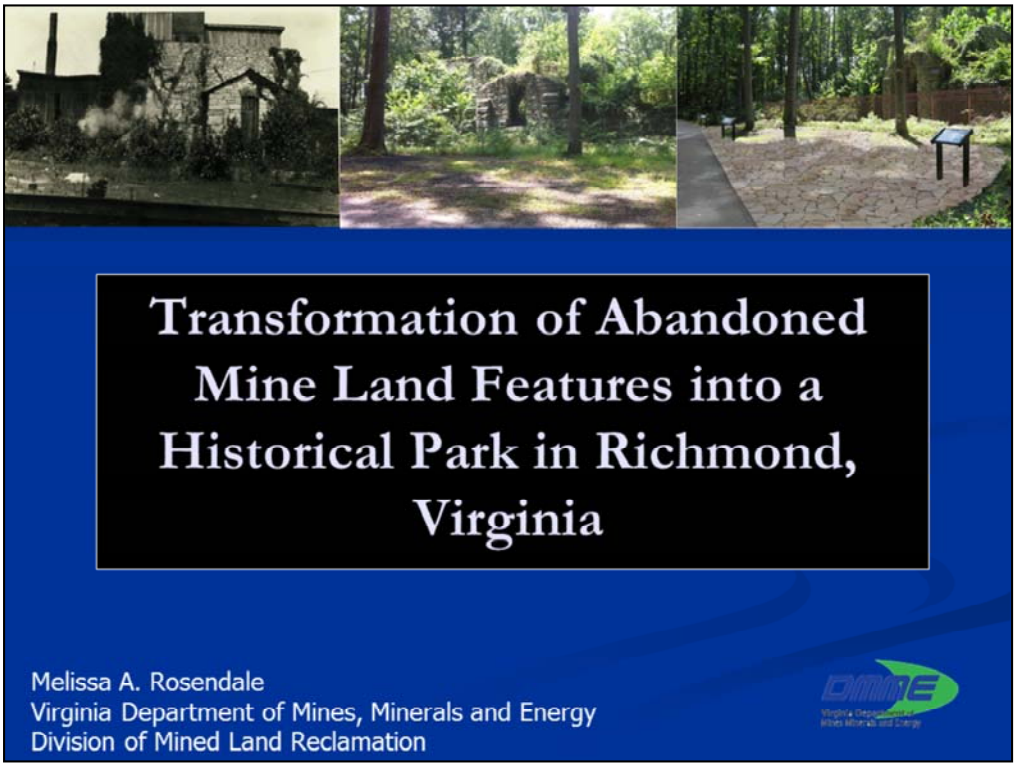
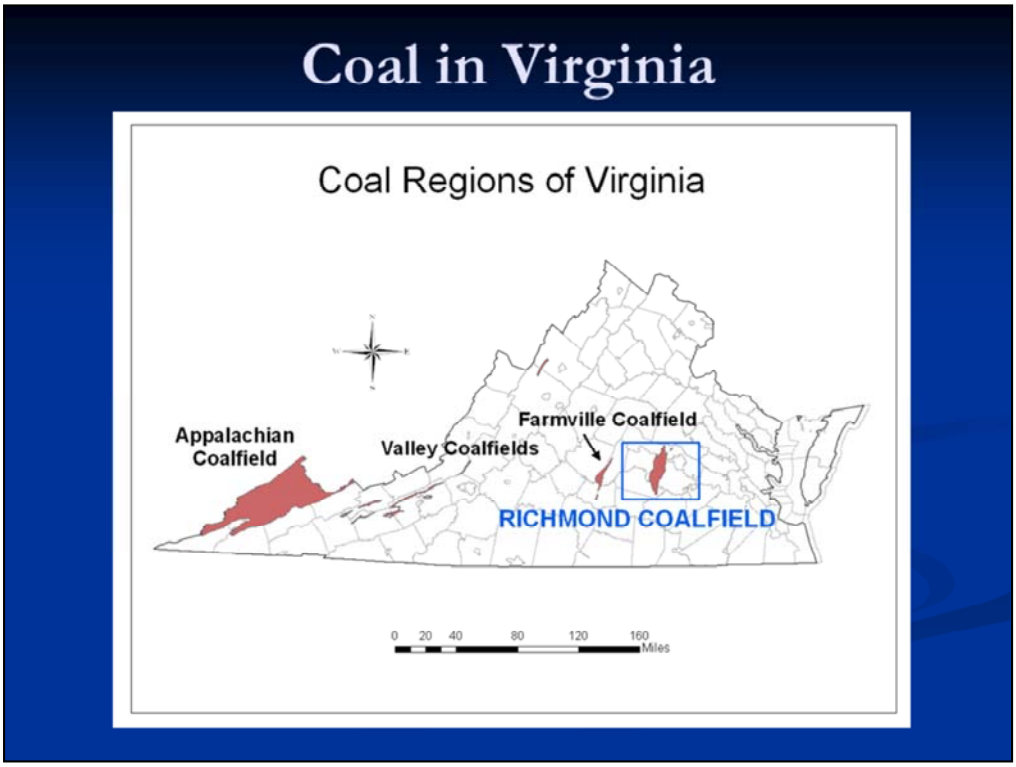


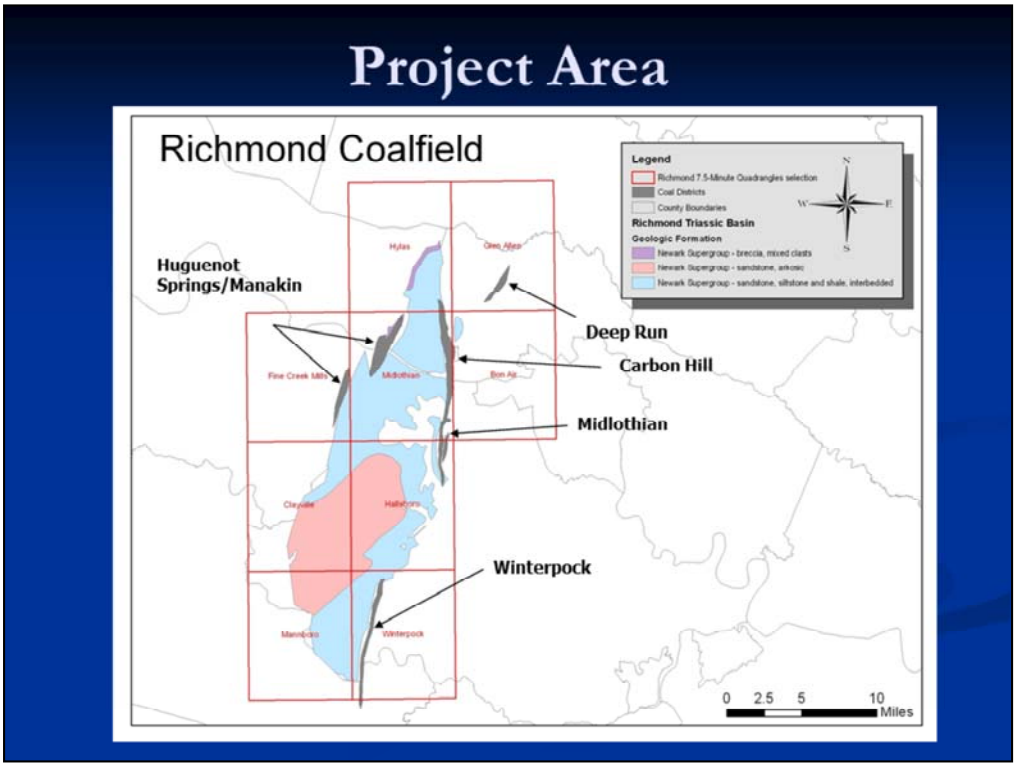
This project centers around transforming AML features into a historical park that, when complete, will highlight Richmond's coal mining heritage.



