

SOUTH BRANCH

SOUTH BRANCH SUBWATERSHED

The South Branch Subwatershed includes the South Branch drainage area plus all the drainage area along the main stream to the south from the mouth of Surrena Run to the mouth of the Upper Main Stream. This total area covers 7.76 square miles or 19.4 percent of the total watershed.

Water quality data recorded at the mouth of South Branch (Station No. 18) indicated it to be the largest source of net alkaline water discharge in the entire Big Scrubgrass Creek Watershed. Flow characteristics determined an average discharge of 284 pounds per day acid and 2833 pounds per day of alkaline water with a maximum of 4440 pounds per day alkalinity. The indicated average pH value was 6.6 (See Figure 54) with an average net alkalinity of 34 ppm (See Figure 55).

Most of the tributaries in this subwatershed were net alkaline. Two sampling stations on small feeder streams in the headwaters were found to leave some net acid discharge however. Sampling Station No. 19, just below an old deep mine area had an average acid discharge of 24 pounds per day and Sampling Station No. 20 had an acid discharge at low flows of about 5 pounds per day. Both of these acid discharges were effectively neutralized upon mixing with net alkaline water in other streams. The discharge rates here are insignificant with respect to the overall subwatershed water quality characteristics.

Fluctuations in water quality were observed during high flows indicating a slight but detectable slugging effect.

FIGURE 54

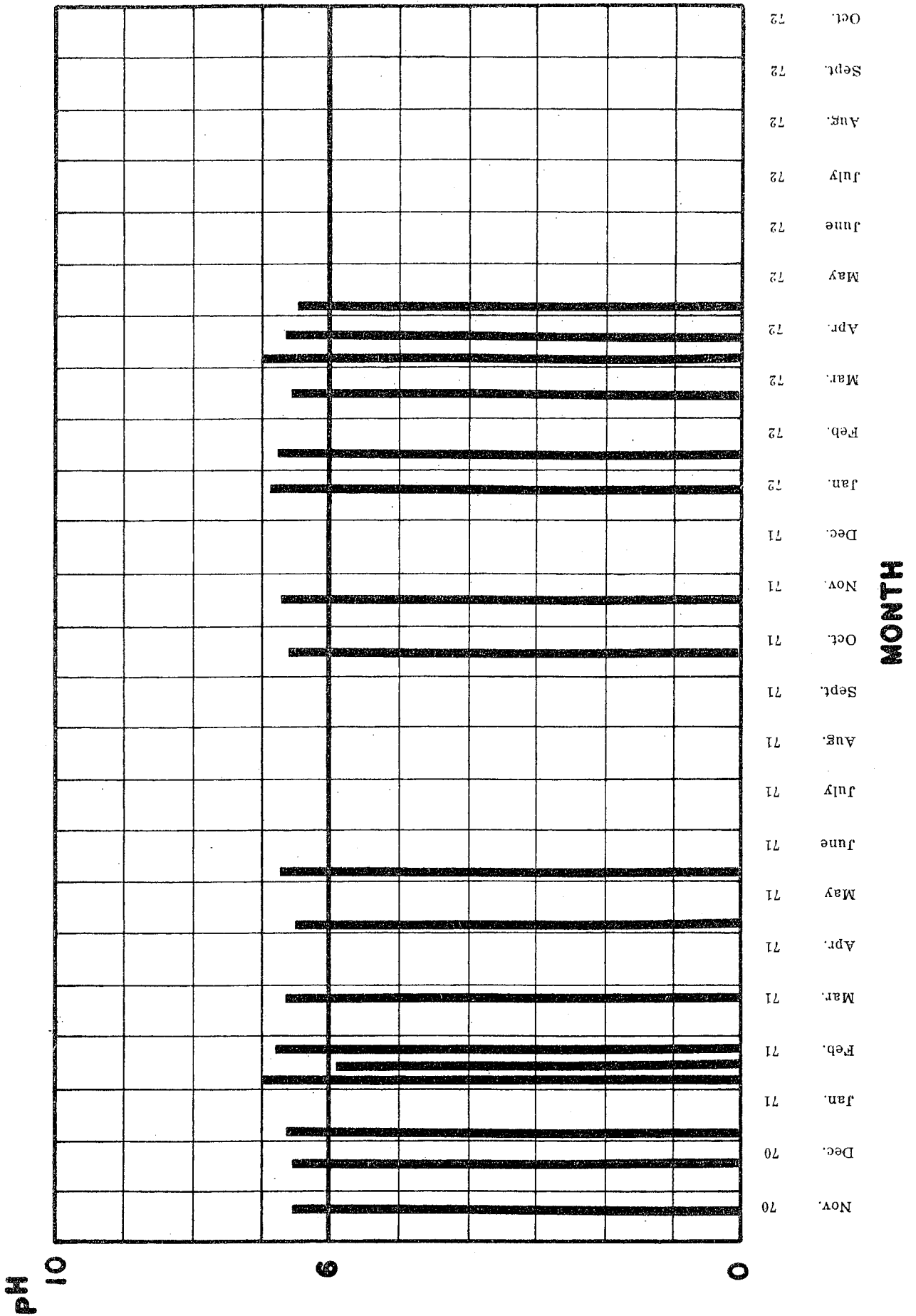
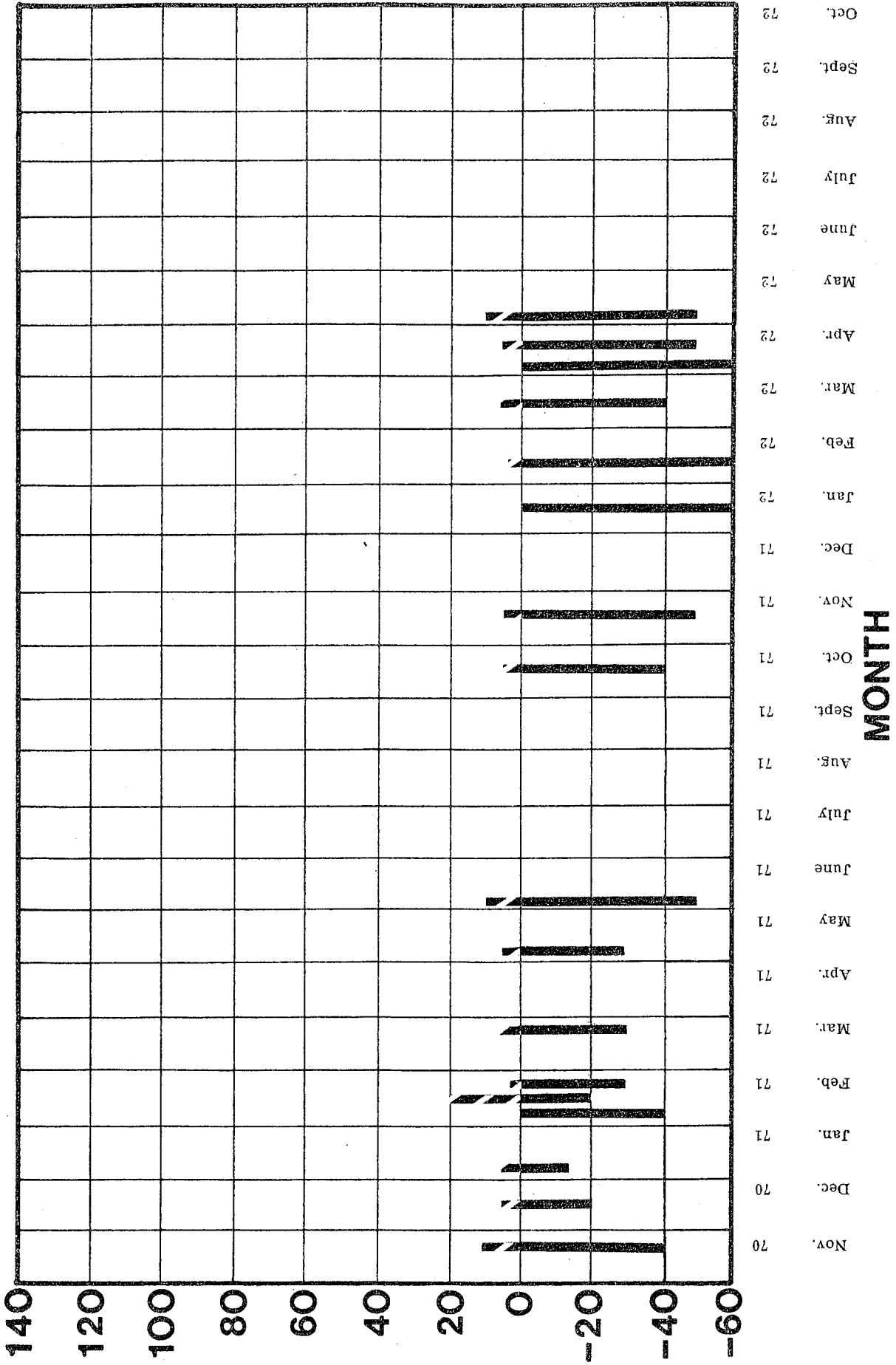


