

Assessing Ground Water Movement and Contaminant Migration Through Aquitards

Comprehensive Characterization of Low-Permeability Units

14 & 15 September 2010

Location:

Bloomington, Minnesota

- Holiday Inn & Suites Conference Center

located between MSP International Airport and the Mall of America

Instructors:

Ken Bradbury, PhD, PG

Wisconsin Geological & Natural History Survey

Tim Kemmis, PhD, PG

AECOM Environment

Dave Hart, PhD, PG

Wisconsin Geological & Natural History Survey

Madeline Gotkowitz

Wisconsin Geological & Natural History Survey

Andrew Kirkman, PE

AECOM Environment

Mark Borchardt, PhD

Marshfield Medical Research Foundation

Tony Runkel, PhD

Minnesota Geological Survey

Apply this course to any aquitard setting.

Learn to test aquitard integrity for a variety of low-permeability conditions....and learn why it's important.

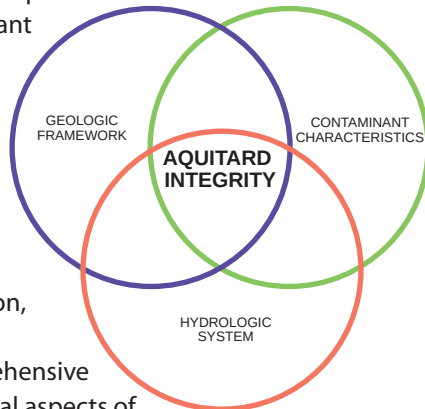
16 Contact Hours
(1.6 CEUs)

SPECIAL WORKSHOP SESSION
...dedicated to
PATHOGENIC VIRUS
sampling, detection and
contamination in deep aquifers
thought to be well protected
water supplies

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www.midwestgeo.com

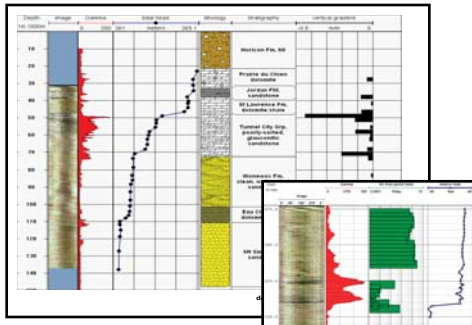
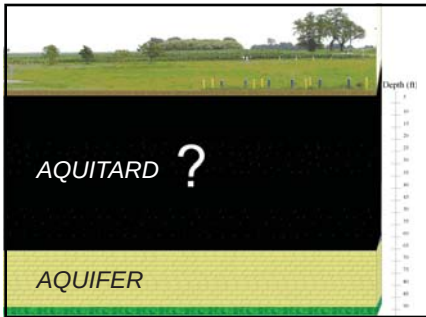
Aquitards (low-hydraulic conductivity hydrogeologic units) are critically important to groundwater and contaminant movement. Characterizing aquitards for environmental and water resource projects is important for protecting deep aquifers and understanding potential contaminant pathways for previously impacted aquifers. Both unconsolidated and bedrock aquitards share inherent low hydraulic conductivities, but approaches and field methods for characterizing each type can be completely different.

Appropriate characterization requires site-specific understanding about the aquitard's origin, unit distribution, heterogeneity, fracturing, and the effects of secondary weathering or tectonics. From basic hydraulics to comprehensive ground water modeling, this course addresses the practical aspects of hydrogeologic analysis for **environmental, engineering and water resources projects**.



Learn Up-To-Date Methods for Investigating & Characterizing Aquitards

- Discover the unique hydraulics of aquitards, vertical gradients, downward seepage, confining conditions, etc
- Explore new approaches for ground water and solute transport modeling in aquitards
- Discover new techniques and field instrumentation for monitoring aquitards
- Learn how to determine which Low-K unit is doing the "work"
- Compare water sampling and hydraulic testing procedures in low hydraulic conductivity units
- Discover the importance of differentiating a sequence of multiple low-hydraulic conductivity units
- Examine a regional bedrock aquitard and understand fracture distribution and mapping
- Understand how to identify and characterize fracture occurrence and distribution in glacial till
- Learn about LNAPL and DNAPL behavior, distribution and recoverability within fine-grained sediments
- Understand the potential for pathogenic virus contamination in deep aquifers thought to be protected by overlying aquitards (*plus a special workshop session on this growing topic*)



Here's what other say about this course

I attended this course prior to a large investigation at a site presumed to have a single Low-K hydrostratigraphic unit. The course was valuable for project planning and allowing a new and realistic perspective of the subsurface. The course helped solve previous perplexities about the site hydraulics and greatly benefited my project and client. This course is very well organized and taught by top-notch instructors. I recommend this course to all ground water professionals.

- Alan Stone, PE, PG, Senior Project Engineer & Hydrogeologist
Concord Engineering and Science, Inc.

The course made me look at aquitards in a new way

- Michael Summers, Illinois Environmental Protection Agency

REGISTRATION FORM

Assessing Ground Water Movement
and Contaminant Migration Through Aquitards:
Comprehensive Characterization of Low-Permeability Units
14 & 15 September 2010

Last Name: _____ First Name: _____

Position: _____

Company: _____

Address: _____

City, State, Zip: _____

Phone: _____

Email: _____

*Early registration must be received by 30 Aug 2010. Cancellations may be made up to 30 August 2010, however 25% of the fee will be charged. No refunds. Registration is accepted on a first come, first served basis. Questions? Call 763.607.0092 or email info@midwestgeo.com.

