

TREATMENT

The present studies of this Watershed have concluded that the water quality at all streams south of pine creek is acidic and contains varying amounts of contained iron. A sample chemical analysis is presented in the Appendix. The analysis indicates that there is very little biological pollution in the polluted streams, the B.O.D. being 2 ppm.

The abatement of mine water pollution and contamination of the Rausch Creek Watershed can be divided into two (2) principal categories:

- I. Surface treatment, and
- II. Water treatment

I. Surface Treatment

Under this category there are two (2) definite problem areas to be considered.

- a) Poor natural drainage caused by flat, swampy areas is the primary problem in the area of the West 8branch of Rausch Creek. The West Bran9h part of the Watershed has been partially restored by Project 40, a Federal Aid Project. This work has been

done on the North Slope of Big Lick Mountain and has effectively restored this area. Methods utilized to accomplish restoration were the backfilling of abandoned stripping operations and construction of drainage ditches and flumes to abet surface drainage. Additional planning has been completed for the area 4,500 feet west and westward of the Main Branch of Rausch Creek on the South slope of Bear Mountain.

- b) The East Branch is plagued with poor drainage problems caused by poor stream gradients and alignments. The discharges from active mining operations are usually intercepted by stripping pits and abandoned workings causing flows to reenter underground workings at a lower elevation. The Borehole just west of the Orchard Airway is presently discharging an intermittent flow over the surface causing a killing of the vegetation and leaving a discoloration due to the contained iron. This flow should be directed to join

the surface flow of the Orchard Airway. A program of drainage control should be initiated. Ditching, flume construction, and channeling would be of prime importance to facilitate the flow of surface water into the East Branch of Rausch Creek. The stripped areas remain as the largest surface treatment problem in the rehabilitation of the Watershed.

The stripped areas in the North and South sides of the area of the West Branch of Rausch Creek have been reasonably restored, or will be restored, under Project 40 supervision. Present plans do not include the first 4,500 feet west of the Gap in Bear Mountain, and some consideration should be given to accomplish this restoration as soon as possible. Major stripping operations have occurred along the north side of the East Branch of Rausch Creek. While it does not appear feasible at this time to backfill all of these workings, the smaller pits at the highest elevations are considered troublesome, with regard to drainage patterns. They intercept any surface run-off and allow the water to find its way into underground workings. Closure of these pits and restoration of surface topography will do a great deal to prevent any further damage to the existing

landscape. Farther to the south, larger stripped areas are in existence. In these areas are found many abandoned workings, as well as new workings, which offer places for surface water to find its way into underground workings. This water, in turn, finds its way to the surface as mine drainage through the operations at lower elevations or through the Orchard Airway.

A program of filling the above mentioned stripping areas should be initiated with the application of surface seals of clayey material to prevent surface permeation. Surface contouring should accompany the back-filling procedures so as to maintain surface runoff. Surface conditioning of the clay cover could be accomplished with lime or limestone treatment as well as other soil conditioners. This is the most ready means of preventing further erosion of the area, There is no doubt that the costs involved in the recommendations set forth are prohibitive and further intensive studies should be undertaken to actually determine the most economical program to realize the goals.

An estimate of costs of restoring stripped areas:

From extensive _ field studies of the existing stripped area within the Watershed Study Area , there is an estimated surface area of approximately 485 acres

involved of which there are approximately 310 acres of actual open pits. An estimated volume of material required to backfill the existing stripped areas would approximate 6,850,000 cubic yards. The estimated costs of backfilling, planting and seeding this area to restore it to its original drainage pattern would be \$1,410,000.

The following tables give the pit numbers, (as found on Map P-2), Status, area in acres, and estimated costs to restore the topography to its original pattern.