FIGURE 55

SAMPLING STATION NO. **18**

ACID MINE DRAINAGE PROJECT
BIG SCRUBGRASS CREEK WATERSHED

TOTAL ACIDITY PPM



Flows through Station No. 19 were net acidic during all flows. Water quality monitoring indicated the stream flowing at Station No. 20 to be predominantly acid during the maximum flow on record. On the average though, this tributary was predominantly alkaline. The main headwater stream was found to be variable when flows were higher. Otherwise, predominantly alkaline conditions existed. Below the confluence of South Branch and Hovis Run, the stream on which Station No. 19 was established, the main stream during high flows was variable downstream to an area just north of Interstate 80. From this point down to the confluence with Big Scrubgrass, South Branch exhibits predominantly alkaline water quality. The entrance of several small good quality feeder streams (Stations No. 67 and No. 68) account for the increased quality.

Following is a discussion of the location, drainage areas and a summary of water quality test results of the 14 sampling stations established in the South Branch Subwatershed. Figure 56 is a map of this subwatershed showing mine site and sampling station locations.

Station No. 18 was established at the mouth of the South Branch Scrubgrass Creek. There are 6.29 square miles of drainage area above this point. Mines No. 45, No. 46, No. 49, No. 50, No. 51, No. 52 and No. 53 contribute flows through this station, however, very little acid mine drainage is contained in the mine flows. Throughout the project period, the stream at this station was net alkaline displaying no specific seasonal variations. It was sampled 17 times between November 20, 1970, and May 4, 1972. Below are the average, maximum and minimum water quality results.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	5101.0	8800.0	1900.0
pH	6.6	7.0	5.9
Total Acidity (ppm)	6.0	20.0	0.0
Alkalinity (ppm)	40.0	60.0	15.0
Iron (ppm)	0.29	3.9	0.05
Sulfates (ppm)	54.0	160.0	25.0
Acid (ppd)	284.0	650.0	0.0
Alkalinity (ppd)	2833.0	4440.0	910.0
Iron (ppd)	3.6	11.0	1.1
Sulfates (ppd)	2853.0	5310.0	960.0

Station No. 19 was located at the west end of a culvert on Hovis Run under Pa. Route 308, 1.6 miles south of the intersection of Pa. Route 208 and Pa. Route 308 at Clintonville. This station has a small drainage area of only 0.06 square miles. U.S. Bureau of Mine Maps indicates that there were once three deep mine openings in the headwaters region, however, these are not distinguishable today. There is evidence though of gob piles and two acid pools accounting for the pollution detected at this station. Between the dates of November 20, 1970, and September 8, 1972, this station was sampled 39 times. The average, maximum and minimum water quality test results are listed below.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	53.0	154.0	1.0
pH	4.8	6.6	3.2
Total Acidity (ppm)	38.0	50.0	10.0
Alkalinity (ppm)	1.4	10.0	0.0
Iron (ppm)	0.36	0.6	0.05
Sulfates (ppm)	111.0	350.0	50.0
Acid (ppd)	24.66	92.0	0.48
Alkalinity (ppd)	1.80	16.3	0.0
Iron (ppd)	0.25	0.8	0.004
Sulfates (ppd)	66.3	240.0	1.2

Station No. 20 was established on a headwater tributary to the South Branch Scrubgrass Creek at the east end of a culvert under Township Road 366, 1.9 miles south of Pa. Route 208. This sampling station has a drainage area of 0.26 square miles and has had water quality ranging from predominantly alkaline in low flows to predominantly acidic in high flows. Between November 20, 1970, and May 4, 1972, Station No. 20 was sampled 38 times. Following is a list of average, maximum and minimum water quality test results.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	160.0	370.0	50.0
pH	5.9	6.8	3.6
Total Acidity (ppm)	17.0	60.0	3.0
Alkalinity (ppm)	26.0	80.0	0.0
Iron (ppm)	0.18	0.5	0.05
Sulfates (ppm)	78.0	150.0	37.0
Acid (ppd)	27.0	130.0	4.7
Alkalinity (ppd)	45.0	170.0	0.0
Iron (ppd)	0.43	0.9	0.05
Sulfates (ppd)	155.0	550.0	48.0

Station No. 21 was established about 200' downstream from the confluence of a tributary and the South Branch just off Township Road 366 about 1.5 miles south of Pa. Route 208. There are about 1.99 square miles of drainage area above this station. The South Branch at this point remained predominantly alkaline for most of the 17 times it was sampled between November 20, 1970, and May 4, 1972. The average, maximum and minimum water quality test results for this station are listed below.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	1235.0	2500.0	540.0
pH	6.5	7.0	5.6
Total Acidity (ppm)	6.0	15.0	0.0
Alkalinity (ppm)	28.0	50.0	0.0
Iron (ppm)	0.1	0.3	0.05
Sulfates (ppm)	59.0	225.0	35.0
Acid (ppd)	57.0	210.0	0.0
Alkalinity (ppd)	522.0	900.0	0.0
Iron (ppd)	0.8	2.1	0.3
Sulfates (ppd)	754.0	1710.0	340.0

Station No. 22 had its location on the downstream side of the Township Road 366 Bridge, about 0.9 miles south of the intersection with Pa. Route 208. Situated on South Branch Scrubgrass Creek, Station No. 22 has a drainage area of 3.11 square miles. The South Branch at this point ranged in quality from variable in high flows, the result of acid water flowing downstream from above Station No. 19 to predominantly alkaline during lower flow periods. Aquatic life in the form of small fish and insects have been observed in the stream in this area. Between November 20, 1970, and May 4, 1977, Station No. 22 was sampled 25 times resulting in the following average, maximum and minimum water quality values.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	2465.0	4300.0	940.0
pH	6.6	7.1	5.2
Total Acidity (ppm)	4.0	10.0	0.0
Alkalinity (ppm)	36.0	50.0	10.0
Iron (ppm)	0.09	0.3	0.05
Sulfates (ppm)	47.0	64.0	30.0
Acid (ppd)	176.0	444.0	0.0
Alkalinity (ppd)	1078.0	1920.0	450.0
Iron (ppd)	2.3	8.8	0.6
Sulfates (ppd)	1420.0	2920.0	530.0

Station No. 37 was established at the end of a drainage pipe contributing flow to Big Scrubgrass Creek approximately 1000' upstream from the point where the Scrubgrass flows under Pa. Route 308. This station collects flows from a marsh area associated with abandoned oil wells. During the project period, this station remained net alkaline, but had indications of acid and iron present, which resulted in "red" water and the precipitation of iron. Between November 20, 1970, and May 4, 1972, this station was sampled 38 times. Following is a list of average, maximum and minimum water quality determinations.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	52.0	96.0	38.0
pH	6.3	6.8	6.0
Total Acidity (ppm)	44.0	80.0	7.0
Alkalinity (ppm)	86.0	120.0	60.0
Iron (ppm)	2.32	6.9	0.5
Sulfates (ppm)	25.0	125.0	8.0
Acid (ppd)	29.0	52.0	4.5
Alkalinity (ppd)	54.0	81.0	13.0
Iron (ppd)	1.5	4.4	0.5
Sulfates (ppd)	12.0	19.0	7.6

