CONCLUSIONS AND RECOMMENDATIONS

The Little Schuylkill River is polluted by acid mine drainage from twenty-four primary sources; fourteen deep mine workings, nine refuse storage bank seeps and the effluent from one active breaker. Under average conditions, the river receives daily 31,000 lbs. of acid, 5,600 lbs. of iron, and 188,000 lbs. of sulfate. A major mine drainage source is at the headwaters of the River and it is of sufficient magnitude to assert an unacceptable water quality for nine miles downstream to Tamaqua. The remainder of the mine drainage load is introduced at Tamaqua from several direct discharges into the River and from the tributary streams which converge with the Borough, the Panther and Wabash Creeks. The additional pollution load is sufficient to render the river virtually useless to its mouth, an additional distance of twenty miles.

By far the largest source of mine drainage pollution is the pumpage into Panther Creek that is associated with the active open-pit mining being conducted by the Greenwood Stripping Corporation. The Corporation's Tamaqua #10 Pumps contribute 45% of the basin's total acid load; while surprisingly, the associated Greenwood #10 Pumps contribute no acid. The combination of these two sources also account for 83% of the iron and 80% of the sulfate discharged in the entire study area.

The greatest single acid source is the Tamaqua #14 pumps, whose annual pumpage averages 4,560 gpm, but whose impact is much greater because of a pumping rate of 7,500 gpm. During periods of low stream flow, the Tamaqua #14 pumps can exert an impact of such magnitude that its acid

can depress the pH of the Main Stem of the Schuylkill River to a value below 5.5. In one case the pH of the Schuylkill River was depressed from a level of 6.9 to 5.0.

There appear to be no conditions in the Little Schuylkill Basin where a "Quick Start" program is feasible. No action of relatively modest scope could be implemented that would result in any significant improvement in the Basin.

With the exclusion of those areas directly associated with the present mining activities of the Greenwood Stripping Corporation, mine drainage abatement through surface reclamation and sub-surface drainage control, to the fullest extent practicable, would result in recovery of river water quality for only four miles of stream north of Tamaqua and little or no beneficial improvement of the water quality below Tamaqua.

With surface reclamation at Silverbrook and the further addition of neutralization facilities to handle the residual acid, water quality suitable as a fishery would be extended to eight miles upstream of Tamaqua. However, if reclamation were extended basin-wide and treatment were expanded to include Greenwood #10 pumpage, Tamaqua #14 pumpage and the Greenwood Breaker effluent, the acidity would be adequately controlled, but sulfates and/or iron would be excessive or at least marginal downstream of the Borough.

If the Greenwood Stripping Corporation were to cease operations and if its disturbed land surfaces were reclaimed, the residual

and continued drainage from the associated mine pool would significantly degrade the Little Schuylkill River and probably add an acid load sufficient to produce an intolerable pH downstream of Tamaqua to its mouth.

It is concluded from this study that:

(1) Reclamation at Silverbrook can beneficially recover four miles of the Little Schuylkill River above Tamaqua.

(2) Reclamation with supplemental acid neutralization at Silverbrook can recover eight miles of River above Tamaqua.

(3) Basin-wide reclamation, both surface and sub-surface, and augmented with conventional treatment, would be incapable of renovating the River to a good quality downstream of Tamaqua.

(4) If the one major mining activity, that of the Green wood Stripping Corporation, were to cease and its disturbed surface areas were reclaimed, the residual pollution from the associated mine pool would still be sufficient to severely pollute the River downstream of Tamaqua.

(5) The Tamaqua #14 pump discharge at 7500 gpm is sufficient to cause a detrimental pH depression of the Main Stem during low flow conditions.

Overall, the study has determined that only a limited portion of the Little Schuylkill River upstream of Tamaqua is recoverable. With the passing of time the pollutants will decrease, hopefully tech-

nology will provide a means to treat mine drainage more effectively and economically, and the Basin can be re-evaluated. The detailed analysis and data included herein should be highly valuable to those who may pursue this problem in the future.

