A Mine Is a Terrible Thing to Waste: Kentucky's Portal 31 Exhibition Mine

By
J. Steven Gardner

In 1917, United States Coal and Coke Company, a subsidiary of U.S. Steel, opened Mine 31 at Lynch, Harlan County, Kentucky. In 1996 Arch Coal, Inc., then the owner of the site, donated the property to Harlan County for public use. In 2009, after thirteen years of fundraising, engineering, and construction, the non-profit Southeast Education Foundation opened the Portal 31 Exhibition Mine to the public as a safe, high-tech museum showcasing Kentucky's coal mining heritage.

Mine No. 31

At the turn of the twentieth century, deep within the Appalachian Mountains, lay an area so remote that it remained unnamed. However, this small site at the foot of Black Mountain, the highest peak in Kentucky, held an untapped resource, metallurgical coal, which would soon play a key role in the industrial United States.

In the early 1900s U.S. Coal and Coke began to explore the area and discovered several coal seams that collectively would soon be understood to contain some of the best gas and coking coals in the United States. The B or "Kelioka" and C or "Darby" seams averaged five feet in thickness and consisted of some of the highest quality metallurgical coal in the world. In 1923, Mine No. 31 would set a world record for coal production in a nine-hour shift, when miners extracted 12,820 tons of coal.

U.S. Coal and Coke decided to begin mining in the region knowing that, due to its remoteness, the company would have to supply all the fundamentals for miners and their families. In the company's pattern, U.S. Steel determined to develop a model coal camp called Lynch at the mine, named for Thomas Lynch, then the president of U.S. Coal and Coke. With the shortage of available manpower in the area, the

company recruited immigrants as they arrived in the United States, as well as African Americans from the Deep South looking for a better life. Residents recall that about forty languages were spoken at Lynch in its early years.

The company used this imported workforce to not only produce bituminous coal of the finest quality, but also to build a town that the miners would be proud to call home. U.S. Steel and its workers constructed a company power plant, schools, churches, a hospital, an impressive three hundred-room hotel, and hundreds of modern, two-story homes with enough land for vegetable and flower gardens, as well as a theater and recreational areas that included baseball fields and tennis courts. The company attempted to make Lynch a town in which everyone would want to live. Benham, another large coal camp nearby, was organized in 1911 and was operated by the Benham Coal Company. Cumberland, originally settled in 1826, was the area's commercial community, providing goods and services that the coal towns did not.[1]

Employment in the district's mines peaked at about 4,500 in 1941, although its greatest annual production, 3.6 million tons, did not occur until 1957. By then the district had produced 80 million tons of coal. Mine 31 ceased operating only a few years later, however, around 1961, after newer, more efficient operations began production. In the late 1970s, U.S. Steel rehabilitated the two main haulage tunnels to around eighteen hundred feet into the mountain, where they intersected with a loading shaft from a surface coal seam, and sealed off the surrounding area of the mine. A belt conveyor was installed in one tun-

The first opening at the Portal 31 Mine. (Photo courtesy of the author.)

nel of Mine 31. This transported coal from the shaft out of the mine to a new silo, which loaded it on trains to be transported to a central preparation plant. The Portal area operated in this manner until the early 1990s, when mining of the upper seams ceased, ending production for good at Lynch's Mine 31.[2]

Acquiring and Preserving the Site

By the 1970s, local officials had seen Lynch's population dwindle from 10,500 in the 1940s to approximately 1,500. Benham and Cumberland experienced similar declines. To provide new income for the area, the Southeast Education Foundation—a non-profit organization created in 1981 to support Southeast Community College and the contiguous communities of Lynch, Cumberland and Benham—secured state and federal grants to acquire and develop historic properties for the purpose of converting them into tourist attractions, such as a coal mining museum, a bed and breakfast, and an exhibition coal mine. Harlan County secured the first two properties, the Benham Coal Commissary and Benham High School. Negotiations for an exhibition mine broke down in 1984, however, when Arch Coal, Inc., purchased U.S. Steel's assets in the area, including the Portal 31 mine and adjacent structures, and wanted to assess what it had acquired.

