Application of Coupled Surface and Subsurface Hydrological Modeling in Hydrology-Based Reclamation Technique of Mine Lands[1]

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Abstract: Both surface and groundwater flow provide significant seepage pathways for contaminant transport from abandoned mine lands to the surrounding environment playing major role in environmental pollution. Thus, effective reclamation technique of mine lands must incorporate detailed understanding of the hydrological characteristics of both surface and subsurface water including the interactions between them at the watershed, where the mine lands are located. Despite of the significance of the interactions between surface and subsurface water for contaminant transport, traditionally, hydrological studies are performed for surface and subsurface water independently and the effect of the interactions between them is assumed to be insignificant. In this study, as part of a hydrology-based design of geomorphic evapotranspiration (GET) covers for the reclamation of mine lands, we applied a coupled surface and groundwater hydrological modeling to understand the hydrological characteristics of the Tin Pan mine site, located in the northern region of New Mexico, United States. For this purpose, the Soil and Water Assessment Tools (SWAT) and the Modular Three-dimensional Finite Difference Groundwater Flow Model (MODFLOW) were coupled to simulate surface and subsurface hydrology of the watershed, where Tin Pan mine site is located. Due to lack of meteorological data at the Tin Pan watershed, the coupled hydrological models were first calibrated using the Purgatoire watershed, which is climatically and topographically similar to the Tin Pan watershed, located in the southern region of Colorado, United States. In this presentation, we show results of the coupled surface and subsurface water simulation at the Tin Pan watershed that are relevant to the hydrology-based design of GET covers for reclamation of mine lands.[3]

Additional Key Words: Abandoned Mine Waste; Water Management; Geomorphic Reclamation; Evapotranspiration Cover.

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3. Work reported here was conducted near 36°56'30.47" N, 104°32'16.51" W.