WHAT HAPPENS UNDERGROUND MAY NOT STAY UNDERGROUND

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MINE SUBSIDENCE IN NYS

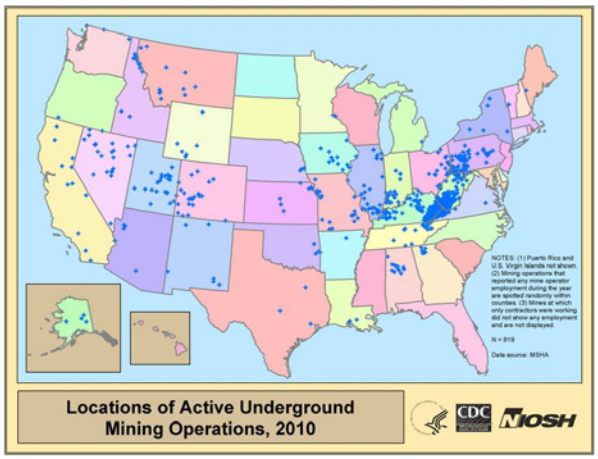
Age old problem

- Crooked House, South Staffordshire, England

You've spilled your beer, there, lad! Watch it run to the kitchen!

Nationwide potential

- Pennsylvania
- Ohio
- Indiana
- Illinois
- Kentucky
- West Virginia
- Virginia
- Tennessee
- And others



New York State Mines

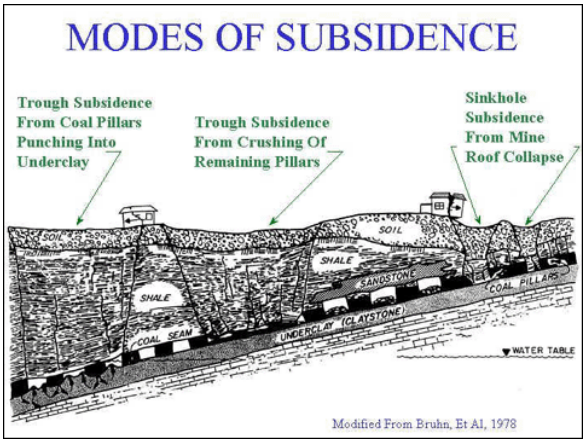
- Arsenic – 1 mine
- Graphite – 11 mines
- Gypsum – 10 mines
- Iron – 42 mines
- Lead – 5 mines
- Natural cement – 7 mines
- Pyrite – 3 mines
- Salt – 31 mines & well sets
- Talc – 13 mines
- Wollastonite – the only 2 mines in the US!
- Zinc – 8 mines

Abandoned mines R trouble

- Total lack of maintenance
- No internal monitoring
- Rare external monitoring
- Often unknown locations

Troubles they cause

- Settlement
- Groundwater loss
- Leachate
- Collapse



National failures

- I-70 collapse in Ohio, 1995
- Centralia, PA mine fire, 1962
- Salt mining in Kansas

So, ITGAUM!

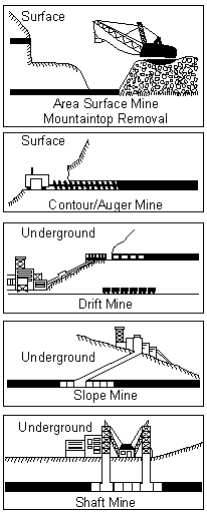
- Interstate Technical Group on Abandoned Underground Mines
- New York, New Jersey, and Pennsylvania in it.
- Also 15 other states, FHWA, FRA, & Canada.
- Founded after Ohio's I-70 collapse

ITGAUM Info

- On FHWA Geotechnical Website
- Proceedings of past meetings
- Procedure manual for inventory and assessment of mines
- https://www.fhwa.dot.gov/engineering/geotech/hazards/mine/index.cfm

Types of mining

- Open pit
- Auger mines
- Room and pillar
- Stopes and drifts
- Solution mining
- Long-wall mining
- *They can all be a problem at times*



