APPENDIX B

HYDROLOGIC ANALYSIS

"Precipitation - Runoff - Water Loss" Relationship

"Inflow - Outflow - Mine Pool Storage" Relationship

PRECIPITATION - RUNOFF - WATER LOSS RELATIONSHIP

LONG TERM RECORDS: The annual mean flow in inches of runoff over the Solomon Creek Watershed is presented in TABLE B-I. Records of the Toby Creek Station and the Susquehanna River Station at Wilkes-Barre are also shown in the Table. Due to the proximity of Toby Creek to Solomon Creek, precipitation over these two watersheds is considered to be virtually the same. However, the watershed above the Toby Creek gage is outside of the coal measures, whereas a large portion of the watershed above the Solomon Creek gage is within the coal mining area. Comparison between surface runoff from precipitation over these two watersheds indicates that there are losses from Solomon Creek Watershed into the deep mines. The Susquehanna River flow records at Wilkes-Barre reflect the total flow of both mined and unmined watersheds upstream of this station. The river flow represents both surface runoff and mine pool discharges from the drainage area above Wilkes-Barre. The records are presented in terms of inches of runoff for each water year (water year starts from October 1st of the preceeding calendar year to September 30th of the indicated calendar year), from 1961 to 1973. The average flow at each station from the beginning of records until 1961 is also indicated in TABLE B-I.

The present method for reporting USGS records started in 1961. Accordingly, the flow records prior to 1961 are presented as the mean flow for the entire period, whereas the water year records are shown from 1961 to 1973.

TABLE B-I

COMPARISON BETWEEN ANNUAL STREAM FLOW RECORDS

DESCRIPTION			DATA FOR THE INDICATED USGS STATIONS					
STATION			TOBY CREEK		SOLOMON CREEK		SUSQUEHANNA R. AT WILKES-BARRE	
DRAINAGE AREA			32.4 (SQ.MI.)		15.7 (SQ.MI.)		9,960 (SQ.MI.)	
YEARS OF RECORD			33		34		74	
PERIOD TO DATE		ANNUAL PRECIP. (INCH)	FLOW IN INCHES OF RUNOFF AND % OF PRECIPITATION FOR THE INDICATED " WATER YEARS"					
		AVOCA / W.B.4NE	INCHES	(%)	INCHES	(%)	INCHES	(%)
FROM BEGINNING OF RECORDS TO 1961		37.27 / 41.37	20.15	48.71	20.84	50.37	18.97	(1)
	1961	34.79 / 38.62	16.88	43.71	16.11	41.71	18.11	↓ ↓
DROUGHT YEARS	1962	31.96 / 35.48	12.73	35.88	13.45	37.91	12.84	↓ ↓
DROUGHT YEARS	1963	26.22 / 29.10	15.05	51.72	14.97	51.44	14.06	↓ ↓
DROUGHT YEARS	1964	30.33 / 33.67	15.99	47.49	11.67	34.66	15.53	↓ ↓
DROUGHT YEARS	1965(2)	26.35 / 29.25	6.39	21.85	7.33	25.06	8.43	↓ ↓
	1966	28.43 / 31.56	12.34	39.10	9.91	31.40	14.67	↓ ↓
	1967	35.17 / 39.04	14.16	36.27	14.42	36.94	15.22	↓ ↓
	1968	30.75 / 34.13	15.72	46.06	10.94	32.05	18.77	↓ ↓
	1969	35.68 / 39.60	14.23	35.93	7.73	19.52	15.67	↓ ↓
	1970	31.54 / 35.01	16.53	47.22	11.39	32.53	17.25	↓ ↓
	1971	35.67 / 39.59	18.08	45.67	11.36	28.69	18.32	↓ ↓
	1972(3)	45.19 / 50.16	29.96	59.73	16.93	33.75	26.65	↓ ↓
	1973	39.01 / 43.30	24.82	57.32	15.21	35.13	23.58	↓ ↓
MEAN ANNUAL		35.65 / 39.57	18.66	47.16	17.62	44.53	18.60	↓ ↓
STUDY PERIOD 8/1/73-7/31/74		35.91 / 39.87	20.41	51.19	13.16	33.01	19.68	↓ ↓