When most people think of coal and Virginia, they think of the Appalachian Basin in the far southwest corner of the state. This region is without a doubt the most prominent and extensive coalfield in the state, but most people don't know that Virginia actually has 3 other coal regions– Valley, Farmville, and Richmond.

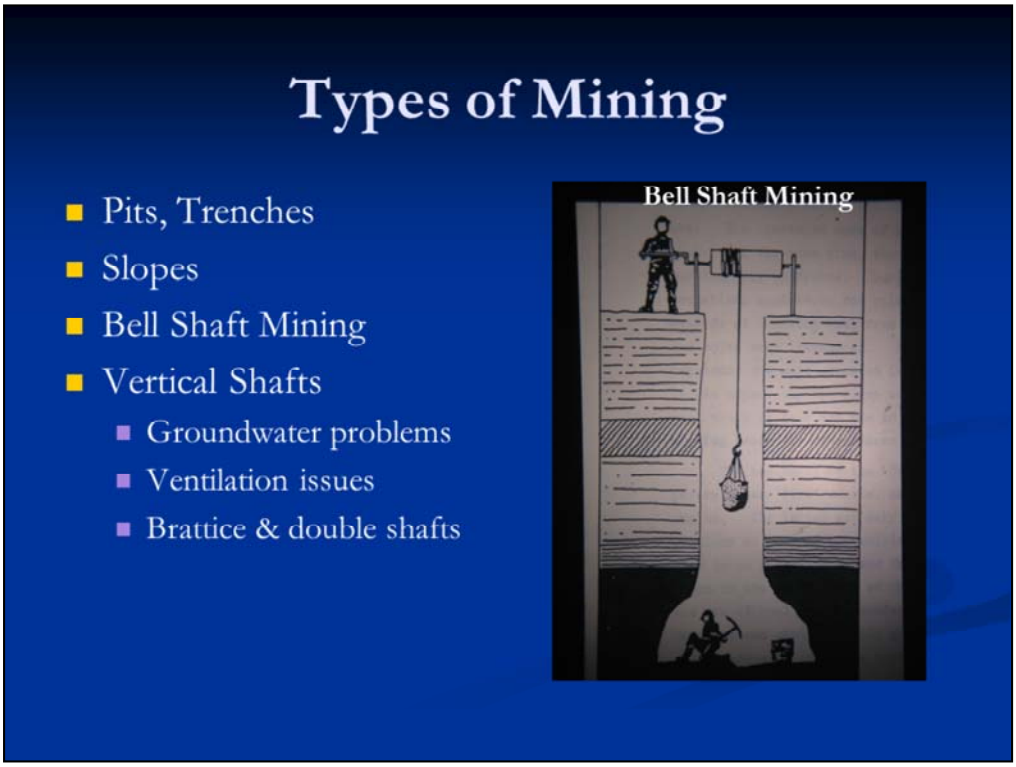
Coal mining is only active in the Appalachian coalfield today, but coal mining in Virginia actually got it's start approximately 300 years ago and some 300 miles away from Appalachia in the Richmond Basin.

In fact, it was in the Richmond Basin where the first commercial production of coal in the United States took place.



For a little geologic background, the Richmond Coalfield is Triassic Basin that is part of a large chain of Mesozoic-aged rift basins that stretches up and down the east coast of NA. The bedrock in the Richmond Basin is comprised of interbedded sandstones, siltstones, shales, with seams of coal occurring in some of the formations along the eastern and western margins of the basin. Within the Richmond coalfield, we recognize 5 distinct mining districts that are categorized based on similarities of the mines. These districts are used for easy and efficient cataloging of AML features and projects.

This is a 1607 map drawn by John Smith depicting the Virginia Territory at that time (North to the right). You can see Jamestown down near the lower left corner, and it was from Jamestown in the late 1600's that French Huguenot settlers were sent up the James River in order to establish a new settlement near present day Richmond. The settlers discovered coal outcroppings soon after arriving and began mining the coal for domestic purposes. In 1701, when Colonel William Byrd traveled up river to visit the new settlement, he saw the coal mines and realized the economic potential of the discovery. Byrd took out a patent on 344 acres of land and mines quickly began to appear throughout the area.



Early mining techniques were very primitive – basically miners followed the coal outcrop and dug small pits and trenches along its length, staying near the ground surface (approx 25-35' deep). This method was not sustainable for economic demands, however, and mines began going underground. Slopes were dug at an angle along the dip of the coal bed as it went underground - usually to a depth of approx. 100 ft.

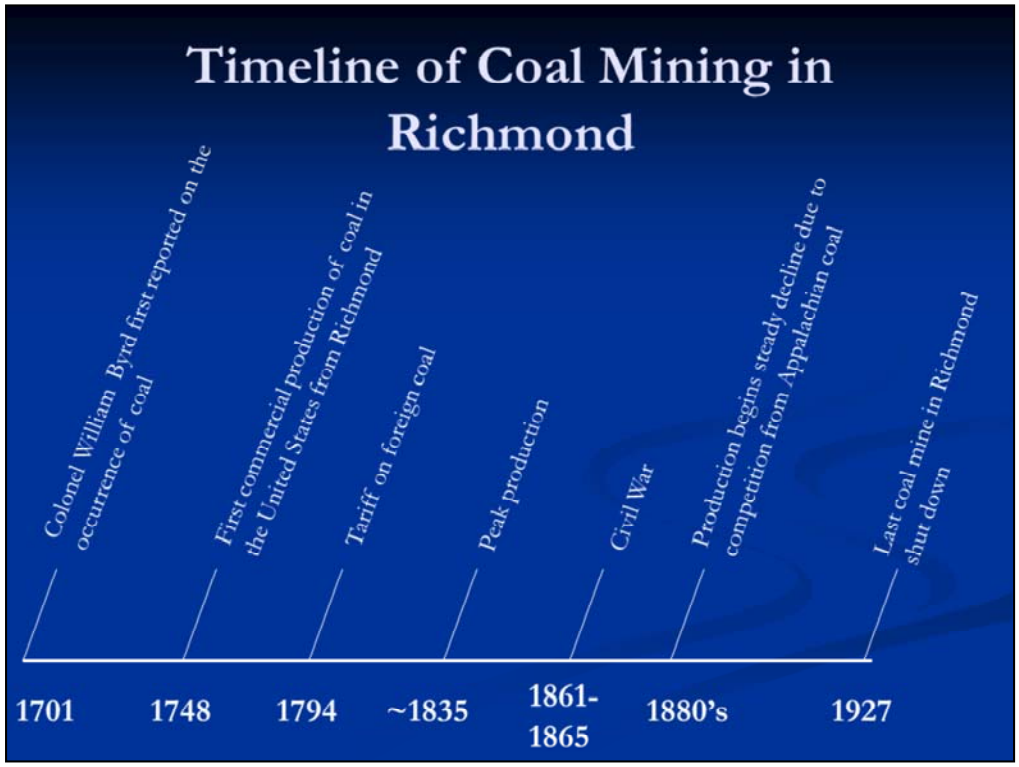
By the mid-1700s, however, most accessible slopes were exhausted and shaft mining began to overtake slopes as the favored method. The first shaft mines were called "bell shafts", as their shape resembled a bell. Miners would dig down to the coal seam then begin advancing along the seam in either direction without establishing any bracing or support. The miners would only be able to go so far along the seam before the unsupported ceiling would come crashing down. The mine was then abandoned and another dug nearby.

