

WHI E-News Topics

2003 May Edition

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Congratulations to Mr. Gerry Baker from Geological Survey of Ireland - winner of our Visual MODFLOW Survey contest! Special thanks to all who completed the survey. Your feedback is very appreciated!

Product News

Supporting Monitored Natural Attenuation with the Remediation ToolKit

The Challenge:

Can you **make sense** of all your field data at a **single glance**? Need a program to **store** and **manage** endless amounts of field data? Do you analyze trends in field data to support **Monitored Natural Attenuation (MNA)** as a remedial alternative?

The Solution:

The [Remediation ToolKit](#) offers a complete software solution for specifically predicting trends in natural attenuation. It fully integrates [SEQUENCE](#), [BioTrends](#), and [BioTracker](#) with a built-in Project Data Management System, giving you the required tools for defending MNA at your site. Use it to support all your MNA projects!

The Remediation ToolKit will help you to quickly...

- Import your field data.
- Monitor trends in concentration data.
- Predict site-specific degradation rates.
- Identify flowpath trajectories.
- Visualize and report results.

The Remediation ToolKit - including SEQUENCE, BioTrends, and BioTracker - is NOW US\$745 (Reg. US\$995)

As defined by the U.S. EPA...

"MNA is a knowledge-based remedy where a proper engineering analysis informs the understanding, monitoring, predicting, and documenting of the natural processes....

MNA is widely used for the remediation of contaminated sites.

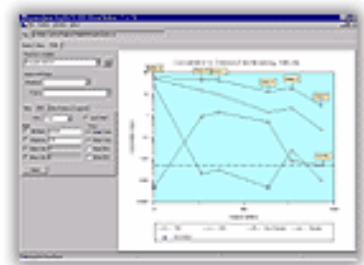
Scrupulous attention to site-specific studies is required to document that processes that destroy or immobilize contaminants are well understood and sufficiently documented to ensure an acceptable remedy." [EPA-SAB-EEC-01-004 - May, 2001](#)

[EPA-SAB-EEC-01-004 - May, 2001](#)

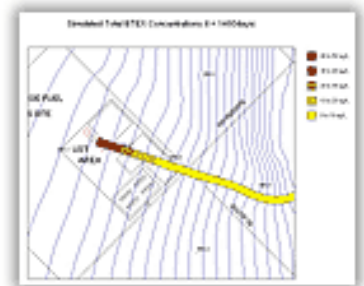
Remediation ToolKit - SAVE 25% before May 25th, 2003!



SEQUENCE



BioTrends



BioTracker

For more information about the Remediation ToolKit, visit our website or contact us:

Website:

http://www.waterloohydrogeologic.com/software/remediation_toolkit/remediation_toolkit_ov.htm

Email: sales@waterloohydrogeologic.com

Phone: (519) 746-1798 and ask for the special!

To learn more about Monitored Natural Attenuation (MNA), download the "*Monitored Natural Attenuation: USEPA Research Program - An EPA Science Advisory Board Review*" pdf file from the WHI website free downloads section:

http://www.waterloohydrogeologic.com/free_downloads_form.htm

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Consulting News

WHI Presents Findings of GSC-CIDA Project in Drought-Prone Northeastern Brazil

WHI is proud to have been one of the chief Canadian partners of the [Northeastern Brazil Groundwater Program \(PROASNE\)](#) - a joint project conducted by the [Geological Survey of Brazil \(CPRM\)](#) and the [Geological Survey of Canada \(GSC\)](#), with support from the [Canadian International Development Agency \(CIDA\)](#).

As part of PROASNE, WHI developed several projects including a national groundwater database for the Brazilian government. During the week of April 20th, WHI's President, Dr. Nilson Guiguer, traveled to Brazil to present the findings of one of these projects - a one-year groundwater resources study developed in the State of Rio Grande do Norte (RN) - one of the least developed regions in Brazil.

The Challenge:

The hydrological study endeavored to bring long-term solutions to the serious problems caused by the periodic droughts that severely affect nearly 25 million people in approximately one million square kilometers of northeastern Brazil.

The Solution:

To solve this ongoing problem, modern Canadian groundwater exploration and management techniques are being transferred to local counterparts, including remote sensing, GIS, geophysical techniques and groundwater modeling.