Station No. 48 was established on the South Branch of Scrubgrass Creek under a Pa. Route 208 bridge crossing the creek about 0.7 miles west of intersection with Pa. Route 308 at Clintonville. South Branch at this point has a drainage area of 5.32 square miles and for the duration of the project has been a net alkaline stream. This station was sampled 18 times between March 9, 1971, and May 4, 1972, resulting in the following average, maximum and minimum test values.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	4618.0	7400.0	1600.0
pH	6.7	7.1	6.4
Total Acidity (ppm)	3.0	5.0	0.0
Alkalinity (ppm)	45.0	80.0	10.0
Iron (ppm)	0.05	0.1	0.05
Sulfates (ppm)	48.0	60.0	22.0
Acid (ppd)	185.0	444.0	0.0
Alkalinity (ppd)	2396.0	4970.0	1150.0
Iron (ppd)	3.5	8.9	1.0
Sulfates (ppd)	2573.0	4970.0	1130.0

Station No. 52 was located at the mouth of a small tributary to Big Scrubgrass Creek about 500' upstream from the point where Big Scrubgrass passes under Pa. Route 308. The stream originates from a seep, probably a spring in the hillside. This station, sampled 18 times between March 9, 1971, and May 4, 1972, was predominantly alkaline throughout the project. Water quality test values for this station follow.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	36.0	60.0	21.0
pH	6.7	6.9	6.2
Total Acidity (ppm)	3.0	7.0	0.0
Alkalinity (ppm)	26.0	40.0	10.0
Iron (ppm)	0.05	0.1	0.05
Sulfates (ppm)	13.4	22.0	6.0
Acid (ppd)	1.4	3.6	0.0
Alkalinity (ppd)	11.4	19.0	5.1
Iron (ppd)	0.02	0.05	0.01
Sulfates (ppd)	5.4	10.0	2.8

Station No. 53 was established just downstream from an 8" abandoned oil well casing flowing into Big Scrubgrass Creek about 1500' upstream from the point where Big Scrubgrass flows under Pa. Route 308. The casing discharged net alkaline water but there was an obvious precipitation of iron. Attempting to determine the depth of the casing, a 12" surveyors rod was emersed but failed to locate the bottom. Upon removal of the rod, crude oil began flowing from the well. This stations was sampled 31 times between March 9, 1971, and May 4, 1972.

Following are the average, maximum and minimum test values.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	54.2	75.0	24.0
pH	6.4	6.8	6.1
Total Acidity (ppm)	25.5	40.0	5.0
Alkalinity (ppm)	81.0	100.0	50.0
Iron (ppm)	1.3	5.3	0.4
Sulfates (ppm)	30.0	54.0	17.0
Acid (ppd)	16.2	34.0	5.7
Alkalinity (ppd)	53.0	76.0	20.0
Iron (ppd)	0.92	3.3	0.1
Sulfates (ppd)	18.7	31.0	11.0

Station No. 54 was located near the mouth of a small tributary into South Branch Scrubgrass Creek about 0.6 miles north of the point where South Branch passes under Pa. Route 208. The stream originates from seepage in a hillside, collecting in a marsh and flowing out into South Branch. It was a predominantly alkaline stream for the 18 times it was sampled between March 9, 1971, and May 4, 1972. Below are average, maximum and minimum water quality test results.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	38.0	80.0	27.0
pH	6.6	7.3	6.3
Total Acidity (ppm)	7.0	20.0	0.0
Alkalinity (ppm)	63.0	80.0	50.0
Iron (ppm)	0.19	1.2	0.05
Sulfates (ppm)	24.0	31.0	18.0
Acid (ppd)	3.3	9.1	1.2
Alkalinity (ppd)	30.0	48.0	19.0
Iron (ppd)	0.09	0.6	0.02
Sulfates (ppd)	11.3	18.0	6.9

Station No. 57 was located at the west end of a culvert under Pa. Route 308, 0.5 miles south of the Venango-Butler County Line. This headwater tributary of the South Branch has a drainage area of 0.14 square miles at this station. Predominantly alkaline conditions have prevailed at this station through each of the 18 times it was sampled between March 9, 1971, and May 4, 1972. Flows are collected from a portion of Mine Site No. 52 upstream but has not indicated any acidic conditions. Below are listed the average, maximum and minimum water quality test values.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	93.0	200.0	38.0
pH	6.6	6.9	6.4
Total acidity (ppm)	3.0	5.0	0.0
Alkalinity (ppm)	52.0	100.0	10.0
Iron (ppm)	0.08	0.3	0.05
Sulfates (ppm)	68.0	89.0	53.0
Acid (ppd)	4.0	12.0	0.0
Alkalinity (ppd)	55.0	170.0	15.0
Iron (ppd)	0.1	0.5	0.02
Sulfates (ppd)	74.0	140.0	29.0

Station No. 67 was located on the north end of a concrete culvert under Interstate Route 80 on an unnamed tributary to South Branch Scrubgrass Creek about 0.6 miles west of the intersection with Pa. Route 308 (Clintonville Interchange). This station has a drainage area of 0.11 square miles collecting flows from Mine Site No. 46. The mine had little effect on the water quality as the stream maintained net alkaline conditions for the 23 times it was sampled between May 3, 1971, and May 4, 1972. Following are the average, maximum and minimum water quality test values.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	30.0	90.0	9.0
pH	6.8	7.0	6.6
Total Acidity (ppm)	3.2	10.0	0.0
Alkalinity (ppm)	39.0	60.0	10.0
Iron (ppm)	0.16	0.75	0.05
Sulfates (ppm)	69.0	110.0	14.0
Acid (ppd)	1.3	9.6	0.0
Alkalinity (ppd)	14.5	54.0	2.2
Iron (ppd)	0.12	0.7	0.0
Sulfates (ppd)	31.3	130.0	1.7

Station No. 68 was established at the north end of a concrete dry pipe under Interstate Route 80 on an unnamed tributary to South Branch Scrubgrass Creek 1.4 miles west of the intersection with Pa. Route 308 (Clintonville Interchange). There are 0.02 square miles above this station which collects flows from Mine Site No. 44, however, analysis proved this stream to be net alkaline with no seasonal variations. Between May 3, 1971, and May 4, 1972, Station No. 68 was sampled 23 times and following are indicated average, maximum and minimum water quality test results.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	12.4	18.0	8.0
pH	6.9	7.2	6.6
Total Acidity (ppm)	0.8	3.0	0.0
Alkalinity (ppm)	190.0	280.0	30.0
Iron (ppm)	0.11	0.4	0.05
Sulfates (ppm)	602.0	1100.0	200.0
Acid (ppd)	0.1	0.4	0.0
Alkalinity (ppd)	29.0	56.0	3.6
Iron (ppd)	0.01	0.07	0.0
Sulfates (ppd)	89.0	200.0	29.0

Station No. 70 had its location on an unnamed tributary to Big Scrubgrass Creek at the south end of a culvert under Interstate Route 80 about 2.7 miles west of the intersection with Pa. Route 308 (Clintonville Interchange). This station has 0.20 square miles of drainage area above it. Part of the flow through this station is contributed by Mine Site No. 43, however, the stream ran alkaline for the duration of the sampling period. From May 3, 1971, until May 4, 1972, this station was sampled 16 times revealing the following average, maximum and minimum water quality test determinations.

