro, a few easy steps allow the user to evaluate the aquifer, and quickly determine the aquifer's properties, by selecting from a wide range of commonly used analysis methods.



AquiferTest Pro analysis methods include:

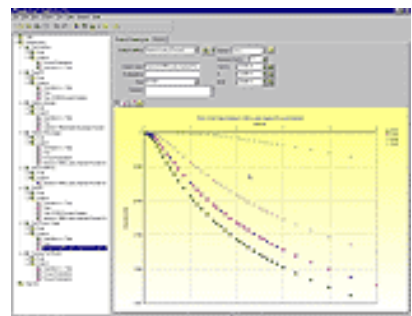
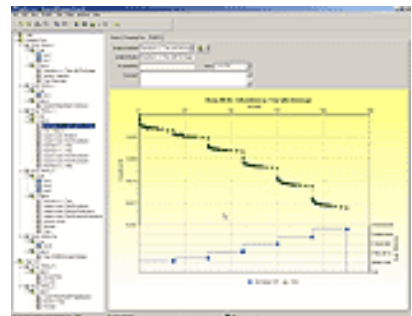
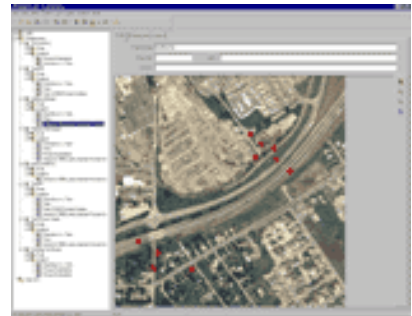
PUMPING TEST METHODS:

- » Theis (1937)
- » Cooper-Jacob Time-Drawdown
- » Cooper-Jacob Distance-Drawdown
- » Cooper-Jacob Time-Distance-Drawdown
- » Walton (Hantush-Jacob)
- » Neuman
- » Moench
- » Moench Fracture Flow
- » Theis Steptest
- » Cooper-Jacob Steptest
- » Theis Recovery
- » Hantush-Bierschenk Well Loss
- » Specific Capacity
- » Theis Prediction
- » Jacob Correction Factor

FORWARD/PREDICTIVE SOLUTIONS:

- » Theis

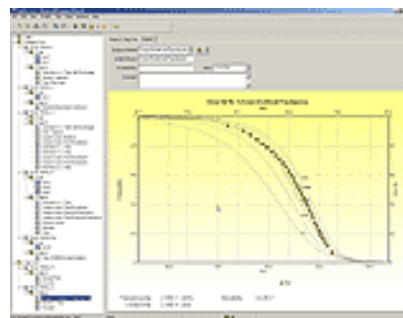
**Buy AquiferTest Pro
SAVE \$100**



- » Hantush-Jacob
- » Stallman (Barrier)
- » Stallman (Recharge)
- » Gringarten-Bourdet (Well Skin Effects)
- » Papadopoulos (Large Diameter Wells)

SLUG/BAIL TEST METHODS:

- » Hvorslev
- » Bouwer-Rice
- » Cooper-Bredehoeft-Papadopoulos



For the month of November,
SAVE \$100 when you purchase AquiferTest
or AquiferTest Pro!



For more information about how to purchase AquiferTest Pro or a Levelogger, visit our website or contact us today:

Website: http://www.waterloohydrogeologic.com/equipment/levelogger/levelogger_ov.htm

Email: sales@waterloohydrogeologic.com

Phone: (519) 746-1798

Quickly Generate Reports on Water Quality Data from your Analytical Lab Results

Analyzing and generating reports for water quality data from analytical lab results can be a time consuming task; particularly if you are using simple spreadsheet solutions such as MS-Excel™. With the release of AquaChem v.4.0, importing lab results, analyzing water quality data, and creating professional reports can all be done in just minutes!

Data Import Features:

- » Use the flexible import wizard to read-in virtually any file format generated by analysis laboratories (.TXT, .CSV, .PRN)
- » Import from a variety of row and column configurations
- » Automatically map CAS Registry numbers to source file
- » Save lab-specific import configurations for future use

Once you have imported your lab data, AquaChem has an abundance of analysis, modeling, and reporting features to help you with all your water quality projects.