The project consisted of a groundwater resources study, involving:

- compiling existing data into a database-GIS data management system,



From April's E-News - how to get the **World Bank Publication for Groundwater Protection Strategies**: After April's E-News, many of you asked how you could purchase the "Groundwater Quality Protection: A Guide for Water Utilities, Municipal Authorities, and Environment Agencies" publication co-authored by Stephen Foster, Ricardo Hirata, Monica D'Elia, Marta Paris and our own Daniel Gomes. Here's how to get a copy...

To purchase a hard copy, visit the [World Bank's Infoshop](#). The cost is US\$30.

To download an electronic version, visit the [World Bank Web Site](#).

- constructing and calibrating a numerical model,
- quantifying existing water resources,
- establishing development and protection strategies, and
- intensive training of the Brazilian counterparts in Canada and in Brazil in such techniques.

The Benefits:

The study identified a considerable groundwater potential yet unexplored (more than 70% of renewable resources), and mapped favorable areas for future groundwater development, possibly benefiting some 250,000 people. In addition, the state of Rio Grande do Norte now has tools to effectively manage and simulate groundwater development alternatives going forward.

For more information about the PROASNE project, please visit the website or contact:

Dr. Yvon Maurice (GSC, Ottawa)
Coordinator, Canada-Brazil Cooperation
Geological Survey of Canada
601 Booth Street
Ottawa, Ontario, Canada, K1A 0E8
Phone: (613) 995-4748
Email: ymaurice@NRCan.gc.ca

Northeastern Brazil Groundwater Program (PROASNE):

<http://proasne.net/sitemapen.html>

For more information about WHI's role in this project, please contact:

Dr. Nilson Guiguer, Ph.D.
President, WHI
Email: nguiguer@waterloohydrogeologic.com
Phone: (519) 746-1798



Training News

Exciting New Course - Don't Miss It!

Aquifer Test Training Course - Our Latest in a Suite of Courses

Waterloo, Canada

June 12-13, 2003

A wide variety of techniques can be applied to analyzing aquifer tests. In this course, you'll learn the theory behind the techniques and obtain hands-on experience in analyzing aquifer test data collected from a variety of conditions. The course includes:



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



Check out the full Course Description:

<http://www.waterloohydrogeologic.com/training/training.htm#aquifer>

Upcoming Professional Courses

	Dates/Locations
<p>Groundwater Modeling </p> <p>3D Groundwater Flow and Solute Transport Modeling Using Visual MODFLOW Pro.</p> <p>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.</p>	<p>Vancouver, Canada May 25-27, 2003</p> <p>Lyon, France June 17-20, 2003</p> <p>Rome, Italy June 17-20, 2003</p> <p>Japan June 25-27, 2003</p> <p>Register Now</p>
<p>Advanced Groundwater Modeling </p> <p>Applying Innovative Techniques and Avoiding Common Pitfalls using MODFLOW-2000, MODPATH, & MT3D.</p> <p>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.</p>	<p>Vancouver, Canada May 29-31, 2003</p> <p>Rome, Italy June 24-27, 2003</p> <p>Register Now</p>

Environmental Risk Assessment



Soil and groundwater clean-up levels - practical approaches to risk-based decision making.

Learn practical approaches to risk-based decision-making related to soil and groundwater clean-up levels. Unlike other courses on risk assessment, this course recognizes the interdependence of contaminant-transport modeling and risk assessment, and provides an integrated approach on both topics.

Covering the topic of risk assessment, co-instructor [Troy Schultz](#) has extensive experience in conducting risk assessments and delivering training courses.

[Chicago, Illinois](#)

[June 2-4, 2003](#)

[Register Now](#)



[Click here for our full 2003 training schedule!](#)



[Click here to request your free 2003 Training Course Schedule Catalog!](#)

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

Website: www.waterloohydrogeologic.com/training/training.htm

Email: training@waterloohydrogeologic.com

Phone: (519) 746-1798

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Tips & Tricks

Troubleshooting Site Maps with WHI Software Products

This month's Tip deals with using AutoCAD™ .DXF Site Maps in WHI software.