	<u>Average</u>	<u>Maximum</u>	<u>Minimum</u>
Flow (gpm)	84.0	160.0	15.0
pH	6.8	7.0	6.6
Total Acidity (ppm)	2.9	5.0	0.0
Alkalinity (ppm)	42.0	70.0	10.0
Iron (ppm)	0.05	0.1	0.05
Sulfates (ppm)	41.0	56.0	28.0
Acid (ppd)	2.9	6.6	0.0
Alkalinity (ppd)	46.0	115.0	7.2
Iron (ppd)	0.05	0.1	0.0
Sulfates (ppd)	39.0	68.0	7.2

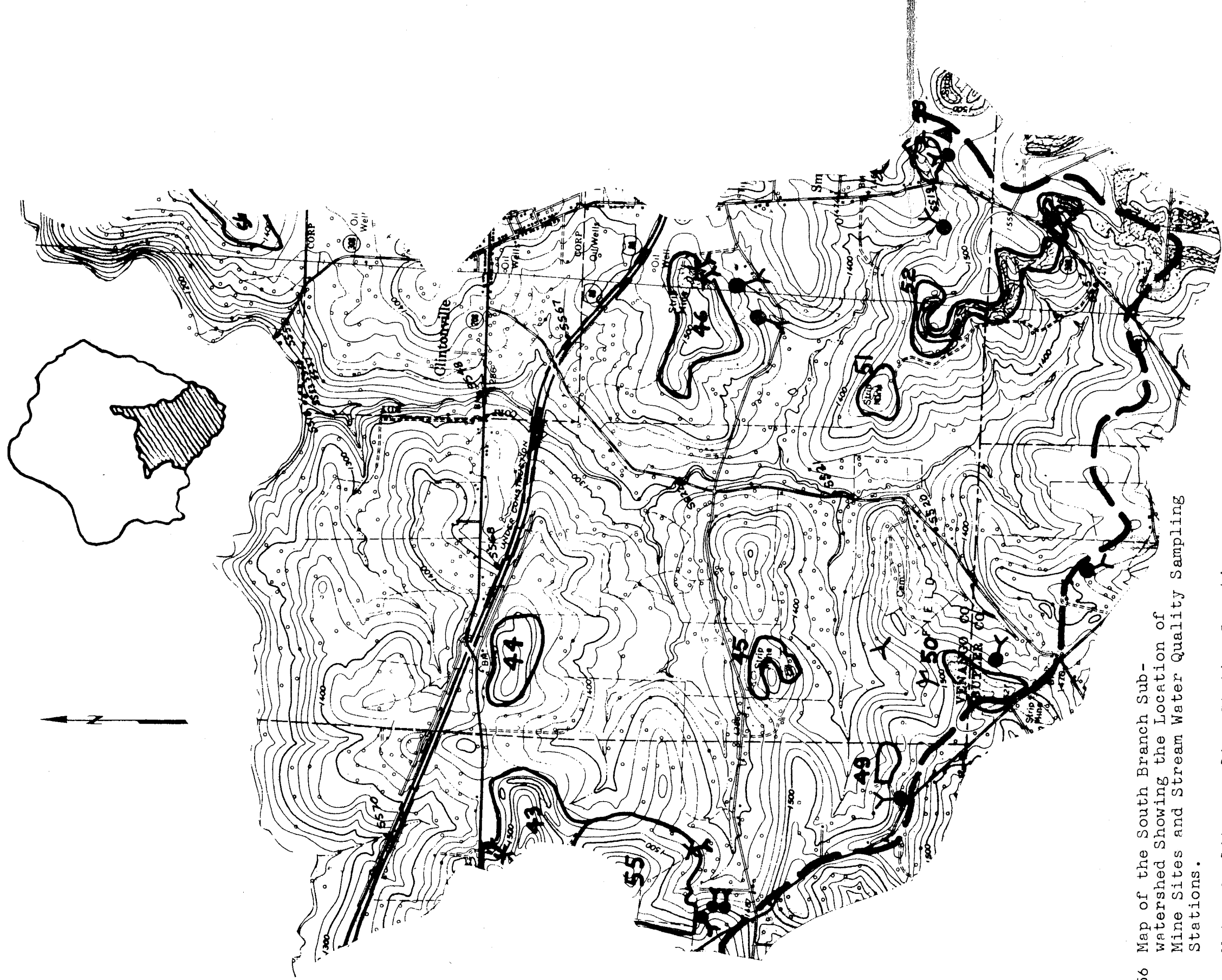


FIGURE 56 Map of the South Branch Sub-watershed Showing the Location of Mine Sites and Stream Water Quality Sampling Stations.

• 557C Water Quality Sampling Station Location.

50 Location of a strip Mine

⌋ Deep Mine Opening - Acid Problem

⌋ Deep Mine Opening - No Acid Problem

⌋ Deep Mine Opening - Workings stripped out.

▲ Air Shaft

Specific Reclamation Plans for the South Branch Subwatershed:

Seven mines lie within this area and three others lie on the watershed divide, partially within this area. These cover an area of approximately 240 acres or 4.8 percent of this drainage area. Several old deep mines are reported in this subwatershed and about half of the strip mining is currently active.

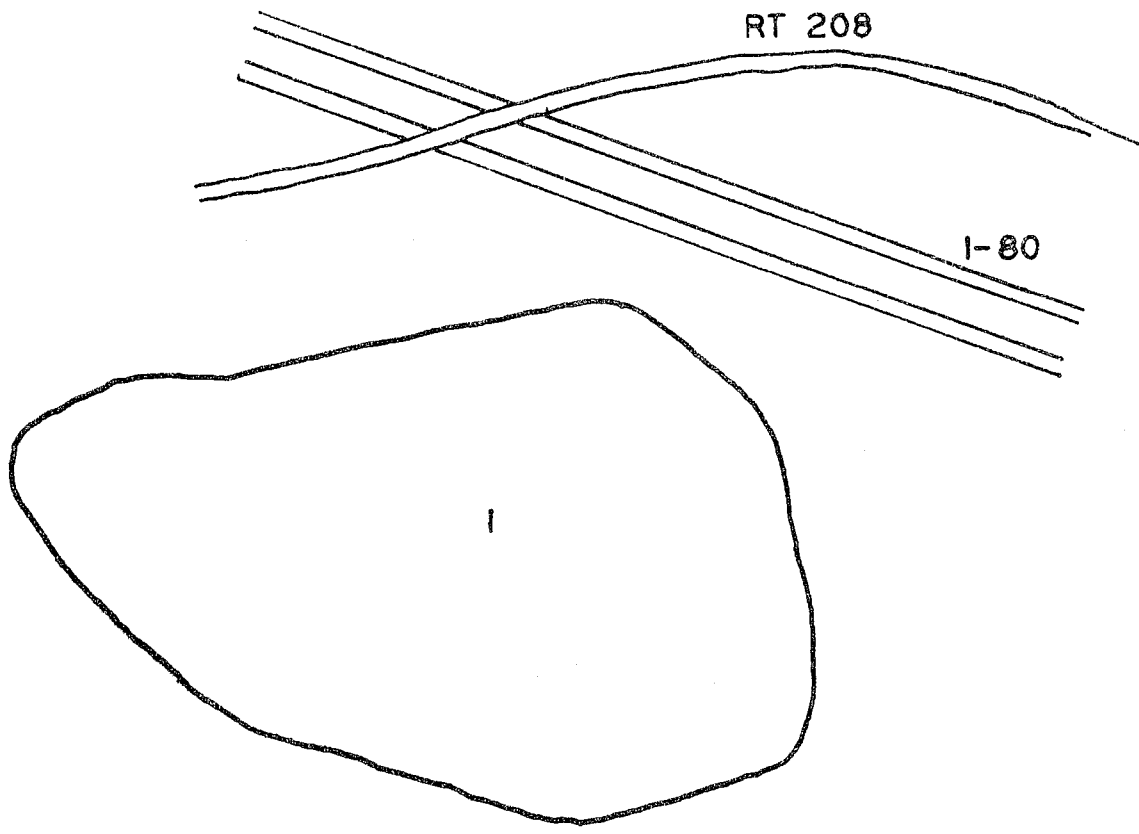
Most of the strip mine sites in this subwatershed are small and are located in remote woodland areas. Several others are in areas that are being reopened for active strip mining. The area which needs additional reclamation is a relatively small portion of the total. A heavy concentration of oil wells exist in this area and oil pollution in small local areas is a problem although there is no evidence on the main tributaries.

