AQUASTOWING
An Effective Means of Curbing Large Karstic Inflows

Geohazards Impacting Transportation in Appalachia
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WHAT IS AQUASTOWING?

US Patent #8,585,328
"Underground Filling and Sealing Method"
Problems Associated With Karst

Kimballton Limestone Mine
Karstic Aquifer 6,000 GPM
Giles County, Virginia

Strip Mine Operation
Acid Mine Drainage
Indiana, Pennsylvania

Hydroelectric Dam
Karstic voiding 8,000 GPM
York, Pennsylvania
Problems Associated With Karst

[Image of a karst formation with water]
Average Discharge Rates (GPM)
Compounding Problems

DECREASED EFFICIENCY

- Increased Fuel Costs
- Longer Haulage Routes
- Limited Access: one road in & out
- Earthen Dam Construction
- Increased Electricity Bill
- We need more discharge pumps!
- 2/3 of the quarry is constantly under water!
- We need more pump maintenance!
Clinton Point Quarry - Karstic Features (Side Elevation)
AquaStowing Setup
Polyurethane Specs

- Single Component – Moisture Activated
- Pre-Catalyzed
- Hydrophobic
- NSF-61 Approval
- Several Minute Reaction Time
- 2-lb Density – Free Rise
- Flexible Foam
AquaStowing in Action

- **Gravel – ¾” Limestone**
  - Acts as a void filler
  - Agitates the void space
  - Becomes a carrier for the urethane
  - Increased density of the urethane "plug”

- **Single Component Polyurethane**
  - Becomes the binding agent
  - Migrates far from entry point
  - Highly expansive
  - Great adhesion to the strata
Karst Flow Path

2,800 tons aggregate in flow path

2,700 tons aggregate in G-16
DISCHARGE RATES

Grouting Begins
Earthen Dams Released
Rain Event (0.95”)
Rain Event (2.63”)
Rain Event (0.67”)
Rain Event (0.94”)
All Contractors Off-Site
Job Summary

3 Weeks On Site

5,500 Tons of Aggregate

60,000 lbs of Polyurethane

28,000 GPM

5,000 GPM
THANK YOU!

Any Questions?

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