GREEN MOUNTAIN AND JEANSVILLE COAL-BASINS
CARBON AND LUZERNE COUNTIES, PENNSVLVANIA

DER PROJECT SL 135-11-101.6

DESIGN CRITERIA AND A CONCEPTUAL PLAN FOR THE ABATEMENT OF AMD DISCHARGES FROM FIVE WATER LEVEL TUNNELS

REPORT OF FINDINGS

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SUMMARY

This study was undertaken to investigate Acid Mine Drainage (AMD) from the abandoned coal mine workings in the Jeansville, South Green Mountain and the North Green Mountain coal basins of the Middle Anthracite coal fields. The purpose of the study is to develop design criteria and a conceptual plan for the abatement of these discharges and to determine its relative impact on the Catawissa Creek Watersheds.

The AMD discharges from five water level tunnels (WLT) degrade the water quality of the Catawissa Creek from source to mouth. During the 384-day study period, the total discharge of the tunnels was 6,960 million gallons, containing 7.015 million pounds of acid, resulting in mean acid concentration of 121 ppm. The Audenried Tunnel contributes over 80% of the total acid load from the tunnels.

Hydrologic analysis indicates that the tunnel discharges represent 60% of the precipitation during the June 1978 thru June 1979 study period. For the same period, the estimated runoff from areas that are not underlain by deep mining, represent approximately 40% of the precipitation.

The hydrology of the tunnel discharges is characterized by the storage provided by the deep mine pools as evidenced by the long lag times observed on the tunnel discharge records. The frequency of the tunnel, discharges appear to be a function of total precipitation over a period of time equal to twice the lag time. The maximum peak flows are associated with combined rainfall and snow melt. High intensity rainfalls have little effect on the peak discharges. This indicates that the major contributor to discharges is infiltration.

Flow-Duration curves for the, tunnels indicate the combined mean flow for all the tunnels is approximately 24 cfs. The combined flows are less than 77 cfs and greater than 14 cfs ninety-eight percent (98%) of the time.

The proposed techniques of AMD abatement by neutralization with limestone consist of downflow limestone beds and revolving drums. The drums are essentially over-shot water wheels partially filled with limestone. Neutralization is achieved by the AMD driving the wheel and grinding the limestone. The resulting fines are discharged into the acid water. In the downflow beds, the AMD is forced through the aggregate in order to neutralize the acid. Because of precipitated metals fouling the limestone surfaces, frequent backwashing of the beds is necessary. Design criteria for the proposed installation are based on results obtained from the demonstration project at the Quakake Water Level Tunnel (SL-135-10).

The total estimated construction cost for all five tunnels is $6,310,000. The estimated annual cost of $1,294,000 consists of $760,000 for amortization of fixed costs and $534,000 for operation and maintenance.

The estimated construction cost is equivalent to $413 per pound of neutralized acid per day. The derived annual cost is equivalent to 23 cents per pound of acid removal per day. The annual cost of abatement is also equivalent to 21.4 cents per 1000 gallons of treated water.

(1)

Estimates made in 1973 indicate that the abatement of AMD from the tunnels would provide a benefit/cost ratio of 2.0& for an investment of five million dollars. The estimate was based on the cost of sealing the tunnels, stream channel and surface restoration and treatment of the remaining discharges. The proposed projects will equal the degree of abatement projected at that time. It is therefore reasonable to assume that the 6.3 million dollars construction cost for the neutralization of
tunnel discharges, derived in this study, will result in an equal or larger benefit/cost ratio.

The Catawissa Creek is a potential surface water source. Its 153 square-mile watershed encompasses parts of Schuylkill, Luzerne and Columbia Counties which have documented water supply problems. Future use of the Catawissa Creek for water supply purposes expected to increase the .aforementioned benefit/cost ratio resulting from AMD abatement.

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