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Product News

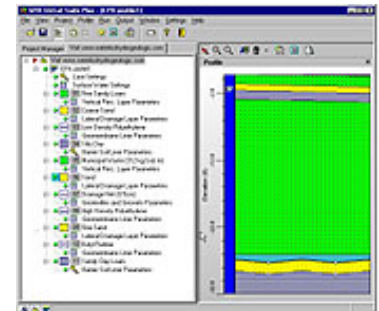
Fine Tuning Your Estimation of Groundwater Recharge Rates using Visual HELP

The Challenge...

Groundwater modelers are constantly faced with determining groundwater recharge rates for use in their saturated flow models. Depending on the complexity of their model, generating estimates for daily, monthly or yearly recharge rates can be a time consuming and difficult task. Finding a tool that will allow them to easily, quickly and accurately determine recharge boundary conditions for their groundwater models has been a struggle for many modelers.

The Solution...

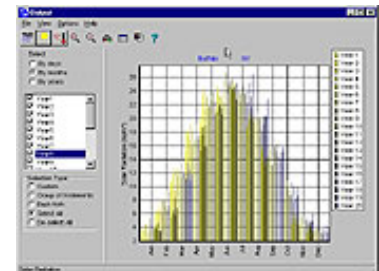
Visual HELP, based on the U.S. EPA HELP model, was developed by Waterloo Hydrogeologic, Inc. (WHI) to model landfill hydrology and predict leachate mounding and seepage. Though originally developed to improve landfill hydrology, Visual HELP has proven to be a valuable tool for groundwater modelers giving them the ability to quickly and accurately estimate groundwater recharge rates for their groundwater models.



Develop Vadose Zone Profiles

Use the following steps to determine recharge rates using Visual HELP:

1. Create simple or complex soil profiles to represent site-specific unsaturated zone conditions
2. Generate local weather conditions using the built-in International Weather Generator
3. Run the model to estimate flow rates through the unsaturated zone profile, while also considering seasonal climate conditions, slope, and vegetation types
4. Export flow rates from the bottom layer of the soil profile
5. Import and assign the simulated flow rates as a recharge boundary condition in groundwater models such as Visual MODFLOW Pro



Weather Data Generation

Visual HELP has proven to be more than a landfill optimization tool, and is now recognized as a valuable tool for predicting groundwater recharge rates. Visual

Product News

- » [Fine Tuning Your Estimation of Groundwater Recharge Rates using Visual HELP](#)
- » [AquaChem 5.0 Release](#)

Training News

- » [WHI's Line-Up of Environmental & Groundwater Modeling Courses!](#)

Upcoming Professional Courses:

- » [Applied Groundwater Flow & Contaminant Transport Modeling](#)
- » [Contaminated Site Risk Assessment and Groundwater Modeling](#)
- » [Aquifer Test Analysis](#)
- » [Finite Element Groundwater Modeling](#)

For more information, please visit our website or contact us today:

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Email: sales@waterloohydrogeologic.com

Phone: (519) 746-1798



Training News

WHI's Line-Up of Environmental & Groundwater Modeling Courses!

The 2005 Waterloo Hydrogeologic Open Enrollment schedule has been set. In response to comments from groundwater professionals who have taken our Groundwater Modeling Courses in the past, and from those who would like to attend courses in the future, WHI has combined the strengths of our previous Groundwater Modeling, Advanced Groundwater Modeling, and Model Calibration courses into one [Applied Groundwater Flow & Contaminant Transport Modeling](#) course. This course includes updated lecture material, as well as new hands-on laboratories to support the new course material. WHI has also created a new short course entitled [GIS Data Management for Groundwater Modelers](#), which teaches the theory and hands-on application of GIS data integration and interpolation to support groundwater modeling efforts, as well as 3-dimensional visualization of modeling results in [Visual MODFLOW](#), [HydroGeo Analyst](#), and GIS environments.

Click on the titles below and see which courses are appropriate for you!

- » [Applied Groundwater Flow & Contaminant Transport Modeling](#) - NEW
- » [Groundwater Contamination & Remediation](#) - UPDATED
- » [Finite Element Groundwater Modeling](#) - UPDATED
- » [Aquifer Test Analysis](#) - NEW
- » [Unsaturated Zone Modeling and Evaluation of Landfill Impacts](#) - UPDATED
- » [The Human Health Risk Assessment Course](#) - NEW
- » [Water Quality Data Management & Modeling](#) - UPDATED
- » [Regulatory Review of Hydrogeology Studies](#) - UPDATED
- » [GIS Data Management for Groundwater Modelers](#) - NEW

Who Can Benefit?