COST SUMMARY

RESTORATION OF DRAINAGE

<u>STRIP PIT NUMBER</u>	<u>STATUS</u>	<u>ESTIMATED AREA (in acres)</u>	<u>VOLUME OF BACKFILL, (cu. yds.)</u>	<u>ESTIMATED COSTS DRAINAGE IMPROVEMENT</u>	<u>LOCATION & REMARKS</u>
46	Abandoned	1.57	45,140	\$ 9,300.	N.W. Sector, W.Branch Rausch Creek
47	do.	3.54	122,220	25,075.	do.
67	do.	5.06	224,580	45,800.	do.
68	do.	0.45	9,260	1,925.	do.
73	do.	0.75	17,825	3,700.	do.
74	do.	0.64	18,475	3,800.	do.
75	do.	1.26	19,860	4,200.	do.
76	do.	0.48	7,290	1,550.	do.
77	do.	0.91	17,780	3,725.	do.
78	do.	0.74	15,650	3,250.	do.
79	do.	1.30	32,985	6,825.	do.
80	do.	0.89	<u>75,550</u>	<u>15,275.</u>	do.
		s. t.	606,615	\$124,425.	

COST SUMMARY

RESTORATION OF DRAINAGE

<u>STRIP PIT. NUMBER</u>	<u>STATUS</u>	<u>ESTIMATED AREA {in acres}</u>	<u>VOLUME OF BACKFILL (cu. yds.)</u>	<u>ESTIMATED COSTS DRAINAGE IMPROVEMENT</u>	<u>LOCATION & REMARKS</u>
81	Abandoned	1.83	70,370	\$ 14,400.	N.W. Sector, W.Branch Rausch Creek
82	do.	0.41	10,185	2,125.	do.
83	do.	3.55	143,520	29,325.	do.
84	do.	5.96	193,795	39,800.	do.
85	do.	2.38	57,175	11,850.	do.
86	do.	0.32	11,020	2,275.	do.
87	do.	1.29	62,500	12,725.	do.
88	do.	1.84	52,780	10,875.	do.
89	do.	1.84	52,780	10,875.	do.
90	do.	0.21	4,860	1,000.	do.
91	do.	0.41	13,335	2,750.	do.
92	do.	0.45 (2)	<u>8,265</u>	<u>1,750.</u>	do.
s.t.			680,585	\$139,750.	

NOTE: (2) - Denotes number of pits.

COST SUMMARY

RESTORATION OF DRAINAGE

<u>STRIP PIT NUMBER</u>	<u>STATUS</u>	<u>ESTIMATED AREA (in acres)</u>	<u>VOLUME OF BACKFILL. (cu. yds.)</u>	<u>ESTIMATED COSTS DRAINAGE IMPROVEMENT</u>	<u>LOCATION & REMARKS</u>
93	Abandoned	0.75	14,815.	\$ 3,100.	N.W. Sector, W.Branch Rausch Creek
95	do.	2.98	44,445	9,425.	do.
96	do.	2.48	81,665	16,775.	do.
48	Abandoned	0.27	1,775	400.	S.W. Sector, W.Branch Rausch Creek
49	do.	0.41	4,000	875.	do.
50	do.	1.61	23,300	4,950.	do.
51	do.	4.13	60,000	12,725.	do.
52	do.	0.12	1,035	225.	do.
53	do.	0.55	5,415	1,200.	do.
62	do.	0.51	6,250	1,350.	do.
63	do.	1.38	<u>15,000</u>	<u>3,250.</u>	do.
		s.t.	257,700	\$ 54,275.	

COST SUMMARY

RESTORATION OF DRAINAGE

<u>STRIP PIT NUMBER</u>	<u>STATUS</u>	<u>ESTIMATED AREA (in acres)</u>	<u>VOLUME OF BACKFILL (cu. yds.)</u>	<u>ESTIMATED COSTS DRAINAGE IMPROVEMENT</u>	<u>LOCATION & REMARKS</u>
64	Abandoned	0.05	225	\$ 50.	S.W. Sector, W.Branch Rausch Creek
65	do.	1.71	23,960	5,100.	do.
66	do.	1.01	14,170	3,025.	do.
69	do.	0.25	3,665	775.	do.
70	do.	1.11	41,670	8,525.	do.
11	do.	0.37	6,000	1,275.	do.
72	do.	1.25 (3)	24,025	5,025.	do.
98	Abandoned	1.51	38,195	7,900.	N.E. Sector, E.Branch Rausch Creek
99	do.	1.49	37,035	7,675.	do
135	do.	0.64	26,670	5,450.	do.
136	do.	7.46	<u>688,655</u>	<u>139,050.</u>	do.
		s.t.	904,270	\$ 183,850.	

