COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF ENVIRONMENTAL RESOURCES

ANNANDALE - HALLSTON HYDROLOGIC AND PROPERTY STUDY

SLIPPERY ROCK CREEK MINE DRAINAGE PROJECT SL 110-4-101.1A

BUTLER COUNTY, PENNSYLVANIA

Prepared by

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CONSULTING ENGINEERS

ALTOONA, PA

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ANNANDALE NO. 2 MINE

Introduction

The purpose of this report is to investigate the property and hydrology that will be affected by the sealing of the Annandale No. 2 Mine Complex in Marion and Venango Townships in Butler County. The proposed sealing of the mine will dramatically abate mine acid drainage that presently flows into Seaton Creek; one of the main tributaries (and worst polluters) of Slippery Rock Creek.

The preparation of this report included identification of the property lines, verification of subsequent mineral rights, locating and sampling water sources (wells and springs) and delineation of the hydrologic area that will be affected by the proposed mine sealing. The accompanying map of the area, shown with the above information, is included for reference.

Geology

The Annandale No. 2 Mine Area is underlain by sedimentary rocks which reach a maximum thickness of about 12,000 feet. This sedimentary succession ranges in age from Cambrian through Pennsylvanian. Surface rocks in the vicinity are of the Pennsylvanian Age. They have been divided, in ascending order, into the Pottsville, Allegheny and Conemaugh Groups.

The stratigraphic sequence as related to coal is associated with the Allegheny Group. The formation is approximately 280 feet thick and is at or near the surface in the northern half of the county. The Allegheny Group contains eight commercial coal beds. In ascending order they are the Brookville and Lower and Upper (scrubgrass) Clarion coals, which are below the Vanport Limestone and the Lower, Middle and Upper Kittanning coals and the Lower and Upper Freeport coals, which are located above the Vanport Limestone. It is interesting to note that in the Annandale Mine Area the Brookville and Clarion coal beds merge to form what is considered to be a Clarion coal bed. The Annandale No. 2 Mine was worked in the early twentieth century and produced Clarion coal ranging from 36 to 42 inches in thickness.

The structure of the area is part of the Appalachian foreland and is located at the northeastern end of the Pittsburgh - Huntington basin. This large northwest - southwest trending down-fold of strata has many smaller folds superimposed on its flanks. Regional dip is generally one degree and rarely exceeds two or three degrees.

Hydrology - Precipitation

Data gathered from Climatology Bulletins of the United States Department of Commerce reveals an average precipitation of 41.9 inches per year (1965-1972, Slippery Rock Station). Generally, more rain falls in the eastern half of the county than in the western half. During the Slippery Rock Creek Watershed Study performed by Gwin, Dobson and Foreman, Inc. in 1969, rainfall was recorded at Boyers, which is in the immediate vicinity of the Annandale No. 2 Mine. The highest monthly total was 5.5 inches in August and the lowest reading of 0.2 inches occurred in February.

The area is characterized by a short, humid and continental type of climate. The average yearly temperature of the area is 49 degrees farenheit.

Hydrology - Groundwater

The main aquifers in this vicinity are contained in the Allegheny Group. This formation is capable of supplying moderate amounts of water to residential wells. Yields range from 5 GPM to more than 50 GPM in the northern part of Butler County. Deeper wells encounter the Pottsville Group which crops out along the major streams in this area. Yields in the aquifer average 36 GPM. The main water quality problems are high iron content, hardness and acidity mainly from association of the water with sulfur-bearing coal stratas.

Hydrology - Streams

The Annandale No. 2 Mine is drained by Seaton Creek. Mine acid drainage enters the creek 2.3 miles from the confluence of Seaton Creek with Slippery Rock Creek. Water drains from the mine at the southeastern openings. The overall water quality of these discharges has an average pH of 3.2 and yields 526 pounds per day of acid. The creek, as a whole, produces 60% of the total acid discharge to Slippery Rock Creek and is its major polluter. Seaton Creek has a drainage area of 10.1 square miles and 6.1 miles of acid affected stream.

Hydrology - Soil Group

Though considerable soil has been eroded away by strip mine activity, most of the area has substantial amounts intact. The mine vicinity is characterized by steep slopes that range from 2% to as much as 30% at the southeastern section.

A hydrologic soil group is a group of soils having the same runoff potential under similar storm and cover conditions. The soil series predominant in this area is the Gilpin, Ernest, Wharton and Cavode association. The Gilpin soil is moderately deep and well drained and can be found on steep hillsides and ridge tops. The Ernest Group is located on lower slopes where the soil is thicker and the Wharton and Cavode soils are on benches and hilltops overlying thick beds of clay shales. These soils are all deeper than the Gilpin, but are somewhat poorly drained. This entire series is classified by the Soil Conservation Service as a Group C Soil. Materials in this category have considerable amounts of clay and colloid and have below average infiltration after presaturation. Their characteristics include slow permeability, seasonal high water table and somewhat limited depth to bedrock.

Land Use

The Annandale mine area is primarily a wooded region. Pennsylvania Route 308 traverses a north-south direction at the western end of the mine while Pennsylvania Route 338 runs east-west at the northern end. The only residential areas are at Murrinsville and Deegan Goff Station and both are very small villages. An abandoned sandstone quarry is located near Deegan. Strip mines, mostly unreclaimed, occupy most of the southeastern end of the area.

Overall, steep slopes, poor groundwater quality and unsightly strip areas prohibit rapid development of this area.