- » Experienced hydrogeologists with no prior groundwater modeling experience
- » Regulators who review modeling reports
- » Managers who want to understand what the modelers are doing
- » Experienced modelers who want to enhance their skills
- » Students who want to acquire new skills
- » Lawyers who want to understand some of the technical issues
- » Industry professionals who want to understand more about what their consultants are telling them

For further details on any of these courses, please visit our [website](#), or contact Miln Harvey, WHI Training Manager, at (519) 746-1798 x233.

Can't make it to one of our Open Enrollment Courses?

Call us about our [On-Site Custom](#) courses designed to suit your specific needs!

APPLIED GROUNDWATER FLOW & CONTAMINANT TRANSPORT MODELING



Theory and Hands-on Applications using MODFLOW-2000, MODPATH, MT3D & WinPEST

Simple to complex applications of groundwater flow and contaminant transport models are covered in this 4-day hands-on course. Groundwater resource topics include model development and calibration to groundwater heads and flows, new well development, capture zone delineation, well interference, and stream impact investigations.

Contaminant transport topics include model development and calibration to contaminant concentration, source area design, concentration boundary choice, solver comparison, and 3D visualization of flow and transport results. This course is ideally suited for hydrogeologists and modelers with some field investigation and modeling experience who wish to advance their modeling knowledge, and whose responsibilities include

[Mexico, D.F., Mexico](#)

[April 5 - 8, 2005](#)

[Tokyo, Japan](#)

[June 8 - 10, 2005](#)

[Delft, Netherlands](#)

[June 7 - 9, 2005](#)

model development, review, planning, and project management.

Course Objectives and Benefits

- » Apply Visual MODFLOW Pro to 3D groundwater flow and contaminant transport projects
- » Use MODFLOW-2000 to develop several groundwater flow models
- » Calibrate your groundwater models to observed field data
- » Use MODPATH particle tracking features to determine preferential flow paths and delineate capture zones
- » Use ZoneBudget to assess subregional water budgets within your groundwater model
- » Simulate 3D contaminant transport using RT3D, MT3DMS & MT3D99
- » Use WinPEST to improve model calibration and understand model uncertainty

Special Course:
PEST
[Delft, Netherlands](#)
[June 10, 2005](#)

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AQUIFER TEST ANALYSIS



Principles of Pumping Test Design and Techniques for Data Analysis

A wide variety of techniques can be applied to analyzing aquifer tests. This course covers the theory behind the techniques and provides an opportunity to obtain hands-on experience in analyzing aquifer test data collected from a variety of conditions.

Course Objectives and Benefits

- » Planning a pumping test
- » Principles of aquifer test analysis
- » Porous and fractured media
- » Isotropic/anisotropic conditions
- » Confined, leaky, and unconfined aquifers

[Waterloo, Ontario](#)
[July 13 - 14, 2005](#)

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FINITE ELEMENT GROUNDWATER MODELING



Advanced Applications for Saturated/Unsaturated Flow & Transport, Density-Dependent Flow, and Heat Transport

Advanced applications of groundwater flow and contaminant transport models using the Finite Element method are covered in this 4-day hands-on course. This course provides a more complete understanding of the use and applicability of finite elements in groundwater modeling, and includes such topics as groundwater flow and transport modeling, principles of unsaturated flow, fracture flow modeling, thermal transport, and density-dependent flow modeling. This course is ideally suited for groundwater modelers who wish to advance their modeling knowledge, and apply finite elements-using FEFLOW- to more complex modeling designs.

Course Objectives and Benefits

- » Understand when to use finite-element vs. finite-difference modeling
- » Apply FEFLOW to 3D groundwater flow and contaminant transport problems
- » Simulate unsaturated zone flow using FEFLOW
- » Simulate density-driven groundwater flow (e.g. saltwater intrusion) using FEFLOW
- » Simulate fracture flow modeling using FEFLOW, and compare to a research case study
- » Introduce the Interface Manager and the concept of model calibration to observed field data

[Waterloo, Ontario](#)
[Sept 13 - 16, 2005](#)

[Register Now](#)

REGULATORY REVIEW OF HYDROGEOLOGY STUDIES



Approaches and Insights for Reviewing Modeling Reports

The overall objective of this course is to give regulators a greater understanding of how models work, and what to look for when reviewing a modeling report. Specifically, the objectives are as follows:

- » To understand the uses and applications of numerical models
- » To understand the uses and applications of the analytical WHPA model
- » To have a practical basis for reviewing models
- » To identify the points of focus for reviewing a modeling study
- » To recognize when review by a specialist is required.