Eventually, miners began bracing the shafts with timber or bricks and workings could then advance much more extensively into the coal.

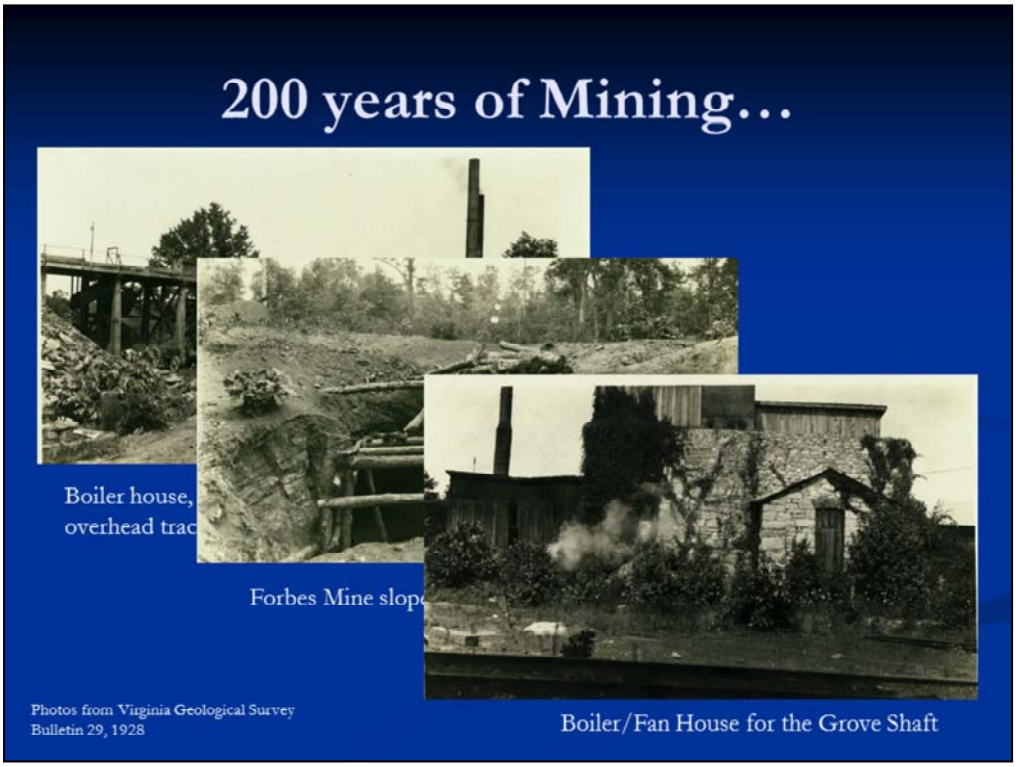
Other issues continued to plague miners in the early mines, though, including groundwater and ventilation. Groundwater had to be removed by buckets hoisted by a mule-driven windlass and later by steam engines, until water pumps were finally available in the late 1800s.

Ventilation was the most dangerous issue. Build up of methane gases caused numerous explosions in the Richmond mines. Miners first attempted to solve this issue by using a "firing line" or "cannoneer". These methods were not ideal, and by the mid-1800s, another solution began to evolve that involved the use of brattice. Brattice separated workings into incoming fresh air and outgoing stale air and kept a constant flow throughout the mine. Used boilers at first to cause a movement of air up and out of the shaft – then used fans. By the late 1800's, two shafts were often dug for every mine – updraft and downdraft, which worked in conjunction with the brattice. Even with improved conditions, the mines in Richmond were still treacherous, and explosions were a far too common occurrence. Records are very inconsistent and incomplete in regards to mining deaths in the Richmond coalfield, but it is estimated that at least 359 men lost their lives due to explosions alone.

Deaths due to other accidents, such as rock falls or noxious atmosphere, are even less well documented, but it is likely that many more men lost their lives in the Richmond mines.



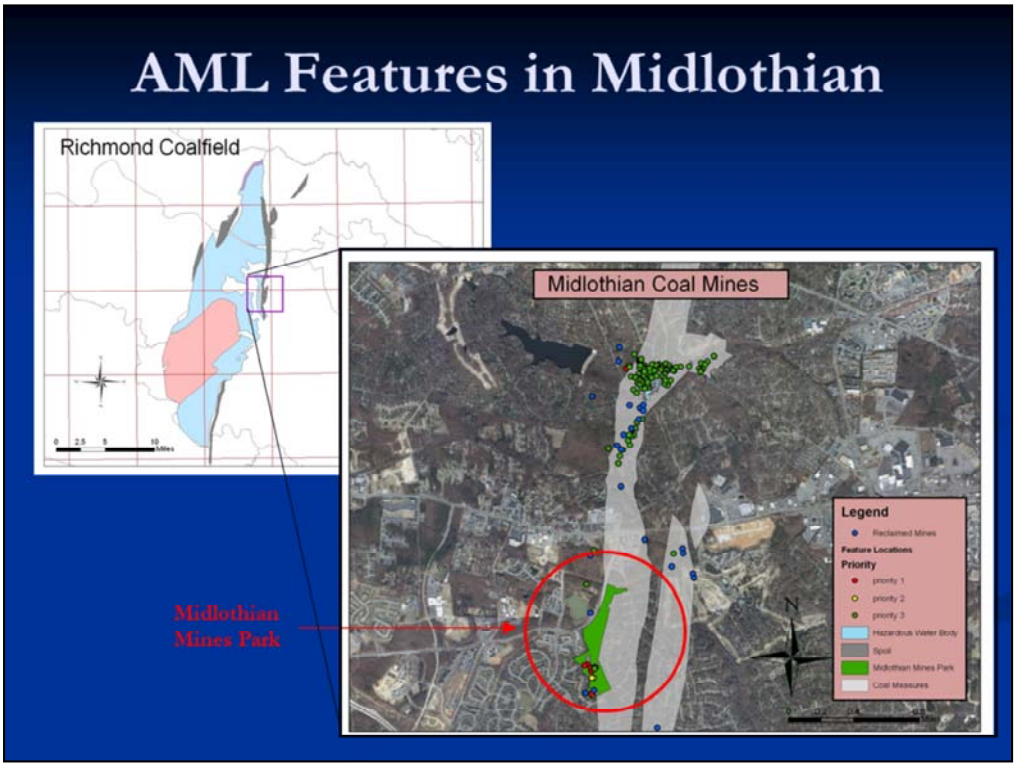
Richmond was only coal field with access to Tidewater Port – led to first commercial production in US in 1748. Tariff on import of foreign coal broadened the markets of the Richmond Coalfield and led to increased production. Heyday from 1794 – 1850, reaching peak production in mid-1830's. Commercial production slowed dramatically during Civil War as production was primarily focused on helping the Confederate war effort. Mines were revived after confederacy's defeat, but production never again reach the peak it saw in the 1830s and mines were operated sporatically. The coal market in Richmond began steady decline in 1883 when railroads made the higher quality and more abundant Appalachian coal accessible, and by the late 1920s, the last of the coal mines in Richmond were shut down, having produced approximately 8 to 9 million tons of coal over the last two centuries.



