



## Appalachian Regional Award

Kempton Coal Waste Stabilization and Doser Installation  
Kempton, Maryland

**Completed by:**  
**Maryland Department of the Environment**  
**Bureau of Mines**  
**Abandoned Mine Land Section**

Project date: May 1, 1998 - December 1, 1998 at a cost of \$394,524.16

### Background

The Davis Coal and Coke Company began underground mining at the Kempton Mine #42 in 1914. To support the extensive mining operation, the company constructed the town of Kempton, which straddled the West Virginia/Maryland border. The Town consisted of over 106 company owned houses, a company store, opera house, and mining facilities. By 1918, the town of Kempton had grown to a population of over 500 people.

The Kempton Mine included two 420 foot deep vertical shafts on the Maryland side of the North Branch of the Potomac River, just east of the West Virginia State line. One shaft transported miners and equipment to and from the underground workings, while the second shaft was dedicated to hauling coal to the surface for processing. As the mine developed, a ventilation shaft was also constructed approximately 1 mile north of Kempton in the headwaters of Laurel Run, a tributary to the Potomac River. During mining, drainage flowed via gravity to a sump located below the coal hauling shaft, where it was pumped to the surface and discharged into the Potomac River. The mine eventually became interconnected with other underground mines operated by the Davis Coal and Coke Company, until the total complex encompassed approximately 12.2 square miles

### The Problem

Following closure of the Kempton Mine in 1950, the site was abandoned and left in an inadequately reclaimed condition. Many of the abandoned structures, including the tippie, rail siding, and other facilities were left in a state of disrepair and collapse, posing a severe threat to public health and safety. The vertical shafts, each more than 12 feet in diameter, and over 400 feet deep, were inadequately sealed and left to deteriorate, posing an imminent threat to the public safety. Over 160,000 cubic yards of abandoned coal refuse had been dumped within the channel and floodplain of the North Branch of the Potomac, a designated American Heritage River, and also within the

Water discharges from the abandoned mine flowed at an average of 3.5 million gallons per day. This flow of highly acidic mine drainage went directly into Laurel Run and the Potomac River.



Kempton Glades, a designated Wetland of Special State Concern, destroying biologically unique wetlands and clogging the river with eroded and acidic sediment. Unauthorized dumping and disposal of industrial and residential waste created further public health and safety concerns. Illegal burning of the waste also posed combustion risk of the coal refuse.

As the abandoned underground mine flooded, acid mine drainage emanating from the entire 12.2 square mile mine complex began discharging from the abandoned ventilation air shaft and a nearby 18" diameter borehole, both located adjacent to Laurel Run. Combined drainage from the air shaft and borehole currently discharge an average of 3.5 million gallons per day of acid mine drainage into Laurel Run and the Potomac River. This acid mine drainage discharge from the mine complex has been responsible for eliminating aquatic habitat in over 4.5 miles of Laurel Run and 35 miles of the Potomac River as well as impacting unique biological wetland species in over 100 acres of wetlands.



This 420 feet deep, 12 foot in diameter abandoned ventilation air shaft is the primary water discharge point for all the water collected in the 12 square mile underground mine complex. Reclamation included removal of the existing deteriorating caps and construction of 36 inch thick reinforced concrete seals, extending 3 feet horizontally beyond the limits of each shaft in all directions.

### Project Design

Before this project began the Maryland Bureau of Mines had been concentrating its restoration efforts and funds on the Potomac River. The magnitude and severity of the acid

mine drainage impacts on the Potomac River and Kempton Glades provided an excellent opportunity to restore the degraded wetlands and improve water quality within the river while at the same time eliminating the high priority health and safety hazards that existed at the site. Approval of the North Branch Potomac River Hydrologic Unit by Office of Surface Mining provided other funding sources (Acid Mine Drainage 10% Set-Aside Funds) that allowed Maryland to expand its environmental restoration efforts at the site.

Design of the project began in 1994. The Bureau of Mines contracted for auger drilling to identify the vertical limits of the coal refuse and potential topsoil borrow areas. Photogrammetric and field surveys were performed to provide mapping and elevation data. The design staff used this data to develop the final grading plan. A vertical shaft stabilization design was also developed, specifying removal of the existing deteriorating caps and construction of 36 inch thick reinforced concrete seals, extending 3 feet horizontally beyond the limits of each shaft in all directions. Since the vertical shafts are 420 feet deep, construction and equipment operator safety were also considered in the design. The hazardous facilities and equipment, including the unstable tipples and collapsing retaining walls would be demolished. Materials unsuitable for on-site disposal, including the industrial and residential waste, were to be hauled to an authorized landfill for proper disposal.