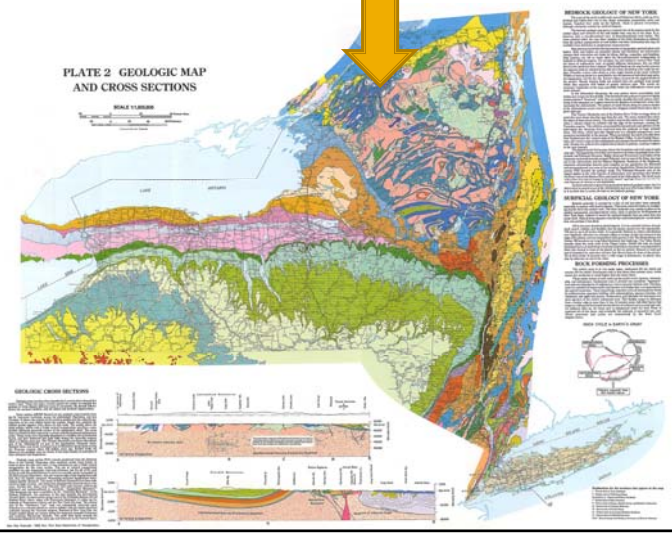
What do they leave behind?

- Open pit- *holes*
- Room and pillar- *pillars*
- Solution mines- *caves*
- Longwall mines- *nothing*

Pioneer Tunnel, Ashland, PA

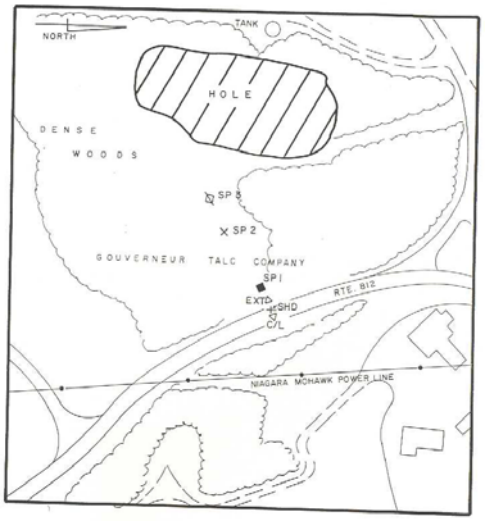
- Coal discovered in PA in 1790 by Necho Allen
- Drift mine operated from 1911 to 1931. Frightening methods.
- Now they give tours from little trains
- Ride 1800 feet straight through the coal seams

Balmat mines, upstate New York

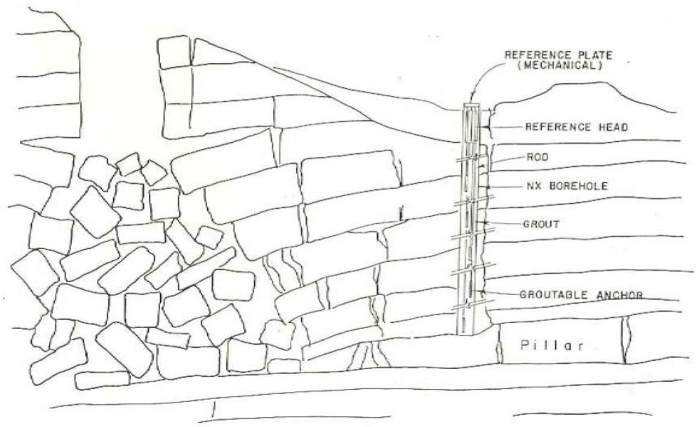


Talc Mine Collapse, 1986

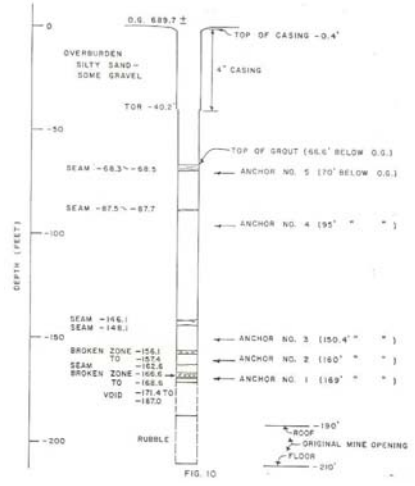
- Hole suddenly appeared 200 feet off ROW
- Concern was generated
- Instrument was installed



Problem monitoring

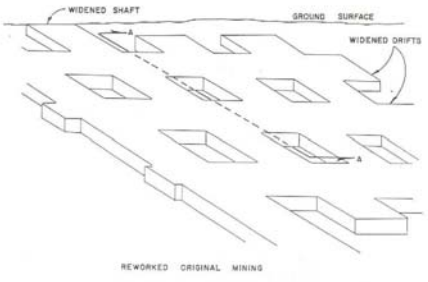


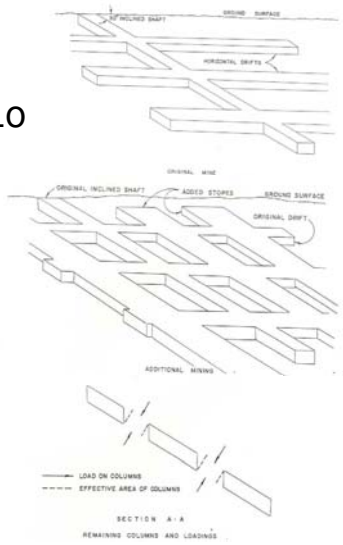
Lithograph



Mine layout

- American Talc 1892-1974
- Gouverneur Talc 1948-2010
- No More Talc in 2010….





