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**ANALYSIS OF COAL COMBUSTION BY-PRODUCTS DISPOSAL PRACTICE IN NM:  
HYDROLOGIC & WATER QUALITY ISSUES**

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**ABSTRACT:** Management of Coal Combustion By-Products (CCBs), often referred to as simply "ash," is under increasing scrutiny because of the potential to contaminate surface and ground waters. Ash may consist of fly ash, bottom ash, and sometimes, flue gas desulfurization products. This concern increased markedly with a spill of 4.1 M m<sup>3</sup> of ash from an impoundment in Tennessee in December 2008.

An open pit coal mine in New Mexico has received CCBs since about 1973, and while there are no issues regarding stability of the disposed material, there are concerns about impacts of leachate on underlying ground water quality. This presentation will describe a laboratory and modeling study conducted to assess the potential for contaminant transport from the disposed ash.

Undisturbed samples were collected by direct push technology (Geoprobe) and disaggregated samples were collected by sonic drilling. The geotechnical and hydrologic properties measured included density, water content, hydraulic conductivity and soil moisture characteristic curves. The chemistry of the ash and associated leachates were characterized. The principal contaminants of concern were salinity (TDS) and elevated concentrations of trace elements including B, Ba, SO<sub>4</sub>, and As among others. The mineralogy of the CCBs was determined by X-ray diffraction and scanning electron microscopy. Of particular interest was determination whether there were observable mineralogical changes with time.

Geochemical analysis results show unburied ash contains elevated concentrations of lead and while buried ash contains elevated concentrations of barium and iron. Unburied ash leachate has the highest concentrations of dissolved calcium which is most likely due to the fact that the buried samples have already had the calcium react with other molecules. Buried ash leachate has the highest concentrations of nitrite most likely due to oxidation occurring from various. Ash samples were plotted against the sample's depth to demonstrate concentrations as a function of time. Concentrations of barium and copper in buried ash samples showed the largest increase as depth increases.

Mineralogical examination found visible signs of mineral dissolution, crystallization or lattice structures forming and evidence of secondary phase minerals. Older ash samples showed evidence of secondary mineralization resulting in formation of calcite and high percentage of crystalline structures.

Columns of CCBs were prepared and were subjected to leaching by de-ionized water and groundwater collected at the site from the coal seam. The columns were packed to approximately the same bulk density as the undisturbed material and one pore volume was sent through each column per day. The purpose of the columns was to determine the sequence of analytes appearing in the leachate. Leachate results displayed mineral dissolution with barium having the highest leachate concentration.

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