

## XV. ANALYSIS OF INDIVIDUAL WATERSHEDS

### A. General

The purpose of this section is to analyze the mine drainage problem of the individual watersheds, relate this problem to the effect that each watershed has on the overall system, and to recommend specific abatement measures to significantly reduce the pollution within the Two Lick Creek Watershed.

Each watershed analysis will include the following information:

(1) A sketch-type map showing the location of sampling stations and the location and condition of the streams which are symbolized as severely and moderately acid; (2) Sampling station data consisting of minimums, maximums, and averages of pollution loads; (3) A graph showing the relationship between stream flow, pollution load, and weather elements; (4) A listing of abandoned and active deep mine complexes located in each watershed; (5) A discussion of past and present strip mining activity; (6) A description of pollution sources; (7) Maps showing the location of pollution sources and property ownerships; (8) Abatement recommendations; and (9) The effect abatement will have on the total watershed.

The recommendations in relation to the above analysis, are based on the total improvement in water quality versus the total cost in achieving this improvement, hereafter referred to as cost benefication.

The recommendations include primary and alternate measures of abatement for a given watershed with corresponding cost benefication and maintenance costs.

Based on previously determined criteria, the watersheds with pH levels less than 6.0 are classified as polluted. Those watersheds classified as non-polluted systems may contain some minimal contamination, however, their pH level is above 5.9.

### B. Cost Benefication

A pollution abatement procedure is itemized for each individual watershed and a cost of abatement broken down into a cost per pound for removal of acid. The cost of abatement per pound of acid is used as a guide in determining remedial measure recommendations. An arbitrary figure of \$1,000 per pound for acid removal was designated as the cost at which abatement of mine drainage pollution becomes excessive. No treatment is provided for any source for which abatement costs are in excess of \$1,000 per pound of acid removal.

The benefication was assigned an arbitrary 75% efficiency as a probable reduction from the completed abatement procedures. The costs per pound are based on this 75% reduction in acid contribution. All remedial measures which are more effective than this 75% assignment will therefore cost less per pound than the indicated figures.

Other criteria include water seals not to exceed 100 feet head, covering of coal refuse piles with impermeable layers of soil and a minimum movement of coal refuse piles. The price of movement versus covering is an extremely high ratio. Strip mine reclamation and refuse pile cover indicate costs varying quite widely for acid removal while deep mine seals remain relatively constant.

In some instances, the dumping of coal refuse from active mines apparently contributes additional acid even though such placement complies with present day legislation. No remedial measures have been recommended for refuse piles which are presently being utilized in active mining operations.

Two treatment plants have been recommended due to high contaminant contribution where water heads in excess of 100 feet were encountered. Water seals for mines with heads of 50 to 100 feet are considered as only partially successful due to probable migration of water through adjacent strata.