Property Owners

Property Owner	Township	Deed Book	Page No.	Minerals	Acres
1. John Murrin Heirs	Marion	1000	307	Owns all	229.7
c/o Mrs. V. Murrin				Minerals	
115 W. Diamond St.					
Butler, PA 16001	Marion	757	456		
2. R.D. Ambrose	Marion	No Listing		Owns all	150
c/o James F. Ambrose				Minerals	
316 3rd St.					
Pittsburgh, PA 15125					
3. Ernest Zilka	Marion	1031	252	Owns all	18
Harrisville, PA				Minerals	
16038					
4. James Kennedy	Marion			Owns all	
218 First St.	Marion	773	324	Minerals	80
Davis, Calif. 95616					
5. T. Boyce	Venango	No Listing		Owns all	20
R.D.#1				Minerals	
Boyers, PA 16020					
6. Ernest Hindman, Hrs.	Venango	998	773	Owns all	325
c/o John M. Hindman		518	222	Minerals	
R.D.#1		552	33		
Boyers, PA 16020		380	429		
7. St. Alphonsus Church	Marion	No Listing		Owns all	3
R.D.#1				Minerals	
Boyers, PA 16020					
8. Thomas Kennedy	Venango	773	328	Owns all	90
4 Blossum Lane	Venango			Minerals	
Middletown, N.J.	Marion				

Property Owner	Township	Deed Book	Page No.	Minerals	Acres
9. W. Farren Grove City, PA 16127	Venango	554	13	Owns all Minerals	30
10. Gary Dillaman R.D.#1 Boyers, PA 16020	Marion	1031	256	Owns all Minerals	1
11. Richard Dillaman R.D.#1 Harrisville, PA 16038	Marion	853	584	Owns all Minerals	2
12. Rodney Hedglin R.D.#1 Boyers, PA 16020	Marion	989	92	Owns all Minerals	1
13. Paul Fitzgerald R.D.#1 Boyers, PA 16020	Marion	598 661	365 301	Owns all Minerals	1
14. Donna Craig R.D.#1 Boyers, PA 16020	Marion	926	988	Owns all Minerals	40
15. Ken Ford R.D.#1 Boyers, PA 16020	Marion	1031	231	Owns all Minerals	1.5
16. Thomas Reed R.D.#1 Boyers, PA 16020	Marion	1029	980	Owns all Minerals	1
17. Naomi Shimo R.D.#1 Boyers, PA 16020	Marion	950	257	Owns all Minerals	2

Water Sources

The water sources within the hydrologic area affected by the sealing of the Annandale No. 2 Mine were located and sampled. A chemical analysis was then performed by Green International, Inc., Sewickley, Pennsylvania to determine relative water quality and is presented at the end of this report. Pertinent data pertaining to depth of well and casing were also gathered. The following sources correspond to those found on the map of the mine area.

Water Source	Source Type	Well Depth	Casing Depth	Aquifer
1. Esther Mitchell Deegan Goff Station	Well	Unknown	Unknown	Unknown
2. Sam Tithe Deegan Goff Station	Spring			Clarion Formation
3. Laura Boyce Rt. 308	Well	Unknown	Unknown	Unknown
4. Gary Dillaman Rt. 308	Well	100'	20'	Kittanning Formation

	Water Source	Source Type	Well Depth	Casing Depth	Aquifer
5.	Rodney Hedglin Murrinsville	Well	107'	20'	Kittanning Formation
6.	Paul Fitzgerald Murrinsville	Well	125'	Total	Kittanning Formation
7.	Tom Reed Murrinsville	Well	150'	Total	Kittanning Formation
8.	Naomi Shimo Murrinsville	Well	35'-40'	None	Kittanning Formation
9.	Richard Dillaman Murrinsville, Rt. 338	Well	55'	10'	Kittanning Formation
10.	St Alphonsus Church Murrinsville	Well	270'	None	Clarion Formation
11.	Donna Craig Top Hill, Murrinsville	Well	130'-140'	Total	Kittanning Formation
12.	Ken Ford Top Hill, Murrinsville	Well	230'	Unknown	Kittanning Formation

Hydrologic Area

When a mine is closed by a seal, a hydraulic head is produced and results in flooding the entire complex and causing a perched water table to be formed. The hydrologic area that will be affected by sealing the Annandale No. 2 Mine is that area from the elevation of the highest mine seal to 20 feet higher than the elevation of the lowest mine seal. The area encompasses a total of 633 acres including the 295 acres of the outlined Annandale No. 2 Mine. A verbal description of this area is as follows: Along the eastern limits of the mine workings roughly following the 1300 foot contour; along the south passing to the north of Deegan; along the west between the stripped land and the western limits of the mine workings; and crossing the northernmost limits of the mine to the north of Murrinsville. The accompanying illustration reveals the scope of this area.

Runoff Computation

Two methods of determining runoff are adaptable to this small watershed. The Rational Method (Q=CIA) is one of the most widely used methods of relating runoff to rainfall. The runoff coefficient, C, is the component of the formula that requires the most judgement of the engineer. The coefficient is not amenable to exact determination in rural areas because of the variable nature of the soil to temperature, infiltration capacity, interception, etc. The method employed by the Soil Conservation Service for runoff determination accounts for rural soil variability and was used in this report. The Engineering Field Manual of the SCS (Chapter 2) contains the reference for the following computations.

The 633 acre watershed is located in a Type II storm distribution area. The soil has been classified in hydrologic soil group C with an average slope of 11 per cent. A physical breakdown of the area is as follows:

2%	-	Paved roads
3%	-	Residential lots, 1-acre
75%	-	Forest land, good cover
20%	-	Stripped land, poor cover

The volume and peak rate of runoff from a 24 hour and 10 year frequency storm is desired.

1. A weighted CN (similar to coefficient "C" of the Rational Method) is required. (page 2-30, EFM).

	Per Cent	CN	Per cent X CN
	.02	98	1.96
	.03	79	2.37
	.75	70	52.5
	.20	77	15.4
Total	1.00		72.23 (round to 72)

2. The storm rainfall for a 10-year storm is found in Exhibit 2-3, sheet 3 of 5. Assume a depth of 4 inches.
3. The volume of runoff from Exhibit 2-7 is 1.47 inches for a rainfall of 4 inches and a CN of 72.
4. The peak discharge for a moderate slope (4%), 633 acre watershed, 4 inch rainfall and CN 72 is:
   CN 70 (Exhibit 2-10, sheet 10 of 21) = 215 cfs
   CN 75 (Exhibit 2-10, sheet 11 of 21) = 320 cfs
   CN 72 = 215 + 2/5(320-215) = 257 cfs (4% slope)
5. The peak discharge for a steep slope (16%), 633 acre watershed, 4 inch rainfall and CN 72 is:
   CN 70 (Exhibit 2-10, sheet 17 of 21) = 370 cfs
   CN 75 (Exhibit 2-10, sheet 18 of 21) = 535 cfs
   CN 72 = 370 + 2/5(535-370) = 436 cfs
6. Using figure 2-1, the peak discharge is interpolated to be 370 cfs for an 11% slope.
   The tabulation below is for storms of various frequencies.