So you have approximately 200 years of coal mining activity in the Richmond area – shafts, portals, mining structures that were abandoned in place – owners and operators walked away and never gave a thought to reclamation. But, at that time, leaving hundreds of open shafts probably didn't seem that dangerous because, though Richmond was a well-populated city, the mining districts fringed the outskirts of town and not much was around.

In the past 84 years since the last mines were abandoned, though, Richmond has grown significantly and the city and suburbs have sprawled out into the surrounding countryside. Mine shafts that were once miles from residential or commercial areas are now in backyards or neighborhood woods. Some of the features are historical and interesting, but not really all that dangerous, while others pose a serious threat to citizens.

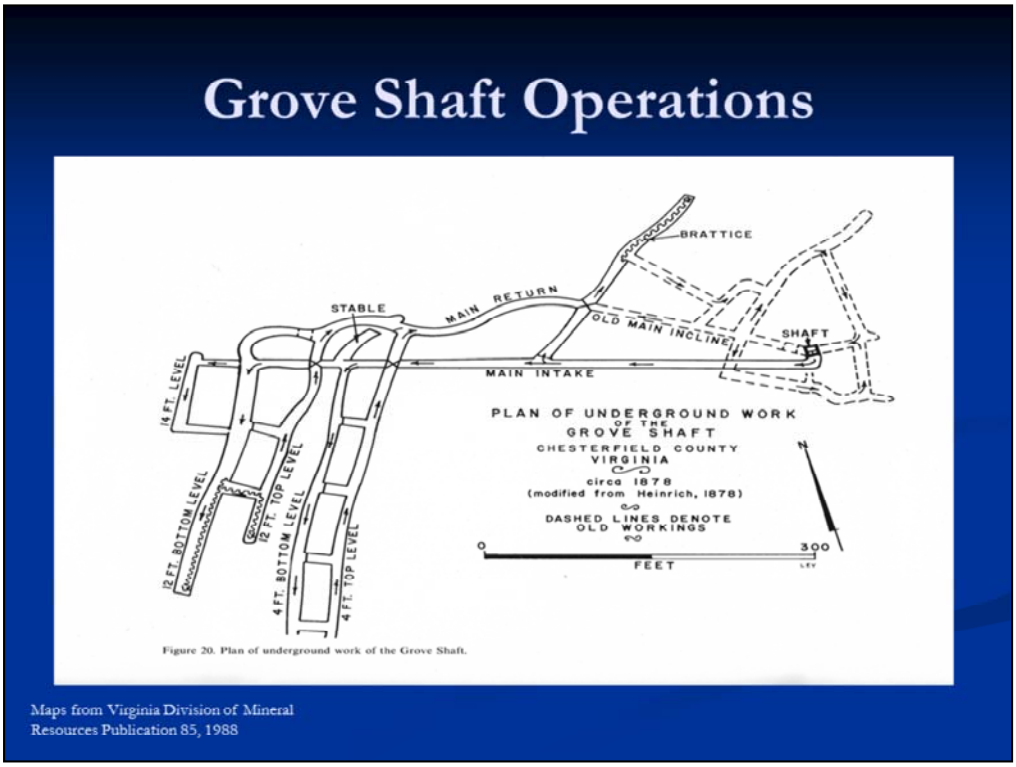
Each type of mining (pits, slopes, shafts) has left a different type of abandoned feature on the ground surface. Some of the shafts have remained open and have filled up with water, as was seen on the last slide, while other pits and shafts have seemed to heal over and reclaim themselves. These types of features are often fairly small scale and blend in well with the surroundings. However, these features that seem to be just depressions in the ground can be some of the most dangerous of all of them – they may be shafts that have “false bottoms” where years of leaf and tree litter have obscured the opening of the shaft. A small amount of weight at the bottom of that depression may open up a 200-ft shaft.



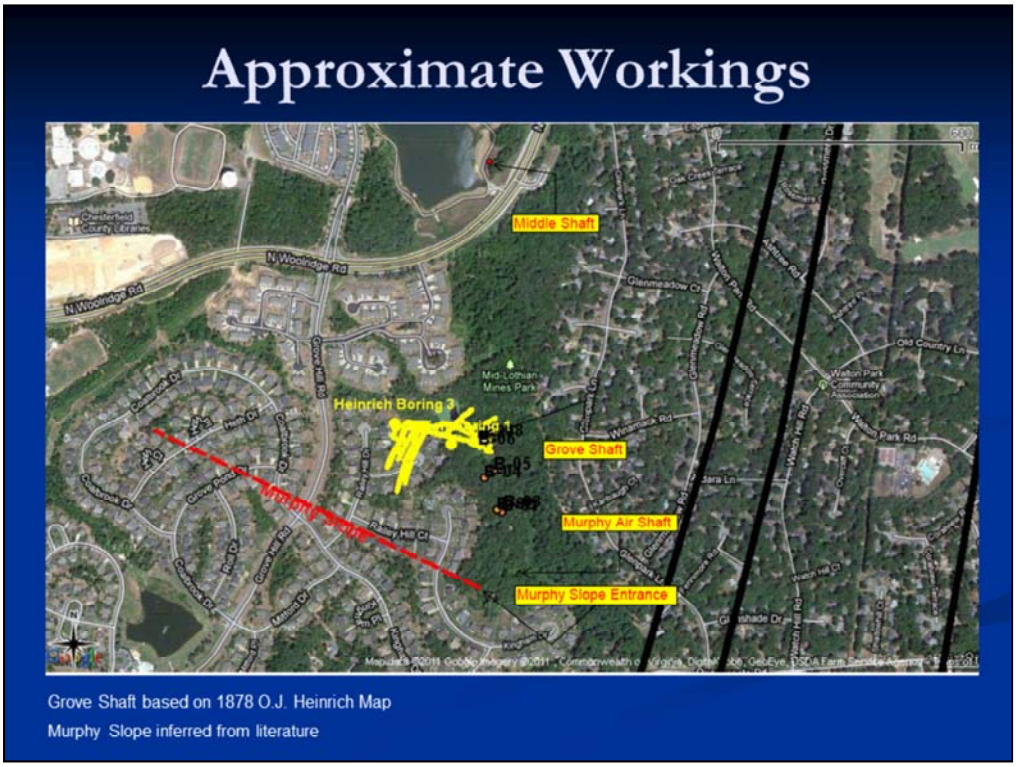
The dangers posed by these features have necessitated a special focus of AML in the Richmond area. The DMLR AML program in Richmond has been revived in the last several years to update the inventory, handle citizen complaints, and reclaim those features that necessitate action. Though there are hundreds to thousands of features in the Richmond coalfield that need to be inventoried and in some cases reclaimed, one project in particular has garnered a great deal of attention, effort and budget in the past year and a half.

