SiREM

CASE STUDY

Client
Geosyntec

Site Location
Confidential Site

Project Duration
6 Weeks

Services Provided

- Bench Scale testing following the United States Environmental Protection Agency (USEPA) Tiered approach guidelines for Mo, B, and SO_4^{2-}
- Evaluation of the attenuation rate and mechanism
- Evaluation of the capacity and stability of attenuation

FIGURE 2: Different soil water ratios were tested to determine the partitioning coefficient (Kd).

Evaluation of a Monitored Natural Attenuation Approach for a CCR Ash Pond Site

Project Highlights

- The EPA tiered approach was used to test attenuation of molybdenum (Mo), boron (B), and sulfate (SO_4^{2-})
- Site-specific partition coefficients were calculated from a laboratory batch test
- A desorption batch test was completed to evaluate the reversibility of attenuation
- Results suggested that the Mo and B desorption was not impacted by changing redox conditions

Problem Definition

Material from two inactive and unlined coal combustion residual (CCR) impoundments had led to exceedances of molybdenum (Mo), boron (B), and sulfate (SO_4^{2-}) in the surrounding groundwater with potential discharges to downgradient surface water. Remedial action involved physical removal of the CCR material, however, other corrective measures for the groundwater were required. Monitored natural attenuation (MNA) using the USEPA tiered approach was evaluated as a feasible option. SiREM was contracted to complete the Tier II and III evaluations. The data from these bench scale studies provided information about the attenuation mechanism (including sorption to iron oxy-hydroxides), rate, capacity, and potential desorption conditions for the contaminants of concern (COCs).

Notable Results

SiREM tested different soil:water ratios to calculate site-specific partition coefficients (Kd) for each COC. The Kd allowed the concentration of contaminants to be modelled as adsorption sites become occupied in the geological material. Using this method, it was determined that the Kd for Mo was 109 L/kg and the linear partition coefficient for SO_4^{2-} was 9.97 L/kg. Once sorbed, SiREM then tested different oxidation-reduction conditions to determine the stability of attenuation and understand under which conditions desorption may occur. Under ambient, oxidizing, and reducing conditions, 8% of the Mo, 70% of the B, and greater than 90% of the SO_4^{2-} desorbed from the geologic material. This suggested that desorption was not affected by redox conditions and that attenuation was likely not correlated with the presence of iron oxy-hydroxides. This data was used by the Site consultant to complete their full evaluation consistent with USEPA's tiered approach to support an MNA remedy for the Site.

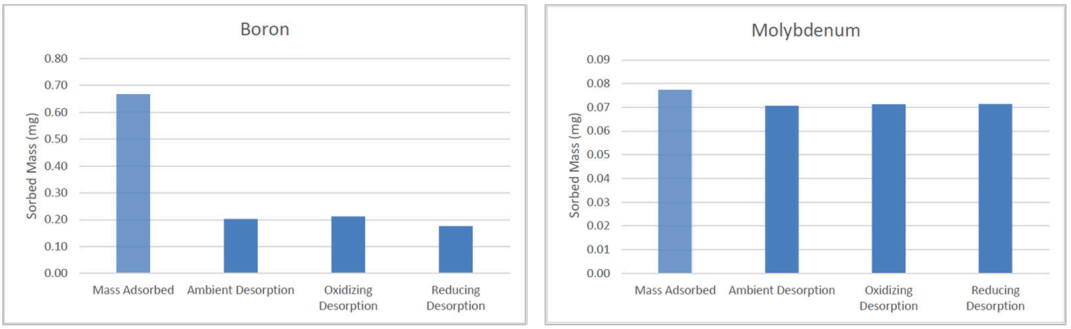

FIGURE 1: The majority of the B and only a minor amount of the Mo desorbed under each redox condition.