24 Hour Storm Frequency	Inches Rainfall	Inches Runoff	Peak Discharge cfs
50	5	2.2	580
25	4.5	1.84	465
10	4	1.47	370
5	3.25	1.14	225
2	2.5	0.54	120

Affects of Mine Sealing on Water Sources

The sealing of the Annandale No. 2 Mine will produce a "damming" effect and cause the complex to flood and a perched water table to be formed. The question at hand is whether the flooding will adversely effect the water sources (wells) within the hydrologic area. The procedure related the well depths (surface elevations approximated) to the elevation of the flooded water in the mine (using approximate coal contours). The summaries that follow are deemed to be sufficiently accurate. However, this must be tempered by the fact that the investigation was not supplemented by a complete exploratory drilling program and is only cursory in nature.

Esther Mitchell: Though information was not secured relative to well depth and casing, the Mitchell well is located outside the hydrologic area and is approximately 25 feet (surface elevation) below the mine portals. This would indicate that the mine sealing would not effect this water source.

Sam Tiche: The source (spring) is located on the outskirts of the hydrologic area. From more accurate mine seal maps previously prepared, the spring is located 40 feet below the mine entrances. The proposed mine sealing should not deteriorate this water source, only if there is a slight chance it is from the crop of the applicable coal.

Laura Boyce and Gary Dillaman: No information could be gathered from the Boyce well. However, the Dillaman well located across the road was drilled to a depth of 100 feet and is above the flood crest in the mine. If the Boyce and Dillaman sources are assumed to be in the same zone and aquifer (major possibility), the wells would not be affected by the mine sealing.

Rodney Hedglin: This well is 107 feet in depth and is about 40 feet above the flood crest. No problem is foreseen at this source.

Paul Fitzgerald: The well is 125 feet in depth, totally cased and is approximately 20 feet above the expected crest level. Again, no problem should be anticipated here.

Tom Reed: Since this well is entirely cased, the mine sealing program will not affect the source.

Naomi Shimo: The water source is a dug well, 35 to 40 feet in depth. Again, no problem is anticipated at this location.

Richard Dillaman: This well is 55 feet deep and cased 10 feet at the bottom of the hole. It is well above the flood crest level.

St. Alphonsus Church: It was revealed by a worker at the church that the well was drilled through coal and is not cased. As anticipated, the water is of extremely poor quality (high iron and sulfate content) and is not being used for drinking purposes. The mine flooding would enter this well, but the water is of such poor quality that it would not affect it that badly. Upon accumulation of additional funds, the church will drill a new well with adequate casing. This would eliminate the problem of flooded water entering the system.

Donna Craig: This well is located at such a high elevation that its depth is well above the approximate flood crest.

Ken Ford: Since this well is entirely cased, the mine sealing program will not affect this source.

Summary - Annandale No. 2 Mine

The majority of the water sources will not be affected by the proposed mine sealing. The exceptions are the Boyce well, Church well and Tiche spring which are, at most, borderline cases. It is felt that these water sources have only a slight chance of being affected. A conclusion that can be drawn from this cursory investigation is that it is highly unlikely that the sealing of the Annandale No. 2 Mine would affect private water supplies.

HALLSTON "BIG FOUR" MINE

Introduction

The purpose of this report is to investigate the property and hydrology that will be affected by the sealing of the Hallston "Big Four" Mine complex in Cherry, Clay and Slippery Rock Townships in Butler County. The proposed hydraulic sealing of the mine complex will drastically reduce the mine acid drainage to Glade and Coaltown runs (tributaries to Slippery Rock Creek).

The preparation of this report is similar to the one performed for the Annandale No. 2 Mine. Property and mineral rights identification, delineation of the hydrologic area and water source location and sampling were undertaken. A map of the Hallston complex is included with all relevent information illustrated.

Geology

The structure and stratigraphy of the area is considered to be the same as the Annandale No. 2 Mine vicinity.

Deep mining was performed at Hallston in the period from 1900-1920. The Middle Kittanning coal seam, the second most valuable bed in the county in terms of original resources in the ground, was mined at an average depth of 36 inches.

Hydrology - Precipitation

Data gathered by the U.S. Weather Bureau at Slippery Rock reveals an average precipitation of 41.9 inches per year. During the Slippery Rock Creek Watershed Study performed by Gwin, Dobson and Foreman, Inc. in 1969, rainfall was recorded at Slippery Rock, which is in the immediate vicinity of the Hallston Mine. The highest monthly total was 4.69 inches in July and the lowest reading of 0.59 inches occurred in February.

Hydrology - Groundwater

The main acquifers encountered in this area are the Allegheny (Freeport, Vanport Limestone and Clarion subgroups) and Pottsville (Homewood, Mercer and Connoquenessing subgroups) formations of the Pennsylvanian system. Groundwater yields are analagous to those in the Annandale vicinity.

Hydrology - Streams

The Hallston Mine vicinity is drained in part by Glade Run (231 acres) and the remaining area by Coaltown Run (358 acres).

Glade Run is located to the south of the mine. An unnamed tributary of Glade Run receives acid discharge that produces a daily average of 129 pounds of acid and has a pH of 3.2. The point of entry is 2.9 miles from the confluence of Glade Run with Slippery Rock Creek. The run drains an area of 7.9 square miles; has 4.8 miles of acid affected stream and is classified as a variable-acid watercourse.

Coaltown Run and an unnamed tributary to it receives acid discharge to the north of the mine. The tributary, located .8 miles from Slippery Rock Creek (S.R.C.), receives mine acid with a pH of 4.1 and a small daily acid loading of 31 pounds. At a distance of 1.2 miled from S.R.C., the main stem of Coaltown Run drains mine acid with a pH of 4.3 and a daily acid production of 10 pounds. Coaltown Run drains an area of 2.9 square miles and is considered to vary between being acid or alkaline; depending on the time of the year.

Hydrology - Soil Group

The Hallston Mine area is located on a hill with gentle slopes on top and relatively steep grades (20%) on all sides. Stripping has been performed around the perimeter of the mine and seems to be fairly well vegetated and thus preventing excessive runoff.