In 1996, Arch Coal donated the Portal 31 property to Harlan County and the company hired Engineering Consulting Services, Inc., to facilitate the donation. Since the site had been part of an active coal mining operation into the 1990s, federal and state reclamation laws required that all surface facilities be removed and the mine's openings sealed. During the first phase of Mine 31's conversion into an exhibition mine, Engineering Consulting Services obtained a revision of the property's state mining permit to alter its post-mining land use to industrial-commercial, and an Experimental Practices Permit from the U.S. Office of Surface Mining, both required to allow the portals to remain open. The federal permit also allowed the mine's coal tipple, silos, conveyors, shops, and other facilities to remain standing.

Engineering Consulting Services subsequently conducted an environmental assessment of the facilities, developed ventilation and safety plans, performed a property survey of the underground mineral tract, and inspected and assessed the underground mine area to be rehabilitated. The consulting firm also inspected on-site buildings for structural integrity and estimated the cost of their refurbishment.

Once the donation of the portal property was completed, the Southeast Education Foundation assumed responsibility for the transformation of the site into the long-awaited exhibition mine. Engineering Consulting Services remained involved with the project and arranged for the mine rescue team of the Kentucky Department of Mines and Minerals to explore the tunnels and select the areas of the mine best suited for the planned exhibits.[3] The final tour route consists primarily of two haulage tunnels, which extend about six hundred feet underground.

Safety Considerations

Many reservations existed about taking the general public into an underground coal mine. The usual mine-related hazards, such as the potential for roof falls and rib rolls, mine atmosphere, and mine drainage had to be addressed. Plans were also developed to deal with such issues as rail accidents and pedestrians tripping, falling, or experiencing claustrophobia due to going under the mountain into total darkness. All potential hazards, regardless of how remote the possibility of their occurrence, had to be considered in the overall design. Safety and training programs for visitors, personnel working as tour guides, and maintenance workers had to be developed.

After the tour route was chosen, the mine had to be cleared of debris and the tunnels' roofs inspected for stability. Engineering Consulting

The exterior of Portal 31, circa the 1950s. (Photo courtesy of the author.)

Services performed the engineering analysis necessary to ensure that the portal was safe for tourists. This included designing a plan combining roof control using a high-strength, fiber mesh-resin, roof bolting system, and wall stabilization using a high-tensile sealant to permanently bind the rock face. The Southeast Education Foundation awarded Rex Mining Co., LLC, the contract to rehabilitate the mine prior to the fabrication of mine exhibits.

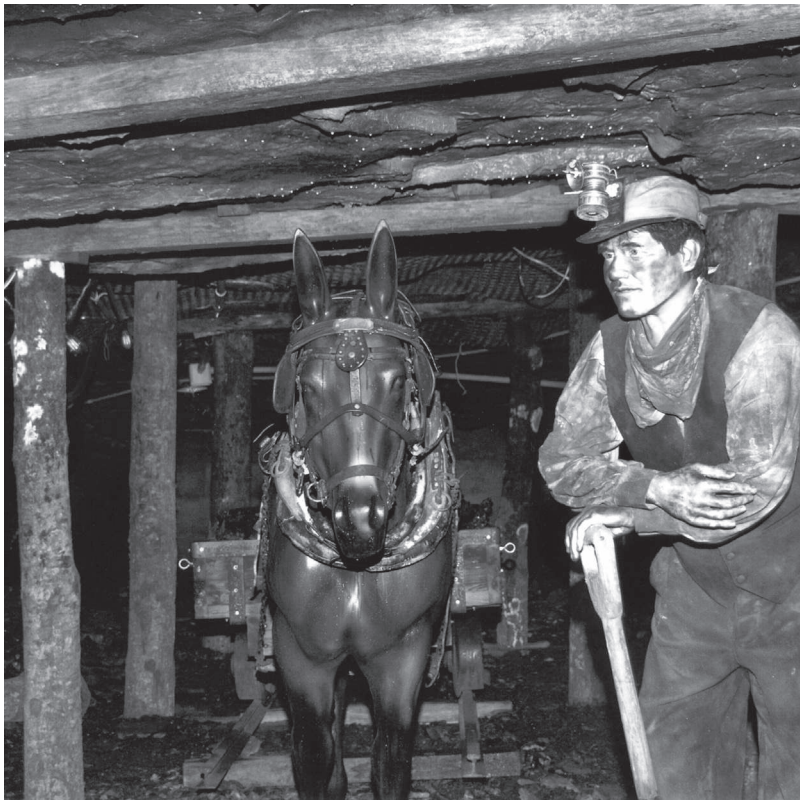
In standard mining practice, roof stabilization is provided by rock or roof bolts. For unstable roof conditions, however, numerous other methods are available. In Portal 31's case, Engineering Consulting Services decided to use multiple roof control measures. These included installing the fiber mesh on the roof and ribs along the tour route to catch small rock that continuously sloughs. In some areas, the experimental sealant Tekflex was applied. Concrete cribs were installed in areas where rock falls had raised the roof to extreme heights.

