II SUMMARY

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1.0 Study Area

The Southern Latrobe Syncline lies in the south central portion of Westmoreland County in southwestern Pennsylvania. The southern border is near the Fayette-Westmoreland county boundary, Jacobs Creek, south of Mt. Pleasant. The northern boundary of the study area was arbitrarily drawn on a line from Marguerite to Whiteley. This line extends beyond the saddle between the northern and southern sections of the southern syncline pool. Within this southern area Gibbs and Hill, Inc. (1972) located four major acid mine discharge source groups.

Before an abatement plan for any of the groups could be developed it was necessary to consider the entire syncline's geologic setting, hydrologic cycle, mining history and the physical condition of the outcrop area. It was found that approximately 75% of the outcrop area has been surface mined prior to 1968. The outcrop of the Pittsburgh Coal can be physically traced along most of its length by following subsidence holes, surface mines, or both. Many of the surface mines exhibited little or no regrading attempted. Many contained exposed coal or deep mine openings with ponds or pooling areas against the coal seam.

Drift mining began along the outcrop area and the coal was removed under very shallow cover. In some areas it was only 10 - 15 feet. In the center of the basin the cover reached 400 - 415 feet. The deep mines within the basin were abandoned before 1935, however, some mines near the outcrop were reopened around World War II. Recovery is estimated at 50% - 70% within the entire basin.

2.0 Monitoring Results

A twelve or six month monitoring program (as previously noted) was initiated for each individual discharge. Flow measurements were taken and water samples were collected for chemical analysis.

As an example of the magnitude of the discharges measured, the six (6) Brinkerton overflow discharges enter Sewickley Creek near Brinkerton. These six discharges compose the largest from this pool. The mean flow of Sewickley Creek downstream of the Brinkerton Overflow was 13MGD. The combined mean flow of the discharges was 9.2 MGD.

Mean values for the Brinkerton Overflow area discharges (M08, M08A, M09, M10, M11 and M12) over the twelve month monitoring period follow as Table II - 1.

Table II - 1 Brinkerton Overflow Discharges, Mean Analysis

Discharge	Flow (MGD)	pH	Acidity	Alkalinity	Sulfate	Ferrous Iron	Total Iron
M08	0.220	4.0	169.7	12.8	581.3	27.0	38.0
M08A	0.018	3.0	266.7	0.0	429.3	1.0	15.7
M09	0.981	6.1	102.5	312.5	497.9	22.7	28.0
M10	2.213	6.3	119.5	297.1	593.2	22.0	34.2
M11	0.768	3.0	311.0	0.0	804.2	30.7	44.8
M12	5.013	4.0	218.0	9.7	764.6	69.8	85.1
Average Parameters		4.4	197.9	105.4	611.8	28.9	41.0

Total Mean Discharge 9.213 (MGD)

Note: All units except pH and flow are in mg/L.

Available mine maps of the discharge area indicate shallow cover, daylight falls and/or barrier stripping. Mine sealing as an effective abatement measure is not feasible in the Brinkerton Overflow area.

The discharges to Stauffer Run are highly acidic. Table II - 2 provides mean values as monitored.

Table II - 2 Stauffer Run Discharges, Mean Analysis

Discharge	Flow (MGD)	pH	Acidity mg/L	Alkalinity mg/L	Sulfate mg/L	Ferrous Iron mg/L	Total Iron mg/L
M101*	0.008	2.8	1550.0	0.0	1500.0	38.1	152.7
M103*	0.011	2.9	933.3	0.0	829.2	1.7	59.9
M62A	0.014	2.7	1104.7	0.0	1495.8	75.3	165.8
M62B	0.069	2.7	951.7	0.0	1227.1	37.0	126.5
M62C	0.011	2.5	1598.3	0.0	1608.3	13.5	187.5
M63	0.078	2.7	837.5	0.0	1247.9	3.6	108.7
Average Parameters		2.7	1162.6	0.0	1318.1	28.2	133.5

Total Mean Discharge 0.191 (MGD)

NOTE: No data available for discharge M102 due to inability to contact property owner to obtain permission to enter.

*Monitored for six months

As a rule it was found that discharges from mines near the outcrop, like the Stauffer Run and Buffalo Run discharges, were acidic while other discharges with more underground travel time before discharging were more alkaline. This is due in part to the limestone units present over the central portion of the syncline which cause the downward percolating ground waters to have a neutralizing effect on the pool waters. (See Volume II Plate 24).

Table II - 3 provides mean values of the Buffalo Run discharges.

Table II - 3 Buffalo Run Discharges, Mean Analysis

Discharge	Flow (MGD)	pH	Acidity mg/L	Alkalinity mg/L	Sulfate mg/L	Ferrous Iron mg/L	Total Iron mg/L
M05	0.963	2.9	468.3	0.0	954.2	28.0	42.8
M104*	0.035	3.3	196.7	0.0	600.0	0.0	4.2
Average Parameters		3.1	332.5	0.0	777.1	14.0	23.5

Total Mean Discharge 0.998 (MGD)

*Monitored for six months

The Wilson Run discharges mean values are provided in Table II - 4.