The soil series predominant in the area is the Gilpen, Ernest, Wharton and Cavode association. It is classified by the Soil Conservation Service as a Group D Soil. The properties of this soil have been discussed in the Annandale report.

Land Use

Like the Annandale area, the Hallston Mine is primarily a wooded region. Township Route T-424 bisects the mine area in a northwest-southwest direction and is overgrown and one-directional at some places. The area is located in four townships and may account for the poor maintenance of the road. A sheep farm with accompanying pasture and crop fields is the only agricultural activity within the hydrologic affected area. An extensive campground provides lots to prospective owners and is located on the hill. Eight other dwellings are the only other signs of inhabitance.

Overall, an improvement of the road and groundwater quality could lead to future migration and farming. At the present time the area is limited to week-end campers and a few homeowners.

Property Owners

Property Owner	Township	Deed Book	Page No.	Minerals	Acre
1. Wm. R. Roudybush R.D.#4 Slippery Rock, PA 16057	Slippery Rock	820	255	Owns all Minerals	58.6
2. Howard L. Stamm R.D.#4 Slippery Rock, PA 16057	Slippery Rock	503	66	Owns all Minerals	94
3. Allan W. Larson R.D.#4 Box 238 Slippery Rock, PA 16057	Clay	963	294	Owns all Minerals	53 29 51

Property Owner	Township	Deed Book	Page No.	Minerals	Acre
4. M.R. Neal R.D.#4 Slippery Rock, PA 16057	Clay	969	442	Owns all Minerals	98.8
5. Emanuel Kober R.D.#4 Slippery Rock, PA 16057	Cherry	503-519 547	208-247 419	Owns all Minerals	94
6. Marvin Tancraitor 1102 Braddock-Ardmore Ave. Pittsburgh, PA 15221	Clay	623	95	Owns all Minerals	32
7. Wm. E. Johnston Box 142 Wildwood, PA 15091	Slippery Rock & Cherry	695	124	Owns all Minerals	50.6
8. Archelaus Weeks R.D.#4 Slippery Rock, PA 16057	Cherry	621	110	Owns all Minerals	32
9. Helen Barron R.D.#4 Slippery Rock, PA 16057	Cherry	982	218	Owns all Minerals	37
10. Fred Huntertmark R.D.#1 Slippery Rock, PA 16057	Slippery Rock	627 666	543 385	Owns all Minerals	30
11. Charles Broad	Cherry	931	149	Owns all Minerals	73
12. E.B. Beal, Inc. 208 Soeder Dr. Glenshaw, PA 16057	Cherry	909	339	Owns all Minerals	76
13. Helen N. Barron & Walter R. Bittenbender R.D.#4 Slippery Rock, PA 16057	Cherry	932	17	Owns all Minerals	18
14. Arthur West Plan R.D.#2 Volant, PA 16156	Cherry	962	1014	Ind. Owners Own Rights	113
15. West Hilltop Acres R.D.#2 Volant, PA 16156 (Individual Lot Owners follow.)	Cherry	985	244	Indv. Owners Own Rights	90

Property Owner	Township	Deed Book	Page No.	Minerals
A-1 Raymond J. & Lou Ann Sadowski 3020 Ruthwood St. Pittsburgh, PA 15227	Cherry	986	834	Owns all Minerals
A-2 Richard W. & Carmen C. Kukulka 245 Sprats Dr. Clarion, PA 15025	Cherry	988	531	Owns all Minerals
A-3 Clyde W. & Moraine J. Triplets, Jr. 3759 Pitney Dr. Allison Park, PA 15101	Cherry	988	527	Owns all Minerals
A-4 Flood L. & A-5 Margaret M. Lent Box 13006 411 Pinyin Dr. Pittsburgh, PA 15243	Cherry	994	762	Owns all Minerals
A-6 Bernard M, & A-7 Patricia B. Germ 333 James St. N. Versailles, PA 15137	Cherry	989	389	Owns all Minerals
A-8 Demetrius & Delores Thomas 115 Warren Ave. New Kensington, PA 15068	Cherry	988	523	Owns all Minerals
A-9 John & Margaret Yuricek 1142 Pacific Ave. Brackenridge, PA 15014	Cherry	987	1038	Owns all Minerals
A-10 Dale A. & Marsha A. Bowser 295-M Marshall St. R.D.#3 Tarentum, PA 15084	Cherry	988	535	Owns all Minerals
A-11 Joseph R. & Dorothy A. Siemon 158 1/2 James St. Springdale, PA 15144	Cherry	988	519	Owns all Minerals
A-12 William J. & Sharon R. Harr 15867 Prospect Rd. Strongsville, Ohio	Cherry	993	213	Owns all Minerals
A-13 Paul, Tony, Ralph & A-14 Rocco Marasia 877 Brackenridge Ave. Brackenridge, PA 15014	Cherry	988	381	Owns all Minerals
A-15 Peter Derbish A-16 Pittsburgh, PA 15212	Cherry	992	177	Owns all Minerals

Properties to east of West's Hill Top Acres Plan

Property Owner	Township	Deed Book	Page No.	Minerals
3? Thomas M. Markewinski Valley View St. Pittsburgh, PA 15214	Cherry	1011	683	Owns all Minerals
39-C Mary Ann Patterson 1605 Broadway Ave. Pittsburgh, PA 15200	Cherry	1011	691	Owns all Minerals
39-F Roy J. & Karyl E. Green 270 Woodside Dr. N. Huntington, PA 15642	Cherry	1013	591	Owns all Minerals
39 Roy J. Green	Cherry	1013	587	Owns all Minerals
39-E Robert A. & Karen Phillips, III 3314 Regan Ave. Pittsburgh, PA 15227	Cherry	1011	982	Owns all Minerals
39-D Roy J. Kunesky 831 Tripoli St. Pittsburgh, PA 15212	Cherry	1011	687	Owns all Minerals
39-B John H. & Theresa A. Dill 1221 Success St. Pittsburgh, PA 15212	Cherry	1011	675	Owns all Minerals

