Upper Portion - Main Stream - Blacklegs CreekWatershed

A. General

The headwaters of the Upper Portion of Blacklegs Creek originates near the Village of Parkwood and flows-in a southwesterly direction for about 7.5 miles where it receives the water from the Whisky Run Watershed. The total stream length including all tributaries is 21.6 miles. The total area of the watershed is 8.6 square miles.

B. Stream Condition

An analysis of mine drainage contamination within the watershed provides the following breakdown on stream condition:

UPPER PORTION	MAIN STREAM	BLACKLEGS CREEK WATERSHED
Classification	Stream Length (Miles)	Stream Length (Total
Non-Polluted	19.6	90
Severely Polluted	0	0
Moderately Polluted	2	9

Approximately nine (9) per cent of the watershed is degraded by mine drainage pollution. Six (6) per cent of this degradation is alkaline mine water that contains iron in solution in concentration beyond that considered acceptable for discharge to clean streams and thus requires an abatement measure.

C.Sampling Station Data

Four (4) sampling stations were installed and monitored. The results of the water data collected are listed as shorn in Tables 20 , 21 , 22 , 23.

TABLE 20

SAMPLE STATION W-10										
	FLOW		ACIDITY		ALKALINITY		TOTAL IRON		SULPHATES	
DATE	GPM	pH	mg/L	lbs/D	mg/L	lbs/D	mg/L	lbs/D	mg/L	lbs/D
Oct. 6, 1971	22	3.5	120	32			.7	.2	560	148
Oct. 13, 1971	4	3.5	72	3			1.5	.07	740	36
Nov. 8, 1971	12	3.9	70	10			.3	.04	350	50
Dec. 9, 1971	284	4.1	32	109			.7	2.3	225	767
Jan. 10, 1972	193	3.9	150	347			2.5	5.8	235	544
*Feb. 8, 1972	N.M.	3.9	50				.1		320	
*Mar. 6, 1972	N.M.	4.0	92				.44		225	
Apr. 14, 1972	193	4.5	51	118			.36	.8	183	424
June 7, 1972	9	4.9	69	7			1.00	.1	350	38
Average	102	4.0	81	99			1.0	1.2	378	463

*Not included in average

TABLE 21

SAMPLE STATION 11										
	FLOW		ACIDITY		ALKALINITY		TOTAL IRON		SULPHATES	
DATE	GPM	pH	mg/L	lbs/D	mg/L	lbs/D	mg/L	lbs/D	mg/L	lbs/D
Oct. 12, 1971	±2200	7.0			74	1954	.1		38	1003
Nov. 9, 1971	±2200	7.3			64	1690	.1		75	1980
Dec. 9, 1971	±2200	7.3			20	528	1.2		44	1162
Jan. 10, 1972	±2200	7.2			26	686	.2		44	1162
Feb. 15, 1972	±2200	7.1			46	1214	.1		70	1848
Mar. 6, 1972	±2200	6.5			11	290	.2		36	950
Apr. 14, 1972	±2200	5.9			13	343	.2		46	1214
June 7, 1972	±2200	7.3			40	1056	.16		51	1346
Average	±2200	7.0			37	977	.3	8	51	1346

TABLE 22

SAMPLE STATION W-21										
DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
Aug. 8, 1971	600	7.1			186	1339	3.5	25.2	560	4032
Oct. 12, 1971	600	6.9			176	1267	5.5	39.6	640	4608
Nov. 9, 1971	338	6.9			196	795	3.0	12.2	600	2434
Dec. 9, 1971	800	7.3			186	1786	7.8	74.9	480	4608
Jan. 10, 1972	846	7.2			270	2741	10.0	101.5	625	6345
Feb. 15, 1972	800	6.9			190	1824	2.4	23.0	1000	9600
Apr. 14, 1972	600	6.7			191	1375	.2	1.4	600	4320
June 7, 1972	500	7.3			214	1284	3.8	22.8	450	2700
Average	636	7.0			201	1534	4.5	34.3	619	4724

TABLE 23

SAMPLE STATION A-10										
DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
Oct. 12, 1971	±2200	7.6			170	4488	3.3	87	600	15,840
Nov. 9, 1971	±2200	7.4			166	4382	.1	3	310	8,184
Dec. 9, 1971	±2200	7.3			46	1214	1.5	40	105	2,772
Jan. 10, 1972	±2200	7.0			74	1954	1.9	50	125	3,300
Feb. 15, 1972	±2200	7.3			96	2534	1.6	42	310	8,184
Mar. 6, 1972	±2200	7.0			60	1584	.23	6	166	4,382
Apr.14, 1972	±2200	7.3			58	1531	.47	12	166	4,382
June 7, 1972	±2200	7.7			140	3696	1.34	35	315	8,316
Average	±2200	7.3			101	2666	1.31	35	262	6,917

Plate 12 shows the location of the sampling stations on the tributaries and main stream of the Upper Portion of Blacklegs Creek Watershed.

An average flow of approximately 3,168,000 gallons of water per day was discharged by this watershed during the study period.

D. Coal Mining Activity

There is one deep mine presently in operation in the watershed. It is located near the Village of West Lebanon and at the headwaters of an unnamed tributary to the Blacklegs Creek. Acid mine drainage was noted draining into the tributary from the vicinity of the active McCracken No. 1 Mine - Water Permit No. 366M030. The present operator claims the mine drainage is from an abandoned mine next to his mine.

A significant mine discharge in this watershed is located on another unnamed tributary. An abandoned cement capped mine shaft is discharging mine water from pipes in its side walls to a receiving stream at the rate of 636 GPM measured at Weir 21. The average alkalinity concentration was 201 mg/L with a resultant alkaline load of 1534 lbs./day. Although alkaline in nature (201 mg/L), the effluent is grossly discolored and approximately a mile of the stream bed is similarly discolored.

E. Description of Pollution Sources

Weir #10 was installed at the mouth of an unnamed tributary of Blacklegs Creek a mile southeast of the Village of West Lebanon. An account of acid mine drainage encountered in field investigations is as shown on Plate 13, Page 51.

14. Northwest and upstream from Weir #10 location 1800' on the west side of the tributary - a deep mine opening in a strip cut with a pool of water discharging acid mine drainage.

15. Northwest and upstream from Weir #10 location 3000' on the west side of the tributary - acid mine discharge from strip spoil and presumably intercepted deep mine workings.

16. Northwest and upstream from Weir #10 location 3800' on the west side adjacent to tributary - acid mine water discharge reportedly from abandoned Mill Mine but close to active McCracken Mine.