Downward trend

What failed?

- Original workings overworked
- Small, eccentrically loaded columns failed
- Roof rock fell to floor
- Instead of bulking up, slid to bottom of mine
- Sliding blocks damaged more pillars

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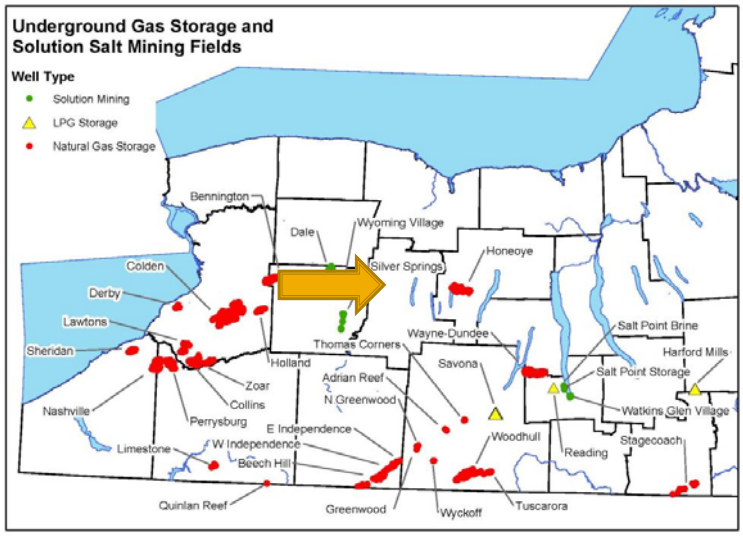
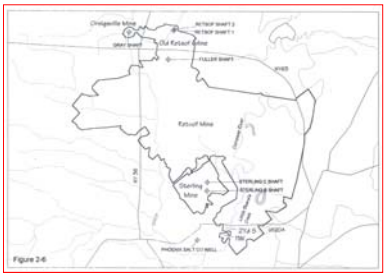
Retsof Salt Mine



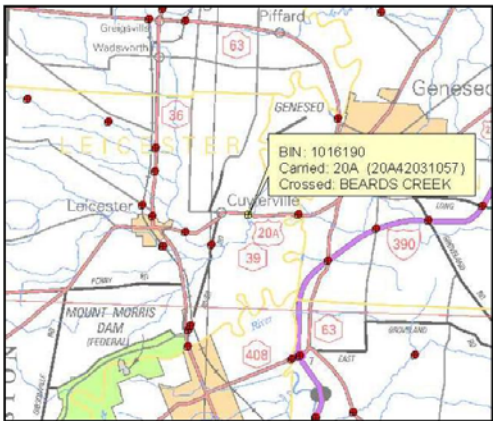
Retsof Salt Mine Collapse, 1994

- Second largest salt mine in the world
- 6000 acres, 1000 feet below ground
- Tried a new method; "yielding pillars" in 11W
- The pillars yielded on March 12th @5:43 AM w/a 3.6 seismic event



Affected our bridge

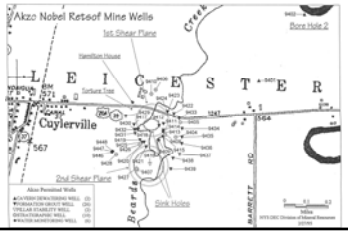
- Route 20A over Beards Creek
- It settled, then moved, and then we closed.
- Apparently, "chimneys" developed in rock and soil.