When Portal 31 was originally explored during its conversion, one tunnel was discovered to be partially flooded to a depth of two or three feet, since the mine's pumps had not been in use for ten to fifteen years. Engineering Consulting Services designed a system of new sump pumps that drain water from the mine utilizing a shaft connecting to a lower mine in another coal seam.

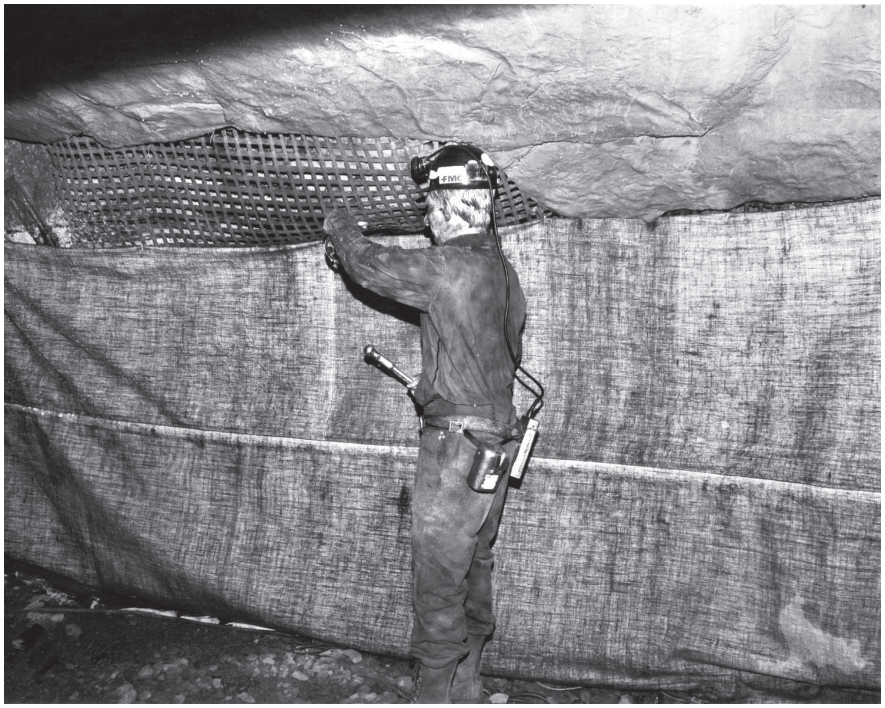
While problems with mine atmosphere were not anticipated, it was thought better to err on the

Roof bolting and the installation of high-strength fiber mesh. (Photo courtesy of the author.)

A worker applying Tekflex sealant to prevent rock falls from the rib. (Photo courtesy of the author.)



The interactive exhibit figures at Stop 1 (above) and Stop 3 (below). (Photos courtesy of the author.)



side of caution. New mine seals were constructed to isolate the tour area from the rest of the mine, and the mine's fan was rehabilitated to circulate fresh air throughout the section of the mine in use. As a bonus, the fan provides visitors with the sensation of air blowing as it would in an actual, operating mine.

Interpreting the Site

For the second phase of the project, the Southeast Education Foundation hired Hilferty and Associates of Athens, Ohio, to design all of the exhibits and educational aspects of the mine tour. The Foundation chose KTA, Inc., to provide electrical engineering design services, and Spike Construction Company to fabricate the mantrip, install rail, and assist with installing exhibits.

Hilferty and Associates had been involved with the idea since the late 1970s, when Dr. Bruce Ayers, president of Southeast Community College, first dreamed of an exhibition mine. The company's personnel worked with Engineering Consulting Services to learn the mining history necessary to design the exhibits. The tour tells the story of the evolution of operations at Lynch, starting with displays depicting coal mining in 1917, when miners used breast augers, dynamite, and hand-loaded horse-drawn mine carts.