AquaChem v.4.0 Features and Benefits:

Data Management: AquaChem uses an MS-Access™ relational data management system to ensure data integrity, improve performance, and provide the flexibility to add an unlimited number of organic/inorganic chemicals with customizable units - **NEW**

Water Quality Standards: Water quality exceedences are automatically highlighted following built-in guidelines from the United States EPA, World Health Organization (WHO), and Canadian Council of Ministers of the Environment (CCME). Users may also customize their own water quality guidelines - **NEW**

Analysis Plots: AquaChem offers 19 plotting methods used for water quality data analysis and reporting, including:

- » Piper, Durov, and Ternary (multi-parameter), Scatter, Histogram, and Time-Series (multi-station) - **NEW**
- » Schoeller, Ludwig-Langelier, Geothermometer, Giggenbach Triangle, Box and Whisker, Wilcox, and Depth Profile - **NEW**

Built-in Tools: Several time-saving utilities are included for unit conversions, species conversion, concentration decay calculations, volumetric concentration conversions, and quality assurance - **NEW**

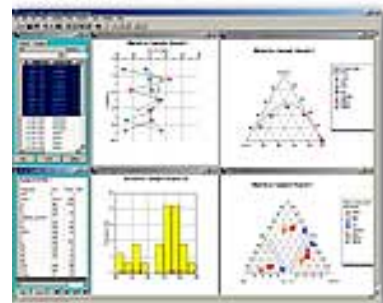
Reports: Create professional reports using the Report Designer, or save reports to .HTML, .CSV, .TXT, or .RTF formats, including:

- » Statistics - including the Mann-Kendall test for determining temporal trends - **NEW**
- » Sample Comparison, Correlation and Mixing

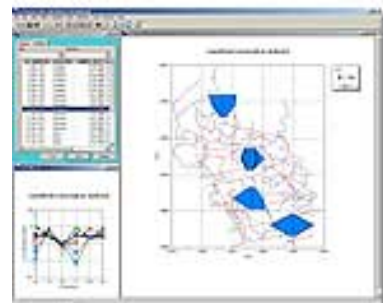
[AquaChem](#) is the most complete software package available for water quality data analysis, plotting and modeling!



Automatic highlighting of exceedences.



Standard water quality plots.

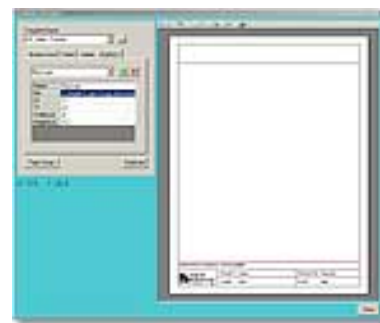


Stiff graphs over site map.

» Reliability Check - for evaluating the validity of calculated values - **NEW**

» Source Rock Deduction - **NEW**

Geochemical Modeling: Built-in link to PHREEQC v.2.8 for calculating saturation indices, pH values, and Eh values for selected samples, and automatically storing them in the database. Users may also launch the USGS PHREEQC-I program for more complex scenarios - **NEW**



Print Template Designer preview.

For more information about our AquaChem software, visit our website or contact us today:

Website: www.waterloohydrogeologic.com/software/aquachem/aquachem_ov.htm

Email: sales@waterloohydrogeologic.com

Phone: (519) 746-1798



Consulting News

WHI Applies Finite Element Models to Advance Water Budget Analyses

Typically, a water budget analysis is undertaken to quantify the volume of water entering and leaving a region, such as a watershed, stream tributary, or specific site. This analysis identifies the functional relationships between water budget components, and produces a current estimate that can be used to evaluate potential future system stresses. Water budget analysis has often been completed using one-dimensional steady-state hydrologic budget equations. The approximation of the water budget components in this manner is referred to as the lumped-parameter approach.

Considerable importance is given to the results of lumped-parameter analyses when decisions are made regarding permits for water taking or new developments. However, this approach does not take into account the three-dimensional spatial variation in physical parameters that define the interactions between the components of the hydrologic cycle.



Topography

Additionally, average values applied in the lumped-parameter approach may neglect important relationships between components.

A distributed-parameter approach accounts for the three-dimensional spatial variability of each parameter, and provides estimates of the water budget components at the scale of the variation in each parameter. Therefore, the need to oversimplify the system by averaging is reduced. This approach incorporates the spatial variability of physical properties compiled within a geographic information system, such as elevation, surface water features, and soil type.

A numerical groundwater flow model is a structured tool, incorporating spatially variable information to quantitatively simulate the interaction between water budget components, without the limitations of the lumped-parameter approach. This facilitates simulation of more complex systems by incorporating spatial variability and complex physically-based equations, such as groundwater flow in three-dimensions. These models are termed "universally applicable" models, which make predictions at a small scale, and can be summed to create predictions at a large scale (up-scaling). Moreover, physically-based groundwater models developed for water budget analysis may also be used for analysis of well capture zones, well interference, and groundwater-surface water interaction.

WHI's Consulting staff has developed numerous groundwater flow models for water budget analyses, at both local and watershed scales, using finite difference (i.e. Visual MODFLOW) and finite element (i.e. FEFLOW) codes. Case studies of finite element models developed using FEFLOW were recently presented at the annual conference of the International Association of Hydrogeologists (IAH) Canadian Chapter.