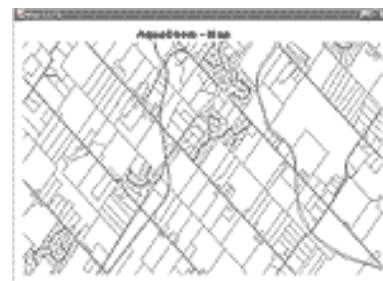
Many WHI software products support site maps to improve the data presentation of your modeling or analysis results. **Here are some tips for using the .DXF files generated by AutoCAD:**

1. Ensure your .DXF files are compatible with your WHI product:

Since the software used to design .DXF files can change rapidly, current .DXF formats may not be compatible with some WHI software products. Be aware of the following requirements:

Products compatible with AutoCAD R12:

- [AquaChem](#)
- [Remediation ToolKit](#)
- [Visual Groundwater](#)



Products compatible with AutoCAD R14:

- [AquiferTest Pro](#)
- [FLOWPATH II](#)
- [Visual MODFLOW Pro](#)
- [Visual MODFLOW 3D-Explorer](#)

2. Keep your site map simple:

Keep your site map as simple as possible for reduced file size. Have you ever loaded an AutoCAD .DXF file into your WHI software, and the site map either does not load completely, or not at all? To avoid this problem, keep the following tips in mind:

When generating your AutoCAD file...

- » Use straight lines and polylines only; do not use arcs.
- » Ensure all layers are active and thawed.
- » Remove external references to images (i.e. no proxy graphic attachments); WHI applications are unable to read these images.
- » Remove all associated (daughter) map windows; view one map image only, using coordinates that match your current coordinate system in the WHI product.
- » Make the coordinate system used in the site map identical to the one used in the WHI application (i.e. be consistent when working with world or model coordinates).

Before saving your final .DXF file...

- » Use the "Purge" command to reduce clutter - removing blocks, fonts, and layers with no information - and reduce the memory required by the file.
- » If necessary, save vector information (the translation and rotation from the daughter location to the parent location) as a new, separate layer in the CAD file, so that the subsidiary maps can be moved to the parent coordinates and saved as a separate .DXF.

Before loading your site map...

- » Remove legends, scale bars, and axis lines.
- » If necessary, use Surfer to convert .DXF files that are not displaying properly.

These tips should make using site maps with WHI products simpler and easier!

The following WHI products support site maps:

- [AquiferTest Pro](#)
- [AquaChem](#)
- [FLOWPATH II](#)
- [Remediation ToolKit](#)
- [Visual Groundwater](#)
- [Visual MODFLOW Pro](#)
- [Visual MODFLOW 3D-Explorer](#)

.DXF files must be designed by AutoCAD™ or MapInfo™ only. Other .DXF generating programs - such as MicroStation™ or TurboCAD™ - are not fully supported by WHI Products.

Archived Tips and Tricks now available!

Due to popular demand, previous versions of the Tips and Tricks are now available on the WHI website! Please visit the Support page at the link below, to browse the Tips and Tricks archives:

[www.waterloohydrogeologic.com/
support.htm#tips](http://www.waterloohydrogeologic.com/support.htm#tips)

For more information about using site maps, for assistance loading your site map, or to share a tip or trick with our e-list, please contact WHI Technical Support:

Email: techsupport@waterloohydrogeologic.com

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

Website: http://www.waterloohydrogeologic.com/software/software_main.htm

Email: sales@waterloohydrogeologic.com

Phone: (519) 746-1798



Technical Highlights

Heterogeneities, Modeling Selection, and Pathway Completeness

Feature "Risk Assessment" Guest Column by Troy L. Schultz, CPG

Greetings to all the subscribers of WHI's E-News. Over the next few months, I will present a series of short articles relating risk assessment and modeling. This month's topic focuses on subsurface heterogeneities, modeling selection, and pathway completeness (a large mouthful, yes?). So, what do all these topics have to do with one another from a risk assessor's perspective? Any one of these topics is worthy of discussion by itself. Lets start at the beginning....

Early mythologies most often assumed that the universe started in chaos, with a supernatural being adding order, then creating a series of specific, complex natural systems. As modelers, risk assessors, and scientists, it is our goal to understand, explain, and predict how these natural systems integrate and evolve. Moreover, anthropogenic involvement in these systems, in all its forms, necessitates much of our work. For example, contaminant releases into aquifers and the potential for human exposure.

The Challenge: Heterogeneities

Subsurface environments can be the most challenging puzzles to solve. Here, in northeast Ohio, several glacial episodes have left us with very complicated soil lithologies. The hardest clay till contains vertical, well-sorted sand deposits resembling igneous dikes (i.e., glacial kame and tunnel deposits). How can you predict and model that?! When you finally do get a site with a fairly homogeneous subsurface (which is almost never), you might consider some type of fate and transport modeling.