The recommended reclamation measures for this subwatershed along with the effects anticipated from adequate reclamation of active mines which involved older mine areas, and reclamation measures on portions of mines which are included in adjacent subwatersheds should effect about 90 percent of the acid sources in this subwatershed. These measures should be 75 percent effective, producing an overall reduction of 68 percent or about 200 pounds of acid per day. The measures included specifically in this section should result in a reduction of about 56 pounds of acid per day with the remainder coming mostly from adequate reclamation of mined over areas by the present active miners. Figure 30 is a key to the symbols used on the site maps.

SITE 44

Mine Site No. 44 covers 28.8 acres on the south side of Interstate 80 at the point where it passes under Route 208. The mine has ungraded slopes covered with trees 15 to 20 years old. The spoil pH is 4.0. Runoff from this mine passes through Sampling Station No. 68 which had net alkaline water most of the time. The existing cover is adequate for acid mine drainage control and no additional reclamation is recommended.

SITE 44



SITE 45

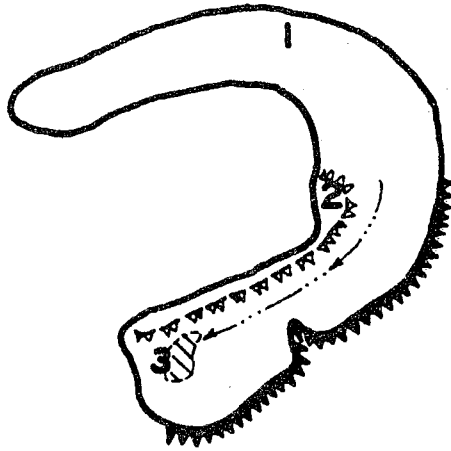
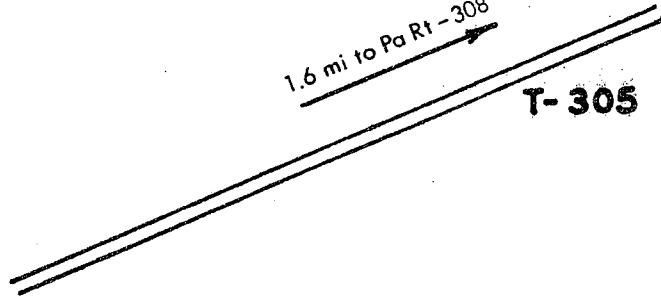
This mine site covers 7.1 acres just south of Township Road T-305 on the west side of the South Branch. Trees planted on the area are providing adequate protection from soil erosion and since there is no apparent acid problem, no additional reclamation is recommended.



SITE 45

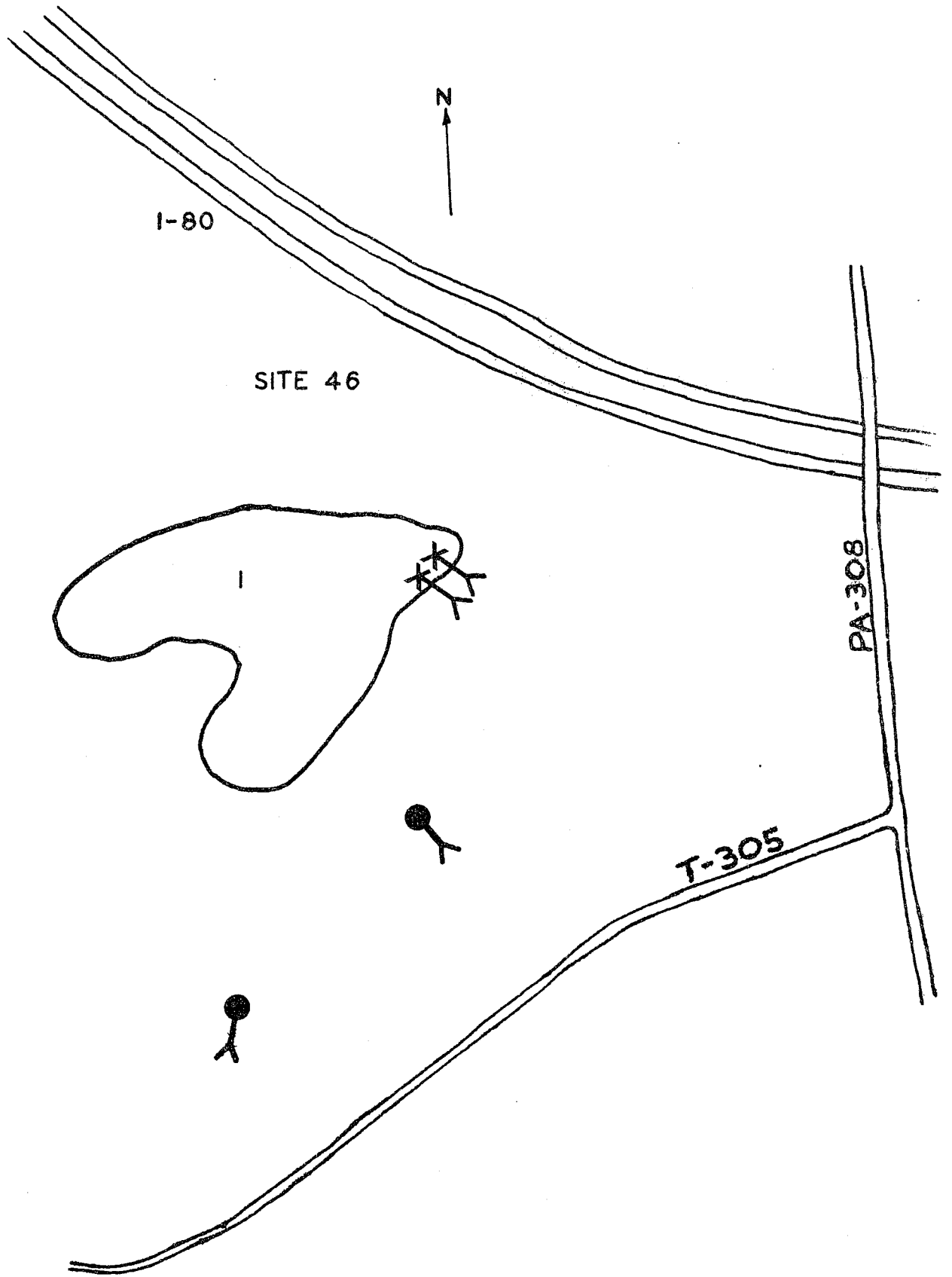
1.6 mi to Pa Rt - 308

T-305



SITE 46

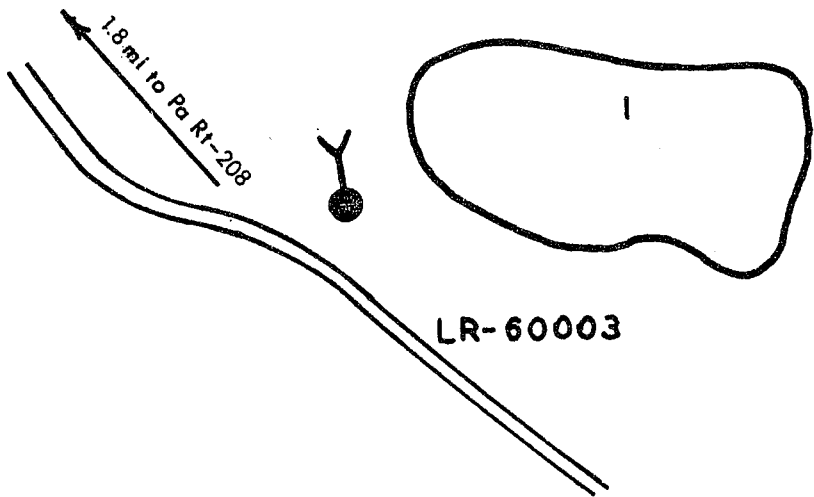
This strip mine is located southwest of the intersection of Route 308 and Interstate 80. The B & D Coal Company has recently reopened this mine under Permit No. 558-3 and mine drainage Permit No. 3771BSM5 and the area is now their responsibility. Four deep mine openings were reported in the area. Two have been completely eliminated by strip mining and two others have no evidence of acid discharges. No additional reclamation is recommended for the control of acid mine drainage.