(1) PRECIPITATION VARIES OVER THE ENTIRE DRAINAGE BASIN
(2) END OF THE PROLONGED DROUGHT PERIOD (1961 - 1965)
(3) INCLUDING THE FLOODS OF JUNE, 1972

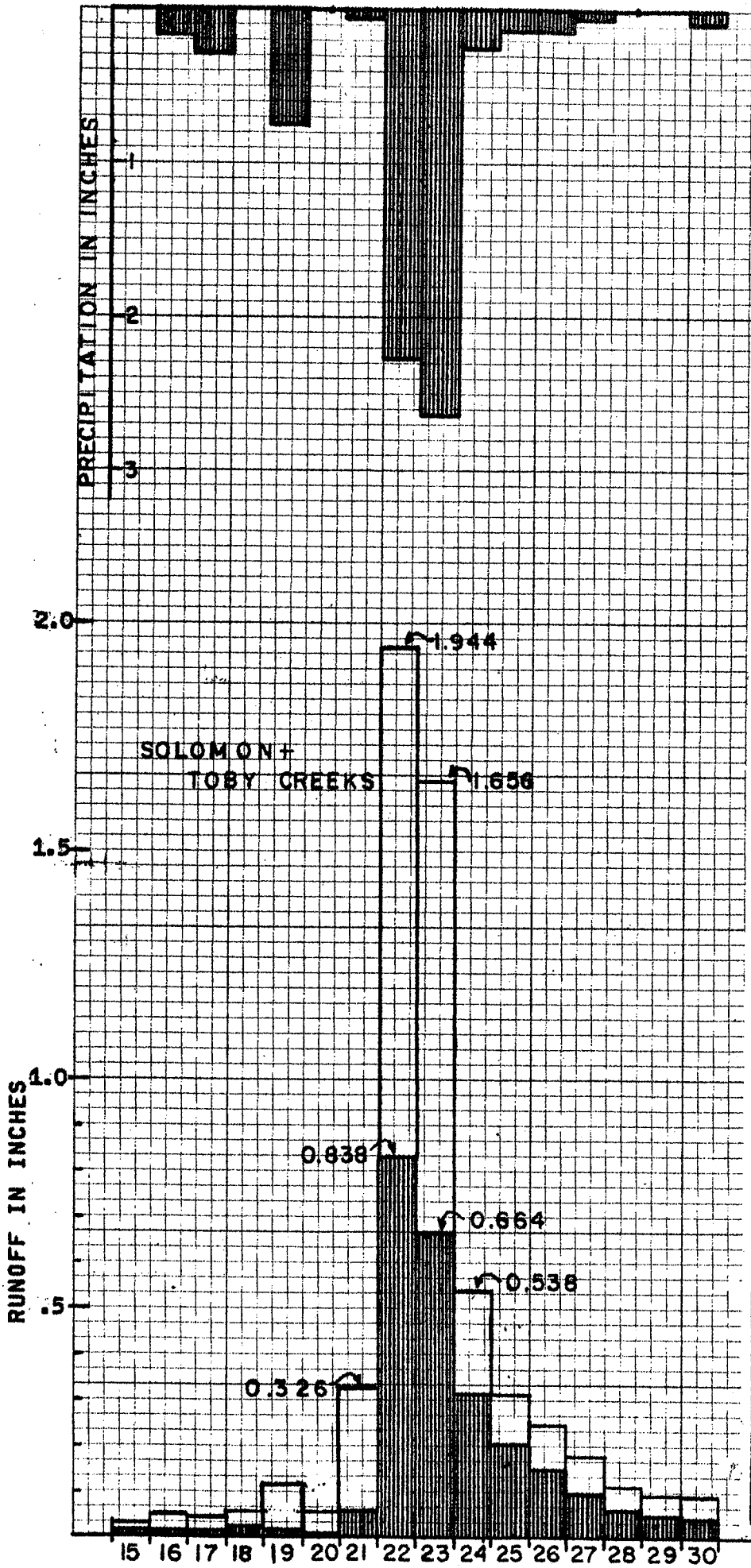
NOTE: 1. THE " AVOCA " STATION IS A FIRST ORDER METEOROLOGIC STATION. HOWEVER, THE " SECOND ORDER " STATION AT WILKES-BARRE (W.B.4NE) BETTER REFLECTS THE PRECIPITATION OVER THE STUDY AREA. PRECIPITATION AT STATION (W.B.4NE) = PRECIPITATION AT AVOCA x 1.11 WHICH IS THE RATIO RECORDED DURING THE STUDY PERIOD.