But, even in the most homogenous subsurface systems, minute heterogeneities can cause significant variances in the migration of a plume both horizontally and vertically (Hubbard et al., 1994). Moreover, without multi-level sampling, one can easily mischaracterize a plume,



Troy Schultz is President of [BJAAM Environmental, Inc. \(BJAAM\)](#). Mr. Schultz specializes in the development of site-specific standards and has given numerous lectures to various governments regarding the use and implementation of risk-based approaches to corrective actions (e.g., OhioEPA, Argentina, Brazil, etc.). He has also provided expert witness reports and testimony regarding risk assessment on behalf of companies such as Shell and BP.

let alone its status with regard to natural attenuation (Hutchins and Acree, 2000). What's a modeler to do?

The Solution: Modeling Selection and Pathway Completeness

1. Modeling Selection: Define the modeling objectives and create a conceptual site model (CSM).

I like to step back from the complexities and approach the problem from a risk perspective before getting too caught up in the details. By defining the modeling objectives with regard to all potential exposure components (i.e., chemicals, populations, pathways, and media), one can clearly create a conceptual site model (CSM) to help put these objectives in their proper perspective (see ASTM E1689-95). To assist in this endeavor, one must have some understanding of plume status (see last month's article on "Plume Status, Modeling, and Points of Compliance").

2. Pathway Completeness: Select an appropriate model for your site.

Decide what level of modeling is necessary to answer your exposure pathway questions to the degree desired. There is plenty of guidance and suggested practices in the literature to select an appropriate model for your site (e.g., ASTM E978-92).

It makes sense to approach problems with simple analytical solutions first to get some idea about your system, but this is just a generality. So, consider a simplified numeric solution where the number of heterogeneities is increased in a step-like manner similar to a risk-based decision-making process. That is, start with very simplified model layers, horizontal surfaces, and boundary conditions, and then add complexities in a tiered approach. This method can be surprisingly quick and inexpensive, and provides a customizable degree of complexity.

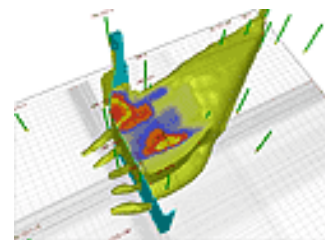
WHI's [Visual MODFLOW Pro](#) allows you to set up this type of simulation in the same time it would take to do an analytic solution, such as BIOSCREEN, but with the added benefit of being able to repeatedly expand the model and view the output.

There you have it: Heterogeneities, Modeling Selection, and Pathway Completeness.

References:

ASTM E978-92. American Society For Testing and Materials. 1992. Standard Practice for Evaluating Mathematical Models for the Environmental Fate of Chemicals.

ASTM E1689-95. American Society For Testing and Materials. 1995. Standard Guide



Contaminant plume migrating through reactive wall.

Too often, modelers see modeling as either analytic and simple or numeric and complex. This attitude may stem from days when numeric modeling was a much more tedious task, but this is certainly not the case today.

Overly conservative modeling is a common approach to dealing with heterogeneity, but may not always provide adequate results. And, from an output perspective, analytical models often fall far short from convincing.

[Visual MODFLOW Pro](#) is 3D groundwater flow and contaminant transport modeling software. It includes MODFLOW, MODPATH, MT3DMS, RT3D, automatic model calibration using WinPEST, and built-in 3D visualization and animation using the Visual MODFLOW 3D-Explorer.

for Developing Conceptual Site Models for Contaminated Sites.

Hubbard et al., 1994. Transport and Fate of Dissolved Methanol, MTBE, and Monoaromatic Hydrocarbons in a Shallow Sandy Aquifer. API Publication 4601.

Hutchins, S.R. and S.D. Acree. 2000. Ground Water Sample Bias Observed in Shallow Conventional Wells. Ground Water Monitoring and Remediation 20. no. 1:86-93.

U.S. EPA. 1996. BIOSCREEN, Natural Attenuation Decision Support System, User's Manual Version 1.3. EPA/600/R-96/087. Office of Research and Development, Washington, D.C.

NEXT MONTH'S TOPIC: Groundwater and Indoor Air Modeling

Join Troy Schultz at our "[Environmental Risk Assessment](#)" course in Chicago, Illinois, June 2-4, 2003; find out more in the [Training Section!](#)



WHI is pleased to consider contributions to our upcoming Feature Guest Columns; if you are interested in writing one of our upcoming features, please contact: Martin Draeger
mdraeger@waterloohydrogeologic.com

For more information about this article or risk assessment strategies, please contact:

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Phone: (330) 854-5300
Website: www.bjaam.com



Thank you for reading this month's edition of WHI E-News!
For more information about our products and services...

[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.

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