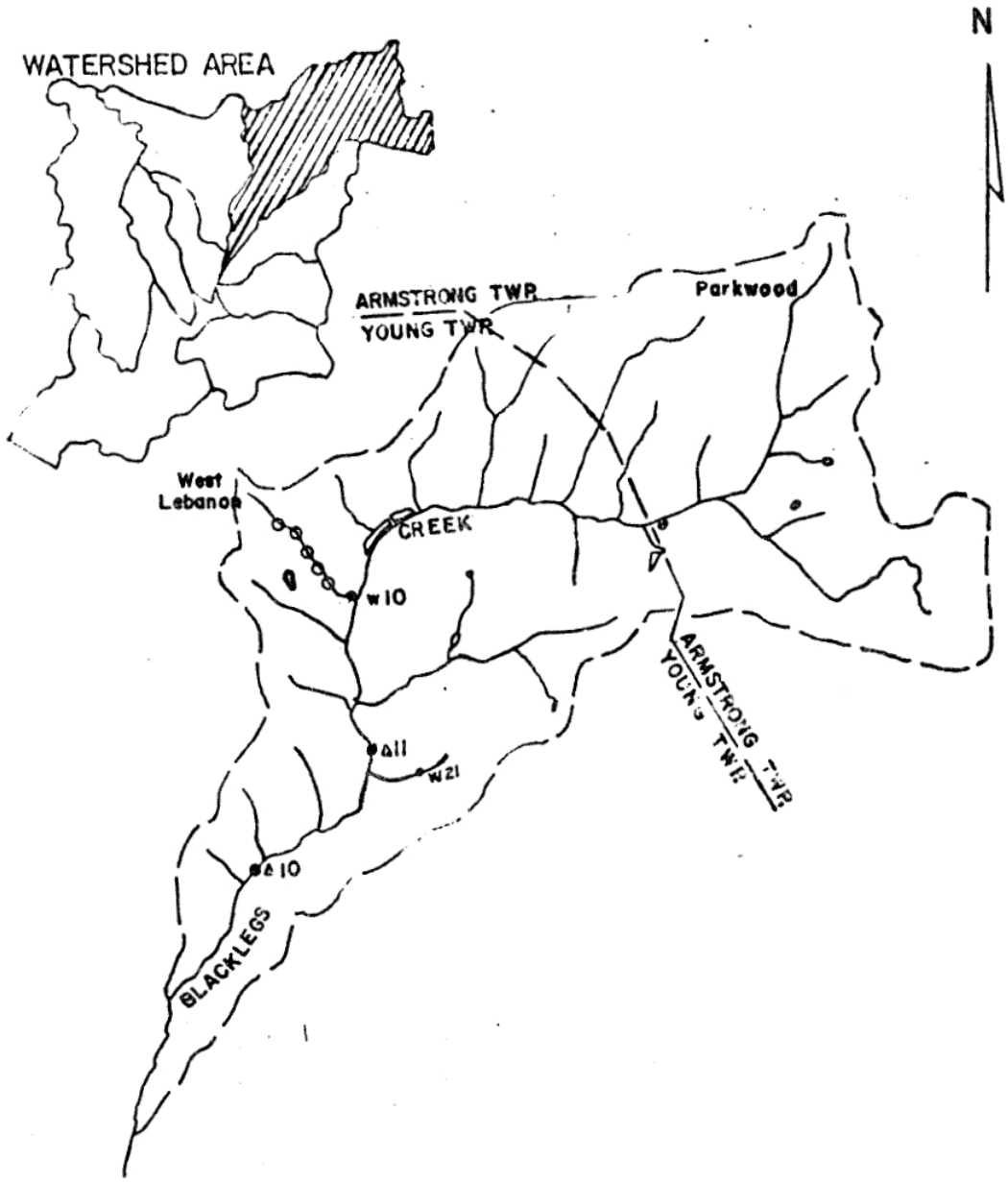
These pollution sources were at times minor with little or no definite discharge. As a result, the combined pollution load of the above sources was measured at Weir #10, tabulated and monitored at one source. (See Table 20 , Page 46 .)

Weir #21 was installed on an unnamed tributary approximately 1100' east and upstream from its confluence with Blacklegs Creek.

17. East and upstream from Weir #21 location 300' on the south bank of the tributary - an abandoned deep mine shaft discharging mine water from pipes in its side walls to a receiving stream at the average rate of 636 GPM. The alkaline load was 1534 lbs/day. This is the only indication of mining activity on the east side of the main stream in the Blacklegs Creek. As a result, this 448' deep mine shaft from the Lower Freeport coal seam drains abandoned mine workings located outside the watershed boundary. The mine known as the McIntyre No. 1 Mine had its slope openings two miles east at the Village of McIntyre.

Plate 13 shows the mined areas and location of mine drainage discharges on the Upper Portion - Main Stream Watershed.

MAIN STREAM
UPPER PORTION: BLACKLEGS CREEK WATERSHED



LEGEND

—— —— UPPER PORTION DRAINING BASIN

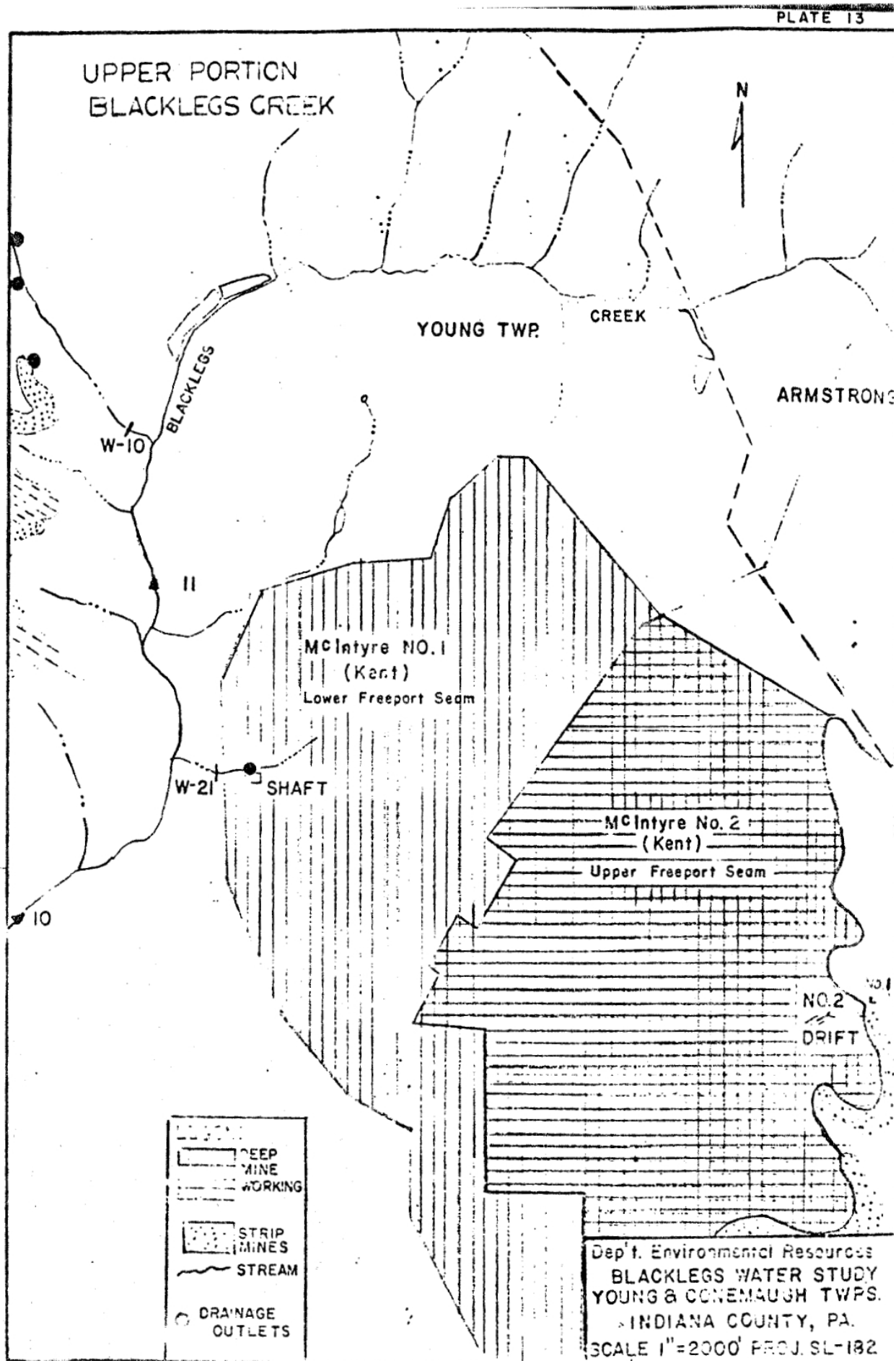
• SAMPLING STATION

O MODERATELY ACID

X SEVERELY ACID

SCALE 1"= 5000' FEBRUARY 1973

BLACKLEGS CREEK
MINE DRAINAGE POLLUTION
ABATEMENT PROJECT SL-182
INDIANA COUNTY, PENNA.


UPPER PORTION
BLACKLEGS CREEK
N
YOUNG TWP.
CREEK
BLACKLEGS
ARMSTRONG
W-10
11
McIntyre NO. 1
(Kent)
Lower Freeport Seam
W-21
SHAFT
McIntyre No. 2
(Kent)
Upper Freeport Seam
10
NO. 2
DRIFT
DEEP MINE WORKING
STRIP MINES
STREAM
DRAINAGE OUTLETS
Dep't. Environmental Resources
BLACKLEGS WATER STUDY
YOUNG & CONEMAUGH TWPS.
INDIANA COUNTY, PA.
SCALE 1"=2000' PROJ. SL-182

Big Run Watershed

A. General

Big Run originates a half mile east of the Village of Shady Plain and flows in a southeasterly direction for 7 miles where it discharges into Blacklegs Creek.