West's Hill Top Acres Plan

Property Owner	Township	Deed Book	Page No.	Minerals
A-1 D.G. Beckcr 132 Catskill Ave. Pittsburgh, PA	Cherry	993	397	Owns all Minerals
A-2 J.E. McGuire R.D.#2 Box 454A Charleroi, PA 15022	Cherry	997	584	Owns all Minerals
A-3 G.S. Repcheck 3467 McClure Ave. Pittsburgh, PA	Cherry	993	815	Owns all Minerals
A-5 G.W. Braun A-6 204 Buttercup Rd. Butler, PA 16001	Cherry	993	755	Owns all Minerals
A-7 J. Rushton 1471 Sloan Ave. Pittsburgh, PA	Cherry	993	751	Owns all Minerals
A-8 R.J. Gray 1110 Virginia Ave. Pittsburgh, PA	Cherry	997	5	Owns all Minerals
A-9 J.J. Green 1162 North Ave. Pitcarion, PA 15140	Cherry	994	1062	Owns all Minerals

West's Hill Top Acres Plan (con't)

Property Owner	Township	Deed Book	Page No.	Minerals
A-10 J.J. Hester 562 Burr St. Pittsburgh, PA 15210	Cherry	993	731	Owns all Minerals
A-11 George Probst 552 Adams St. Rochester, PA 15074	Cherry	993	743	Owns all Minerals
A-12 Robert L. Terek 1929 Pennsylvania Ave. West Mifflin, PA 15122	Cherry	1001	122	Owns all Minerals
A-13 C. & A.E. Fowler, Jr. 4615 Parnell St. Pittsburgh, PA 15207	Cherry	993	723	Owns all Minerals
A-14 Thomas J. Decristofaro 169 Alcan Dr. Pittsburgh, PA 15329	Cherry	993	735	Owns all Minerals
A-15 Gregory M. Ravintz 1154 Voskamd St. Pittsburgh, PA 15212	Cherry	1023	767	Owns all Minerals
A-16 T.D. Piper No listing	Cherry	994	770	Owns all Minerals
A-17 Carl H. Simpson R.D.#4 Slippery Rock, PA 16057	Cherry	1001	126	Owns all Minerals
A-18 Robert D. Ciardi 124 Gilmore Dr. Pittsburgh, PA 15235	Cherry	993	739	Owns all Minerals
A-19 John S. Elliott, Jr. 3730 Holly Springs Dr. Allison Park, PA 15101	Cherry	1001	754	Owns all Minerals
A-20 Richard C. Ritz Box 95 R.D.#1 Champion, PA 15622	Cherry	993	819	Owns all Minerals
A-21 Louis R. Brahler A-22 R.D.#4, 242 B Slippery Rock, PA 16057	Cherry	994	9	Owns all Minerals
A-23 Zoltan S. Seech, Jr. 111 Second Ave. West Mifflin, PA 15122	Cherry	994	774	Owns all Minerals
A-24 Edward V. & D.M. Weibel & S.J. & D. Falatovich R.D.#6, Middletown Rd. Greensburg, PA 15601	Cherry	994	331	Owns all Minerals
A-25 R.L. Allison R.D.#6 Middletown Rd. Greensburg, PA 15601	Cherry	994	327	Owns all Minerals

West's Hill Top Acres Plan (con't)

Property Owner	Township	Deed Book	Page No.	Minerals
A-26 Ernest W. Baxter 3220 Haberlein Rd. Gibsonia, PA 15044	Cherry	994	1	Owns all Minerals
A-27 Felix J. Cancino 1526 Kansas Ave. White Oak, PA 15131	Cherry	992	958	Owns all Minerals
A-28 William A. Ammer 4324 W. 145th St. Lawndale, Calif. 90260	Cherry	997	801	Owns all Minerals
A-29 Robert E. Flaherty 2308 Walton Ave. Pittsburgh, PA 15210	Cherry	994	13	Owns all Minerals
A-30 John B. Till 205 Yosemite Drive Pittsburgh, PA	Cherry	993	472	Owns all Minerals
A-31 David A. Ritenour 2517 Wenzell Ave. Pittsburgh, PA	Cherry	996	799	Owns all Minerals
A-32 Edward W. Friday 138 S. Joslyn Drive Pittsburgh, PA 15235	Cherry	997	588	Owns all Minerals
A-33 Carmen J. Marmo Box 523 Main St. Russelton, PA 15076	Cherry	994	5	Owns all Minerals
A-34 Paul R. Grieser 208 Dature Dr. Pittsburgh, PA 15235	Cherry	993	287	Owns all Minerals
A-35 Carmen J. Marmo Box 523 Main St. Russelton, PA 15076	Cherry	994	17	Owns all Minerals
A-36 Emanuel Kober, Jr. Box 210 A, R.D.#4 Slippery Rock, PA 16057	Cherry	994	21	Owns all Minerals
A-37 D.B. Sallade No listing	Cherry	1029	85	Owns all Minerals
A-38 Lawrence J. Krahling 305 Statler Rd. Pittsburgh, PA 15235	Cherry	1024	443	Owns all Minerals
A-39 Paul N. Lakits 4026 Brownsville Rd. Pittsburgh, PA 15227	Cherry	1028	21	Owns all Minerals
A-40 Frank Osowski 2328 Valera Drive Pittsburgh, PA	Cherry	994	323	Owns all Minerals

Water Source

The water sources within the hydrologic area affected by the sealing of the Hallston "Big Four" Mine were located and sampled. A chemical analysis was then performed by Green International Inc., Sewickley, Pennsylvania, to determine relative water quality. Pertinent data relative to depth of well and casing were also gathered.

The sources listed below correspond to those found on the identification map.

Water Source	Source Type	Well Depth	Casing Depth	Aquifer
1. Allen Larsen T-424	Well	300'	40'	Connoquenessing Formation
2. M. Tancraitor T-424	Roof-Cistern	---	---	---
3. Allen Larsen T-424	Well	150'	20'	Kittanning Formation
4. Walter Barron T-424	Well	350'	230'	Connoquenessing Formation
5. E. Kober Jr. T-424	Well	367'	112'	Connoquenessing Formation
6. Gresscott T-424	Well	130'	Total	Kittanning Formation
7. W.R. Roudybush T-424	Well	289'	Total	Homewood Formation
8. Steihm West Hilltop Acres	Well	110'	Total	Kittanning Formation
9. Leitem West Hilltop Acres	Well	367'	138'	Connoquenessing Formation
10. Louis Brahler West Hilltop Acres	Well	327'	None	Homewood Formation
11. Carl Simpson West Hilltop Acres	Well	167'	20'	Kittanning Formation
12. M.R. Neal Hallston Road	Spring	---	---	Kittanning Formation

Hydrologic Area

When a mine is closed by a seal, a hydraulic head is produced and results in flooding the entire mine and causing a perched water table to be formed. The hydrologic area that will be affected by sealing the Hallston "Big Four" Mine Complex is that area from the elevation of the highest mine seal to 20 feet higher than the elevation of the lowest mine seal. The area encompasses 589 acres including 241 acres of the outlined Hallston "Big Four" Mine area.

