

IMPACT OF GEOFLUVIAL APPROACH ON RECLAMATION PRACTICES AT SAN JUAN COAL COMPANY'S LA PLATA MINE¹

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Extended Abstract: San Juan Coal Company implemented a geofluvial based approach to design and construction of reclamation areas at La Plata Mine (LPM) in 2002. Our goals in using the fluvial geomorphic principals for reclamation were to; create stable landforms, enhance topographic diversity which in turn would allow for the establishment of diverse plant communities and wildlife habitat, meet water quality criteria for runoff from the reclamation areas, promote bond release, and reduce long term maintenance costs associated with traditional reclamation designs. However, the implementation of geofluvial based reclamation does not come without challenges such as; spoil suitability and mitigation, topsoil lay-down, seeding, 434 National Pollution Discharge Elimination System (NPDES) issues, tie in with natural drainages, intensive dozer use, enhanced operator skills requirements, management acceptance, and acceptance and flexibility in reclamation plans with the SMCRA agency.

The quality of materials used for root-zone reconstruction and plans for addressing potentially toxic or acid forming materials (PTAFM) must be fully developed before implementation of the geofluvial based approach. Mitigation of questionable materials by burial can create unstable and erosive features within a slope or drainage area. La Plata Mine addressed PTAFM issues with a commitment to conduct mitigation in areas of denuded vegetation that can be attributed to root-zone material quality.

Geofluvial designs are more complex and require modification in topsoil replacement and seeding. The high drainage densities and resulting complex topography necessitates the development of area specific topsoiling and seeding plans. The varying topography allowed La Plata to add diversity to topsoil replacement thickness and revegetation seed mixes. Shallow (8 inches) topsoil is replaced on steep slopes and thick topsoil (14 inches) is replaced in relatively flat slopes (< 6%). La Plata implemented the use of four major revegetation classes based on slope, aspect, and topsoil replacement thickness: 1) North and east facing Shrubland, 2) South and west facing Shrubland, 3) Grassland, and 4) Drainages.

Additional Key Words: Landform stability, innovative reclamation, revegetation, RUSLE, Sed Cad.

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The 40 CFR 434 NPDES rules were recently amended for Western Alkaline Coal Mines, to allow for runoff to occur without numeric limitations once reclamation has been completed. Runoff from reclaimed areas must be covered under an approved Sediment Control Plan (SCP). While we were in the process of regrading the spoil, then topsoiling, and finally revegetation, we were required to maintain water management features to meet water quality numeric limitations within our NPDES permit and New Mexico State Water Quality regulations. We used ponds to capture the water before it went off site. After the watershed of a specific pond was revegetated we reclaim the pond or leave it in place as a permanent reclamation feature depending on the location and the stability of the pond itself. La Plata mine used RUSLE and Sed Cad models to demonstrate that the geofluvial based reclamation had average annual sediment yields that were less than sediment yields from pre mined, undisturbed conditions.

There are many natural drainages surrounding LPM. Channels must be properly designed with proper tie-in elevations and gradients to ensure stability and to maintain the hydrologic balance of the final reclamation. Geofluvial designs require extensive dozer work to build the various sized channels at the required stable drainage density and associated complex topography.

Training was required for operators to understand the necessary operational and reclamation principals. A dozer operator who understood the principals of what we were trying to achieve came to help train the operators at La Plata. He previously learned how to construct the designs based entirely on staking at San Juan Mine. La Plata began to use Machine Control on the dozers in 2003. This technology almost eliminated the need for staking and increased efficiency significantly. Once the design had been completed using CAD software, it was transferred to the dozers and a screen in their cabs told them their cuts and fills and provided a larger plan view of the area to which they were assigned to work. With the various initial and long term challenges we had to demonstrate the long-term value of the geofluvial approach to reclamation.

The acceptance and flexibility given by New Mexico Mining and Minerals Division (MMD) staff was based upon their understanding of the necessity to be flexible with our reclamation plan. Initially, it would take a large amount of time to come up with detailed designs in the Final Surface Configuration (FSC). Working with MMD we were able to come up with a less detailed FSC and made commitments in the text of our mine plans stating how we would complete the detailed reclamation. There also had to be an understanding by MMD that erosion was natural process and that LPM's goal was to mimic the natural erosion rates.

La Plata Mine has successfully combined stable landform design with variable seed mixes along with variable soil quality and replacement depths to enhance diversity of reclamation areas. Consideration must be made for additional effort required to design, construct, replace topsoil, and revegetate complex landscape features.

The key to successful implementation of geofluvial based reclamation at La Plata mine was open discussions and coordination with New Mexico Mining and Minerals Division Staff.