Total stream length including all tributaries is 21 miles. The total area of 'the watershed is 8.7 square miles.

B. Stream Condition

An analysis of mine drainage contamination within the watershed provides the following breakdown on stream condition:

Table 24

Big Run Watershed

Stream Classification	Stream Length Miles	Percent Total Stream Length
Non-Polluted	18.3	85
Severely Polluted	l.2	6
Moderately Polluted	2.0	9

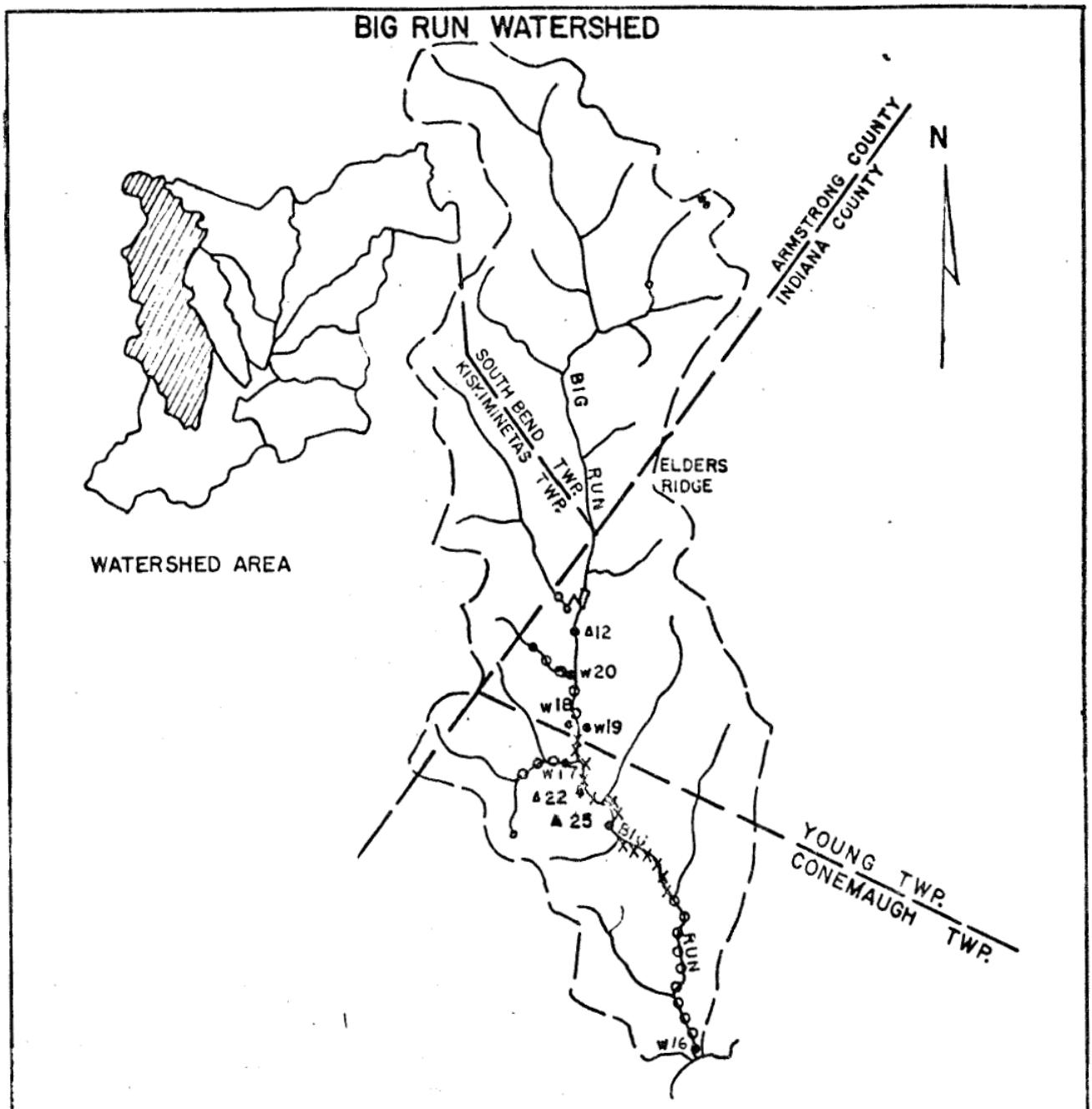
Approximately 15% of Big Run is seriously degraded by mine drainage.

Plate 14 shows the location of the sampling stations and extent of mine drainage within the various portions of the watershed.

C. Sampling Station Data

Eight (8) sampling stations were installed and monitored. The results of the water data collected are listed as in Tables 25 through 32.

Plate 14



LEGEND

— — BIG RUN DRAINING BASIN

• SAMPLING STATION

O MODERATELY ACID

X SEVERELY ACID

SCALE 1" = 5000' FEBRUARY 1973

BLACKLEGS CREEK
MINE DRAINAGE POLLUTION
ABATEMENT PROJECT SL-182
INDIANA COUNTY, PENNA.

TABLE 25

SAMPLE STATION 12										
DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
Oct. 12, 1971	N.M.	6.2			40		.4		190	
Nov. 9, 1971	N.M.	6.8			38		.4		170	
Dec. 9, 1971	N.M.	6.7			30		1.1		95	
Jan. 10, 1972	N.M.	2.8	90				5.3		472	
Feb. 9, 1972	N.M.	6.0			16		.1		100	
March 6, 1972	N.M.	7.4	.5		15		1.15		74	
April 14, 1972	N.M.	6.7	12		9		.34		60	
June 7, 1972	N.M.	7.1	7		27		.58		184	
Average	300	6.21	28.50	103	25.00	90.00	1.17	4.20	168	605

TABLE 26

SAMPLE STATION W-20										
DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
Nov. 9, 1971	6.05	2.8	36	2.61			25	1.81	960	70
Dec. 9, 1971	21.7	2.8	240	62.50			19	4.95	600	156
Jan. 10, 1972	177.8	6.5			22	47	7.3	15.58	24	51
April 14, 1972	1337	3.5	142	2278			6.76	108.43	255	4091
*June 7, 1972	N.M.	3.2	107				12.3		370	
Average	385.64	3.90	139	781	22	47		15	460	1092

*Not included in average

TABLE 27

SAMPLE STATION W-19										
DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
Oct. 12, 1971	205	2.9	110	271			6.5	16	700	1722
Nov. 9, 1971	227	3.2	146	398			3.1	8.4	1200	3269
Dec. 9, 1971	1469	3.2	100	1763			4.0	70.5	475	8373
Jan. 10, 1972	227	4.3	22	60			9.5	25.9	100	272
*Feb. 9, 1972	N.M.	4.2	14				.7		170	
March 6, 1972	N.M.	3.3	202				4.4		600	
April 14, 1972	1609	3.6	126	2433			1.1	21.2	320	6179
*June 7, 1972	N.M.	3.4	176				6.5		310	
Average	747	3.4	101	905			4.8	43.0	559	5011

*Not included in average

TABLE 28

SAMPLE STATION W-18

DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
Oct. 12, 1971	50	2.5	450	270			25	15	1200	720
Nov. 9, 1971	50	2.8	456	274			27.5	16.5	900	540
Dec. 9, 1971	70	2.7	340	286			18	15.1	700	588
Jan. 10, 1972	193	2.2	260	602			11	25.5	600	1390
*Feb. 9, 1972	N.M.	1.8	240				10		525	
March 6, 1972	N.M.	3	278				28.3		690	
April 14, 1972	1094	3.1	452	5934			23.3	306	740	9715
*June 7, 1972	N.M.	2.9	452				30.8		460	
Average	291	2.7	392	1369			21.0	73	828	2891

