Natural Approach to Mine Rehabilitation

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FIG
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GeoFluv™

LANDFORMA
NATURAL SURFACE DESIGN

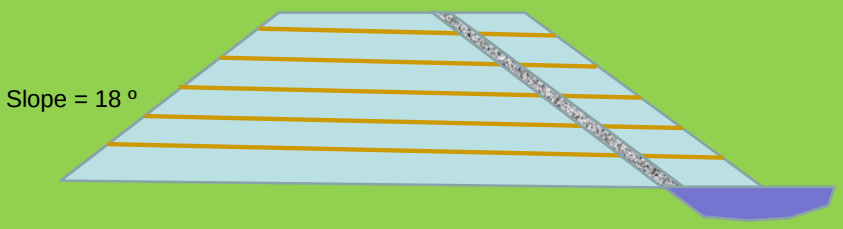
Waste Dumps

- Mine requirements
  - Move the dirt cost effectively
  - Meet regulatory requirements
- Regulators
  - Reduce the footprint
  - Protect local environment – water quality, drainage patterns, dust and noise
- Community input
  - Minimise disturbance
  - Return land to pre-mined use

Something just tells you it isn't right . . .

Waste Dump Construction

- Mines build the waste dump to fit the most dirt in the smallest footprint – leads to flat-topped pyramid.



- The flat gradient slopes can be up to 1:3 (=18º, 33%)
- Water flow control structures are constructed
  - Contour banks and
  - Rock drains
- Retention Ponds are built to hold turbid water

Contour Banks, Rock Drains, Retention Ponds

Problems with Waste Dumps

- Need Long term maintenance
  - Erosion and infrastructure failures
- Erosion leads to water quality issues
- Often do not provide habitats and biodiversity

New Approach to Mined Land Rehabilitation

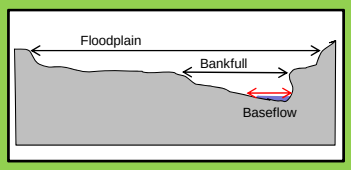
- Combines knowledge of fluvial geomorphic principles with CAD programs and Machine Guidance to enable the construction of “natural” landforms.
- Drainage Patterns

A network of tributaries that join together to form larger channels – each characterised by gradient slope, discharge volume and sinuosity

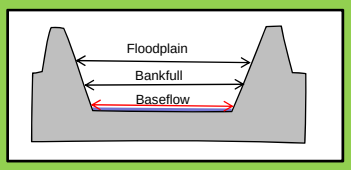
New Approach to Mined Land Rehabilitation

- Ridge line profiles – complex gradient slopes

- Channel Cross sections – allow for variable flow

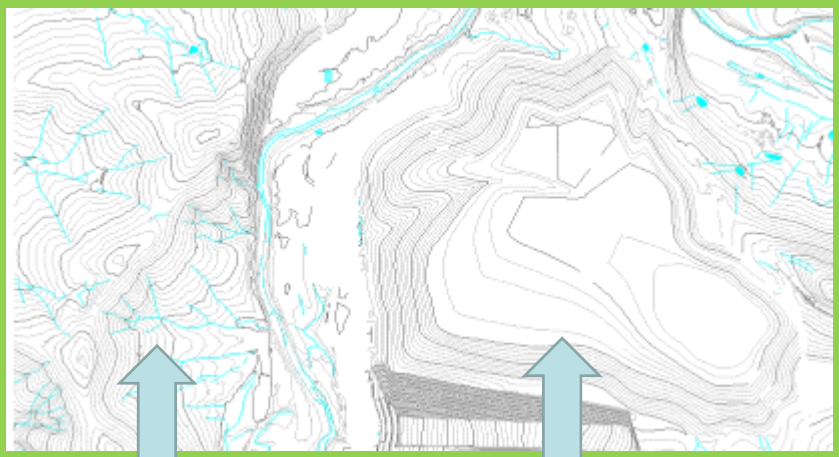


(Rosgen, 1996)



(Rosgen, 1996)

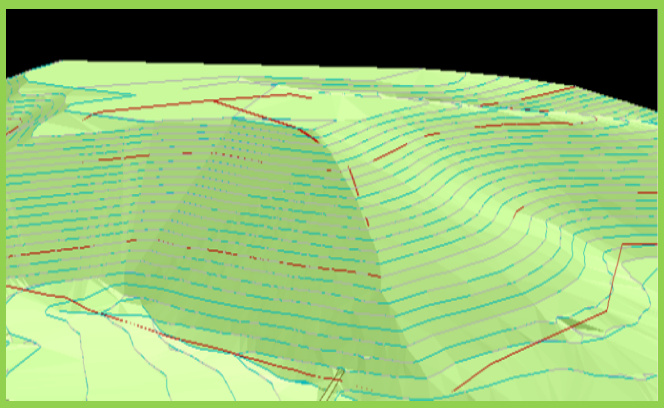
Contour Maps



Natural Surface

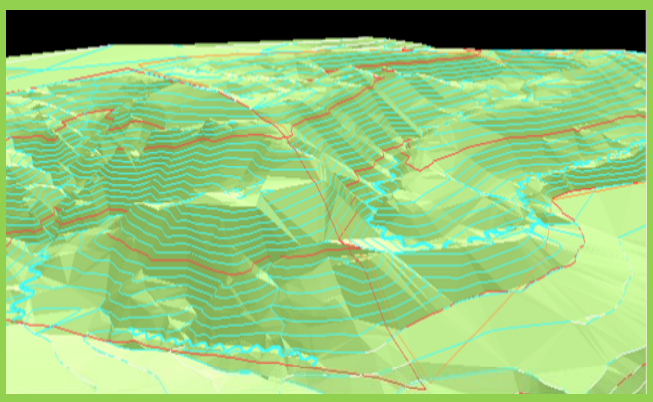
Waste Dump

3D View of Traditional Design



- Long slopes without channels, promote rill and gully erosion
  - Needs artificial down-drains
- Water quality – turbid run-off
- Minimal diversity for vegetation and wildlife
- Does not blend with surrounding terrain

3D View of GeoFluv Design



- Complex slopes with smaller sub-watersheds to reduce erosion
- Water run-off less turbid
- Natural slope and habitat diversity for vegetation and wildlife
- Blends with surrounding terrain

Build with Machine Guidance

What does it look like when it is built ?

LA Plata Mine – New Mexico USA

GeoFluv 'laboratory' and Results

One year later