Wasn't built like that

Sinkholes formed

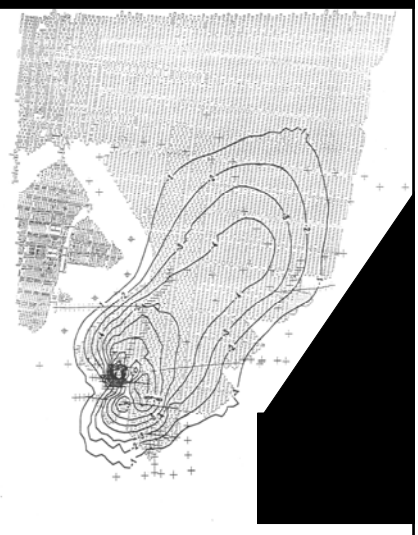
- Above collapse of the "yielding pillar" area



And then filled with water

Sinking feeling

- As water drained, consolidation occurred
- Several feet of settlement in area
- Mine slowly flooded over a two year period
- Locals opened a new mine a few miles away

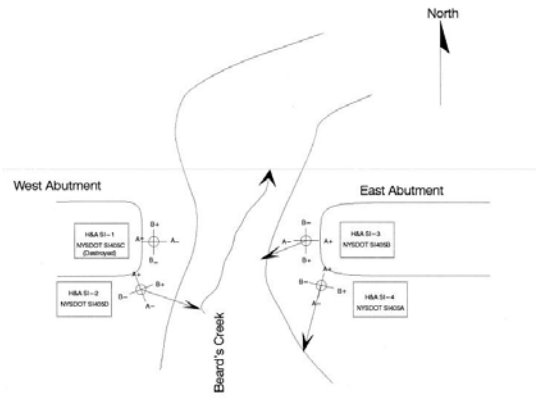


What to do?

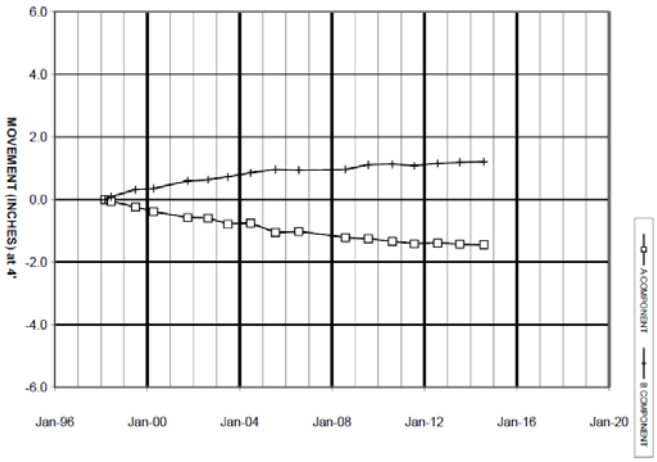
- Bridge was closed
- Settlement waited out
- New bridge built with gravel approaches
- Paved approaches later