A verbal description of the area is as follows: Along the south following the 1360 foot contour just beneath the elevation of the deep mine openings; along the eastern limits of the mine northward, crossing T-424 and following the 1300 foot contour to the westernmost mine openings.

The accompanying map illustrates the above.

Runoff Computation

As mentioned previously, the Soil Conservation Service method of runoff determination will be utilized.

Two creeks; Glade Run and Coaltown Run, drain water from the mine area. Glade Run drains 231 acres while Coaltown Run services 358 acres. The calculation will be carried out for Glade Run and the Engineering Field Manual of the S.C.S. will be referred to.

The 231 acre watershed is located in a Type II storm distribution area. The soil has been classified in hydrologic soil group C with an average slope of 8%. A physical breakdown of the area is as follows:

50%	-	Woods, good cover.
20%	-	Pasture, good condition.
30%	-	Open area, more than 75% grass covered.

The volume and peak rate of runoff from a 24 hour and 10 year frequency storm is desired.

1. A weighted CN is required (page 2-30, EFM)

Percent	CN	Percent X CN
.50	77	38.5
.20	74	14.8
.30	74	22.2
1.00		75.5 (round to 75)

2. The storm rainfall for a 10 year storm is found in Exhibit 2-3, sheet 3 of 5. Assume a depth of 4 inches.
3. The volume of runoff from Exhibit 2-7 is 1.67 inches for a rainfall of 4 inches and CN 75.
4. The peak discharge for a moderate slope (4%), 231 acre watershed, 4 inch rainfall and CN 75 is:

   CN 75 (Exhibit 2-10, sheet 11 of 21) = 170 cfs
5. The peak discharge for a steep slope (16%), 231 acre watershed, 4 inch rainfall and CN 75 is:

   CN 75 (Exhibit 2-10, sheet 18 of 21) = 270 cfs
6. Using figure 2-1, the peak discharge is interpolated to be 220 cfs for an 8% slope.

The following tabulation is for storms of various frequencies.

24 Hour Storm Frequency	Rainfall (inches)	Runoff (inches)	Peak Discharge (cfs)
50	5.00	2.20	320
25	4.50	1.84	255
10	4.00	1.47	220
5	3.25	1.14	135
2	2.50	0.54	75

A similar tabulation was prepared for the area drained by Coaltown Run. The hydrologic abstract of the area is as follows:

The 358 acre watershed is located in a Type II storm distribution area. The soil has been classified in hydrologic soil group C with an average slope of 12%. A physical breakdown of the area is as follows:

70% - Woods, good cover.
30% - Open area, more than 75% covered with grass.

The volume and peak rate of runoff from various 24 hour storms is required.

24 Hour Storm Frequency	Rainfall (inches)	Runoff (inches)	Peak Discharge (cfs)
50	5.00	2.45	480
25	4.50	2.06	380
10	4.00	1.67	320
5	3.25	1.14	190
2	2.50	0.65	115

Affect of Mine Sealing on Water Sources

As previously discussed, the Hallston "Big 4" Mine would be flooded by a proposed mine sealing project. The possible affect of this inundation on private water supplies is discussed in this section. The techniques that were used for the Annandale No. 2 Mine to determine the possible affect are also applicable for the Hallston Mine. It must be re-emphasized that the following cursory summaries are sufficiently accurate in leiu of a complete exploratory drilling program.

Allen Larsen: This well was drilled to a depth of 300 feet and is located far below the expected flood crest. The casing in the hole is not sufficient to seal the hole from flood waters. There is a strong possibility that this source would be affected by a mine sealing program.

M. Tancraitor: This source (roof-cistern) would not be affected.

Allen Larsen: The well is located at an abandoned house owned by Larson. From drilling and casing information, the well would probably be affected by mine-sealing.

Walter Barron: This water source is 350 feet deep and cased 230 feet. The casing would protect the hole to 10 feet above the elevation of the flood crest. It is not expected that the mine sealing will affect this source.

E. Kober, Jr.: The well is located at a depth far below the expected flood elevation. The casing in the hole is not sufficient to seal the hole from flood waters. There is a strong possibility that the source would be affected by a mine sealing program.

Gresscott: Since this well is totally cased, the mine sealing program is not expected to be a problem.

W. R. Roudybush: Again the hole is entirely cased and is not expected to be affected.

Steihm: The elevation of the bottom of the well is about 40 feet above the expected flood crest. No problem is expected from the proposed sealing program.

Leitem: The well is located at a depth far below the expected flood elevation. The casing in the hole is not sufficient to seal the hole from flood waters. The source is expected to be affected by sealing of the "Big 4" Mine.

L. Brahler: The well was drilled through the mine workings and is not cased. The source would be affected by the sealing program.

C. Simpson: The well is located about 50 feet below the expected flood crest level. The source is expected to be affected by the sealing program.

M. R. Neal: The water source (spring) is located below the hydrologic area and would not be affected by the sealing of the Hallston Mine.

Summary of the Hallston "Big 4" Mine

It is seen that about half of the water sources would be affected by the proposed mine sealing project. It must be noted, however, that general water quality in this area is not good with hardness and excessive sulfate being the main problems. It is also not known how the flood mine waters would affect an already deleterious situation. Therefore, the benefits resulting from a mine sealing project must be carefully weighed against the adverse affects of mine inundations on private water supplies.