Midlo Mines Park has attracted particular attention, not only due to its abundance of AML features, but also due to its unique historical nature and its potential to attract local and perhaps national interest.

The Midlo Mines Park is part of Midlothian Mining District within the richmond coalfield and is currently owned by Chesterfield County. The park is a 42-acre tract of woods in between subdivisions and is improved with a gravel walking trail and historic signs. Located within the boundaries of the park are the remnants of two historic mining operations: the Grove Shaft and the Murphy Slope.



The Midlothian Coal Mining Company dug the Grove Shaft to a depth of approx. 621ft in 1836. Coal was mined sporadically from the mine until about 1873, when additional coal was discovered deeper in the mine, and the workings were cleaned out and a double horizontal tunnel, approx 520' long, was driven at the bottom of the shaft to reach these coal seams. At the end of the tunnel, an incline 2000' long, known as Dodd's incline, worked a 12' seam of coal. In 1902, a new company bought the shaft and dug a new slope to intersect the Grove workings at the 11th level of Dodd's Incline. By 1920, the mine traded hands again and the Murphy Coal Corporation made improvements to the new slope entry, which came to be known as the Murphy Slope. The MCC mined coal from the Grove-Murphy workings until 1925. And, like most mines of it's time, the Grove Shaft was equipped with an elaborate ventilation system consisting of brattice work, boilers, and fans. The main shaft entrance was divided into a downcast and upcast chamber, with the downcast section being further divided in half for hoisting up and down. The upcast chamber was intersected by a horizontal tunnel that connected to a second upcast chamber approximately 32' deep that drew the stale air to the surface. Later, this tunnel was lengthened and connected to a engine-driven fan that helped increase the air flow in the shaft.

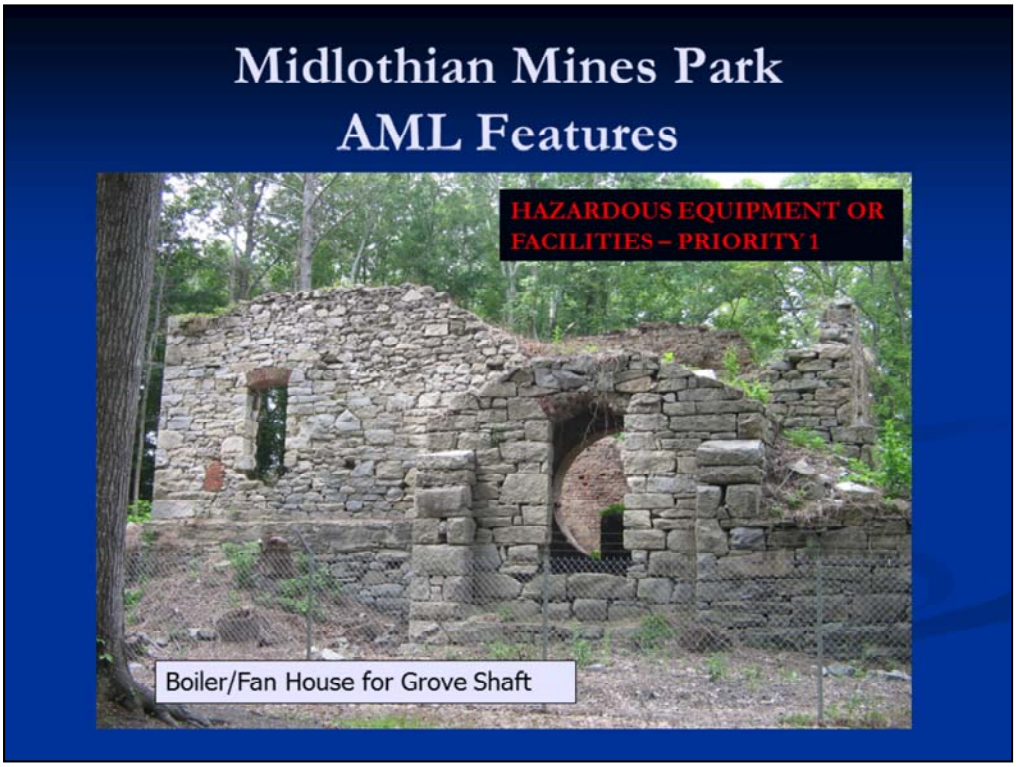


Shows the interpretive workings. You can see the outline of the park here with the trees. The yellow lines are based on a 1878 map of the Grove shaft workings, while the red line is the direction and length of the Murphy Slope as inferred from literature. We didn't have any maps of the Murphy slope workings, but theoretically, they would have connected with the Grove workings.

The Grove Shaft and Murphy Slope were big operations in the Midlothian District and consequently had a big impact on the surrounding area. To date, 17 AML features associated with these mining operations have been inventoried in the MMP, five of which are classified as priority 1 and three of which are priority 2. Based on the location of these features, you can see the dangers that they pose.

The priority 1 features include the 2 vertical shafts associated with the Grove operation. This is the main entrance to the Grove Shaft.

Air shaft for the Grove Shaft



Boiler and fan house for the Grove shaft – circa 1835-1870, making it the oldest standing coal mining structure in Virginia and, from what I have been able to determine, the oldest in the country. It is also a dry set stone structure (no mortar), making it all the more surprising that it is still standing.

Wingwall for the tipple pile at the Murphy slope railroad operations

The priority 2 features include the foundation for the Murphy Slope boiler

Several subsidence features of unknown origin – did not know of any other mine openings in area based on literature, and thought the workings to be 600+ feet underground.

And a subsidence feature located next to the Boiler House – origin for this subsidence was unknown

Located in a mining refuse pile full of gob and red dog (burned rock) – observations of the area show that an emergent stream surfaces at the toe of an abandoned railroad grade approx. 110 ft northeast of this feature – sediments in this stream reveal fragments of red dog and gob – indicates channel or some kind of outlet below surface of this feature – could be workings

Also several priority 3 features including 6 spoil piles and 3 slumps

Two features within the park had been previously reclaimed by DMLR – the entrance to the Murphy slope and the air shaft for the Murphy slope. At the time of this reclamation, the landowner did not wish DMLR to reclaim the other features. He later donated the land to the county for the purpose of creating this park.

This park and the historic features within it create a unique situation for Chesterfield County and they feel a need to preserve this history**.** Notice the Chesterfield County seal? That is a miner!

