David Blowes of the University of Waterloo has been selected as the 2006 Birdsall-Dreiss Lecturer for 2006. This lecture series is sponsored by the GSA Hydrogeology Division. At the request of interested institutions, he will present one of the two lectures described below.

David Blowes teaches in the Department of Earth Sciences at the University of Waterloo, where he has held the Canada Research Chair in Groundwater Remediation since 2001. He is a member of the Waterloo Institute for Groundwater Research. He received his B.Sc. in Earth Sciences from the University of Waterloo, then went on to complete M.Sc. and Ph.D. studies specializing in hydrogeology and aqueous geochemistry at the same institution. In 1991 he joined the faculty, and now holds the rank of Professor. At Waterloo he teaches courses on groundwater geochemistry and hydrogeology. His research focuses on the release and transport of dissolved metals from mine wastes, transport of dissolved metals and nutrients in aquifers and remediation of groundwater contaminated by dissolved metals and nutrients. He has published over 100 professional papers and presented more than 100 professional talks. He has co-edited three volumes on the environmental effects of sulfide mineral oxidation in mine wastes. He has participated in review panels for Natural Sciences and Engineering Research Council of Canada and for government agencies in Canada, the United States, Australia and Europe. He has acted as a consultant for private companies and government agencies.

Permeable Reactive Barriers for Treating Groundwater Contaminated by Dissolved Metals

In situ techniques for treating contaminated groundwater have evolved rapidly over the past decade. Permeable reactive barriers were among the first of these new approaches, and now are applied widely. Permeable reactive barriers are installed by excavating a portion of the contaminated aquifer and replacing the aquifer materials with a reactive material tailored to treat the target contaminants. More than 150 reactive barriers have been installed since the initial installations in the mid 1990’s. These barriers treat a variety of contaminants, including dissolved metals, nutrients, mine drainage, halogenated hydrocarbons and petroleum derivatives. Reactive barriers designed to treat dissolved metals rely on removing the metal from the water and retaining it in the reactive mixture through precipitation or adsorption reactions. Most frequently, metal retention is achieved by changing the oxidation state of the metal and precipitating a secondary mineral which is sparingly soluble under the conditions that prevail in the barrier.

During this presentation I will focus on the development of reactive barrier systems for treating dissolved metals, describing the steps from bench-scale testing to full-scale implementation. The presentation will include the results of laboratory testing, conducted to assess the properties of reactive materials, field installations, long-term monitoring and the development and application of reactive transport models, used to understand the interaction of physical and chemical processes within reactive barriers and to predict their long-term performance. I will describe our continuing efforts to understand, refine and extend the limitations of this developing technology.