SITE 49

This abandoned strip mine is located near the watershed divide just north of the Butler County Line. Drainage from the area passes through Sampling Station No. 21 which has good quality water. The entire 6.7 acres has been planted to trees which are now about 15 years old and are providing adequate cover. One deep mine was reported in the area but no acid seepage was evident. No additional reclamation is recommended.

SITE 49



LR-60003

SITE 50

Mine Site No. 50 is a 17 acre strip mine with an adjacent deep mine area of unknown extent located just northwest of the strip mine. This area is located on the watershed divide and on the Venango-Butler County Line. The stripped area has been partially regraded and planted to trees that are about 15 years old. The spoil pH is 4.2. Two drift mine openings are indicated in the area on the Slippery Rock Creek side of the divide. These have been recommended for sealing in the Slippery Rock Creek Mine Drainage Report, Project SL-110. A small amount of acid seepage is coming from one depression on the Big Scrubgrass Creek side of the hill which may be related to the deep mining on the other side of the hill. It is recommended that this seepage point be sealed at the same time any work is done on the Slippery Rock side.

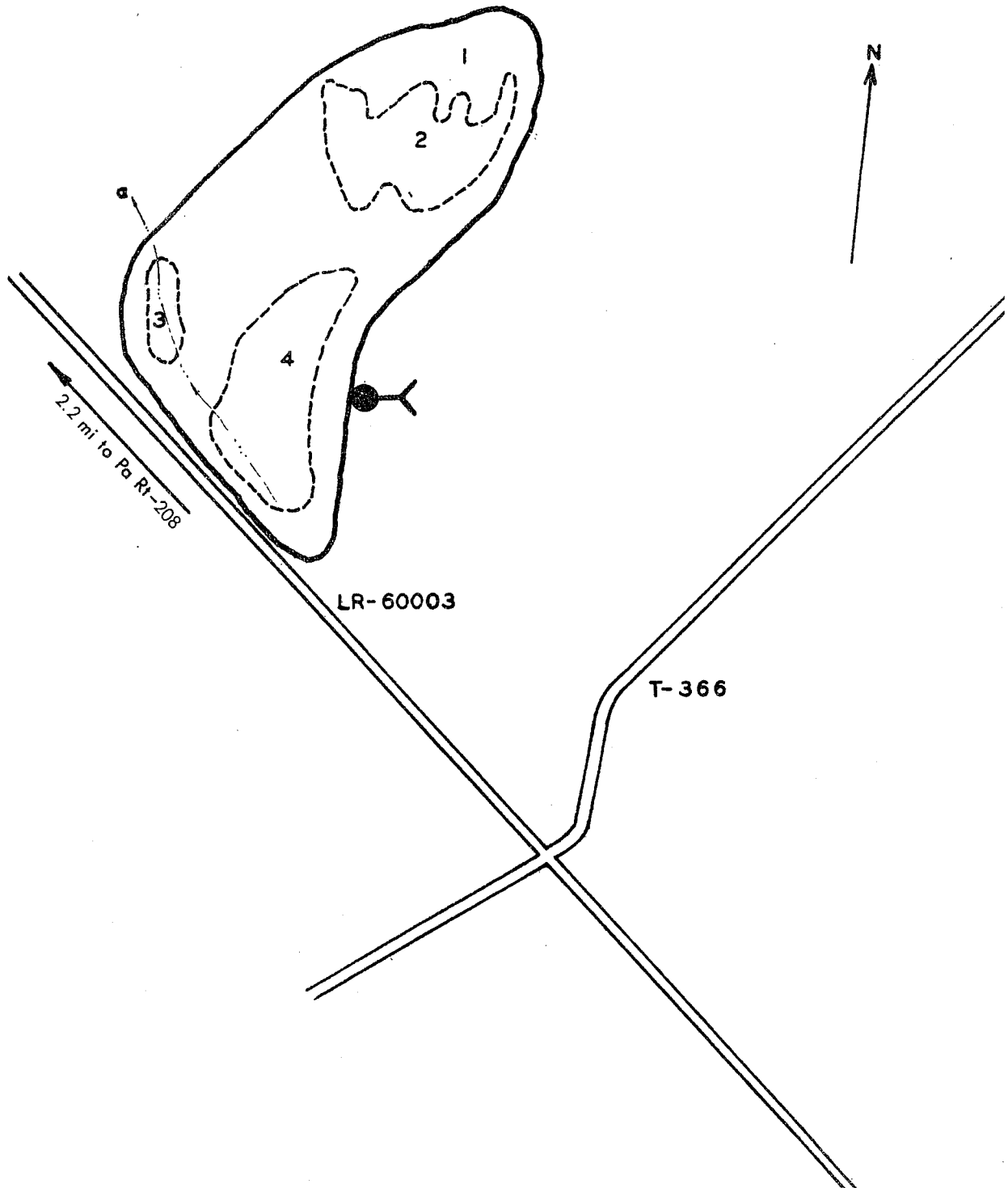
A second acid seep is located more directly north of the stripped area. The surface evidence does not indicate this to be an old drift mine, but the possibility is not eliminated. This seep has a more substantial flow and should be investigated by drilling and pressure testing. From this data a decision would be made as to the feasibility of installing a hydraulic seal.

Areas #2, #3 and #4 cover 5.6 acres which have very little cover for the prevention of acid formation. The area has been regraded and should be planted using revegetation Method No. 1.

Estimated Cost of Reclamation:

Areas #3, #3 and #4	
5.6 acres of revegetation Method No. 1	\$ 1,700
Sealing two deep mine openings	<u>40,000</u>
TOTAL	\$41,700

SITE 50



2.2 mi to Pa RI-208

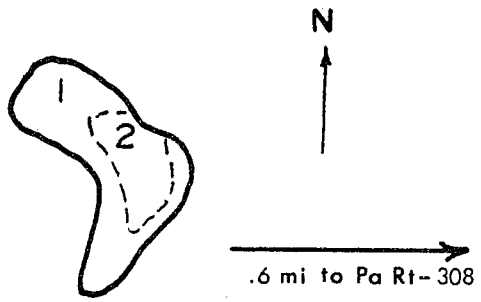
LR-60003

T-366

SITE 51

This small strip mine covers only 1.8 acres deep in the woodland south of Clintonville near the Butler County Line. Because of its small size and remote location as well as the lack of acid pollution in the area, no reclamation is recommended.

