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Factors Influencing Water Discharges from Pennsylvania Underground Coal Mine Pools

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Abstract

The Surface Mining Control and Reclamation Act of 1977 requires underground coal mines with acid- or iron-producing strata to prevent discharges. In Pennsylvania, engineered barriers are designed to prevent discharges to surface waters, primarily from contained mine pools. In many cases, mine layout designs focus primarily on the size and hydraulic performance of the un-mined coal barrier between the up-dip mine pool and areas where down-dip surface discharge is possible. In other cases, designs focus on preventing discharges from barriers contained within the strata surrounding the mined coalbed.

This Appalachian Research Initiative for Environmental Sciences (ARIES) sponsored research effort is focused on identifying the factors responsible for barriers that have performed successfully, as well as those that have not. Nine case studies are analyzed providing an opportunity to examine a diverse set of conditions, both from a geologic and mining standpoint. While the exact causes for the successes and failures could not always be determined, reasonable mechanisms are presented. Important factors include: mine layouts (coal barrier size), mining methods (extraction ratio), hydraulic head and conductivity (interaction of both conditions), geology (strength variations), and overburden. These factors are used to identify risk to barrier design.