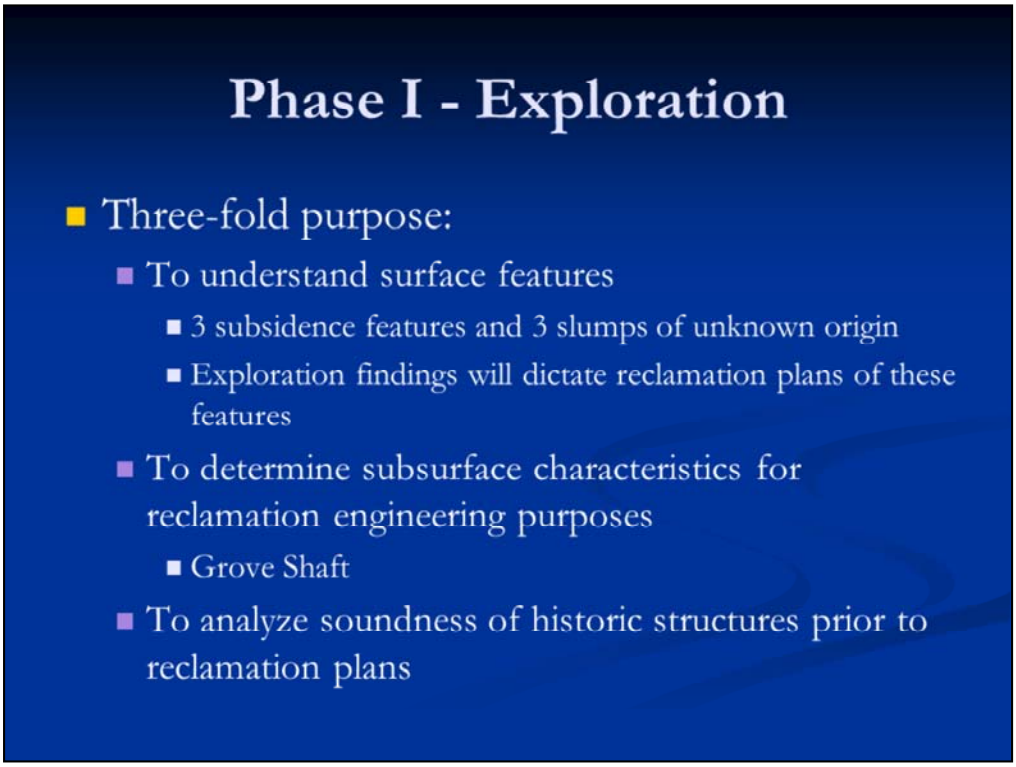
Of course, DMME's main goal is to abate these features and make the area safe for the public. However, DMME wanted to work in conjunction with CC to create a park that will satisfy both parties – we want to support the county and make this park a reality

To that end, an MOU signed in September 2010 – clarifies the work that needs to be done to satisfy both parties, and the corresponding financial responsibilities of DMLR and the County.

DMLR will end up paying for 75% of the park's construction funds – this 75% will cover the cost of exploration (drilling, studies), compliance documents (environmental, NEPA), and actual reclamation construction .

County will pay for aesthetics out of their own funds – this would include things like trail improvements, signs, parking lot improvements, and public facilities.

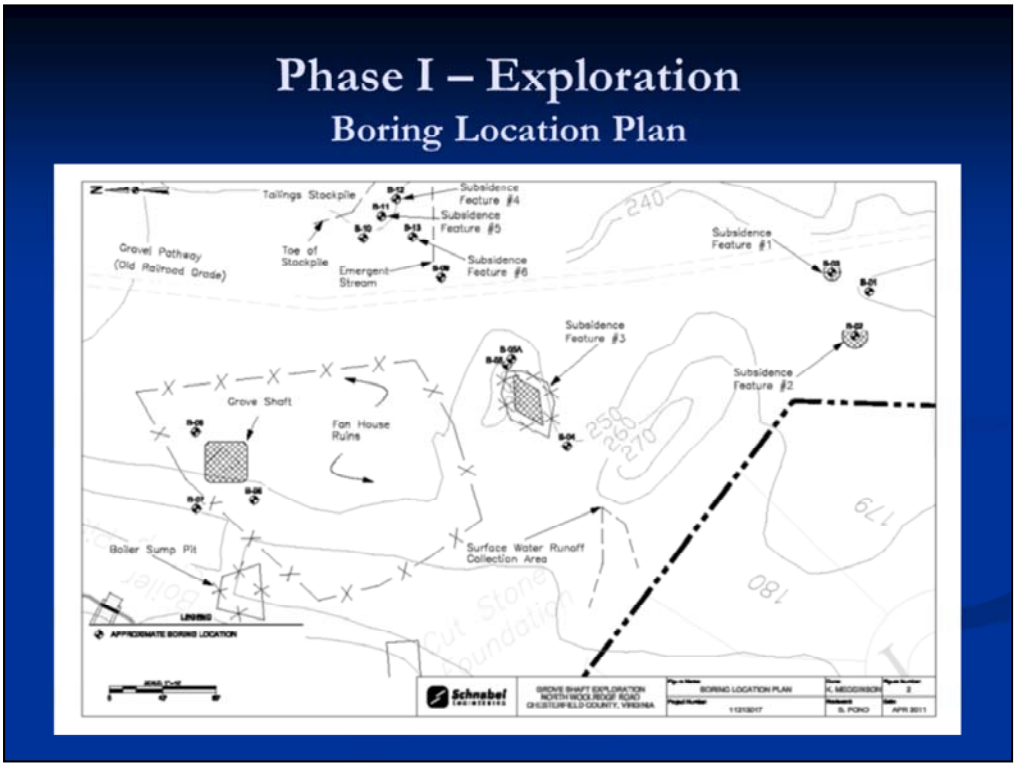
With DMLR's and the County's roles in mind, a plan was put together that establishes a 3-phased approach to the work: Phase I includes Exploration activities, most of which DMLR has agreed to conduct with AML funds. After the results from Phase I have been obtained and interpreted, Phase II of Reclamation/Construction can begin. After all reclamation activities have finished and there are no longer any AML hazards, the county will proceed on its own with Phase III. This will involve the construction of any public facilities, such as an information center, improved trails, historic signs and markers, etc.



The first phase of this project was necessary for three main reasons…

Structural analysis necessary to determine stability of structures and what reclamation method will work best to preserve these features.

The other two exploration goals were accomplished by subsurface geotechnical drilling.



Drilling from March 3, 2011 – March 22, 2011 – Schnabel Engineering

Fourteen holes drilled:

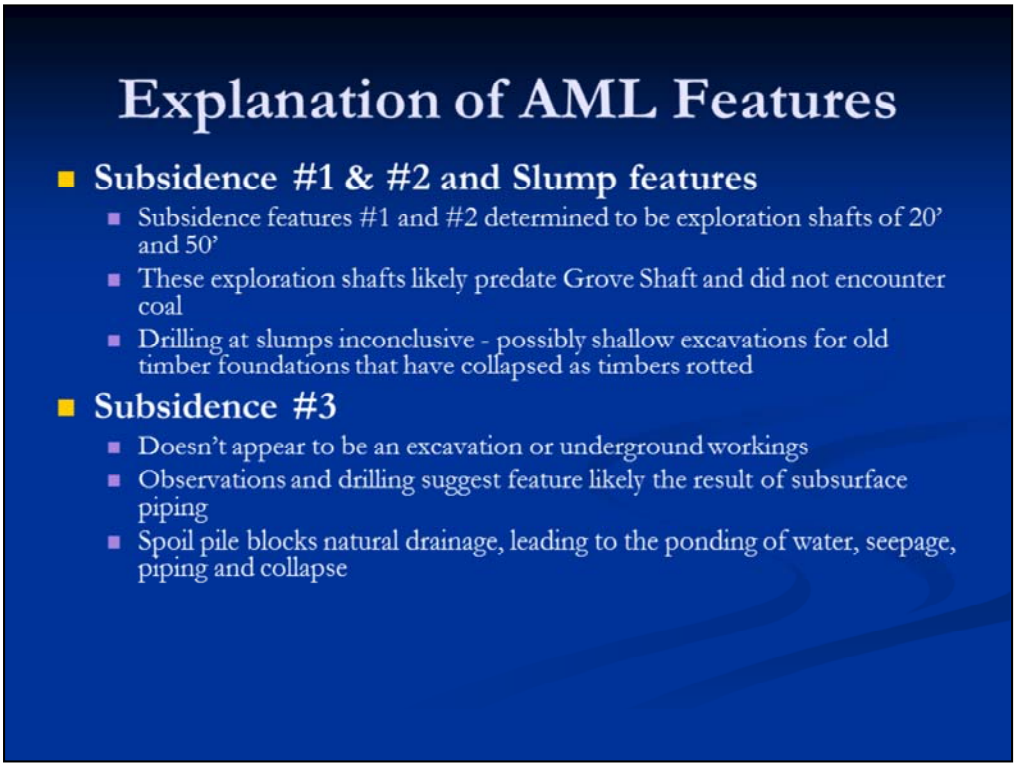
- 3 reference holes
- 5 borings directly overtop features
- 3 borings near Grove Shaft
- 2 borings bordering subsidence
- 1 angled boring