Two recommendations for the consideration of the Department of Environmental Resources are submitted below:

(1) The Department require that the Greenwood Stripping Corporation modify its pumping practice of the Tamaqua #14 pumps from the normal operation of 7,500 gpm for approximately 50 hours on weekends to a more uniform rate of 3,000 gallons per minute throughout the week, during the low stream flow periods of August, September and October, or longer if required, in order to eliminate the pH shocks on the Main Stem of the Schuylkill River.

(2) The Department consider a reclamation and neutralization program at Silverbrook for the recovery of eight miles of the Little Schuylkill River for a fishing stream and for a potential water supply below Locust Creek. In addition to stream recovery, the Silverbrook project would reclaim 478 acres of disturbed surface land and recover a watershed encompassing 1220 acres. The estimated cost of this project follows, to permit its comparison with the results of similar mine drainage control studies.

TABLE 14

ESTIMATED COSTS FOR MINE DRAINAGE CONTROL AT SILVERBROOK

A. CAPITAL COSTS

1. Surface Reclamation (478 acres)

Basic Construction Cost	$2,200,000
Engineering, Legal, Administrative and Contingency	550,000
Maintenance of Surface (5 years)	489,000
Total -	$3,239,000

2. Neutralization Facilities (av. 1200 lbs. acid/day)

Lime Handling & Storage 25 tons		14,000
Chemical Feeder, 125 lb/hr cap. & duplicate for back-up		11 ,000
pH Control Instrumentation & duplicate for back-up		4,500
Total Equipment Costs	$	29,500
Installed Equipment Cost ($29,500 x 1.5)	$	45,000
Control Building & Foundations		15,000
Engineering & Contingency		15 , 000
Total -	$	75,000
TOTAL CAPITAL COSTS		$3,314,000

B. OPERATING COSTS

Labor & Supervision (2 Hr./day)	$	4,000/yr.
Maintenance		4,500
Lime (hydrated)		4,800
Power		300
TOTAL ANNUAL OPERATING COSTS-	$	17,600

###

The neutralization facilities under Recommendation (2) and presented in Table 14 are a positive chemical addition system with control instrumentation. The possibility exists, however, that the same result may be attainable at a lower cost by the placement of crushed limestone directly into a stream bed and securing the needed alkalinity through its dissolution.

The practicality of supplementing stream alkalinity by the above method is unconfirmed; therefore, a pilot-scale experiment is recommended, from which a full scale project can later be designated if the concept proves applicable.

Since all of the unpolluted tributary streams in the study area have essentially identical chemical characteristics, the limestone experiment can be applied to anyone stream and the results extrapolated and applied to any or all the streams. Lofty Creek, because of its small size, and Still Creek, because of the possibility of a regulated flow from Still Creek Dam, are two streams that would lend themselves best to the limestone test.

Although there is the danger of limestone incrusation by mine drainage pollutants if it were placed directly into the Little Schuylkill River, it is, nevertheless, suggested that the scope of the experiment also include its placement into the River below Silverbrook. The reason being is that the low pH water will be a strong driving force for the dissolving of the limestone and the subsequent utilization of its alkalinity.

Between Lofty and Neifert Creeks, Sample Station No. 5 for example, the Little Schuylkill River generally shows a pH of 3.6 and relatively low sulfate and iron concentrations.

A major report conclusion is that a basin-wide reclamation program would be incapable of renovating the Little Schuylkill River to a good quality downstream of Tamaqua; however, it is recognized that the Little Schuylkill Basin is but a fraction of the total mine drainage problem on the Schuylkill River. On the overall, therefore, the Department of Environmental Resources may wish to undertake selective reclamation projects to reduce the total basin pollution load and/or to achieve desirable surface or sub-surface conditions. Aside from the Silverbrook Basin, which has been covered in detail, the south side of Wabash Valley (Reclamation Areas W: IS through W: 7S) and a portion of the south side of Panther Valley (Reclamation Areas P: 1S through P: 13S) show relatively good cost/benefit ratios of, respectively, $422 and $549 per pound of acid per day abated (based on cost figures adjusted to total project cost). In the Wabash Valley this work would eliminate 2,375 pounds of acid per day and provide 196 areas of reclaimed surface; while in the Panther Valley the project would eliminate 2,463 pounds of acid and result in 359 reclaimed acres.