Interactive lifelike figures tell the story of Kentucky coal mining through simulated mining scenes. While riding a specially built mantrip on light rail, visitors learn the story of the mine, in part, by following an Italian immigrant coal miner and then his son through the years. As the tour progresses through the mine it also moves forward through the decades, showing the evolution of mining technology—including rail installation, ventilation, mechanization, and escapeway construction—that led to increased production, improved working conditions, and greater safety.

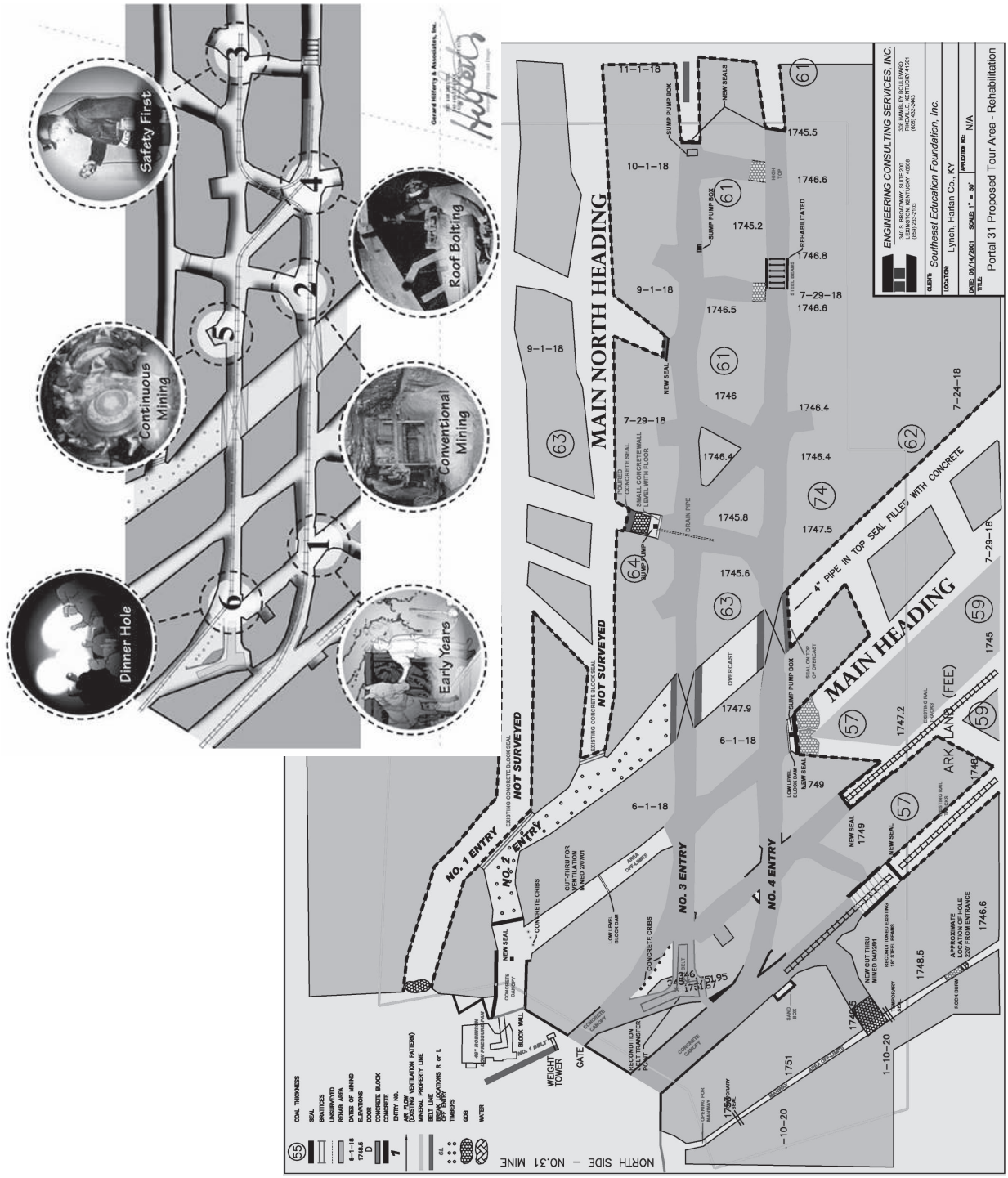
As the mantrip passes through the mine it jumps from stop to stop in the dark, back and forth in the two entries, giving visitors the impression that they have traveled a great distance underground. The tour generally follows the route depicted opposite. The final stop takes place in an area where a roof fall has created a chamber almost twenty feet high, which now serves as a theater. A short film, an IMAX-like extravaganza, illustrates the importance of the coal mining industry in the production of industrial and commercial commodities and discusses life in the coal towns. After the film, the mantrip speeds all the way outside, completing the overall tour that lasts approximately thirty minutes.