Safety measure were needed at the 5 borings that were drilled directly over the subsidence features in case the features turned out to be mine openings with false bottoms.

Subsurface Exploration in Progress

Subsurface Exploration in Progress

Subsurface Exploration in Progress



Subsidence Features #1 & #2 – changed to Priority 3 pits

Active Subsidence - Subsidence Feature #3: Gob pile blocks natural drainage, causing surface runoff from residential area to pond near the feature and infiltrate through the gob and red dog - Infiltrating water has removed fines and transported fragments of gob and red dog to emergent stream, creating a void underground that has collapsed.

In addition to the subsurface and structural exploration, DMLR, in conjunction with the VA Dept of Environmental Quality, and with the help of the CCFD, conducted exploration of the Grove Shaft using underwater video equipment provided by DEQ.

This video footage allowed us a glimpse inside the mine not only to assess the condition of the shaft for reclamation purposes, but it was also educational – it provided a glimpse of the mine engineering and historical artifacts.

Set up for underwater video – system of pulleys and ropes – CCFD helped out with rigging the ropes – gave them experience working around shafts.

What's Next for the Park?

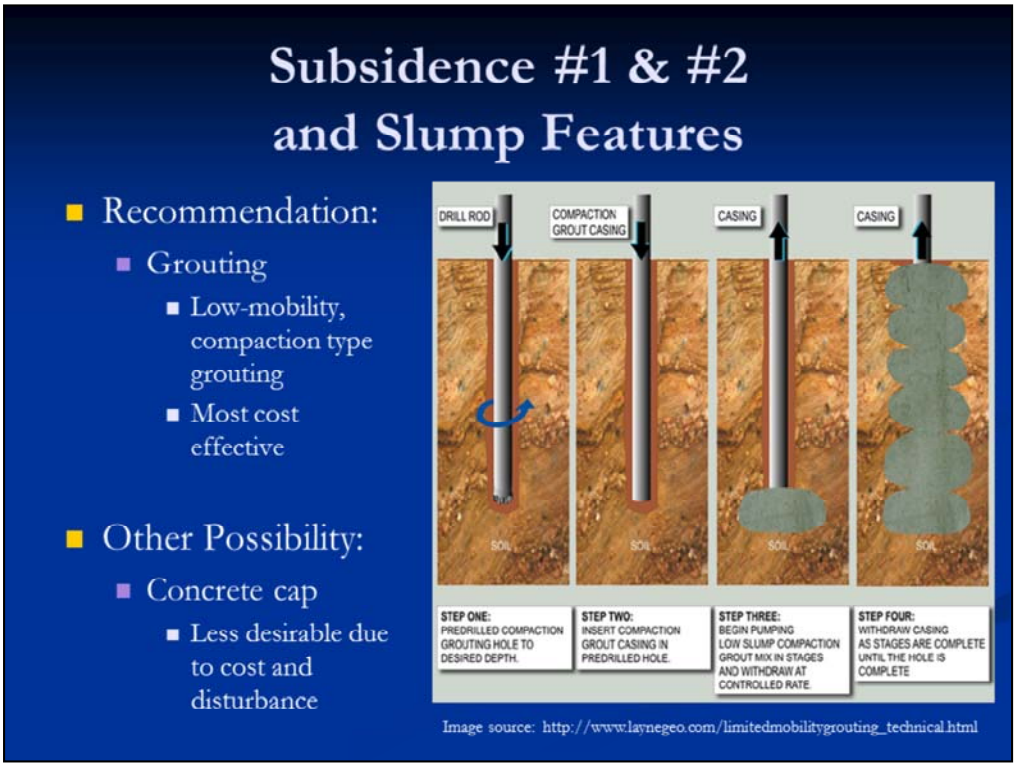
- **PHASE II** – Reclamation and Construction
  - Will begin after all exploration in Phase I complete
- Recommendations have been made for reclaiming subsidence and vertical opening features
- Schematics were created for potential reclamation of historic structures
- No reclamation plans are yet finalized

Vertical Openings: Grove Shaft and Air Shaft

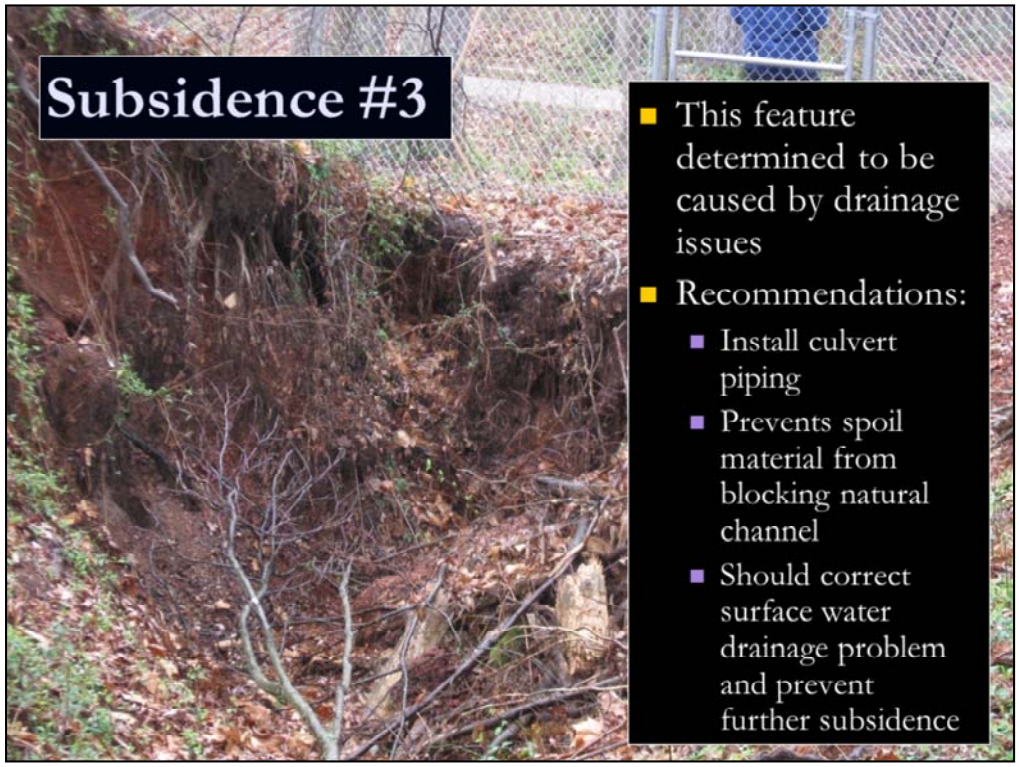
- Wire Mesh cap is recommended reclamation method
  - Safe, aesthetic, relatively cheap
- Other Possibilities:
  - Stone fill and concrete cap (much more expensive, more land disturbance, logistically difficult)

