Short Course

Name of Short Course:	**Environmental Geochemistry and Geochemical Modeling**
Date:	Saturday, September 17, 2011
Time:	8:30 am – 4:00 pm
Location:	Fairmont Chateau Lake Louise / **Pipestone Room**
REGISTRATION FEE:	$550 (CDN)
# of participants:	20
Facilitated by:	Robert Donahue
Language:	English

Short Course Description:

An understanding of geochemical principles is essential to the cost effective management of groundwater and waste management problems. The course will provide the environmental science practitioner with the tools to characterize groundwater systems and predict their response to contaminants loading or remediation efforts. The material is presented through examples of basic mineral-water-atmospheric gas interactions and through case studies of mine waste management operations. The course material is delivered though lectures and hands on geochemical modeling designed to reinforce geochemical concepts and provide analytical tools for the working professional.

Short Course Objectives:

- Become familiar with the basic terms and concepts of aqueous chemistry and geochemistry
- Understand how to characterize groundwater and surface water chemistry
- Understand the redox chemistry of carbon, nitrogen, iron and sulphur species
- Understand how geochemistry impacts the mobility of inorganic contaminants in groundwater systems
- Become familiar with the geochemistry of mine waste management
- Learn how to do geochemical analysis in PHREEQC to characterize groundwater and surface water samples and to be able to conduct simple minerals solubility and oxidation reaction modeling

Target audience: (ie. who should attend)

The course is designed for the practicing geo-science professional engineer, geologist, soil scientist, and hydrogeologist.

About the facilitator(s):

Robert Donahue, PhD., P.Eng., specializes in applied geochemistry and has over 18 years of consulting and research experience in geotechnical and geo-environmental engineering. He has a BSc. In Civil Engineering, a MSc. In Geotechnical/Geo-environmental and a PhD. in Geological Sciences all from the University of Saskatchewan. Mr. Donahue has conducted geotechnical and environmental sites investigation across western Canada. His work included environmental site assessments, risk assessment, decommissioning,

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remediation, and environmental earthworks design and construction for petrochemical and mining industries. He has conducted geochemical field investigations at active uranium mine in-pit and above ground tailings facilities and has conducted geotechnical and geochemical assessments of uranium, oils sands, copper and phospho-gypsum tailings. While at the University of Alberta Dr Donahue funded, constructed and operated the Applied Environmental Geochemistry Research Facility a state of the art analytical chemistry and experimental facility. His research included the geochemistry of cation exchange in oil sands extraction and CT tailings production. Geochemistry of non-segregating oil sands tailings using lime and CO_2 amendments. Geologic storage of salt and sulphur waste from oil sands processing. Geo-environmental impact of sulphur concrete haul roads. Dr Donahue is currently a contract engineer for Syncrude at their Edmonton Research and Development centre investigating geotechnical and environmental issues with fluid fine tailings.

Short Course Agenda

8:30 AM	Registration and Distribution of Course Materials
9:00 AM	**Introductions and Course Objectives**
9:15 AM	**Lecture 1 Introduction to Basic Aqueous Chemistry Calculations** Problem Session 1 basic chemical calculations
10:00	Coffee and a Stretch
10:15	**Lecture 2 Basic Aqueous Geochemistry** Aqueous complexes, Activity Coefficients, Aqueous Speciation, Oxidation and Reduction Theory
12:00 PM	Lunch
1:30PM	**Problem Session 2 Characterization of Water** Introduction to Speciation Modeling using PHREEQC Solution, Solution_spread, selected_output, Mineral solubility calculations, Plotting Data in Excel,
3:00 PM	Refreshments and a Stretch
3:15 PM	**Problem Session 3 Geochemical Reactions in PHREEQC** Mineral and Gas Phase Equilibrium, Mineral Dissolution and Precipitation reactions. Mixing Models
4:00 PM	Finished for the Day

Equipment required: (ie. laptop)

A laptop computer is required as the course includes hands on geochemical modeling using the USGS freeware PHREEQC. Software is available on the USGS web page or can be supplied for installation the morning of the course

Materials provided: (ie. copies of ppt presentation, course binder)

A course binder of notes and a CD of the course geochemical models with solutions will be provided