*Not included in average

TABLE 29

SAMPLE STATION W-17

DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
Oct. 12, 1971	6	3.3	84	6			1.0	.1	740	53
Nov. 9, 1971	17	3.6	146	30			.3	.1	540	110
Dec. 9, 1971	284	6.9	18	61			.7	2.4	75	256
Jan. 10, 1972	214	6.8			6	15	.4	1.0	60	154
*Feb. 9, 1972	N.M.	1.9	140				12		375	
March 6, 1972	N.M.	3.3	160				2.3		540	
April 14, 1972	533	3.7	124	793			.9	5.8	275	1759
*June 7, 1972	N.M.	3.4	241				8.5		360	
Average	271	4.9	74	187	1	3	.7	1.8	338	856

*Not included in average

TABLE 30

SAMPLE STATION 22

DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
*Jan. 10, 1972	N.M.	2.3	200				57.5		1000	
*Feb. 9, 1972	N.M.	1.9	220				35		700	
*March 6, 1972	N.M.	2.9	376				28.8		810	
April 14, 1972	324	3.1	560	2177			11.1	43.15	690	2683
*June 7, 1972	N.M.	3.0	450				54.6		590	
Average	324	3.1	560	2177			11.1	43	690	2683

*Not included in average

TABLE 31

SAMPLE STATION 25										
DATE	FLOW GPM	pH	ACIDITY		ALKALINITY		TOTAL IRON		SULPHATES	
			mg/L	lbs/D	mg/L	lbs/D	mg/L	lbs/D	mg/L	lbs/D
Apr. 14, 1972	± 2300	3.4	74	2042			44	1214	187	5161
Average	± 2300	3.4	74	2042			44	1214	187	5161

TABLE 32

SAMPLE STATION W-16										
DATE	FLOW GPM	pH	ACIDITY		ALKALINITY		TOTAL IRON		SULPHATES	
			mg/L	lbs/D	mg/L	lbs/D	mg/L	lbs/D	mg/L	lbs/D
Oct. 12, 1971	170	3.0	56	194			7.5	90.2	950	1938
Nov. 9, 1971	1424	2.9	200	3418			6.0	102.5	560	9569
Nov. 24, 1971	1424	3.1	100	1709			6.7	114.5	450	7690
Dec. 9, 1971	7165	4.0	124	10,662			4.5	386.9	160	13757
*Jan. 10, 1972	N.M.	3.5	40				3.8		210	
Feb. 9, 1972	2600	2.3	180	5616			4.2	131	600	18720
*Mar. 6, 1972	N.M.	3.4	115				.9	275		
Apr. 14, 1972	2600	3.6	119	3713			1.1	34.3	260	8112
*June 7, 1972	N.M.	3.4	156				5.4		370	
Average	2564	3.3	130	4000			5.0	154	497	15291

* Not included in average

D. Coal Mining Activity

Four extensive deep mines have been identified within the Big Run Watershed; namely, the Iselin #l, Fritz #2, Fritz #3, and Foster Mines. These mines are in the Pittsburgh seam of coal and were owned and operated by the Rochester and Pittsburgh Coal Company under different affiliations from the year 1910 to 1932. At least six other small house coal mines operations were reported to be on the outcrop of Iselin #l, Fritz #2 and #3 deep mine workings. The outcrop of the Pittsburgh seam of coal in the Big Run Watershed has been strip mined. The strip mining cut into deep mine workings at several locations. Erosion and partial backfilling has made the exact location of these holes difficult to ascertain.

E. Description of Pollution Sources

Identification of acid mine discharge was made by field tests and water samples. Field investigations were made on all tributaries flowing into the main stream of Big Run. Pollution was traced to its flow from out of the spoil of strip-cuts and discharges from mine openings.

An account of acid mine drainage encountered in field investigations is as shown on Plate 15 , Page 60

18. North and upstream two miles from Weir #16 location (mouth of Big Run) on the west bank of Big Run; deep mine discharge from Fritz #3 Mine opening. Water quality data recorded at Station 22. (See Table 30 , Page 55 .)

19. West and upstream on tributary from Weir #17 location 300' and 1400'; two deep mine drifts discharging acid mine drainage. Further upstream on this tributary 500' from the above mentioned drift were two other deep mine drifts but only one discharging acid mine drainage. The flows were

minimal and water quality data was recorded at Weir #17. (See Table 29 , Page 55 .)

20. At Weir #18 location, which is 2.8 miles upstream from the mouth of Big Run, is- a 12" pipe discharging acid mine drainage. This presumably is a discharge from the Fritz #2 Mine. For water quality data, see Table 28 , Page 55 .

21. At Weir #19 location, which is opposite Weir #18, is an old abandoned mine slope discharging acid mine water. This is the abandoned Iselin #1 Mine.

22. North and upstream 700' on the tributary from Weir #20 location; old mine works in strip cut discharging acid mine water and recorded in Table 26 , Page 54

23. Alkaline surface water entering Iselin #1 Mine through a sink hole and discharging acid laden at Weir #19 location. Project SL-182-1 has been initiated to correct this situation. Filling and sealing the hole and channel construction will assure an alkaline surface flow to Big Run.

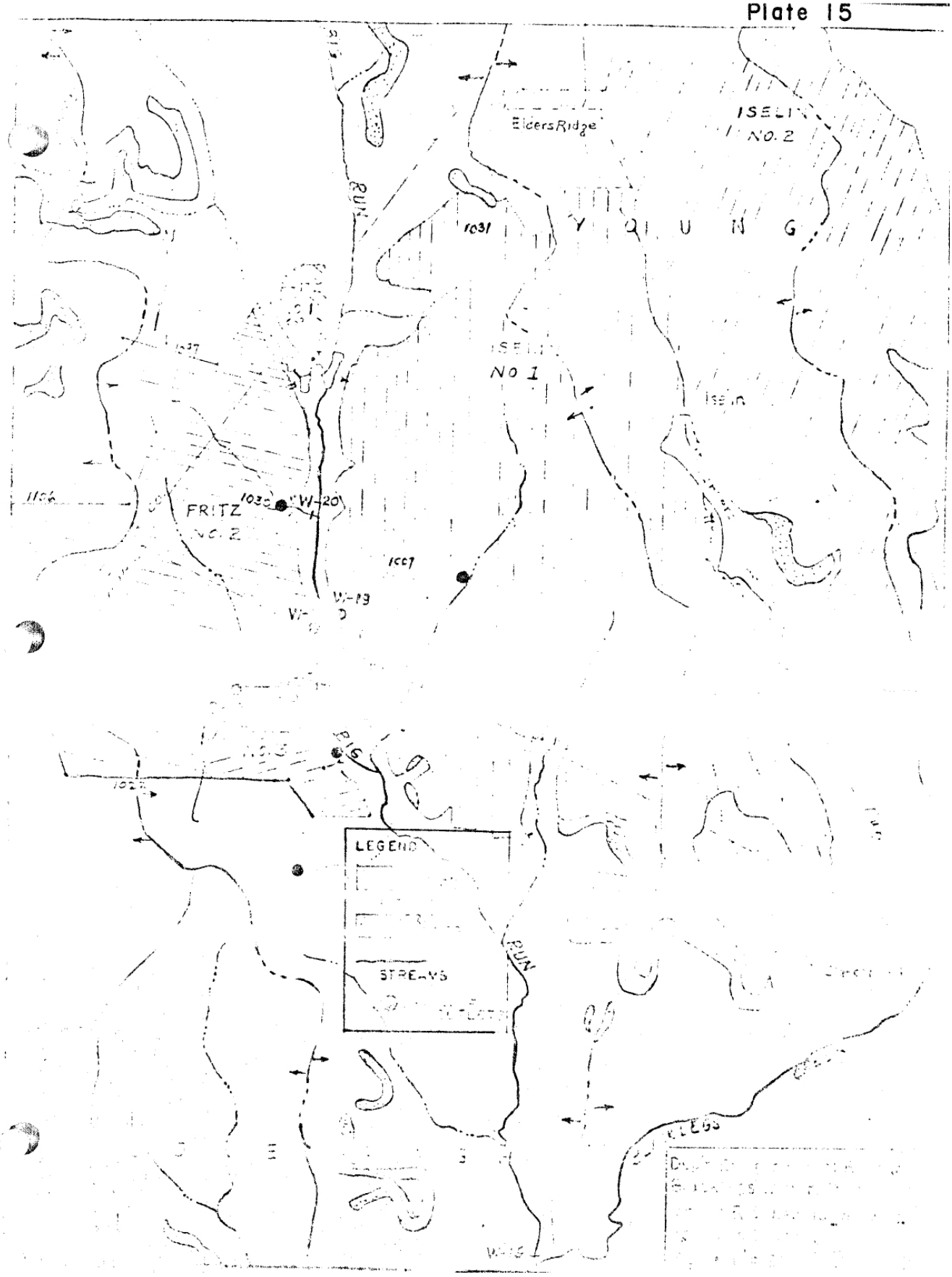
24. Alkaline surface water entering the abandoned Foster Mine through a stream bed and broken strata over the coal seam. Sealing and charnel construction under Project SL-182-I will prevent water entering mine and add to the alkaline flow to Big Run.