Surficial Geology



Land Use



Finite Element Model

If you would like more information about WHI's Consulting activities and capabilities, visit our website or contact us today:

Website: www.waterloohydrogeologic.com/consulting/consulting_services.htm

Email: consulting@waterloohydrogeologic.com

Phone: (519) 746-1798

The Regulators Course with a Twist of Risk

The increasing use of groundwater models for the design of, and analysis of, groundwater remediation systems has made it imperative that State Regulators become more knowledgeable concerning their application and implementation. Their knowledge must also take into account local regulations pertaining to groundwater contamination issues.

Waterloo Hydrogeologic, Inc. (WHI) successfully completed an in-house training course for the Ohio Fire Marshall's Office - Bureau of Underground Storage Tank Regulation (Ohio BUSTR). The course was presented by Alge Merry, of WHI's Consulting Division, from October 7-9 2003, to 19 regulators at the Ohio BUSTR offices in Reynoldsburg, Ohio.

Course topics included:

- » Principles of groundwater flow and contaminant transport
- » Overviews of MODFLOW, MODPATH and MT3D modeling software
- » Analysis of the impact of conceptual models on modeling solutions
- » Critical review of groundwater modeling reports
- » Numerical modeling applicable to BUSTR Tier 3 RBCA

Additionally, the course included hands-on exercises emphasizing the use of groundwater flow and transport models in contaminated sites, for both investigation and remediation. To provide understanding of local RBCA regulations in Ohio, Troy Schulz of BJAAM Environmental presented lectures on the application of modeling to BUSTR Tier 3 RBCA regulations.

Below are some comments received from the attendees:

- » I thought this was an excellent course, and very well presented by Alge Merry.
- » Alge was very knowledgeable. He was very easy to talk to, and answered our questions in a professional manner....

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Learn more about [Troy Schulz of BJAAM Environmental](#)



Upcoming Professional Courses

Dates/Locations

Groundwater Modeling



3D Groundwater Flow and Solute Transport Modeling Using Visual MODFLOW Pro.

Simple to complex applications of groundwater flow and contaminant transport models are covered in this hands-on course. Ideally suited for people with beginner or intermediate level modeling experience who wish to advance their modeling knowledge and who's responsibilities include model review, planning, and project management.

[Auckland, New Zealand](#)
[November 11 - 13, 2003](#)

[Melbourne, Australia](#)
[November 18 - 20, 2003](#)

[Waterloo, Ontario](#)
[November 18 - 20, 2003](#)

[Waterloo, Ontario](#)
[February 3 - 5, 2004](#)

[Register Now](#)

Model Calibration Using PEST



Applied to MODFLOW and Other Numeric Models.

This course teaches strategies for calibrating groundwater models, the most time-consuming, challenging and critical phase of a modeling study. You will learn about model calibration issues in general and also how to use the parameter estimation software package PEST, which has been developed to enhance our ability to calibrate models and to understand the limits of that calibration.

[Auckland, New Zealand](#)
[November 14, 2003](#)

[Melbourne, Australia](#)
[November 21, 2003](#)

[Waterloo, Ontario](#)
[November 21, 2003](#)

[Waterloo, Ontario](#)
[February 6, 2004](#)

[Register Now](#)

Advanced Groundwater Modeling



Applying Innovative Techniques and Avoiding Common Pitfalls using MODFLOW-2000, MODPATH, & MT3D.

The advanced course builds on the topics covered in “Groundwater Modeling” and develops a higher level of skill in building and troubleshooting groundwater flow models. Ideal for “Groundwater Modeling” graduates or experienced modeling professionals.

[Melbourne, Australia](#)
[November 24 - 26 2003](#)

[Register Now](#)

Finite Element Groundwater Modeling



Advanced Applications for Saturated Flow & Transport, Density-Dependant Flow, Unsaturated Conditions & Heat Transport using FEFLOW

This four-day course features alternating lectures and hands-on experience with FEFLOW to build 2D and 3D groundwater models for solving applied groundwater flow and contaminant transport problems. The lectures cover background theory, limitations and practical considerations of finite element modeling using FEFLOW. Practical examples of applied modeling projects will be examined and discussed in detail.

[San Francisco, California](#)
[November 4 - 7, 2003](#)

[Register Now](#)

Human Health Risk Assessment



Practical Approaches to Estimating Risk and Developing Site-Specific Target Levels Using RISC Workbench

Risk assessments require an integrated approach that includes fate and transport modeling combined with rigorous application of risk assessment protocols. This hands-on course presents standardized protocols that have been applied to contaminated soil and groundwater environments around the world. Over the two days of the course, you will be trained in a systematic approach to risk assessment starting with contaminant transport processes and ending with methods for developing site-specific target levels.