2. SHADED AREAS INDICATE YEARS WHERE THE RUNOFF IN SOLOMON CREEK REFLECTS WATER LOSSES INTO THE DEEP MINES (COMPARISON WITH TOBY CR.)

Comparison between the records of Toby Creek and Solomon Creek Stations indicates that the mean runoff is virtually the same for both watersheds, from the beginning of records to 1961. A pronounced difference between consecutive runoff records from the aforementioned stations started in the water year of 1968 and continues to the present time. This 1968 date coincides with the termination of pumping from the deep mines in the Solomon Creek Watershed. Although similar differences in runoff are also indicated for the 1964 and 1966 water years, the latter differences may be attributed to the rate of pumping from the deep mines. However, information relating to pumping rates for these years is not available at the present writing.

Prior to the prolonged 1961 to 1965 drought period, the mean annual runoff in the Solomon Creek was 20.8 inches, or 50.4% of the mean annual precipitation. During these drought years the surface runoff was considerably lower, reaching a low of 7.3 inches, or 25% of the precipitation in 1965. After the termination of pumping from the deep mines (water year 1968), surface runoff averaged 12.26 inches, or 30.4% of the mean annual precipitation from 1968 to 1973. Assuming that Toby Creek runoff conditions are comparable to those in Solomon Creek prior to the coal mining activities, the surface runoff in the Solomon Creek Watershed, for the period 1968-1973, would have averaged 19.89 inches, as compared to the aforementioned 12.26 inches. Therefore, the annual surface runoff losses to the deep mines are 19.89" - 12.26 = 7.63 inches, or $\frac{7.63}{40.30} \times 100 = 18.9\%$ of the mean annual precipitation for the period

1968-1973. Based on the above findings, the losses into the deep mines are $\frac{7.63}{19.89} \times 100 = 38.4\%$ of the total watershed runoff. During the June 1972 flood, the calculated losses into the mine pools were 56.8 percent of the total runoff, as indicated by the Hydrograph in FIGURE B-1 which follows.



DATE	INCHES			
	RUNOFF		WATER LOSSES INTO DEEP MINES	PRECIPITATION
	TOBY CREEK	SOLOMON CR.		
1	2	3	4=3-2	
JUNE 1972 14	.032	.010	.022	T
15	.028	.008	.020	0
16	.053	.010	.043	.19
17	.043	.011	.032	.30
18	.068	.022	.046	0
19	.116	.014	.102	.75
20	.068	.008	.060	T
21	.326	.064	.262	.04
22	1.944	.838	1.106	2.27
23	1.656	.664	.992	2.62
24	.538	.322	.216	.24
25	.319	.207	.112	.15
26	.252	.143	.109	.14
27	.176	.096	.080	.04
28	.116	.062	.054	T
29	.098	.045	.053	0
30	.096	.038	.058	.08
TOTAL	5.929	2.562	3.367	6.82

