ABATEMENT PLANS STUDIED IN DETAIL TO ACHIEVE ALKALINE WATER IN THE TIOGA-HAMMOND LAKE UNDER VARYING FLOW CONDITIONS

Based on the findings, conclusions, and recommendations of the FWPCA Report and subsequent evaluation of those plans using the established design criteria, the following three alternatives were studied to achieve alkaline water in the proposed Tioga-Hammond Lake under varying flow conditions:

Abatement Plan I

Construction of the preventive measures recommended in the FWPCA Report, taking into consideration the acid reductions estimated to be achieved after construction of the preventive measures funded by the EPA demonstration project and the changes in surface and subsurface conditions that have occurred since the FWPCA Report was published; construction of a collection system to convey in closed conduits to a single treatment plant sufficient residual AMD from two sources to meet the requirements of the Corps

Abatement Plan II

Construction of the same preventive measures as described in Abatement Plan I, followed by construction of two AMD treatment plants to replace the one centralized AMD treatment plant and collection system described in Abatement Plan I.

Abatement Plan III

Construction of a collection system to convey sufficient AMD to meet the Corps' requirements from three sources to treatment plants to be constructed at two locations.

DISCUSSION OF AMD PLANS STUDIED IN DETAIL

Cost was a major consideration in evaluating the abatement plans that were studied in detail. Both project and total annual costs were estimated and compared. These cost estimates, based on present price levels, are summarized in Table 4. Information used in developing these estimates is presented in Exhibit C.

TABLE 4

SUMMARY OF ESTIMATED COSTS

Abatement Plan	Initial Project Cost	Total Annual Costs		
		Average Over Initial 30 Years	Average Over Next 270 Years	Average Over 300 Years
I	$5,198,000	$515,400	$167,800	$202,600
II	$5,146,000	$511,500	$165,500	$200,145
III	$2,068,000	$445,200	$445,200	$445,200

In addition to costs, other factors were considered. A discussion of the principal factors involved in evaluating each plan follows:

Abatement Plan I

For all practical purposes, the initial project cost for this plan is equal to the initial project cost for Abatement Plan II. It is also significantly higher than the initial project cost for Abatement Plan III. The long term annual costs for Abatement Plan I are considerably lower than they are for Abatement Plan III but are practically the same as those estimated for Abatement Plan II. Stage construction of the preventive and treatment measures could be undertaken with this plan, and the effect of each evaluated.

Abatement Plan II

Project and long term costs for Abatement Plan II are only slightly less than those estimated for Abatement Plan I. The project cost for this plan is considerably higher than the project cost for Abatement Plan III,
but the annual long term costs are considerably lower. Stage construction of both preventive and treatment measures could be undertaken with an evaluation of the effectiveness of each stage accomplished.

Abatement Plan III

The project cost for Abatement Plan III is the lowest of all three plans studied in detail; however, annual long term costs are significantly higher than for the other plans. Stage construction of these treatment measures could be undertaken, and the effect of treatment on stream quality evaluated.

RECOMMENDED ABATEMENT PLAN

Based on long term costs and flexibility to enable stage construction and evaluation of preventive and treatment measures, Abatement Plan II is recommended for construction. Abatement Plan II is also recommended because it closely parallels the recommended plan in the FWPCA Report, which was demonstrated to be the least costly in achieving high degrees of AMD reduction. From a stream quality aspect, further AMD reductions may be warranted in the Study Area beyond the Corps' requirements.

The recommended abatement plan can be briefly described as follows:

Preventive measures:

> Reconstruct four stream channels; construct surface water diversion ditches at nineteen strip mines; restore three subsidence areas; bury all refuse material; and restore nine strip mines.

The construction of these preventive measures will make it possible to meet the requirements of the, Corps except during design low flow, when only 30 percent of the required acid load reduction will be achieved. It will, therefore, be necessary to collect and treat an additional increment of acid load to fully achieve the Corps' requirements. After construction of the recommended preventive measures, two significant AMD sources remain that could be collected and treated.

Treatment measures:

Two treatment plants that will operate only when flows are below design average conditions:

1 . Coal Creek approximately 1 , 000 feet upstream from its confluence with the Tioga River; design flow of 0.74 mgd.

2. AMD No. 14; design flow of 0.25 mgd.

By constructing and operating these treatment measures when Tioga River flows are less than design average, the Corps' requirements can be achieved under all flow conditions.

Certain specific components within both plants can be oversized to insure against acid slugging of the Tioga River should localized rainstorms occur in the Study Area.

The locations of abatement measures comprising the recommended plan are noted on Plate II. The information used in preparing the estimated reductions, together with incremental flow and acid load reductions, for each abatement measure is presented in Exhibit B.

The initial project cost of $5,146,000 for the recommended plan exceeds the estimated $1,600,000 savings, which could be achieved by not constructing the control structure in the channel between Hammond and Tioga Lakes. However, improved Tioga River quality and the potential increased use of these waters would be important considerations in a decision concerning implementation of the recommended plan.

RECOMMENDED ORDER OF CONSTRUCTION FOR THE SELECTED ABATEMENT PLAN

The abatement plan selected consists of the construction of preventive measures and treatment facilities in the locations shown on Plate II. The recommended order for implementing the plan is as follows

1. Reconstruct and grout stream channel DD' and restore S-26.

2. Restore Bloss vein strip mines along Fall Brook (using refuse to meet partial fill requirements). 3. Reconstruct stream channel CC' and construct SWD ditches at S-11 , S-12 , S-13 , S-14 , and S-15.

4. Reconstruct stream channel BB', restore subsidence area B-2, and construct SWD ditches at S-6 and S-10.

5. Reconstruct stream channel AN, restore strip mine S-3 as well as subsidence area B-1 , and construct SWD ditches at S-4.

6. Restore S-19 (using refuse to meet partial fill requirements), restore subsidence area B-3, and construct SWD ditches at S-16, S-17, 5-18, and 5-20.

7. Restore S-2 7 (using refuse to meet partial fill requirements) .

8. Construct SWD ditches at 5-22, S-24, S-25, S-28, S-31 S-33, and S-41.

9. Construct treatment facilities.

Exhibit D indicates estimated AMD volumes and major constituents that remain at each AMD discharge point under design flow conditions after construction of the preventive measures.

All Study Area lands where abatement projects are proposed are privately owned. To gain entrance upon these lands, easements must be secured. If easements are not willingly granted by the landowner or occupier, it is understood that the Commonwealth may secure such authorization by use of Section 316 of the Clean Streams Law and Section 6 of the Abandoned Coal Mine Sealing Act.

It is recognized that strip mining will continue in the Study Area for the foreseeable future. Adequate protection of the Tioga River watershed from additional AMD pollution by future mining and safeguarding those abatement projects constructed as a part of the recommended abatement plan should be provided through the enforcement of provisions of the Clean Streams Law, issuance of restrictive permits, and strict surveillance during mining operations