The content of this course will be applicable to the following areas:

- » Alternatives for landfill or septic system design
- » Prediction of contaminant movement and impact from landfills, septic systems, and contaminated sites
- » Selection of remediation alternatives
- » Delineation of well capture zones and groundwater protection areas
- » Assessment of impacts from large groundwater extractions, and pit and quarry development in the context of the Permit To Take Water Program (PTTW) and groundwater interference investigations.

These applications could include review of modeling studies submitted by consultants, evaluation of workplans submitted by owners/proponents, and specification of modeling requirements for tendering hydrogeological studies.

[Waterloo, Ontario](#)
[April 26 - 29, 2005](#)

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WATER QUALITY DATA MANAGEMENT & MODELING



Applications using AquaChem and USGS PHREEQC

The large quantity and range of environmental groundwater data types presents a challenge to professionals who wish to develop a comprehensive interpretation of a suite of data. This course provides hands-on experience in temporal and spatial data interpretation, including the use of convenient computer software for organizing and plotting the data.

- » Planning a data collection program
- » Interpreting temporal and spatial data densities
- » Quality control issues
- » Applied geochemical modeling
- » How to use AquaChem

[Waterloo, Ontario](#)
[April 13 - 14, 2005](#)

[Waterloo, Ontario](#)
[Sept 21 - 23, 2005](#)

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GIS DATA MANAGEMENT FOR GROUNDWATER MODELERS



Understanding Data Sources, Data Analysis and Visualization

This 3-day hands-on course presents an introduction to the management and analysis of groundwater data for Visual MODFLOW modelers. Topics include the data types used in groundwater models, the coordinate systems, datums and map projections in a GIS, the interpolation of data within the GIS (kriging, natural neighbor analysis, ...), the development of model layers (cross-sectional analysis of site hydrogeology) and parameter fields for groundwater model construction, and the import and export of different types of data from the GIS system to the groundwater model and back to the GIS system. Other topics that will be covered include 2-D and 3-D visualization of model input and model output. This course is ideally suited for groundwater modelers who wish to develop a comprehensive understanding of the sources of data that are used in groundwater models, the interpolation of this data for modeling, and the interchange of information between the groundwater model and the GIS system.

Course Objectives and Benefits

- » Understand the integration between the GIS system and

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[Canada](#)
[Dec 6 - 8, 2005](#)

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Visual MODFLOW

- » Assess the applicability of MapInfo, Surfer and HydroGeo Analyst for developing a GIS
- » Use HydroGeo Analyst to develop model cross-sections and layer interfaces
- » Use HydroGeo Analyst to interpolate layer elevations and export them to Visual MODFLOW
- » Export Visual MODFLOW results to GIS and prepare report figures
- » Develop animation files of Visual MODFLOW results and insert them into client presentations

CUSTOM DATA MANAGEMENT & MODELING



Data management, analysis and visualization are key components in the modeling process, and have an important impact on site characterization, hydrogeologic conceptualization and numerical model development. This 4-day course looks at the integration between site characterization, groundwater modeling and risk assessment software for analyzing contaminated sites. The first part of the course analyzes the integration of GIS software, using HydroGeo Analyst, in the development of calibrated groundwater models (using Visual MODFLOW), and the implications of data uncertainty in model predictions. The second part of this course analyzes the integration between groundwater modeling results and risk characterization software. RISC Workbench will be used as a risk characterization tool, and integrated with the output from groundwater models to assess the impact of common contaminants on the risk to Human Health. This course will be held in Budapest, Hungary in October 2005.

[Budapest, Hungary](#)
[October 4 - 7, 2005](#)

[Register Now](#)

The NEW MODFLOW Course



The MODFLOW Course Theory & Hands-on Applications using MODFLOW-2000, MODPATH, MT3D & WinPEST

Course Description

The course begins with an introduction to the ground water modeling process, providing lectures and hands-on exercises in topics that range from data sources and evaluation, conceptual model development, numerical model implementation and model calibration and prediction. Presentations alternate between the theory behind each course topic and practical exercises to implement the concepts using Visual MODFLOW Pro. This course is a hands-on course. Attendees will spend 2 ½ days of the 4-day course using the computer to complete exercises.

New exercises have been developed to show the attributes of MODFLOW-2000, MODPATH, ZoneBudget, MT3D and RT3D, and how they can be used as part of a hydrogeologic modeling analysis.