After the project's completion in 2009, The Kentucky Chapter of American Council of Engineering Companies awarded the Portal 31 Exhibition Mine its Grand Conceptor Award in March of 2010. That award qualified the Portal 31 rehabilitation for the national competition for the ACEC's 2010 Engineering Excellence Award, in which the project received an Honor Award as one of the top 24 entries from among 163 submitted from around the world as preeminent engineering achievements for 2010.[4]

Revitalization and Visitation

By redeveloping an abandoned underground coal mine for public tours, Engineering Consulting Services and the Southeast Education Foundation were able to apply the sustainable design concept of adaptive reuse to this project. The city of Lynch, Kentucky, and the surrounding area have experienced economic losses as their populations have diminished through the years. Businesses and industries have departed the area, leaving many people unemployed. The Portal 31 Exhibition Mine is providing an important source of income for residents, the local economy, and the city of Lynch, one of the best preserved coal camps in the country.

Just as importantly, Portal 31 educates the public about Kentucky history, energy production, and the environment through the unusual and memorable experience of touring an actual



The tour routes and exhibits in the Portal 31 Exhibition Mine occupy entries 3 and 4 of the foermer working mine, as shown on Engineering Consulting Services' rehabilitation plan. The tour route and stops are indicated in the inset. (Courtesy of Engineering Consulting Services, Hilferty and Associates, and the Southeast Education Foundation.)

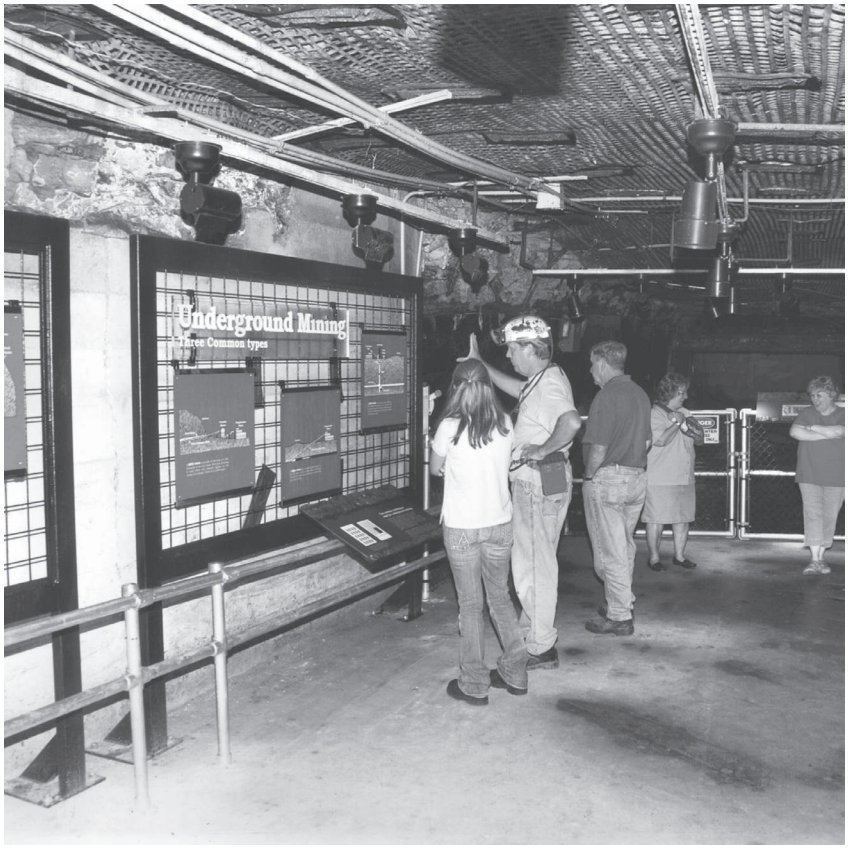
underground coal mine by rail car. And there is more to the site than the underground tour. Outside Portal 31 stands a black granite monument to John L. Lewis, the long-time president of the United Mine Workers of America, as well as a UMWA memorial to miners who died in mining accidents. The site also features a 1920s lamphouse, a bathhouse, the Louisville and Nashville Railroad's depot, and the mine's coal tipple. That structure, used to load the trains moving coal to U.S. Steel's mills around the region, was the world's largest loadout system when built circa 1911.