25. Alkaline surface water entering the abandoned Iselin #1 :Fine through a stream bed and broken strata over the coal seam. Sealing and channel construction initiated under Project SL 182-1 will prevent water entering mine and add to the alkaline flow to Big Run.

26. Alkaline surface water entering an abandoned mine through a sink hole and stream bed on Sulphur Run. Sealing and channel construction under Project SL 182-I will prevent water entering mine and discharging on another watershed.

Plate 15 , Page 60 shows mined areas and location of acid mine drainage discharges on the Big Run Watershed.

Plate 15


Elders Ridge
ISELIN NO. 2
YOUNG
1031
ISELIN NO 1
1037
FRITZ NO. 2
1038
W-20
1007
W-19
LEGEND
STREAMS
BIG
PUN
ELEGS

Lower Portion - Main Stream – Blacklegs Creek

A. General

The lower. portion of the main stream is located between the Village of Clarksburg and the junction with the Kiskiminetas River.

Major tributaries discharging into this portion of the Blacklegs Creek are Marshall Run (alkaline) and Big Run (polluted). For the purpose of this study, the above tributaries are excluded from this portion of Blacklegs Creek and are treated as separate watersheds elsewhere in this section of the report.

The total stream length including all tributaries, except those mentioned above is approximately 22.5 miles. Total area is 8.6 square miles.

B. Stream Condition

An analysis of mine drainage within the watershed provides the following breakdown on stream condition:

Table 33

Stream Condition

Stream Classification	Stream Length Miles	Percent Total Stream Length
Non-Polluted	17.9	80
Severely Polluted	0	0
Moderately Polluted	4.5	20

Twenty (20) per cent of the Lower Portion of the Blacklegs Watershed is seriously degraded by mine drainage.

Plate 16 shows the location of the sampling stations and the extent of mine drainage within the watershed.

C. Sampling Station Data

Eight sampling stations were designated and monitored. The results of the water data collected are listed as shown in Tables 34 through 41

D. Coal Mining Activity

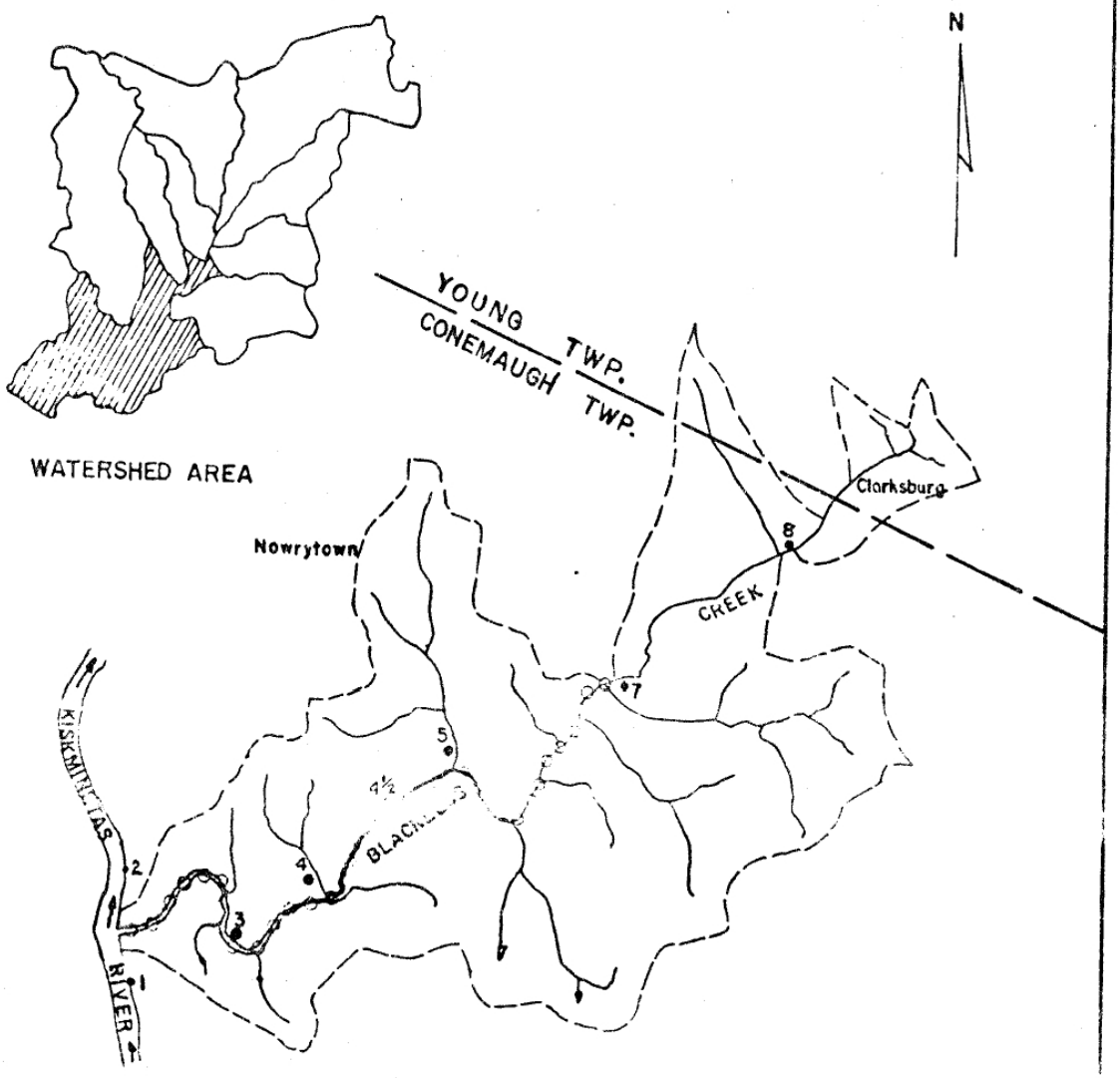
The area has several abandoned deep and surface mines to the north of Blacklegs Creek on this watershed, however, there is no mine drainage and the tributaries to Blacklegs Creek are alkaline. The coal that outcrops ,on this watershed dips to the northwest at approximately 2%. About a mile in this direction, the coal seam outcrops again on Sulphur Run where mine drifts and facilities were once operative. Sulphur Run is a 2 mile acid laden stream that discharges into the Kiskiminetas River on a watershed of the same name.

E. Description of Pollution Sources

The waters of the Lower Portion of Blacklegs Creek would be alkaline except for the discharge from the Big Run Watershed. All of the 12 small tributaries emptying into this watershed were tested and found to be alkaline. Abatement measures will be recommended for the Big Run sector and any reduction in the pollution load of that stream will directly affect the waters of the main stream of Blacklegs Creek.

Plate 16

MAIN STREAM
LOWER PORTION: BLACKLEGS CREEK WATERSHED



LEGEND

— —	LOWER PORTION DRAINING BASIN
•	SAMPLING STATION
O	MODERATELY ACIC
X	SEVERELY ACID

SCALE 1"= 5000' FEBRUARY 1973

BLACKLEGS CREEK
MINE DRAINAGE POLLUTION
ABATEMENT PROJECT SL-182
INDIANA COUNTY, PENNA.