NOTE: (3) - Denotes number of pits.

COST SUMMARY

RESTORATION OF DRAINAGE

STRIP PIT NUMBER	STATUS	ESTIMATED AREA (in acres)	VOLUME OF BACKFILL (cu. yds.)	ESTIMATED COSTS DRAINAGE IMPROVEMENT	LOCATION & REMARKS
137	Abandoned	3.43	186,575	\$ 37,925.	N.E. Sector, E.Branch Rausch Creek
138	do.	0.34	4,165	900.	do.
139	do.	0.48	7,780	1,650.	do.
140	do.	0.87	50,925	103,375.	do.
141	do.	1.64	51,945	10,675.	do.
142	do.	0.17	5,285	1,100.	do.
158	do.	1.89	58,335	12,000.	do.
159	do.	0.17	1,620	350.	do.
160	do.	0.61	8,335	1,775.	do.
161	do.	0.34	5,415	1,150.	do.
162	do.	0.19	4,670	975.	do.
163	do.	3.51	<u>303,335</u>	<u>61,300.</u>	do.
		s.t.	688,385	\$ 233,175.	

COST SUMMARY

RESTORATION OF DRAINAGE

<u>STRIP PIT NUMBER</u>	<u>STATUS</u>	<u>ESTIMATED AREA (in acres)</u>	<u>VOLUME OF. BACKFILL (cu. yds.)</u>	<u>ESTIMATED COSTS DRAINAGE IMPROVEMENT</u>	<u>LOCATION & REMARKS</u>
164	Abandoned	1.74	170,000	\$ 34,300.	N.E. Sector, E.Branch Rausch Creek
165	do.	0.77	23,110	4,750.	do.
166	do.	0.89	26,670	5,500.	do.
167	do.	1.11	21,555	4,500.	do.
168	do.	2.06	77,780	15,925.	do.
169	do.	3.01 (3)	112,685	23,075.	do.
170	do.	5.56 (3)	188,380	38,650.	do.
171	do.	1.15 (3)	28,075	5,825.	do.
172	do.	1.63 (4)	44,350	9,150.	do.
103	Abandoned	3.78 (2)	169,075	34,475.	S.E. Sector, E.Branch Rausch Creek
104	do.	1.85	<u>64,165</u>	<u>13,150.</u>	do.
		s.t.	925,845	\$ 189,300.	

NOTE: (2), (3) - Denotes number of pits.

COST SUMMARY

RESTORATION OF DRAINAGE

<u>STRIP PIT NUMBER</u>	<u>STATUS</u>	<u>ESTIMATED AREA (in acres)</u>	<u>VOLUME OF BACKFILL (cu. yds.)</u>	<u>ESTIMATED COSTS DRAINAGE IMPROVEMENT</u>	<u>LOCATION & REMARKS</u>
105	Abandoned	2.61	64,815	\$ 13,425.	S.E. Sector, E.Branch Rausch Creek
106	do.	1.82 (2)	52,870	10,900.	do.
107	do.	0.48	14,075	2,900.	do.
108	do.	3.05	131,575	26,850.	do.
109	do.	5.17 (3)	231,110	47,125.	do.
110	do.	1.66 (3)	37,840	7,850.	do.
111	do.	0.90	31,600	6,475.	do.
112	do.	0.55	12,960	2,700.	do.
113	do.	2.53	70,275	14,500.	do.
114	do.	1.38	38,335	7,900.	do.
115	do.	0.80	22,555	4,650.	do.
116	do.	1.17	<u>33,335</u>	<u>6,875.</u>	do.
		s.t.	741,345	\$152,150.	

NOTE: (2), (3) - denotes number of pits.