The course then looks at automated parameter estimation using WinPEST to evaluate the quality of model calibration using error statistics to help decide when a model is calibrated. The course goes beyond these introductory topics and provides advice on how to develop a model efficiently, and how to choose appropriate parameter distributions and boundary conditions to effectively represent the groundwater flow system that is being modeled.

[Princeton, NJ, USA](#)
[Oct 25 -28, 2005](#)

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To register for this course you must be a member of the NGWA, if you are not please call NGWA Customer Service at 800.551.7379, or [email](#)

GROUNDWATER FLOW & CONTAMINANT TRANSPORT MODELING FOR RISK



This 4-day hands-on groundwater modeling and risk assessment course provides the bridge between the risk assessment process for contaminated sites and groundwater modeling, which is used to assess the amount of contamination. The first 3 days consist of groundwater flow and transport modeling topics, which include model development, model calibration using groundwater heads and concentrations, well impact assessment, source area design, choice of appropriate concentration boundary conditions, comparison of transport solvers and 3D visualization of flow and transport results. The last day of the course is dedicated to introducing the Risk Assessment process and the place of groundwater modeling within it, which includes an introduction to data collection and evaluation, exposure assessment, toxicity assessment and risk characterization. Attendees will also gain a more complete understanding of Risk-Based Corrective Action for contaminated site management. This course is ideally suited for hydrogeologists and modelers with some knowledge of field investigation and groundwater modeling who wish to advance their modeling knowledge, and whose responsibilities include model development, review, planning and project management.

Course Objectives and Benefits

- » Apply Visual MODFLOW Pro to 3D groundwater flow and contaminant transport projects
- » Use MODFLOW-2000 to develop several groundwater flow models as part of hands-on laboratory exercises
- » Simulate 3D contaminant transport using MT3D and RT3D
- » Enhance your knowledge of contaminant transport and natural attenuation processes in the groundwater environment
- » Linking fate and transport models to risk-based decision-making models
- » Understand the Baseline Risk Assessment process and Risk-Based Corrective Action (RBCA)
- » Understand data collection and site characterization issues for risk assessment modeling
- » Increase your ability to make environmental decisions on risk assessment
- » Define potential exposure risks to chemical contaminants
- » Discuss how to establish site-specific clean-up levels for remediation
- » A complete set of course lecture notes and lab exercises

[Santiago, Chile](#)
[Sept 27 - 30, 2005](#)

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 [For our full 2005 training schedule, click here!](#)

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For more information about our course offerings, visit our website or contact us today:
Website: www.waterloohydrogeologic.com/training/training.htm
Email: training@waterloohydrogeologic.com
Phone: (519) 746-1798

Tips & Tricks

AquaChem 5.0 Alkalinity

ISSUE:

Once you have imported your data which includes a column for bicarbonate and a column for carbonate (as meq/L) PHREEQC does not recognize the bicarbonate and carbonate values as alkalinity. When trying to model with PHREEQC it reports 0 for alkalinity, even though both bicarbonate and carbonate values are in the database.

RESOLUTION:

The concentration of inorganic carbon can be expressed either as HCO_3 , CO_3 or by the alkalinity. The demo database is set up to use alkalinity for expressing inorganic carbon. HCO_3 and CO_3 can still be entered, but will not be used for PHREEQC simulations. In order to deactivate alkalinity as the "master" for inorganic carbon, simply remove the respective alias field in the database settings:

- Select File/Database/Alias tab
- Remove database parameter cell for measured alkalinity
- Save and close screen

Since there are no more parameters defined for expressing alkalinity, Aquachem will use HCO_3 and CO_3 wherever carbonate species are required. You may still enter data in the alkalinity field, but it will not be taken into account for carbonate related calculations, since the program does not know the "meaning" of the parameter.



Description	Database Parameter
180 of water oxygen	180
180 of dissolved SO4	
Deuterium	2H
Measured alkalinity	
Calcium	Ca

For more information about WHI's Environmental Information Technology (EIT) services:

Email: techsupport@waterloohydrogeologic.com

Web: <http://www.waterloohydrogeologic.com/support.htm>

Thank you for reading this month's edition of WHI E-News! For more information about our products and services please use the links below!

[Visit our Website](#) - See what Waterloo Hydrogeologic Inc. has to offer!

[Software Division](#) - Check out our groundwater modeling software.

[Consulting Division](#) - Visit our Consulting Division on the web to see how we can help you.

[Training Division](#) - Visit our Training Division on the web to find a course in your area.

[Equipment Division](#) - WHI is now selling groundwater monitoring equipment.

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