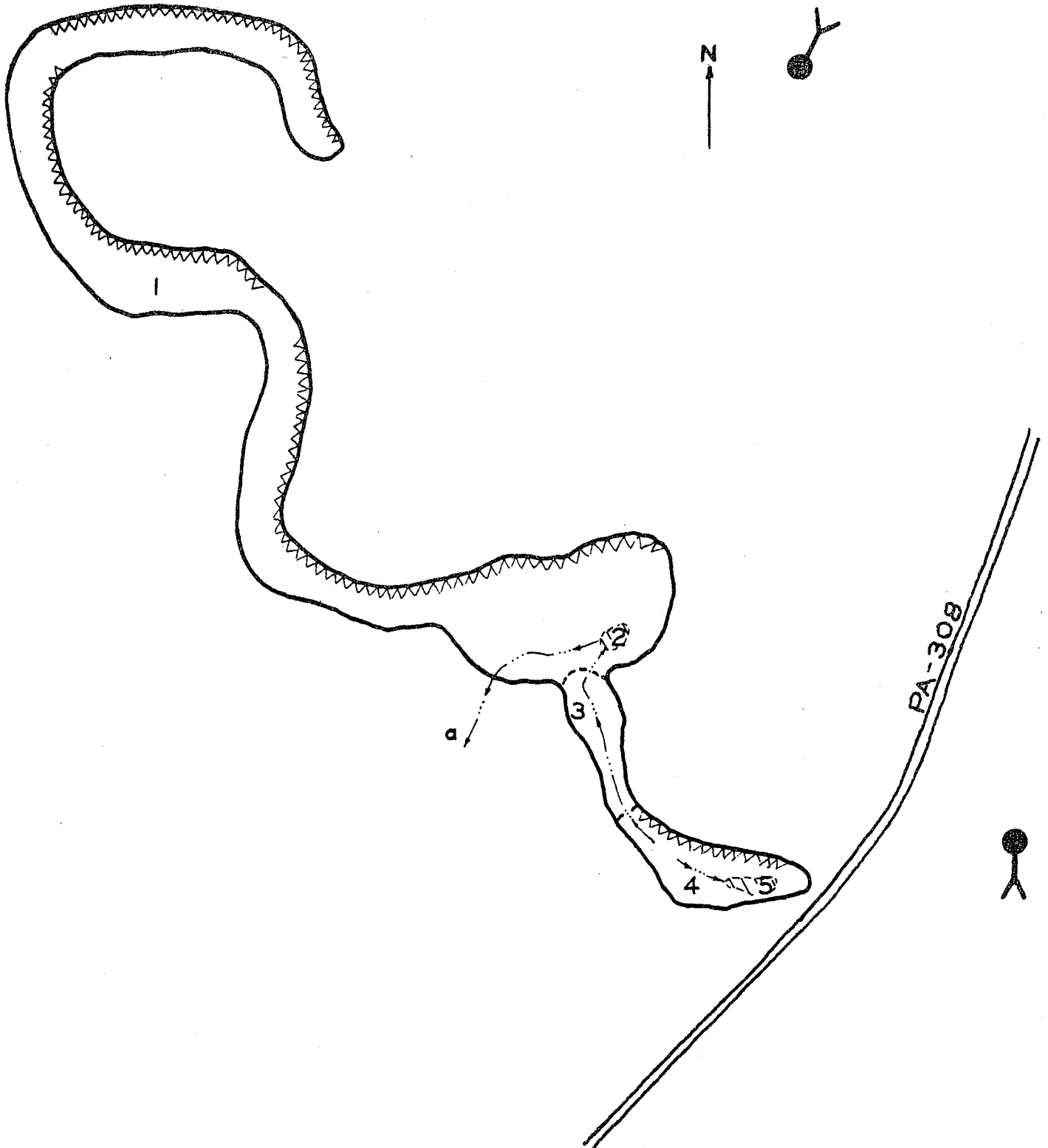
SITE 51



SITE 52

Strip Mine Site No. 52 covers 17.6 acres at the extreme southeastern edge of the watershed along Route 308. The area is a long narrow cut around the contour of the hill with very steep highwalls and spoil that was not regraded in any way. The surrounding area is all woodland. The southeast end of this site has acid spoil only partially covered by pine trees and acid seepage which flows out through point "a" and enters the stream below Sampling Station No. 57. However, this station was predominantly alkaline and apparently neutralizes the acid from this seep since the next downstream sampling point is also predominantly alkaline, therefore no reclamation is recommended for this site.

SITE 52



SITE 53

Mine Site No. 53 covers 17.5 acres of strip mine on the ridge between the South Branch Subwatershed and the East Tributaries Subwatershed southwest of Smith Corners. The stripped area is mostly rough mine spoil covered with trees about 20 years old. The southern portion also contains evidence of old deep mine openings. Two openings have been investigated in this area and extensive deep mining is reported on the other side of the hill in the Little Scrubgrass Creek Watershed. A deep mine airshaft was also located in the vicinity. Drainage from the area passes through Sampling Station No. 23 to the north into the East Tributaries Subwatershed and Sampling Station No. 23 has good quality water but Sampling Station No. 19 has an average discharge of 24 pounds per day. The drainage through this station comes from two acid pools which could be seepage from one of the old deep mines.

Area #1 covers 10.2 acres of rough mine spoil which drains to the north. This area has an adequate cover of trees to prevent acid drainage and no additional reclamation is recommended.

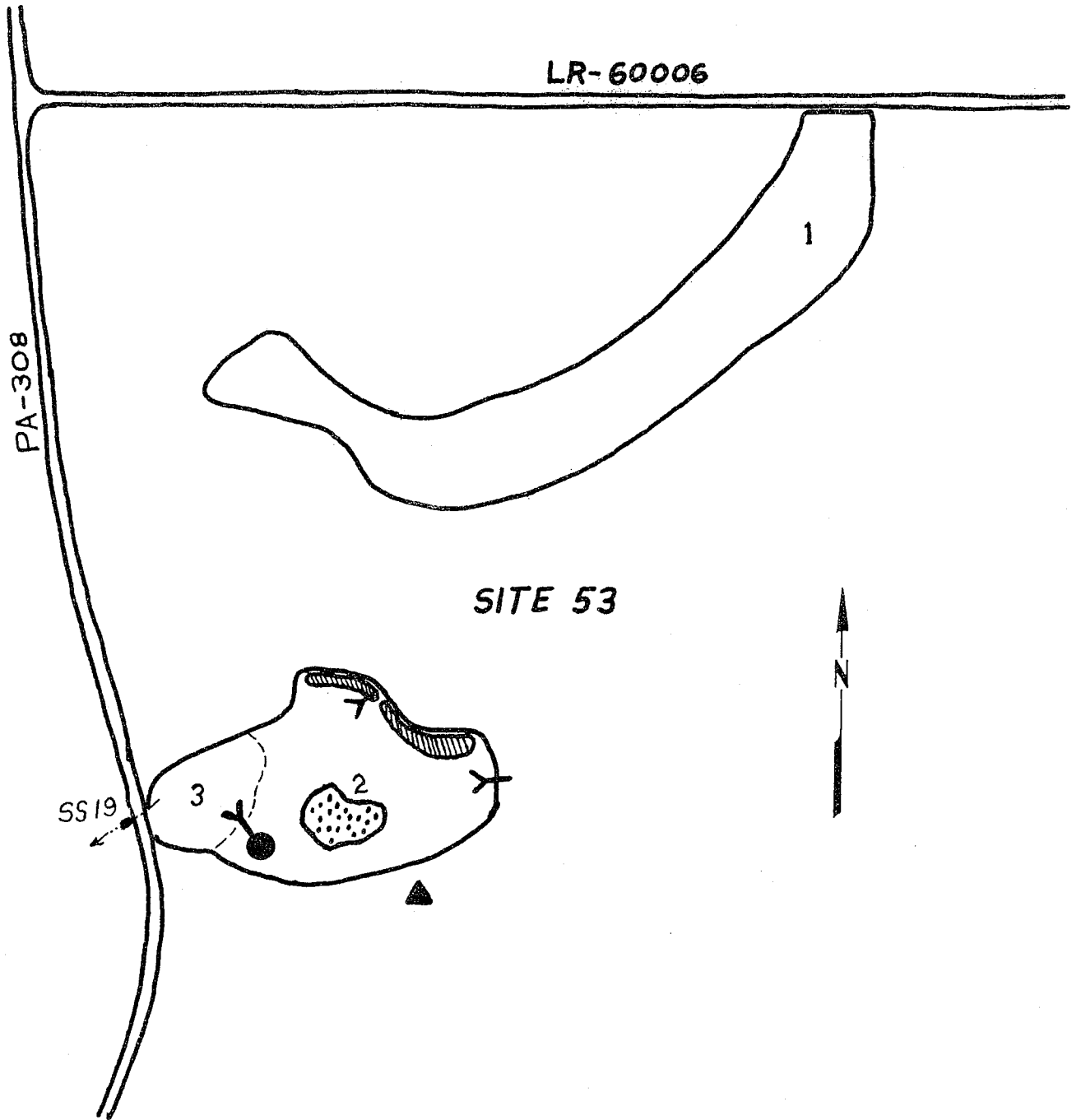
Area #2 covers 5.9 acres of rough strip mine spoil, two acid pools and a reported abandoned deep mine opening in the northern portion. The southern portion of this area contains large, toxic gob piles from old deep mine workings and just to the south of this area is an open airshaft. Recommendations include the draining of the two pools in the northern section. The water in these pools could possibly originate from seepage from the old deep mine. At the time the pools are drained, exploratory excavations should be done to determine the extent of the old opening and whether or not it was the contributor of water to the pools. If it is evident that the opening is the source, a surface seal should be applied. The gob material from the southern portion