TABLE 34

SAMPLE STATION 1 Kiskiminetas River

DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
Sept. 9, 1971		3.2	72				2.9		600	
Oct. 12, 1971		3.2	44				9.0		550	
Nov. 9, 1971		3.5	54				2.4		235	
Average		3.3	57				4.77		462	

TABLE 35

SAMPLE STATION 2 Kiskiminetas River

DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
Sept. 9, 1971		3.2	56				1.7		725	
Nov. 9, 1971		3.6	40				1.6		260	
Average		3.4	48				1.65		492.5	

TABLE 36

SAMPLE STATION 3

DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
Sept. 9, 1971	N.M.	4.2	80				0.9		950	
Oct. 12, 1971	N.M.	5.2	2				4.0		390	
Nov. 9, 1971	N.M.	5.4	14				1.9		240	
Dec. 9, 1971	N.M.	7.3	8				1.5		100	
Jan. 10, 1972	N.M.	7.3	18				3.0		105	
Feb. 15, 1972	N.M.	4.7	16				2.2		210	
Mar. 6, 1972	N.M.	4.9	39				3.0		216	
Apr. 14, 1972	N.M.	5.9	14		7.0		0.23		180	
June 7, 1972	N.M.	6.5	5		7.0		2.18		256	
Average	±2288	5.71	22	2452	7.0	780	2.10	234	305	33994

TABLE 37

SAMPLE STATION 4

DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
Sept 9, 1971	N.M.	7.4			96		0.1		85	
Oct. 12, 1971	N.M.	7.1			96		2.0		95	
Nov. 9, 1971	N.M.	6.9			96		0.1		75	
Dec. 9, 1971	N.M.	7.6			42		0.6		100	
Average		7.25			82.5		0.7		88.75	

TABLE 38

SAMPLE STATION 4a

DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
Oct. 12, 1971		4.8	34				3.2		380	
Nov. 9, 1971		5.3	16				2.2		370	
Dec. 9, 1971		7.6	24				1.5		105	
Jan. 10, 1972		7.1			10		2.2		120	
Mar. 6, 1972		4.8	41		2.0		0.58		216	
Apr. 14, 1972		4.6	55		1.0		0.33		205	
June 7, 1972		6.4	7		8.0		2.06		325	
Average		5.80	29.50		5.25		1.72		245.86	

TABLE 39

SAMPLE STATION 5

DATE	FLOW GPM	pH	ACIDITY mg/L	ACIDITY lbs/D	ALKALINITY mg/L	ALKALINITY lbs/D	TOTAL IRON mg/L	TOTAL IRON lbs/D	SULPHATES mg/L	SULPHATES lbs/D
Sept. 23, 1971		7.1			84		1.9		155	
Oct. 12, 1971		7.2			60		3.3		185	
Nov. 9, 1971		6.9			58		0.2		195	
Dec. 9, 1971		7.5			34		0.2		100	
Average		7.18			59.00		1.58		158.75	

TABLE 40

SAMPLE STATION 7										
DATE	FLOW GPM	pH	ACIDITY		ALKALINITY		TOTAL IRON		SULPHATES	
			mg/L	lbs/D	mg/L	lbs/D	mg/L	lbs/D	mg/L	lbs/D
Sept. 23, 1971	N.M.	8.0			100		0.3		440	
Oct. 12, 1971	N.M.	7.2			84		0.5		340	
Nov. 9, 1971	N.M.	6.9			88		0.1		270	
Dec. 9, 1971	N.M.	6.9			20		0.8		105	
Jan. 10, 1972	N.M.	6.7			22		1.9		105	
Mar. 6, 1972	N.M.	7.3			11		0.83		206	
Apr. 14, 1972	N.M.	6.2			20		0.18		162	
June 7, 1972	N.M.	7.5			60		0.20		226	
Average	±6500	7.09			45	3510	0.60	47	232	18096

TABLE 41

SAMPLE STATION 8										
DATE	FLOW GPM	pH	ACIDITY		ALKALINITY		TOTAL IRON		SULPHATES	
			mg/L	lbs/D	mg/L	lbs/D	mg/L	lbs/D	mg/L	lbs/D
Sept.23,1971	N.M.	7.8			182		0.1		450	
Oct. 12, 1971	N.M.	7.3			88		0.1		320	
Nov. 9, 1971	N.M.	7.5			84		0.1		310	
Dec. 9, 1971	N.M.	7.5			24		0.4		44	
Jan. 10, 1972	N.M.	6.5			22		9.5		100	
Feb. 15, 1972	N.M.	6.7			50		1.2		170	
Mar. 6, 1972	N.M.	6.3			16		0.54		128	
Apr. 14, 1972	N.M.	7.5			26		0.20		150	
June 7, 1972	N.M.	7.7			60		0.45		202	
Average	±6600	7.2			61	4831	1.40	111	204	16156

VII CONCLUSIONS

A. Pollution Sources

The bulk of mine drainage pollution in the Blacklegs Watershed Drainage Basin is concentrated in two general areas. They are on the Whisky Run Watershed southwest from West Lebanon and the Big Run Watershed south of Elders Ridge.

Big Run Area accounts for 30% of the pollutant sources and contributes 81% of the total acid load into Blacklegs Creek.

Whisky Run Area accounts for 60% of the pollutant sources and contributes 17% of the acid load into Blacklegs Creek.

Upper Portion of Blacklegs accounts for l0% of the pollutant sources and contributes 2% of the total acid load to Blacklegs Creek.

Lower Portion of Blacklegs receives practically all its pollution from Big Run. The tributaries are all alkaline in the Lower Portion; therefore any benefaction by remedial measures, especially on Big Run, will directly affect the waters of this watershed and the main stream of Blacklegs Creek.

B. Priorities

It is concluded that the abatement of mine drainage pollution within the Blacklegs Watershed Drainage Basin would best be accomplished, by individual watersheds.

Priority would best be given to the upstream watersheds where the abatement of pollution will have a buffering effect on the waters downstream. This approach would result in more miles of alkaline stream that would readily benefit the populated areas of the watershed. The benefaction is based on improving 59% of the total stream length involving 61% of the total land area on the watershed.

Abatement of the downstream watershed, namely Big Run, will be given a lower priority even though it contains major sources of pollution with greater acid loads.

Therefore, the recommended priority arrangement for the individual polluted watersheds in this study will be:

1. Whisky Run Watershed
2. Upper Portion Blacklegs Watershed
3. Big Run Watershed
4. Lower Portion Blacklegs Watershed

C. General

Due to the fact that the coal bed has been so frequently opened in this basin, a reasonable estimate of the openings that did exist could not be made. Approximately 85j, of the outcrop has been surfaced mined and partially backfilled making it impossible to determine where deep mines workings have been intercepted. The surface mining was done in most part during World War II period and backfilled to lax standards and regulations of that time.

It is suggested to improve the natural drainage through the strip cuts by means of highwall rounding and channeling. This method will reduce the flow of water entering the deep mines and improve the drainage through the strip cuts. The unpolluted water to the streams should increase the natural alkalinity and neutralize some of the acidity.

Additional abatement methods are being considered and may be introduced in the future as conditions in the field warrant.

VIII ABATEMENT MEASURES AND COSTS

The ultimate pollution discharge points are indicated under "Source Description" in the Table beginning on Page 70 . These are the points where attention should be devoted to abate pollution. Each known source is given, its pollution load, proposed method of abatement, and the estimated cost of abatement. In some instances, an acid load was estimated for a minor acid mine drainage source because of difficult field conditions which prevented an accurate estimate of the flow.

Cost estimates were computed on one judgmental criteria and that was bid experiences of the Department by similar types of projects and abatement measures.