WATER QUALITY ANALYSIS — Annandale No. 2 Mine — CHEMICAL ANALYSIS (mg/l)

No.	Date Analyzed	Source	pH	Acidity	Alkalinity	Total Iron	Iron (Ferrous)	Sulfate
1	3-3-77	Esther Mitchel	6.0	0	102	19.8	18.75	368
2	3-3-77	Sam Tiche	6.1	4	14	0.10	0.05	28
3	3-3-77	Laura Boyce	6.8	0	44	0.2	0.05	58
4	7-20-77	Gary Dillaman	4.2	16	22	34	11	638
5	3-3-77	Rodney Hedglin	5.8	2	36	6.1	2.88	34
6	7-20-77	Paul Fitzgerald	5.1	8	14	0.10	0.05	30
7	7-20-77	Tom Reed	6.3	6	36	9.1	6.6	9
8	3-3-77	Naomi Shimo	5.0	8	14	0.1	0.05	48
9	7-20-77	Richard Dellaman	6.4	6	44	7.7	6.06	215
10	7-20-77	St. Alphonsus Church	5.9	8	56	30	7.5	275
11	7-20-77	Donna Craig	5.6	14	32	26	26	738
12	7-20-77	Ken Ford	6.5	0	136	0.45	0.10	108

WATER QUALITY ANALYSIS — Hallston "Big 4" Mine — CHEMICAL ANALYSIS (mg/l)

No.	Date Analyzed	Source	pH	Acidity	Alkalinity	Total Iron	Iron (Ferrous)	Sulfate
1	3-3-77	Alan Larson	7.3	0	196	3.6	0.93	25
2	---	Marvin Tancraitor	---	---	Roof Water	---	---	---
3	3-3-77	Alan Larson	6.7	0	110	0.25	0	438
4	3-18-74	Walter Barron	6.7	0	130	0.6	---	29
5	7-20-77	Emmanuel Kober, Jr.	6.6	8	162	0.42	0.05	263
6	7-20-77	Grescott	6.4	4	76	19	18	355
7	3-3-77	W.R. Roudybush	6.7	0	130	0.35	0	5
[illegible]	---	Charles Steihm	6.9	0	94	4.9	0.39	25
9	7-20-77	Leitem	Water has not been connected to house as of 7-20-77.					
10	7-20-77	Louis Brahler	6.6	0	196	0.16	0	228
11	7-20-77	Carl Simpson	5.7	10	16	0.15	0.05	10

REFERENCES

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Patterson, E.D. and Van Lieu, J.A.; Coal Resources of Butler County, Pennsylvania: United States Geological Survey, Bulletin 1143-C (1971).

Sisler, J.D., Bituminous Coal Fields of Pennsylvania: Pennsylvania Geological Survey, Bulletin M-6, Part II (1928).

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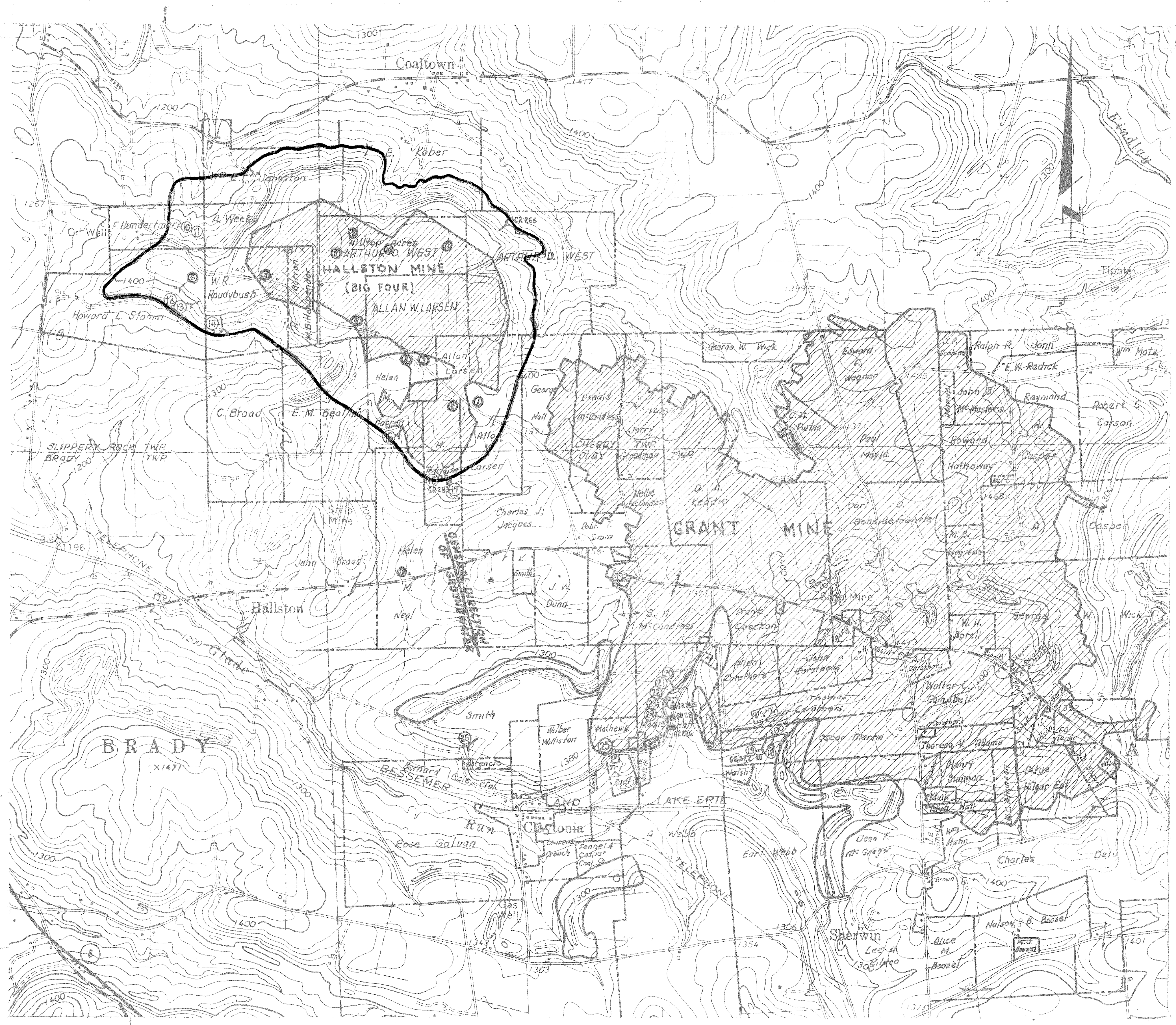


