Geomorphic Reclamation in New Mexico: A Regulator’s Perspective

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New Mexico’s coal fields can be very dry ...
...or suddenly, very wet
Soils and overburden are often of poor quality
Natural vegetation cover can be sparse
Community diversity requires substrate diversity
Conventional steep slope construction is typified by low gradient terraces that convey runoff across a slope to a rock-armored drop structure that has been designed to pass a specific event. On coal mines, this is typically the local 10-year / 24-hour precipitation event.

Storms that are smaller or larger than the design event cause problems, either by sediment deposition or erosion.

Differential settling may also be a problem.
Traditional slope design, with a gradient terrace, a rock down drain, and a boulder pile.

- Uniform aspect
- Convex “basketball” profile
- Uniform topsoil
- One seed mix
Geomorphic Grading Goals

• Provide long-term drainage stabilization
• Meet runoff water quality criteria
• Reduce long-term maintenance
• Provide topographic diversity to enhance vegetation community development and wildlife habitat
• Promote timely liability bond release
Challenges

- Spoil suitability and mitigation
- Topsoil lay-down and seeding; extremely difficult in rough terrain
- Implement the new 434 NPDES regulation
- Tie in with natural drainages and previous reclamation—need an extremely good survey
- Dozer intensive; overly large mining equipment
- Enhanced operator skills; better communication and feedback; Machine Control
- Rock placement in channels and on slopes; if poorly done can create problems
- Management acceptance
- Regulatory acceptance
McDermott Dump 52-ac “proving ground”

- Geomorphic drainages
- Scallop slope
- Talus slope
- Rock rims
- Suitable spoil
- Rock mulch
- Multiple seed mixtures
- Wildlife pond
Best quality San Juan Mine revegetation prior to geomorphic grading
Failed stands may not have much more than annual wheatgrass cover
Topsoil re-spread underway at Cottonwood Pit
Cottonwood Pit end wall regrade
Highwall reclamation prior to seeding
Highwall reduction in 2008
Irrigating for seedling establishment
Reclaimed drainage channels and tie-in with older reclamation at SJM
Tie-in to a native arroyo
Close up of transition from reclaim to native
Two years after seeding Cottonwood Pit reclamation
Looking west over La Plata Mine in 2001
LPM pre-disturbance type topography with cuestas
LPM regrade plan prior to geomorphic design
York Canyon Mine, 1996 reclamation
LPM regrade plan after Natural Regrade was used
La Plata Mine, 2006 reclamation
Artificial outcrops
MMD inspection after a 200-yr/2-hr storm
Wildlife trail down to a permanent pond
Clarity of water in that pond
Wildlife watering hole within a permanent pond
McKinley Mine
Subsidence piping features on terraced reclamation
Piping hole
Differential settling on a terrace
Major feature requiring costly repair and creating liability concerns
Area 9 terrace, over-steepened cut slope
Erosion, flow blockage, differential settling, breach
Recently removed terraces
Cattle on a removed terrace
Complex topography, Pit 10 highwall reclamation
Ridges built by dumping excess spoil in windrows
Area 10 pit approaching final grade
Drainage channel constructed in a pit ramp
Swales and soil substitute material on slopes
Revegetation becoming established on Area 11 pit reclamation
2004 National Award recipients
2008 NM EMNRD Excellence in Reclamation Award recipients
Questions?

Photo by Mickey Ginn, SJCC