Table II - 4 Wilson Run Discharges, Mean Analysis

Discharge	Flow (MGD)	pH	Acidity mg/L	Alkalinity mg/L	Sulfate mg/L	Ferrous Iron mg/L	Total Iron mg/L
M06	2.337	5.7	123.8	115.8	612.5	31.3	43.6
M07	2.468	6.0	93.8	241.5	560.4	14.7	28.6
Average Parameters		5.9	108.8	178.7	586.5	23.0	36.1

Total Mean Discharge 4.805 (MGD)

3.0 The Abatement Plan

The abatement plan recommended for the southern portion of the Southern Latrobe Syncline mine pool considers the total area of the pool and seventeen of the discharges present. The essential phases of the plan and the estimated costs are:

Phase 1: Sealing and reclamation of major and minor inflow areas, $7,832,400.00;

Phase II: Mine seal, grout curtain and flume construction in the Stauffer Run Area, $679,350.00;

Phase III: Pipe diversion of M05 and M104, $61,600.00;

Phase IV: Settling pond construction on Wilson Run at M06 and M07, $557,545.00;

Phase V: Settling pond construction on Boyer Run (M08, M08A, M09) and Sewickley Creek (M10, M11, M12), $1,996,475.00;

Phase VI: Addition of alkaline materials into the mine pool through existing conduits; and

Phase VII: Installation of continuous liming units at a minimum of three locations if necessary, $3,470,100.00.

4.0 Discharges not Included in Abatement Plan

Table II-5 below lists the discharges not included in the abatement plan and their mean analysis (monitored for six months). Reasons for exclusion are detailed in Section VI, Subsection 11.0.

Table 11-5, Remaining Discharges, Mean Analysis

Discharge	Flow (MGD)	pH	Acidity mg/L	Alkalinity mg/L	Sulfate mg/L	Ferrous Iron mg/L	Total Iron mg/L
M100	0.015	3.0	875.7	0.0	562.5	4.5	36.1
M105	Source blocked by surface mine operation						
M106	0.047	2.8	840.0	0.0	1210.0	1.6	52.6
M107	0.009	2.8	991.7	0.0	1287.5	2.1	72.7
M108	0.015	3.1	350.4	0.0	1530.0	0.0	13.2
M109	0003	2.8	680.0	0.0	770.0	0.2	43.6
M110	0.006	2.7	1900.0	0.0	2687.5	4.1	173.2
M111	0.009	3.1	355.7	0.0	779.2	1.1	15.3
Average Parameters		2.9	856.2	0.0	1261.0	1.9	58.1

Total Mean Flow 0.104 (MGD)

5.0 Abatement Plan Alternatives

The abatement plan, as outlined above, represents an economic total approach. Alternatives are available which do not provide as complete an approach to total abatement.

Alternative 1. A settling pond and continuous liming unit could be constructed on Stauffer Run, to replace the mine seals and grout curtain. This would reduce the anticipated flow through the Buffalo Run (M05, M104) pipe diversion, and decrease the size of Pond #1 on Wilson Run (M06, M07),

Alternative 2. A settling pond and continuous liming unit could be constructed on Buffalo Run to replace the pipe diversion. This would decrease the required size of Pond #1 on Wilson Run (M06, M07).

Alternative 3. Elimination of Phase I, reclamation of major and minor inflow areas.

These alternatives were not included in the recommended abatement plan for the reasons outlined below.

Alternative 1

1. The mine seals, grout curtain and flume require little or no maintenance.
2. The settling pond would require use of surface land which might have a higher use in the future.
3. The neutralizing effect gained by mixing with the more alkaline central portion of the pool would be eliminated and this source would re-

quire larger amounts of lime to be added.

4. The possibility that some ferric hydroxide will precipitate in the mine workings is eliminated.

Alternative 2

1. The pipe diversion requires little or no future maintenance, and is low cost.
2. The settling pond would require surface land which may be put to a higher use in the future.
3. The neutralizing effect gained by mixing with the more alkaline central portion of the mine pool would be eliminated and this source would require substantially large amounts of lime to be added.
4. The possibility that some ferric hydroxide may precipitate in the mine workings is eliminated.

Alternative 3.

1. Reduction in the total volume of water to be handled in other phases (II, III, IV) should reduce the estimated construction costs. The seduction in volume may be on the order of 13% for phases II, III and IV after reclamation of the areas south and west of Wilson Run.
2. Social and aesthetic benefits are derived from this phase which are impossible to evaluate on a cost basis.
3. Future subsidence may cause additional inflow areas or enlargement of present ones sufficiently to cause an increase in the mine pool level causing additional discharges, possibly in more developed areas.

4. Extraction of the coal in some of these areas may be used to help defray the cost by approximately $2,270,000.00.
5. Additional inflow in the future may overtax the capacity of ponds constructed on present discharge volumes.
6. Reduction of direct inflow of surface water to the mine pool appears to be a more economic manner to reduce AMD than treating the additional water volume after flowing through the mine and reacting with the pollution forming materials. This manner of reducing AMD also adds to the general aesthetics of the environment.
7. The additional runoff from reclaimed areas will provide a dilutional effect on the existing AMD in the streams draining the area.

Other alternatives are available but will require evaluation beyond the scope of this project.

1. Diversion of all or a portion of naturally alkaline surface streams into the mine pool.
2. Addition of caustic waste to the mine pool either at the flume on Stauffer Run, pipe diversions on Buffalo Run or through new or existing boreholes. This alternative is included as recommended Phase VI because the basic premise is valid. Before any valid cost and benefit analysis could be determined, a detailed investigation is necessary.

A monitoring program should be implemented prior to completion of final design of Phases III, IV, V, VI and VII. The scope of the monitoring program will vary depending on the phase it is implementing. The degree of monitoring and parameters will provide the design criteria that should reduce construction and maintenance costs for the three proposed ponds.

6.0 Field Investigation

The two week "Outcrop Inventory" and numerous field trips to the study area failed to locate any discharges from the Redstone seam, although it was both deep and surface mined. This lead to the conclusion that this seam is effectively dewatered by fracturing of the underlying rock caused by earlier mining in the Pittsburgh Coal. This conclusion is supported by earlier workers (Sisler, 1924; Piper, 1933) and information from the test borings drilled for this study (See Table IV-2).