should then be buried in the cuts where the pools were. The area should then be backfilled with 5 feet of compacted fill containing at least 20% clay, graded and planted using revegetation Method No. 1. The open air shaft should be sealed using surface sealing.

Area #3 covers 1.4 acres including some old ungraded strip mine spoil, old gob material and an abandoned deep mine opening. The gob material should be buried in Area #2 and a hydraulic seal should be applied to the deep mine. There is no seepage currently coming from the mine but a Mine Drainage Abatement Project for Little Scrubgrass Creek has recommended sealing mines on the other side of the hill. To prevent seepage back-up of acid water through the hill, the deep mine in Area #3 should be sealed.

Estimated Cost of Reclamation:

Area #2	
Draining of pools	\$ 200
Two surface seals	2,000
Burial of gob (including Area #3)	20,000
4 acres of contour backfilling	2,400
4 acres of revegetation Method No. 1	1,200
Area #3	
Sealing one deep mine opening	<u>20,000</u>
TOTAL	\$45,800



SITE 60

Mine Site No. 60 covers 22.3 acres of partially regraded strip mine at the extreme southern edge of the watershed in Butler County. The southern half of this site lies in the Slippery Rock Creek Watershed. At the eastern edge of this portion are the remains of an old slope type deep mine and a small tipple. This mine opening does not appear to have any drainage problem. The strip mine has been planted to pine trees which are all less than four feet high and many have apparently not grown much since planting. The spoil is exposed and runoff from the area shows some acid content which passes through Sampling Station No. 20.

Area #1 covers 5.0 acres of rough spoil material which has good cover and needs no additional reclamation.

Area #2 covers 17.3 acres of nearly bare spoil with small pine trees. This area should be reclaimed by applying lime, fertilizer, and mulch along with seeding over the trees using revegetation Method No. 2.

Estimated Cost of Reclamation:

Area #2	
17.3 acres of revegetation Method No. 2	\$10,300

SITE 60

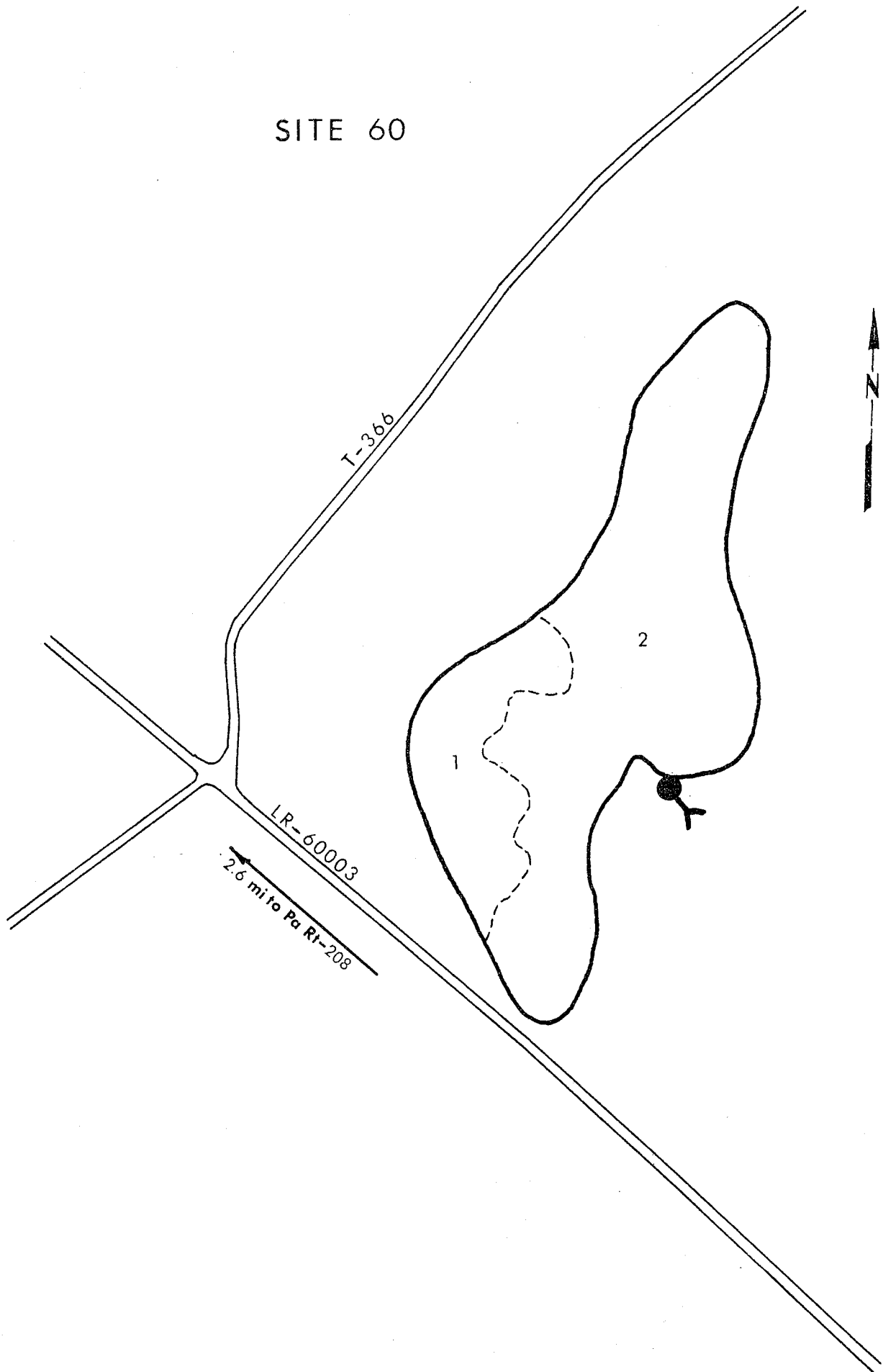


TABLE 15. SUMMARY OF ABATEMENT PLANS AND COSTS FOR THE SOUTH BRANCH SUBWATERSHED

Mine Site No.	ABATEMENT METHOD												TOTAL COST				
	CLEARING Acres	CLEARING Cost	TERRACE BACKFILL Acres	TERRACE BACKFILL Cost	CONTOUR BACKFILL Acres	CONTOUR BACKFILL Cost	SELECTED GRADING Acres	SELECTED GRADING Cost	SURFACE SEALING Cost	DEEP MINE SEALING Cost	SOIL REVEGETATION Acres	SOIL REVEGETATION Cost		DIVERSION Feet	DIVERSION Cost	LINED CHANNELS Feet	LINED CHANNELS Cost
44																	*
45																	*
46																	*
49																	*
50									40000		5.6	1700					\$41,700
51																	*
52																	*
53					4.0	2400	0.3	200	** 22000	20000	4.0	1200					\$45,800
60											17.3	10300					\$10,300

TO TOTAL \$97,800

*Where no costs are shown, no work has been recommended

**Includes \$20000 for burial of gob material