WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2003WY10B

Title: Geochemistry of CBM Retention Ponds Across the Powder River Basin, Wyoming

Project Type: Research

Focus Categories: Geochemical Processes, Groundwater, Surface Water

Keywords: Salinity, Sodium Adsorption Ratio, Water Chemistry, Ponds, Water Uses

Start Date: 03/01/2003

End Date: 02/29/2006

Federal Funds Requested: $9,660

Non-Federal Matching Funds Requested: $86,022

Congressional District: 1

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Abstract

Wyoming Water Research Program Request for Proposals (WRP RFP, 2002) identified the geochemistry changes of coalbed methane (CBM) retention pond waters in the Powder River Basin (PRB) as a high priority research to the State. Objectives of this research are to monitor the geochemical changes and water quality of CBM retention ponds in Little Powder River Basin (LPRB), Belle Fourche River Basin (BFRB), and Cheyenne River Basin (CRB). The CBM product water samples from discharge points and corresponding retention ponds will be collected during the summer months over a period of 3 years. Samples will be analyzed for pH, dissolved oxygen (DO), electrical conductivity (EC), major cations (e.g., Ca, Mg, Na, and K), major anions (e.g., alkalinity, sulfate, chloride, fluoride, nitrate, and phosphate), and trace elements (e.g., Al, As, Ba, B, Fe, Cd, Cu, Cr, Mn, Mo, Se, Pb, and Zn). Sodium adsorption ration (SAR) will be calculated from the measurements of Ca, Mg, and Na. Statical analysis will be performed on analytical data to determine means, standard deviation, and significant differences.

Analytical data of CBM discharge water and retention pond water will be modeled with MINTEQA2 geochemical model to predict geochemical changes (complexation, adsorption, and precipitation) of trace elements in retention ponds as a function of time and watershed soils. In addition, sediment samples from the retention ponds will be separated into different fractions (water soluble, associated with carbonates and oxides, and residual) to determine the fate of Fe, Ba, As, and Se. In addition, we propose to investigate the relationship between wetland plant community attributes (species density, canopy cover, diversity) and water quality parameters, as well as the diversity of benthic macroinvertebrates found in retention ponds.

The proposed research helps determine the water quality and fate (complexation, adsorption, and precipitation) of trace elements in CBM retention ponds. Also, the proposed research helps determine the relationship between wetland plant community attributes and water quality parameters and the diversity of benthic macroinvertebrates in CBM retention ponds. Such information will help water users (landowners, agriculture and livestock producers, and ranchers) and water managers (state, federal, and local agencies) with the planning and management of CBM product water within the Powder River Basin. A graduate student will be an integral part of this project. The project results will be presented at state, regional, and national meetings and published in appropriate peer-reviewed journals.