Course Benefits

- Learn the fundamentals of accepted risk assessment protocols
- Acquire lots of hands-on experience using the RISC Workbench software
- Understand the practical aspects of conducting a risk assessment
- Learn from an experienced risk assessment professional with worldwide experience

[Melbourne, Australia](#)
[November 27 - 28, 2003](#)

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For more information about our course offerings, visit our website or contact us at:

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 TOP

Tips & Tricks

AquaChem v.4.0:

Applying Water Quality Standards to Well Data

The ability to compare water quality data to selected water quality standards is an important process for any water quality analysis. AquaChem v.4.0 allows the user to create and manage multiple sets of water quality standards, with up to three different action levels for each parameter. Three popular water quality standards are included with AquaChem v.4.0:

- » World Health Organization (WHO) - Guidelines for Drinking Water Quality - 3rd Edition - 2003
- » Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines - 2002
- » U.S. Environmental Protection Agency (US EPA) - National Primary Drinking Water Regulations -EPA 816-F 02-013, July 2002

If these standards are not applicable to a particular study area, a new set of standards can be easily created (see the example below).

AquaChem v.4.0 also provides an option to automatically highlight parameter exceedences (with different colours for each action level) when viewing individual sample details or a tabular view of a selected group of samples:

- » Values that exceed Level 1 are shaded red
- » Values that exceed Level 2 are shaded orange
- » Values that exceed Level 3 are shaded yellow

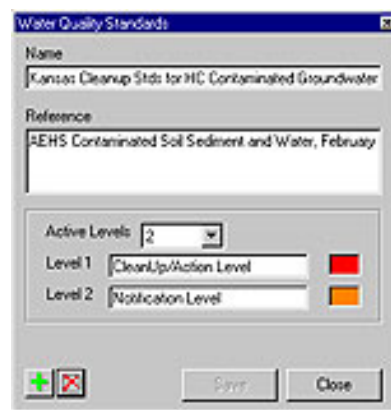


Figure 1

In this example, Level 1 is the CleanUp/Action Level and Level 2 is the Notification Level.

A user-defined name may be entered for each action level. AquaChem also offers the flexibility of switching from one standard to another at any time during the project.

Example:

In the State of Kansas, the following cleanup guidelines are used for gasoline-contaminated groundwater:

Kansas Cleanup Standards for HydroCarbon Contaminated Groundwater

Constituent	Detection Level (ug/L)	Notification Level (ug/L)	Action/Clean Up Level (ug/L)
Benzene	0.5	0.5	5
Ethylbenzene	68	68	680
Toluene	100	100	1000
Xylene	44	44	440

Source: AEHS Contaminated Soil Sediment and Water, February 2001.

[AquaChem v.4.0](#) allows the user to easily input this new set of standards, and define the number of action levels and corresponding level names. As seen in Figure 1, Level 1 is the CleanUp/Action Level and Level 2 is the Notification Level.

Once the new Water Quality Standard has been created, the criteria for each chemical parameter may be manually entered, or easily imported from a tab-delimited text file. The user may then select this new standard in the program settings, and compare their water samples to these guideline levels. AquaChem will respond by flagging sample exceedences with the appropriate colour (red or orange), allowing the user to quickly identify samples that exceed legally enforceable guidelines (CleanUp/Action Levels), and also identify samples that may require further analysis or sampling (Notification Levels).

An example of the AquaChem tabular view displaying water samples is shown in Figure 2; the tabular view allows the user to quickly compare measured values of BTEX for selected samples to the Kansas State Water Quality Standards.

Additionally, a Water Quality Standards Report may be created for each sample. The report provides a quick summary of exceedences for each sample. An example is shown in Figure 3.

For more details on [AquaChem v.4.0](#) click here!



Figure 2
The tabular view allows the user to quickly compare measured values of BTEX for selected samples to the Kansas State Water Quality Standards.

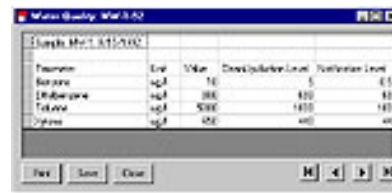


Figure 3
A Water Quality Standards Report may be created for each sample. The report provides a quick summary of exceedences for each sample.

Download your demo copy of AquaChem 4.0 here:

For more information about this tip, contact us at:

Email: techsupport@waterloohydrogeologic.com

For more information about Aquachem v.4.0, visit our website or contact us today:

Website: http://www.waterloohydrogeologic.com/software/aquachem/aquachem_ov.htm

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