Practically all of the pollution of the waters in the Blacklegs Watershed is the result of acid mine drainage. This drainage is from abandoned surface and deep mines. In the recommendations, it will be noted that emphasis has been put on mine seals and channeling these areas. A description of these abatement measures is as follows:

1. Mine Sealing - the construction of a barrier within a mine entry, sometimes extended into the adjacent strata by means of a grout curtain. The barrier is usually intended to impede the movement of water from the mine so that the ground water level will rise to an elevation sufficient to inundate the pyritic strata associated with the coal seam. The method recommended shown on Plate 17 , Page 75 , has been successfully used on other projects.

2. Channeling - the draining, grading and excavation of strip spoil in a manner as to provide a constructed channel for rapid flow of water unabated out of the strip cut.

WHISKY RUN WATERSHED

Source No.	Priority No.	Source Description	Recommended Abatement Measures	Cost
1.	7	Gravity discharge of AMD from 3 deep mine drifts. Acid Load = 91#/day	Construction of 3 water-tight mine seals - 60' head.	$ 45,000.00
			Channeling strip cut - 2 acres.	$ 6,000.00
2.	24	Gravity discharge of AMD from mine opening and partially backfilled strip cut. Acid Load = 6#/day	Construction of a water-tight mine seal - 80' head.	$ 15,000.00
			Channeling strip cut - 2 acres.	$ 6,000.00
3.	17	Gravity discharge of AMD from 2 mine drifts in strip cut. Acid Load = 66#/day	Construction of 2 mine seals - 65' head.	$ 30,000.00
			Channeling strip cut - 4 acres.	$ 12,000.00
4.	8	Gravity discharge of AMD from mine drift. Acid Load = 272#/day	Construction of 18 remote watertight mine seals.	$270,000.00
5.	21	Gravity discharge of AMD from backfilled mine drifts. Acid Load = 6#/day	Construction of 3 watertight mine seals - 72' head.	$ 45,000.00
6.	9	3½ acres of mine refuse adjacent to unnamed tributary at Iselin #5 mine site. Acid Load = 19#/day	Grade, cover with soil and revegetate - 3.5 acres.	$ 9,000.00
			Install 500' concrete pipe.	$ 15,000.00
7.	10	Gravity discharge of AMD from 3 mine openings in highwall of strip cut and 2 deep mine drifts. Acid Load = 159#/day	Construction of 5 water-tight mine seals. Mine #5 - 60' and 40' head, Mine #3 - 40', 35' and 30' head.	$ 75,000.00
			Channeling strip cut - 6.5 acres. Sealing out-crop in selected areas.	$ 20,000.00
8.	22	Gravity discharge of AMD from open strip cut and abandoned mine workings. Acid Load = 6#/day	Construction of a mine seal - 72' head	$ 15,000.00
			Channeling strip cut - 3.3 acres.	$ 10,000.00

WHISKY RUN WATERSHED

Source No.	Priority No.	Source Description	Recommended Abatement Measures	Cost
9.	18	Gravity discharge of AMD from strip spoil and mine workings. Acid Load = 47#/day	Construction of a mine seal - 60' head. Channeling strip cut - 3.3 acres.	$ 15,000.00 $ 10,000.00
10.	19	Gravity discharge of AMD from open strip cut and mine workings. Acid Load = 59#/day	Construction of a mine seal - 68' head. Channeling strip cut - 3.3 acres.	$ 15,000.00 $ 10,000.00
11.	23	Gravity discharge of AMD from open strip cut and mine workings. Acid Load = 5#/day	Construction of a mine seal - 27' head. Channeling strip cut - 3.3 acres.	$ 15,000.00 $ 10,000.00
12.	20	Gravity discharge of AMD in a swampy strip mined area. No definite source found. Acid Load = 140#/day	Exploration by excavating Channeling strip cut - 3 acres.	$ 6,000.00 $ 9,000.00

UPPER PORTION - MAIN STREAM - BLACKLEGS CREEK WATERSHED

Source No.	Priority No.	Source Description	Recommended Abatement Measures	Cost
14.	27	Gravity discharge of AMD from open strip cut and abandoned deep mine opening. Acid Load 19#/day	Construction of a clay plug mine seal - 20' head Channeling strip cut - 3.3 acres	$ 1,000.00 $ 10,000.00
15.	26	Gravity discharge from strip spoil and intercepted deep mine working. Acid Load = 19#/day	Construction of a clay plug mine seal - 18' head Channeling strip cut - 3.3 acres	$ 1,000.00 $ 10,000.00
16.	25	Gravity discharge from deep mine opening. Acid Load = 19#/day	Construction of clay plug mine seal - 10' head	$ 1,000.00
17.	6	Pipe discharge of mine drainage from deep mine shaft and Lower Freeport seam workings. Iron Load = 34.3#/day	Construction of 3 lagoons and facilities for treatment to precipitate the iron and other metal compounds from the mine discharge. Lagoon capacities to be sufficient to provide the necessary holding time.	$120,000.00