The Bureau of Mines worked closely with the Maryland Department of the Environment, Wetlands Division, and the Department of Natural Resources to develop a cost effective wetland restoration plan that included removal of the abandoned coal refuse material dumped within the limits of the Kempton Glades, and reestablishment of over 5 acres of wetland utilizing native species collected from the area. In addition, a site specific wetland revegetation mixture was developed utilizing selected wetland grass species to further promote wetland recovery.

The Bureau of Mine's Research and Development Section also worked jointly with the Bureau's Abandoned Mine Land Section to develop an acid mine drainage remediation plan for the air shaft/ borehole discharge. The Bureau of Mines had previously installed an automated lime doser on Laurel Run, approximately 2 miles downstream from the air shaft/ borehole discharge. Although this doser was functioning adequately enough for recovery of aquatic habitat along 35 miles of the main stem of the North Branch of the Potomac River, the Bureau was concerned that lack of a backup system would

The water driven lime doser delivers a continuous flow of lime that is proportional to the volume of water passing through the doser. Inside the doser, the small flow of lime can be seen dropping into the water and being carried off as it goes downstream into Laurel Run.





The acid mine drainage emanating from the entire 12.2 square mile mine complex discharges at an average of 3.5 million gallons per day. This water-powered lime doser, located just below the ventilation shaft, provides the primary treatment for acid mine drainage flowing from the mine. It protects over 4.5 miles of Laurel Run and 35 miles of the Potomac River.

destroy the recovery in the event of mechanical failure to the existing automated doser. Additionally, there was no recovery to Laurel Run and its extensive wetland systems since treatment of the acid mine drainage was occurring well downstream of the mine discharge. Considering these factors, the project design included development of a water powered dosing system to be installed immediately adjacent to the air shaft discharge. Installation of the doser would be reliable, given the limited accessibility of the site during inclement weather. The doser would also function as the primary treatment system for the acid mine drainage discharge. The existing doser, located two miles downstream, would then become a backup system, dispensing lime only if sensors detected a dip in pH, indicating technical problems at the primary system.

During the design process, several innovative concepts, techniques, and construction practices were utilized in order to overcome obstacles encountered during development of the project, including: 1) Auger boring of the coal refuse indicated that a large coal refuse pile located within the wetland had sunk as much as 4 feet below the surrounding wetland elevation. Testing of this zone of refuse determined that due to the saturated, oxygen reduced environment of the wetland, this refuse could remain in place, thus eliminating the need for an additional 25,000 cubic yards of excavation. Additionally, special handling

practices were developed allowing for the salvaging and reintroduction of existing wetland vegetation and soils for placement within the reconstructed wetland. Utilization of the existing wetland vegetation also provided a native, biologically unique seed stock for the disturbed area and reduced the chance for nonnative, invasive species to develop. 2) Laboratory and field testing of alternative neutralizing agents determined that the new water powered doser could be operated using kiln dust, a limestone dust by-product of the cement industry, thereby reducing the annual operating cost of the dosers by 50 percent.

### **Project Construction and Reclamation**

Construction of the Kempton Coal Waste Stabilization and Doser Installation Project was completed during the summer and fall of 1998. A competitive sealed bid procurement method was utilized and contracts awarded for the coal waste stabilization phase of the project at a cost of \$ 290,511.97. Another contractor was awarded the doser fabrication and installation at a cost of \$104,012.19. Under Cooperative Agreement with the Garrett County Soil Conservation District the U.S. D.A. Natural Resource Conservation Service provided contract management and inspection services during construction.

Project construction took seven months to complete and included excavation and grading of 160,000 cubic yards of coal refuse, salvaging and spreading of 26,000 cubic yards of topsoil; installation of two vertical mine shaft seals, installation of 500 linear feet of subsurface drain; construction of 5,000 linear feet of surface water diversion channel; restoration of 5.2 acres of wetland; collection and disposal of 150 tons of residential and industrial waste; construction of two sediment basins; fabrication and installation of a 100 ton capacity water powered lime doser and silo; construction of 1,000 linear feet of access road; and revegetation of 30 acres.

The removal of coal refuse from the wetland restored the natural floodplain and eliminated sedimentation and acid runoff from impacting the North Branch Potomac River and the

Prior to reclamation the Kempton Glades was covered with coal refuse. Today with native wetland vegetation reestablished this site is once again a biological diverse wetland environment.



Kempton Glades. The 5.2 acres of restored wetland was lightly planted with annual grass species to allow migration of native plants into the disturbed area. Native vegetation disturbed during construction was transplanted within the restoration area. The restored and ecologically healthy wetland has now become an appropriate beginning for the long journey downstream to our Nation's Capitol, and the Chesapeake Bay.