PCPG
Pennsylvania Council of Professional Geologists
116 Forest Drive • Camp Hill, PA 17011
Phone (717) 730-9745 • pcpg.org

Introduction to Inorganic and Organic Groundwater Geochemistry

Presented by Bill Deutsch

September 12-13, 2019
Doubletree by Hilton Pittsburgh Cranberry
Mars, PA

September 16-17, 2019
Doubletree Suites by Hilton Philadelphia West
Plymouth Meeting, PA

Western

DAY ONE

7:30 - 8:00 **Registration and Continental Breakfast**

8:00 - 10:00 **The Geochemical System, Chemical Reactions, and Data Collection Requirements**
- Geochemical Systems
- Overview of Water/Sediment/Gas Interactions
- Definitions and Concentration Units
- Sampling Requirements

10:00 - 10:15 **Break**

10:15 - 12:00 **Solution and Gas Phase Reactions**
- Solution Species and Speciation Reactions
- Concentration, Activity, and Activity coefficients
- Henry's Law
- Partial Pressure
- Solubility of O_2 and CO_2 in Water
- Groundwater pH control

Noon - 1:00 **Lunch**

1:00 - 3:00 **Mineral Dissolution/Precipitation**
- Chemical Equilibrium
- Mineral Solubility
- Solution Factors affecting Solubility
- Reactive Minerals

3:00 - 3:15 **Break**

3:15 - 5:00 **Oxidation/Reduction Reactions**
- Electron Transfer
- Acid Mine Drainage
- Landfill Environment
- Eh Measurement & Equilibrium

5:00 **Course evaluation, Adjournment (Certificate pick up after day two concludes)**

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DAY TWO

7:30 - 8:00 **Registration and Continental Breakfast**

8:00 - 10:00 **Adsorption/Desorption Reactions**
- Surface Complexation
- Kds and other Isotherms
- Retardation Factor
- Solid Phase Adsorption Characterization

10:00 - 10:15 **Break**

10:15 - 12:00 **Geochemical Processes Controlling Fate and Transport of Inorganic Contaminants**
- Natural Attenuation
- Adsorption/Desorption Effects
- Mineral Dissolution/Precipitation Effects
- Limitations on Natural Attenuation
- Conservative Contaminants

Noon - 1:00 **Lunch**

1:00 - 3:00 **Geochemical Processes Controlling Fate and Transport of Organic Contaminants**
- Focus on petroleum hydrocarbons and chlorinated solvents
- Volatilization
- Adsorption
- Biodegradation

3:00 - 3:15 **Break**

3:15 - 5:00 **Case Studies**
- Coal Combustion Residuals
- Arsenic
- Chromium
- Petroleum hydrocarbons and chlorinated solvents

5:00 **Course evaluation, Adjournment, and Certificate Pick-Up**

Please turn in your course evaluation and pick up your Certificate of Attendance before leaving. Hope you enjoyed the course and found it to be useful.

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Instructor Biography

Bill Deutsch holds a B.S. and M.S. in geological sciences from the University of Washington, Seattle. As a groundwater geochemist with research and consulting firms for more than 30 years, his project experience includes environmental assessments and investigations of landfills, refineries, CCR sites, pesticides plants/distributorships, military bases, mines and mills, federal weapons facilities and a wide variety of additional industrial sites. In addition, he has participated in remedial designs of sites contaminated with metal, radionuclides, pesticides, solvents, petroleum hydrocarbons and ordnance compounds. Since 1985, Bill has instructed more than 200 courses on groundwater geochemistry and geochemical modeling. He is the author of Groundwater Geochemistry, published by CRC Press, and is an independent environmental consultant.