Mine Stability Mapping

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Stability Mapping
(Hazard Mapping)

- Has been practiced for many years:
  - Initial stability maps hand-drawn and highlighted one feature
  - With computers, more comprehensive information is available and more complex (accurate?) analysis is easier to perform.
  - Geologic Databases, LaModel, CMRR
Geologic Hazard Map
Integrated Stability Mapping System

- **Combines:**

  - **AutoCAD** as the basic drawing and mapping foundation.
  - **SurvCADD** as the geologic characterization and database model.
  - **LaModel** for the overburden and multi-seam stresses, subsidence-based strains and pillar safety factors.
  - **CMRR** for the structural analysis of geology.
Stability Mapping Application
Stability Mapping Application

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Stability Mapping at Bowie

- Bowie Resources, LLC:
  - Paonia, Colorado, Somerset Coal Field, Piceance Basin, 4 Million tons per year
  - Bowie No. 2 – D Seam, 9.5 ft extraction
  - Bowie No. 3 – B Seam, 250 ft interburden
Southwest Mining District

B1 Longwall Panel

B2 Longwall Panel

B3 Longwall Panel
Critical Parameters at Bowie

- Overburden and Multiple-Seam Stress
- Interburden to Rider Seam
- Sandstone Channels
- Faults, Slumps and Warps
- Coal Mine Roof rating
Insitu Stress
Critical Parameters at Bowie

- Overburden and Multiple-Seam Stress
- Interburden to Rider Seam
- Sandstone Channels
- Faults, Slumps and Warps
- Coal Mine Roof Rating
Rider Interburden
Critical Parameters at Bowie

- Overburden and Multiple-Seam Stress
- Interburden to Rider Seam
- Sandstone Channels
- Faults, Slumps and Warps
- Coal Mine Roof Rating
Faults, Slumps & Warps

Mains Fault

B3 Fault

Faults
Slumps
Warps
Faults, Slumps, Warps
Index
Critical Parameters at Bowie

- Overburden and Multiple-Seam Stress
- Interburden to Rider Seam
- Sandstone Channels
- Faults, Slumps and Warps
- Coal Mine Roof Rating
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Results

- Weighting Factors were optimized with results from mining in the first panel.
- In subsequent mining, the stability mapping successfully predicted problematic zones.
- With foreknowledge of the problem zones, the management was able to be pro-active in their ground support plan.
Roof Support was applied based on the stability rating:

- Minimum 7 ft torque-tension bolt
- Supplemented with 12 ft cable bolts, 4 per row, heavy mats, 5 ft max row spacing
- 24 in Burrell cans, 2 per row, 8 ft max spacing
Part of a Bigger System

- Comprehensive geologic data collection:
  - Roof bolters log lithology
  - Underground core drilling
  - Underground mapping
  - Geologic model continuously updated

- Weekly “Quality” meetings to communicate ground conditions
Conclusions

- The operational plans developed from projecting problem zones through stability mapping have allowed Bowie Resources to successfully mine through difficult conditions, safely and successfully.

- Bowie Resources continues to use the stability mapping system on their present and future panels.