Photos of mine shaft reclamation courtesy Roger Williams (VA DMME) and John Kretzmann and staff (New Mexico AML Program)

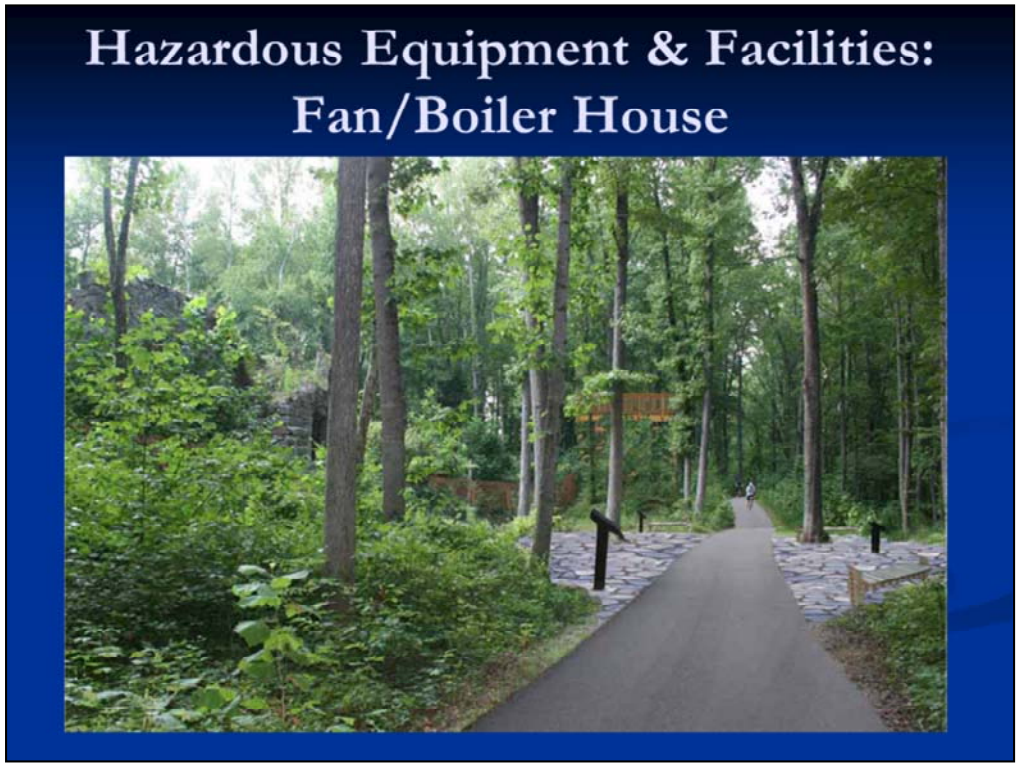
Pictures are from a reclamation project in New Mexico



Compaction grouting – grout is used to strengthen soft soils existing as fill within the shafts (tremie pipe driven to near base of feature – grout injected into soil and pressure monitored. Injection pressure of grout compacts the soft soils against the sidewalls of the shaft improving density. Grouting also fills in any voids. Grouting done in lifts from bottom up until process is complete.


Subsidence #3
This feature determined to be caused by drainage issues
Recommendations:
Install culvert piping
Prevents spoil material from blocking natural channel
Should correct surface water drainage problem and prevent further subsidence

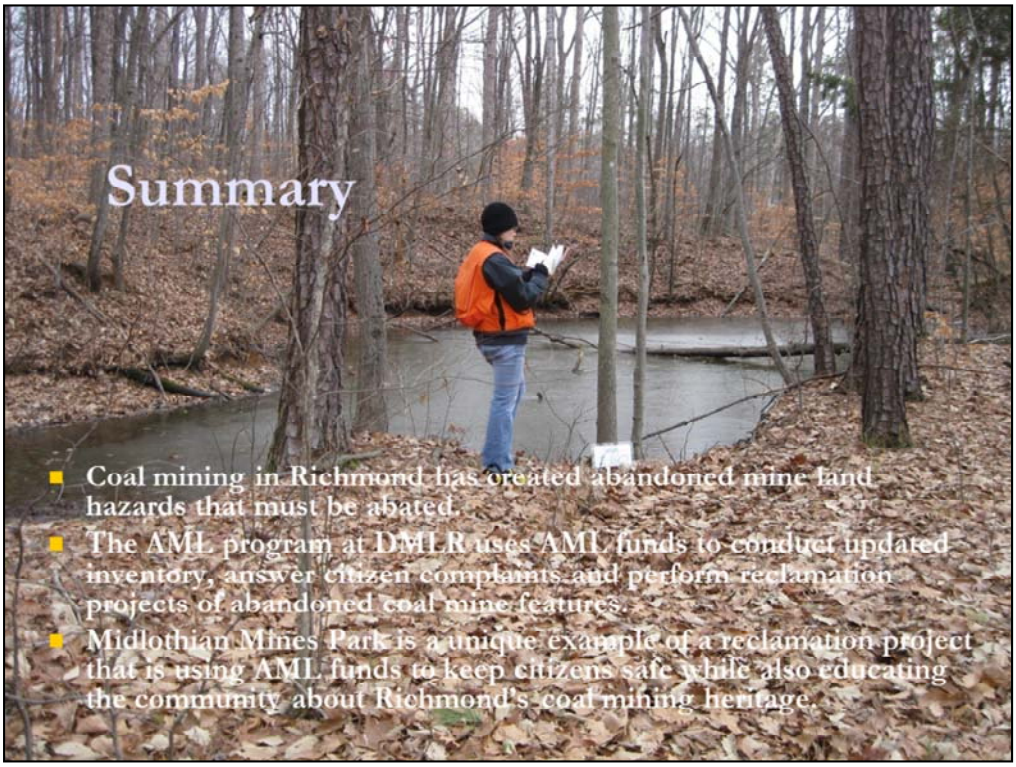
AML funds pay for fencing and structure stabilization, but not the aesthetics like stone and signs.



Observation tower to look down at Grove Shaft workings (funded by County).

Hazardous Equipment & Facilities: Wingwall

Paid for by county – not a reclamation


Summary
Coal mining in Richmond has created abandoned mine land hazards that must be abated.
The AML program at DMLR uses AML funds to conduct updated inventory, answer citizen complaints and perform reclamation projects of abandoned coal mine features.
Midlothian Mines Park is a unique example of a reclamation project that is using AML funds to keep citizens safe while also educating the community about Richmond's coal mining heritage.