After paving

Some movement continued

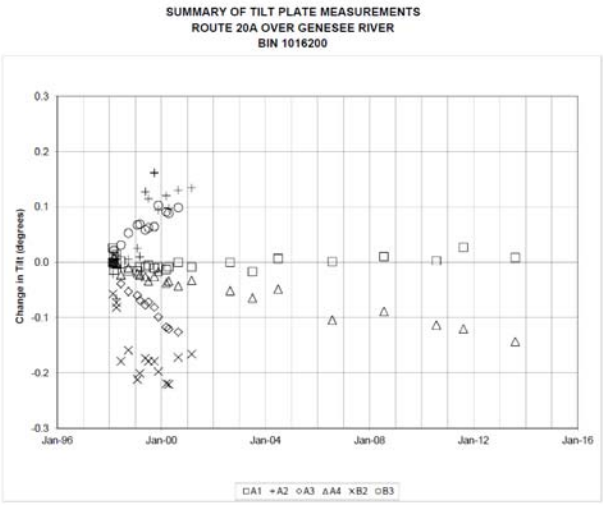


Slowly decreasing



Bridge over Genesee River

Gentle movement in recent years

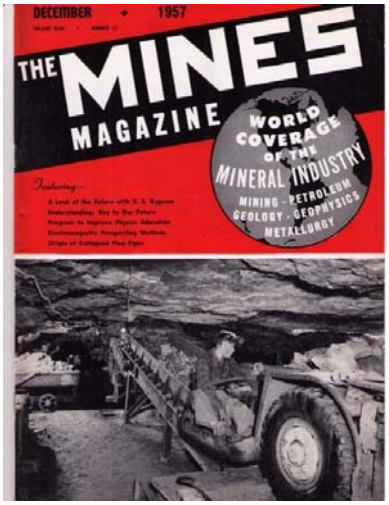


Route 63, Oakfield

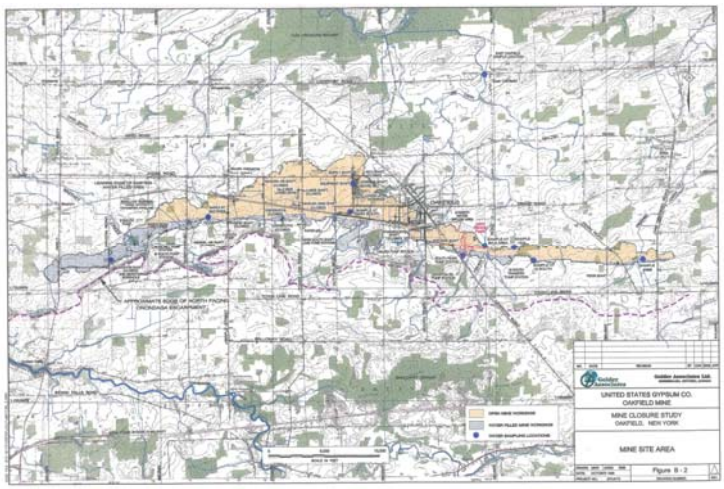
- Subsidence noticed in shoulder
- Settlement noted in field
- Abandoned gypsum mine beneath

Once a thriving operation

- In operation since the 1800's
- High tech in 1957
- Made the cover of Mines Magazine!
- No one had been back in this portion for decades

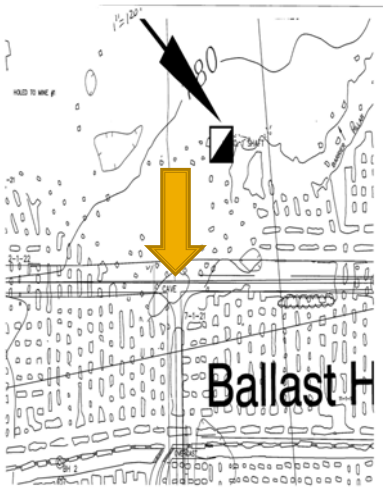


Certainly a big operation



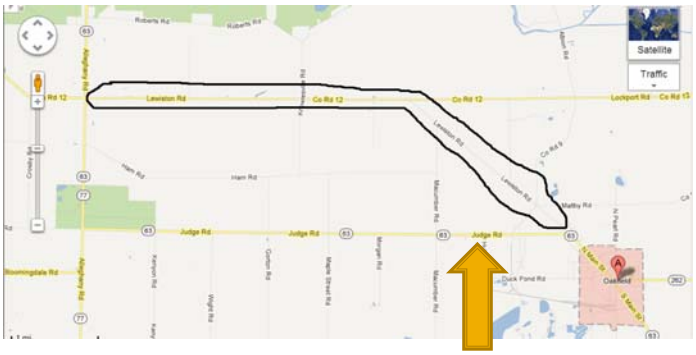
Perhaps an old problem

- Does the word "cave" mean anything to you?
- Maybe "cave-in"?
- Workings in this area more than 100 years old.



Detour established

- Perfectly good detour available
- Perfectly sensible locals avoided it



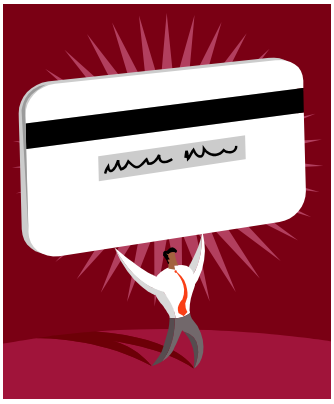
Tracks from people driving around

US Gypsum stepped up

- Drilled, inspected by camera, and then grouted up the area
- Monitored the movement
- Vigilance established, we re-opened the road
- Road was safer than the field, anyway

Credits

- Dr. William Kelly, NYS Geologic Survey
- NYS DEC Division of Natural Resources
- Kappel, Yager, & Miller, w/USGS, Ithaca, NY
- NYS DOT Regions 4 & 7
- Pennsylvania DEP



PDH Questions

- Name five minerals mined in New York.
- Name three types of subsurface mines.
- What is the name of the expert group that studies this subject?
- What is it called when fallen roof rock piles up and supports the ceiling?
- Why are abandoned mines often more troublesome than active mines?

PDH Answers

- Arsenic , Graphite, Gypsum, Iron, Lead, Natural cement, Pyrite, Salt, Talc, Wollastonite, Zinc
- Auger, Room & Pillar, Stopes & Drifts, Solution, Long-wall
- Interstate Technical Group on Abandoned Underground Mines (ITGAUM)
- Bulking
- No maintenance, little monitoring, often unknown locations.

Questions?

- Keep them easy, I'm no geologist.