COST SUMMARY

RESTORATION OF DRAINAGE

<u>STRIP PIT NUMBER</u>	<u>STATUS</u>	<u>ESTIMATED AREA (in acres)</u>	<u>VOLUME OF BACKFILL (cu. yds.)</u>	<u>ESTIMATED COSTS DRAINAGE IMPROVEMENT</u>	<u>LOCATION & REMARKS</u>
117	Abandoned	0.34	6,480	\$ 1,350.	S.E. Sector, E.Branch Rausch Creek
118	do.	1.57 (3)	49,715	10,225.	do.
119	do.	8.88 (3)	636,215	28,800.	do.
120	do.	3.71	140,000	28,650.	do.
121	do.	3.51	105,000	21,625.	do.
183	do.	2.04	99,165	20,200.	do.
191	do.	1.85	88,150	17,950.	do.
192	do.	0.82	55,000	11,150.	do.
122	Abandoned	0.17	2,915	625.	C.E. Sector, E.Branch Rausch Creek
123	do.	2.08	35,000	7,375.	do.
124	do.	0.41	<u>6,460</u>	<u>1,375.</u>	do.
		s.t.	1,224,100	\$ 149,325.	

NOTE: (3) - denotes number of pits.

COST SUMMARY

RESTORATION OF DRAINAGE

<u>STRIP PIT NUMBER</u>	<u>STATUS</u>	<u>ESTIMATED AREA (in acres)</u>	<u>VOLUME OF BACKFILL (cu. yds.)</u>	<u>ESTIMATED COSTS DRAINAGE IMPROVEMENT</u>	<u>LOCATION & REMARKS</u>
125	Abandoned	0.45	10,370	\$ 2,150.	C.E. Sector, E.Branch Rausch Creek
126	do.	3.78	138,520	28,375.	do.
127	do.	1.72	125,000	25,300.	do.
128	do.	4.54	169,165	34,625.	do.
129	do.	1.66 (2)	94,445	19,175.	do.
130	do.	0.80	31,110	6,375.	do.
131	do.	1.78 (2)	34,445	7,200.	do.
134	do.	0.87	14,515	3,050.	do.
178	Hegins Landfill Operation				
179	Abandoned	0.42	5,890	1,250.	C.E. Sector, E.Branch Rausch Creek
101	do.	1.97 (3)	69,025	14,150.	do.
102	do.	2.74 (3)	<u>91,665</u>	<u>18,825.</u>	do.
		s.t.	784,150	\$160,475.	
		TOTALS	6,812,995	\$1,386,125.	

NOTE: (2), (3) - denotes number of pits.

COST SUMMARY

RESTORATION OF DRAINAGE

<u>STRIP PIT NUMBER</u>	<u>STATUS</u>	<u>ESTIMATED AREA (in acres)</u>	<u>VOLUME OF BACKFILL (cu. yds.)</u>	<u>ESTIMATED COSTS DRAINAGE IMPROVEMENT</u>	<u>REMARKS</u>
Group "A"	Abandoned,-- but backfilled	6.74		\$ 1,115.	
Group "B"	do.	11.15		1,950.	
Group "C"	do.	35.99		6,300.	
Group "D"	do.	78.98		13,825.	
	Total	132.86		\$ 23,250.	includes only hatched areas on map 6805-P-2 that have been backfilled but not planted & seeded.
All Areas	Abandoned, but require back- filling <u>planting</u> and seeding Total-	175.54	6,812,995	\$1,386,725.	includes NW, SW, NE, SE, and CE Sectors of West & - East Branch of Rausch Creek.
	GRAND TOTAL	308.40	6,812,995	\$1,409,975.	Total estimated acreage and costs to restore watershed to its original drainage pattern.

II. Water Treatment

As mentioned previously, the present studies of this Watershed have revealed the water quality to be of an acidic nature containing varying amounts of iron. Therefore, chemical treatment is necessary to restore the water to a "clean stream" state. The treatment of these waters have been studied from three

(3) different points of view, namely:

Scheme "A"

Individual plants to be built and operated by the mining operators.

Scheme "B"

Strategically Located Plants

Plants built on each branch of Rausch Creek at selected sites.

Scheme "G"

A Universal Plant

The plant to be located immediately north of all sources of pollution.