MGWA RATE

Register Now \$980
After Aug 30 \$1,195
MGWA Members (before Aug 30) \$599
Govt Rate 2 for 1

☐ Check Enclosed

☐ VISA ☐ MasterCard ☐ AMEX

VISA / MC / AMEX NUMBER

EXP

CARDHOLDER NAME

☐ Purchase Order

Mail completed form
with payment to:

Or Register On-Line:

Midwest GeoSciences Group
6771 County Road 8 SW
Waverly, Minnesota 55390
www.midwestgeo.com

An intensive two-day short course

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GEOSCIENCES
group**
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6771 County Road 8 SW
Waverly, MN 55390 USA

Location:

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- **Holiday Inn & Suites
Conference Center**

located between MSP International
Airport and the Mall of America

Date:

14 & 15 September 2010

Here's what others say about this course:

"The tools provided during the (Aquitard Course) will be a major contribution towards solving problems in low permeability formations and by taking a new approach at how we can look at the geology beneath a particular site..."

....Thanks again and I look forward to attending additional courses in the future."

- **Bradley D. Nordberg, Senior Hydrogeologist
Minnesota Pollution Control Agency**

"Great course, notebook, instructors, and examples!"

- **Guilio Scarzella, Hydrogeologist
AMEC, Inc.**

"The entire course was very applicable to my daily projects. The discussions, open forum, and the hands on work really shined.

- **Jeremy Reynolds, Hydrogeologist
Huff & Huff, Inc.**

"This class was outstanding in every respect. I enjoyed the problem solving, field work, and classroom sessions. I highly recommend this class to all hydrogeologists regardless of the program they serve.

- **Brian Kalvelage, Senior Regional Hydrogeologist,
Wisconsin Department of Natural Resources**

Registration

Advance registration is necessary in this limited-enrollment workshop to reserve space and receive course materials. A confirmation letter and map will be sent within 10 days of registering for the course.

Registration is accepted on a first come, first served basis. Midwest GeoSciences Group is not responsible for registrant's airfare, hotel, rental car reservations or other ticketing.

Special arrangements for diet, equipment, or handicap facilities should be indicated when registering for the course. Complete course details and a registration form is available on-line at midwestgeo.com

Cancellation Policy

Cancellations may be made up to two weeks before the course, however, 25 percent of the course fee will be charged. Cancellations made after two weeks before the course will be charged \$500. No refunds. One substitute is allowed for each registrant who is unable to attend.

Continuing Education Units

A Course Completion Certificate will be administered by Midwest GeoSciences Group. Most state professional licensure programs accept CEUs for this course.

What You Will Receive

You will receive 16.0 contact hours of instruction, a Field Guide for Soil and Stratigraphic Analysis, a Field Guide for Rock Core Logging and Fracture Analysis, a comprehensive 350-page course notebook with many reference resources and a CEU completion certificate from Midwest GeoSciences Group.

Registration also includes continental breakfast, morning coffee break, lunch, and an afternoon break.

Recording devices are not permitted during classroom sessions.



Free with Registration

FIELD GUIDE FOR
SOIL AND
STRATIGRAPHIC
ANALYSIS and

FIELD GUIDE FOR
ROCK CORE LOGGING
AND FRACTURE
ANALYSIS.

Venue & Accommodations

**Holiday Inn & Suites Select
and Conference Center
MSP International Airport / Mall of America**

3 APPLETREE SQUARE
1494 & 34TH AVE EXIT 1
BLOOMINGTON, MINNESOTA 55425



Block of rooms reserved at beautiful and newly renovated Holiday Inn Express.

Discounts

Register before August 30th and take advantage of the early registration rate. For Group and full-time Student Discounts, please call Dan Kelleher at 763.607.0092.

Appreciable discounts are available for groups registering at the same time. Call 763.607.0092 for details. .

Details

Complete details at www.midwestgeo.com

Dear Ground Water Professional:

We face a common problem: how many times have you learned of a shallow groundwater contamination problem and heard someone say “We don’t have to worry about the deep aquifer, it is protected by an overlying aquitard”? How many times have you seen cross sections showing that downward migration of contaminants stops at a clay or shale layer? Have you ever really investigated these aquitards? How do you know they are effective barriers to contaminant movement?

Aquitards are critically important for understanding groundwater protection, drinking water supplies, and contaminant movement. Although aquitards may seem to make up only minor parts of hydrostratigraphic sequences they commonly control the overall groundwater flow system by influencing recharge, discharge, vertical head distributions, groundwater flow paths, and contaminant migration. During this course, you will:

- **Discover the unique hydraulic properties of low-permeability units.**
- **Learn about recent advances for testing aquitard integrity and apply it to your monitoring or ground water supply protection program.**
- **Avoid common mistakes related to characterizing ground water movement and contaminant pathways in low-permeability units.**

Both unconsolidated and bedrock aquitards share inherent low hydraulic conductivities, but approaches and field methods for characterizing each type can be completely different. This course will unravel the complexity of aquitards and their hydrogeologic and hydraulic relationships.

Register before August 30 to receive early registration discount:

2-Day Professional Education Course: Minneapolis, Minnesota

“The Aquitard Course”

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