Short- and Long-Term Behavior of Fixated FGD Material Grout at the Roberts-Dawson Mine

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ABSTRACT

We examine both the short- (~ 1 year) and long-term (~ 4 years) behavior of fixated flue gas desulfurization (FGD) material grout following placement within an underground coal mine. Immediately after grout injection, significant increases in acidity, Fe, Al, S, and Ca were observed for most of the surface and groundwater monitoring locations near where grouting was carried out. However, after four years, the long-term fluxes of acidity, iron, sulfur and calcium were only slightly elevated compared to pre-grout conditions. We suspect that the initial increase in discharge of inorganic elements was due to dissolution of accumulated iron and aluminum sulfate salts and ferrihydrite within the mine voids following the increase in water level and/or rerouting of drainage flow. The long-term discharge of these constituents was likely controlled by the continued dissolution of these soluble salts as well as grout material (for Ca and S). Although the long term fluxes of some elements from the main seeps were slightly elevated, no measurable deleterious short- or long-term impact was observed for the underlying groundwater or adjacent surface water reservoir. Mineralogical analyses indicate that the fixated FGD material grout injected into the Roberts-Dawson mine was geochemically stable and groundwater sampling showed that the grout could locally neutralize mine drainage. However, a grouting strategy that minimizes the dissolution or transport of accumulated soluble salts within the mine voids upon changes in water flow paths is likely needed in order to bring about significant improvements in seep water quality.

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