

Regulatory Review of Hydrogeology Studies

Approaches and Insights for Reviewing Modeling Reports

Visual MODFLOW
Discount Available!

"Wonderful cycle of enthusiastic, knowledgeable modelers who obviously love their work and are able to explain complex concepts in clear, simple terms, illustrated with varied practical examples."
- Ontario Ministry of the Environment



Course Topics

- ▶ Fundamentals of reviewing the groundwater modeling component of a hydrogeologic analysis
- ▶ Conceptualizing site hydrogeology/hydrology
- ▶ Integrating GIS into groundwater modeling
- ▶ Principles of 3D groundwater flow modeling using USGS MODFLOW-2000
- ▶ An overview of analytical and numerical modeling software
- ▶ "Behind-the-scenes" of MODFLOW
- ▶ Understanding sub-regional water budget analysis using USGS ZONEBUDGET
- ▶ Analyzing pathlines and capture zones using US EPA WHPA and USGS MODPATH
- ▶ Fundamentals of natural attenuation and the principles of contaminant transport
- ▶ Reactive transport modeling with MT3D/RT3D
- ▶ Uncertainty analysis of model results (flowpaths, capture zones, contaminant plumes)
- ▶ Theory behind model calibration and WinPEST
- ▶ Understanding model calibration results, model error, and reporting of error statistics

Course Objectives

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

- ▶ The skills necessary to effectively review a groundwater modeling study
- ▶ The components of a complete groundwater modeling study and model report
- ▶ Applications for flow and transport modeling
- ▶ To understand steady-state vs. transient analysis for groundwater model predictions
- ▶ Effective use of GIS information in conceptual and numerical model development
- ▶ When to apply analytical models vs. finite difference and finite element models
- ▶ To understanding uncertainty in model results
- ▶ To know when a model is calibrated, and how error is reported
- ▶ To recognize when peer review by a modeling specialist is required

Course Description

Groundwater models are an important component of most hydrogeologic studies. As a result, the regulatory community needs to understand how models these are

developed, how well they work, what the results mean, and how all of this information should be summarized in the Groundwater Modeling Report. This 4-day course provides an overview of how to review a hydrogeologic study from a regulatory perspective, with attention given to the groundwater modeling component and how it is reported. This has applications in reviewing modeling studies, peer review of consultant workplans, and specification of modeling requirements for tendering groundwater studies.

Lecture Format

The course uses a combination of lectures to give background and theory, and hands-on exercises to clarify concepts. The lectures cover a wide range of topics from developing and reporting the hydrogeologic conceptualization in GIS, to calibrating a groundwater flow and transport model, as well as reviewing the components of a hydrogeologic study report.

Lab Exercise Format

The exercises are designed to show the benefits of site conceptualization in GIS, the strengths and weaknesses of groundwater flow and transport models, and the integration between the two. Each model exercise was developed for a specific application and emphasizes concepts such as defining groundwater heads using MODFLOW, particle pathlines using MODPATH, water budgets using ZoneBudget and transport results analysis using MT3D and RT3D. The limits of each model are discussed to give reviewers an idea of when they are being used appropriately and when they are being used inappropriately.

Reviewing Groundwater Analysis Reports

Finally, the detailed components of a standard groundwater analysis report are discussed to provide guidance on how well the consultant has prepared a report, and when it is necessary to ask for peer review by a specialist.

Course software: Visual MODFLOW Pro*, WHPA, BioScreen & Prince

Course Schedule

Day 1

- Course Introduction
- Lecture: Reviewing Groundwater Modeling Studies
- Lecture: Fundamentals of Groundwater Modeling
- Exercise: Intro: Introduction to Groundwater Modeling
- Lecture: Hydrogeologic Conceptualization
- Exercise: Open Pits: Transient MODFLOW Modeling

Day 2

- Lecture: Overview of Analytical & Numerical Models
- Exercise: Analytical WHPA Modeling (WHPA)
- Exercise: Analytical Transport Modeling (Prince)
- Lecture: Principles of USGS MODFLOW
- Lecture: Principles of MODPATH and ZoneBudget
- Exercise: Numerical Groundwater Modeling (3DCap)

Day 3

- Lecture: Fundamentals of Natural Attenuation
- Exercise: Natural Attenuation Modeling (BioScreen)
- Lecture: Principles of Transport Modeling
- Exercise: Numerical Transport Modeling (Drumco plume)

Day 4

- Lecture: Theoretical Approaches to Model Calibration
- Exercise: Valley - Calibrating a MODFLOW Model
- Lecture: Calibration Results: What do they mean?
- Lecture: Reviewing Modeling Reports: What to Look For!
- Exercise: Calibrating a Transport Model (Channel)

Note: Breaks and lunches are not listed.

Register online at www.swstechnology.com or call 519-746-1798.