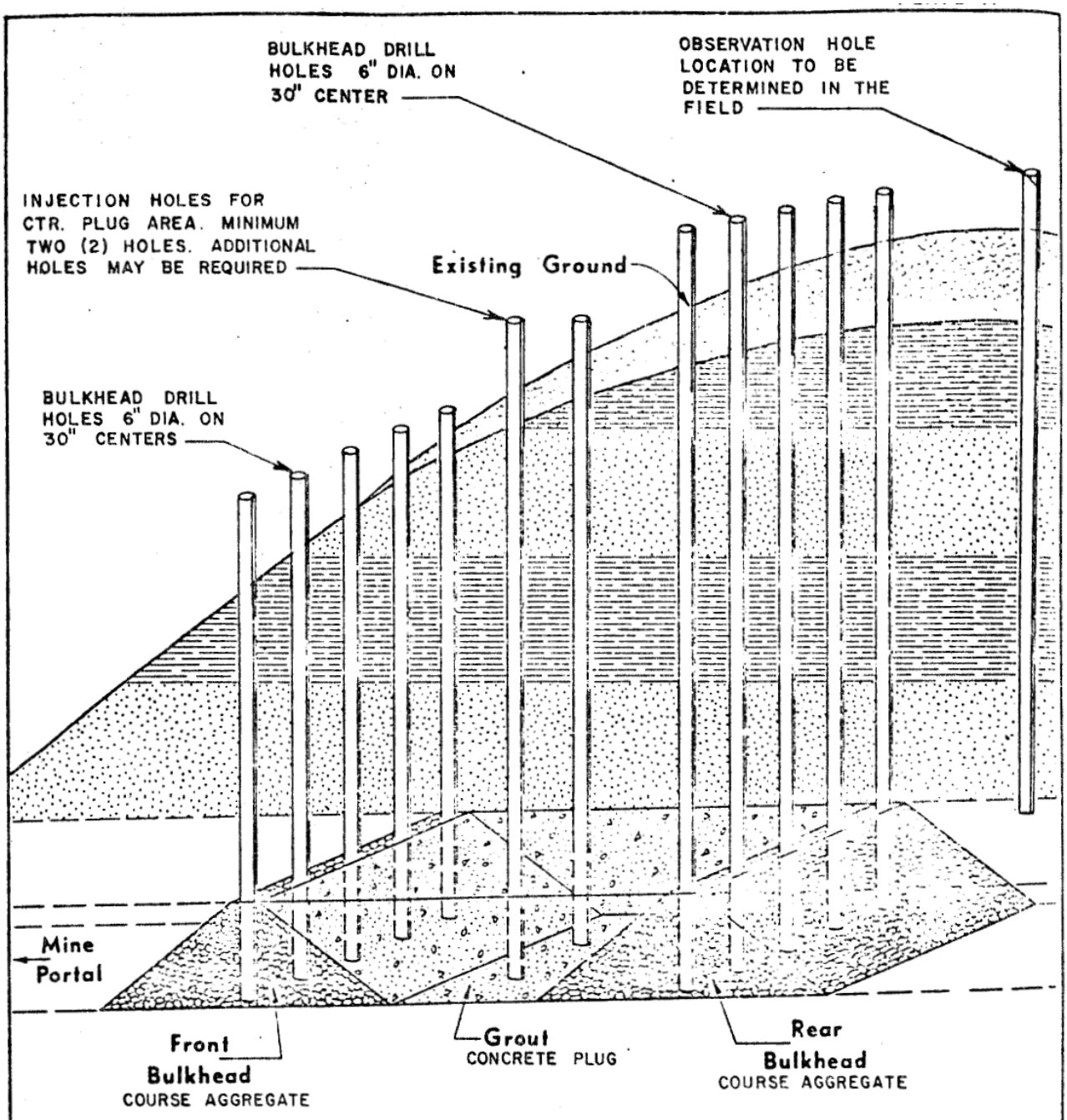
BIG RUN WATERSHED

Source No.	Priority No.	Source Description	Recommended Abatement Measures	Cost
18.	11	Gravity discharge of AMD from the Fritz #3 mine opening. Acid Load = 2177#/day	Construction of a watertight mine seal and curtain grouting - 97' head	$ 30,000.00
19.	15	Gravity discharge of AMD from 2 drifts of the Fritz #3 Mine and from the 2 drifts of the Fritz #2 Mine. Acid Load = 187#/day	Construction of 4 water-tight mine seals - 107' head	$ 60,000.00
20.	12	Gravity discharge of AMD from a 12" galvanized pipe. Presumably from the Fritz #2 mine workings. Acid Load = 1369#/day	Extensive curtain grouting - approximately 500 feet in length.	$100,000.00
21.	13	Gravity discharge of AMD from a slope out of the Iselin #1 Mine. Acid Load = 905#/day	Construction of a water-tight mine seal and installation of ±2000' of pipe line to convey water from Iselin #1 slope to the Fritz #3 Mine. 100' head	$ 15,000.00 $ 40,000.00
22.	14	Gravity discharge of AMD from a strip cut and mine opening. Acid Load = 781#/day	Construction of a water-tight mine seal. 67' head Channeling strip cut - 3.3 acres	$ 18,000.00 $ 10,000.00
27.	16	Gravity discharge of AMD from strip cut and mine openings. Acid Load = 80#/day	Construction of 2 clay plug mine seals - 20' head . Channeling strip cut - 3 acres	$ 2,000.00 $ 9,000.00

PROJECT SL 182-1

Source No.	Priority No.	Source Description	Recommended Abatement Measures	Cost
13.	5	Alkaline surface water entering Iselin #4 Mine through the stream bed and broken strata over the coal seam. Discharging acid laden at Weir #19 on the Big Run Watershed.	Channel construction and sealing with bentonite and sand mix.	Project SL 182-1 Completed Mar. 1, 1974 $ 3,393.60
23.	4	Alkaline surface water entering the abandoned Iselin #1 Mine through a sink hole and discharging acid laden at Weir #19.	Filling and sealing the sink hole. Construction and sealing of stream channel.	Project SL 182-1 Completed Mar. 1, 1974 $ 9,593.60
24.	3	Alkaline surface water entering the abandoned Foster Mine through the stream bed and broken strata over the coal seam. Discharging acid laden into Sulphur Run.	Construction and sealing of the stream channel.	Project SL 182-1 Completed Mar. 1, 1974 $ 5,393.60
25.	2	Alkaline surface water entering the abandoned Iselin #1 Mine through the stream bed and broken strata. Discharging acid laden at Weir #19 on the Big Run Watershed.	Construction and sealing of the stream channel.	Project SL 182-1 Completed Mar. 1, 1974 $ 3,933.60
26.	1	Alkaline surface water entering an abandoned mine through a sink hole and stream bed on Sulphur Run. Discharge unknown on another watershed.	Filling and sealing the sink hole. Construction and sealing stream channel.	Project SL 182-1 Completed Mar. 1, 1974 $ 4,393.60
TOTALS		ACID LOAD = 6432#/DAY		$1,116,708.00

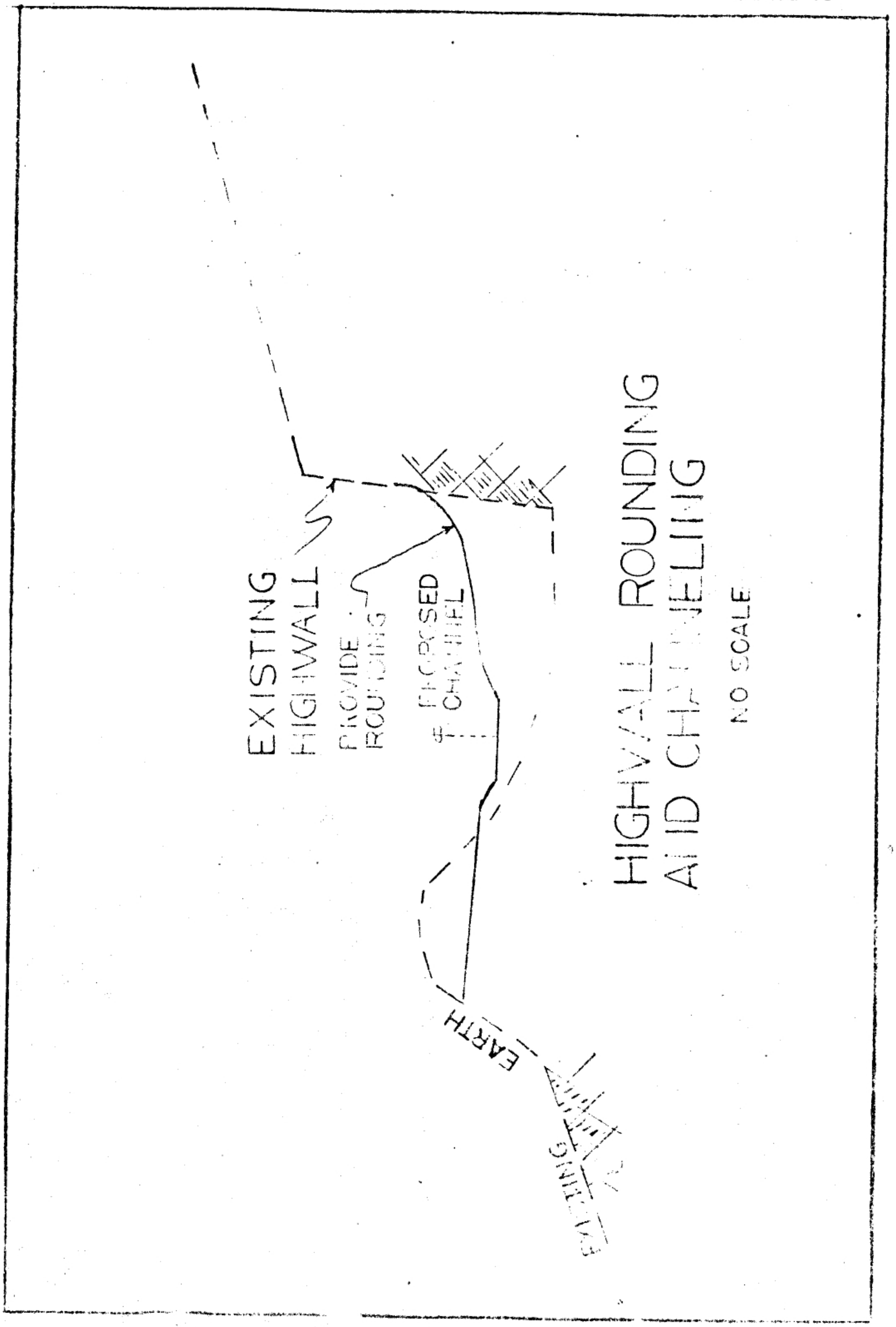
The total pounds of acid per day is calculated from each individual source of pollution and totals 6432# per day. Blacklegs Creek receives from pollution sources, as tabulated under Polluted Systems, Page 34, a total of 4843# of acid per day. The total iron from pollutant sources is 242# per day.



TYPICAL DEEP MINE SEAL

(DOUBLE BULKHEAD)

No Scale


EXISTING HIGHWALL
PROVIDE ROUNDING
PROPOSED CHANNEL
EARTH
HIGHWALL ROUNDING
AND CHANNELING
NO SCALE