The Portal 31 complex is but the last element of a series of area attractions designed to bring much-needed tourist dollars to this part of the state. The old Benham coal camp commissary building, located only two miles from Portal 31 on Highway 160—known as The Trail of the Lonesome Pine and immortalized in the novel of the same name by John Fox, Jr.—now contains the Kentucky Coal Museum.

The Kentucky Coal Museum, also operated by the Southeast Education Foundation, offers a complete picture of the lives that revolved around the coal industry. Visitors can view the processes involved in the formation of coal by looking at numerous visual elements and fossil displays. Other exhibits include items from the company hospital, commissary, and miners' homes, early mining tools, and a working scale model of a coal tipple. The museum also holds an impressive collection of photography documenting the history of the area, and features a narrated video describing the early days of coal mining in Benham and Lynch.

Directly across the road from the museum, at the Benham School House Inn, guests can step back in time while experiencing the hospitality of people of Appalachia whose roots are closely tied

Tourists' safety is protected by transportation in a covered rail mantrip while underground. (Photo courtesy of the author.)



One of the underground exhibits used to educate the public at the Portal 31 Exhibition Mine. (Photo courtesy of the author.)

The Kentucky Coal Museum is located in the former commissary building of the Benham Coal Company. (Photo courtesy of the author.)

to the coal industry. This structure was the old public high school, built by International Harvester in the early 1900s. The Foundation chose to preserve and operate the building because it is a magnificent example of the efforts made in the early part of the twentieth century to provide a proper education for miners' families. This mountain resort features a beautiful banquet hall located in the school's former gymnasium.

Visitors to the Kentucky Coal Museum and the Portal 31 mine, which operate seasonally on Tuesday through Saturday, are encouraged to make reservations by calling: (606) 848-1530. For more information about the Portal 31 mine and the museum, visit the mine's web site at www.portal31.org.

Dr. Bruce Ayers, president of Southeast Community College; Mr. Rayburn Doss, chairman of the Southeast Education Foundation; Ms. Bobbie Gothard, former curator of the Kentucky Coal Museum; Ms. Phyllis Sizemore, the current curator; and the volunteer efforts of retired miners and their families in the Tri-City area of Benham, Lynch, and Cumberland are to be commended for their almost forty-year pursuit of this dream. They have now truly reached the end of the tunnel, and have proven that a mine is a terrible thing to waste.

J. Steven Gardner, P.E., is president and CEO of Engineering Consulting Services, Inc., in Lexington, Kentucky. Engineering Consulting Services has been providing environmental, mining, and engineering services throughout Kentucky and surrounding states for almost thirty years. Engineering Consulting Services and Ecology and Environment, Inc.—a global leader in environmental management employing over 1,100 professionals in eighty-five engineering and scientific disciplines in offices around the world—recently formed a third company, ECSI, LLC. For more information please visit our websites: www.engrservices.com and www.ene.com.

Notes:

1. Lynch's construction, a major engineering accomplishment for the time, was documented in: Howard N. Eavenson, *Coal Through the Ages* (New York: American Institute of Mining and Metallurgical Engineers, 1939); Interviews with Ms. Bobbie Gothard, curator, Kentucky Coal Museum.
2. T. E. Johnson, "History of Lynch District, 1917-1957," manuscript in the author's possession, 16, 52. (Johnson was special represetative for the Coal Division of United States Steel Corporation, Lynch, Kentucky.)
3. Kentucky's Department of Mines and Minerals has since been renamed the Office of Mine Safety and Licensing.
4. Judging for this competition is conducted by a panel of about thirty engineers, architects, and representatives from government, media, and academia. Criteria for awards include uniqueness and originality; technical, social and economic value; complexity; and the success of the project in meeting its goals.