WATER SUPPLY LOCATIONS

NO.	OWNER
1	A. Larsen
2	M. Trncraitor
3	A. Larsen
4	W. Barron
5	E. Kober, Jr.
6	Gresscot
7	W. R. Roudybush
8	C. Steihm
9	Leitem
10	L. Brahler
11	C. Simpson
12	H. Neal

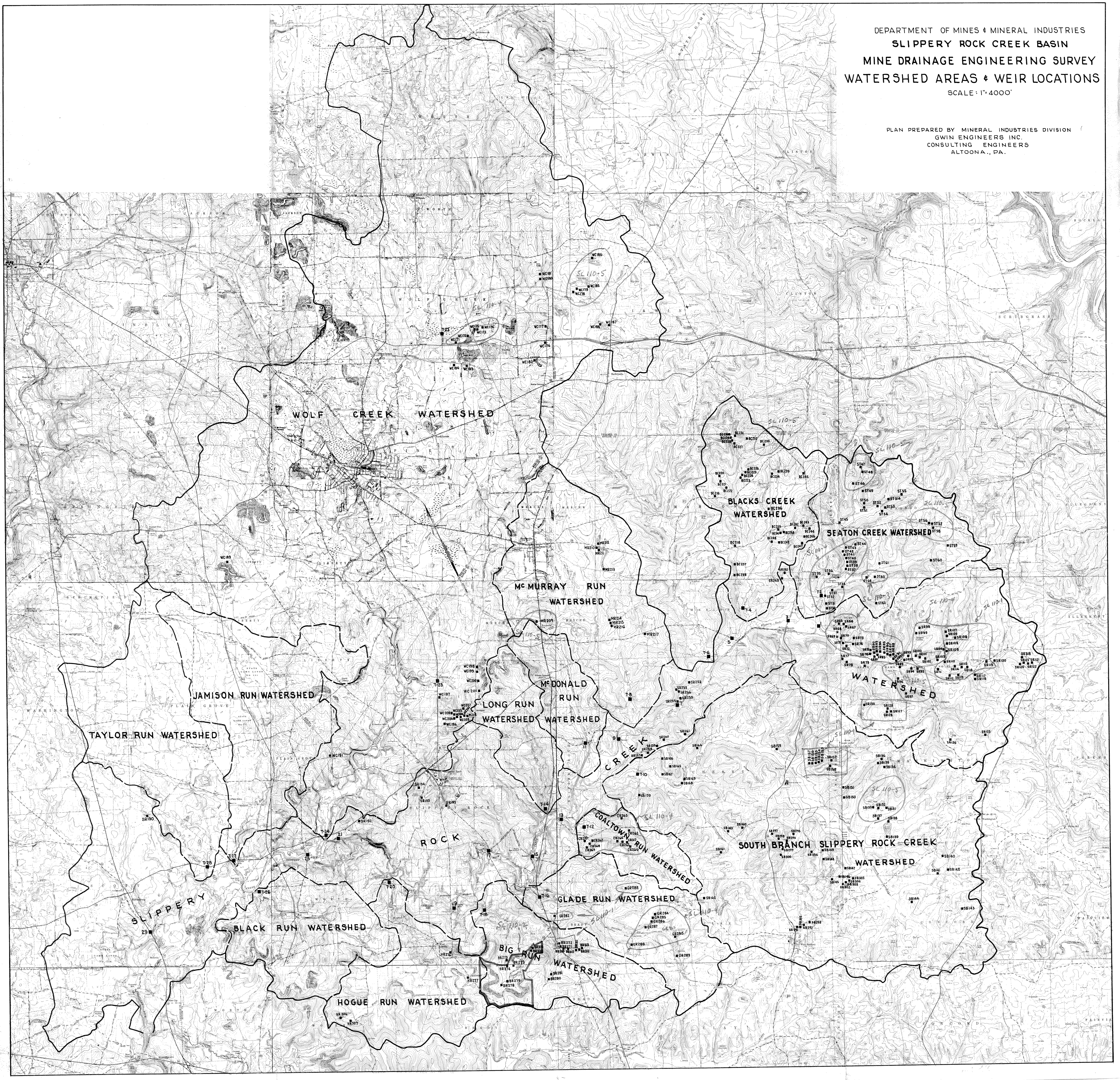
LEGEND

- PROPERTY LINE
- WATER SOURCE
- HYDROLOGIC AREA

DEPARTMENT OF ENVIRONMENTAL RESOURCES
SLIPPERY ROCK CREEK WATERSHED
MINE DRAINAGE
HYDROLOGIC & PROPERTY STUDY
HALLSTON MINE AREA
SLIPPERY ROCK, CHERRY, CLAY & BRADY TWPS., BUTLER CO., PA.

SCALE	GWIN, DOBSON & FOREMAN, INC. CONSULTING ENGINEERS ALTOONA · PENNSYLVANIA	SHEET NO.
1" = 1000'		1

SL 110-4-101.1


DEPARTMENT OF MINES & MINERAL INDUSTRIES
SLIPPERY ROCK CREEK BASIN
MINE DRAINAGE ENGINEERING SURVEY
WATERSHED AREAS & WEIR LOCATIONS
SCALE: 1" = 4000'
PLAN PREPARED BY MINERAL INDUSTRIES DIVISION
GWIN ENGINEERS INC.
CONSULTING ENGINEERS
ALTOONA., PA.
WOLF CREEK WATERSHED
BLACKS CREEK WATERSHED
SEATON CREEK WATERSHED
McMURRAY RUN WATERSHED
McDONALD RUN WATERSHED
LONG RUN WATERSHED
JAMISON RUN WATERSHED
TAYLOR RUN WATERSHED
WATERSHED
CREEK
ROCK
SLIPPERY
COALTOWN RUN WATERSHED
SOUTH BRANCH SLIPPERY ROCK CREEK WATERSHED
GLADE RUN WATERSHED
BLACK RUN WATERSHED
BIG RUN WATERSHED
HOGUE RUN WATERSHED