

Impact of Coal Mine Reclamation Using Coal Combustion By-products (CCBs) on Groundwater Quality: Two Case Studies

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ABSTRACT

Currently, two coal mine reclamation demonstration projects, referred to as Five Points and Star Ridge, of varying constructability scales and fill material combination are being carried out at mine sites in eastern Ohio. Approximate one million tons of stabilized FGD material and FGD gypsum are used to reclaim a highwall complex at the Five Points site. FGD gypsum is used at the Star Ridge site, which is a highwall pit with an estimated FGD capacity of half million tons. The water qualities of the upper-most aquifer systems underlying the sites are monitored on a monthly basis. More than 18 months' worth of background water data was collected for both sites. Principal component analysis, hydrochemical analysis, and geochemical modeling were used to elucidate potential hydrogeochemical processes involved in the underlying aquifer systems. Based on the data collected over a period of more than three years since the reclamation began, the water qualities at both sites are found to be significantly different from the background levels. The concentrations of a number of monitoring parameters have exceeded the background upper prediction limits in one or more of the sampling locations. In addition, at both sites, a number of major monitoring parameters show significant incline or decline trends in more than one sampling locations after reclamation began. It is concluded that, instead of the leachate from the backfilled FGD materials, altered hydrogeological conditions resulting from reclamation likely caused the observed water quality changes at both sites during the study period.

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