

# Techniques and Challenges for Material Stabilization within Historically Mitigated Underground Abandoned Coal Mines <sup>1</sup>

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**Abstract:** This presentation covers subsurface variabilities faced with historic backfilling techniques and how to approach maximizing underground abandoned mine stabilization for long term reliability in subsidence prone areas. Techniques and technology used for abandoned coal mine mitigation have evolved, not only in material sourcing but also in engineering approach over the years. The historic abandoned mine mitigation approach specifically used in Hanna, WY within the Hanna No. 4 Coal Mine, utilized a combination of sand and water ('sand slurry') material injected into the mine under high velocity. While initially thought to reduce existing void space and prevent further structural degradation and eventual mine subsidence, the slurry injected introduced further mine destabilization concerns through erosion and material migration processes within the mine over time due to water movement within the mine. This historic engineering approach has ultimately compounded the potential for subsidence risk and has led to a modified modern day engineering approach to not only stabilize the historically injected material, but also provide a long-term solution to reduce continued risk of subsidence in the area. This presentation will discuss existing geologic conditions, historic mitigation techniques, current mitigation challenges in pre-existing conditions, and a long-term stabilization solution to prevent continued mine subsidence in abandoned underground coal mines.

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