NOTE: T = TRACE

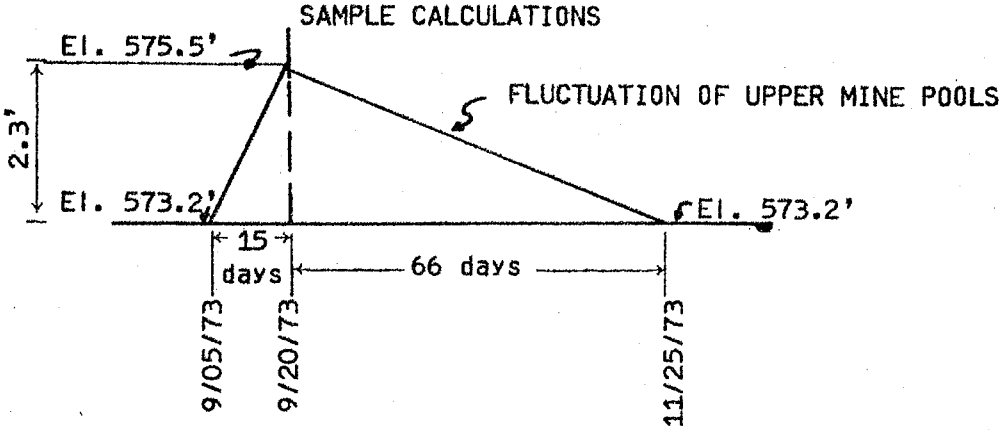
CONCLUSION:
WATER LOSSES TO DEEP MINES DURING THE JUNE 1972 FLOOD WERE $\frac{3.367}{5.929} \times 100 = 56.8\%$ OF THE TOTAL RUNOFF.

SOLOMON CREEK WATERSHED

RUNOFF CHARACTERISTICS DURING THE 1972 FLOOD

FIGURE B-1

" INFLOW-OUTFLOW-MINE POOL STORAGE RELATIONSHIP"
UPPER MINE POOLS
SAMPLE CALCULATIONS



Σ outflow $-$ Σ inflow = Storage

When Pool level drops to elevation 573.2' there is no discharge from the Askam borehole. Mass curve {FIGURE 9} indicates that 1.2 MGD is required to maintain pool level at El. 573.2. Therefore, at Zero discharge from the Askam borehole, Inflow = Outflow = 1.2 MGD at pool level elevation 573.2'.

ASSUMPTIONS:

1. Total outflow from Upper Mine Pools
   Σ outflow = Σ outflow from Askam borehole + 1.2 MGD x Σ days
   Where Σ denotes the sum of accumulative flow for the selected period of consecutive " flow days" .

2. The outflow from the mine pools, other than that recorded for the Askam borehole does not materially increase at mine pool stages above El. 537.2'. Therefore, a constant value of 1.2 MGD is added to each period of recorded outflow from the Askam borehole to obtain the Total Outflow {Σ outflow}.

3. Inflow consists of:

   a. Groundwater recharge

   b. Streambed losses from " base flow" , originating from above the Coal Measures.

   c. Losses from runoff within the Coal Measures into strippings and additional streambed losses due to runoff from above the Coal Measures

For the period shown on Sheet No. 1

Between 9/05/73 and 9/20/73, mine pool levels fluctuated from El. 573.2' (zero discharge from Askam borehole) to El. 575.5' (+2.3')

The Total Outflow for this Period was:

From Askam borehole outflow Mass curve (FIGURE 9) 46.655 - 37.055 = 9.6 MG
From Assumption 2, Sheet 1, unrecorded outflow was 1.2 MGD x 15 days = 18.0 MG
TOTAL OUTFLOW = 27.6 MG

The total inflow for this period consists of:

a. Groundwater recharge (assumed to be included in the following items)
b. Streambed losses of base flow from above the Coal Measures:
   From Tables B-II & B-III, 145 GPM x 15 days x 1,440 = 3.14 MG
   Diversion by Blue Coal Co. from Solomon Creek $\frac{270 \text{ MG}}{365} \times 15 =$ 11.10 MG
   SUB-TOTAL INFLOW 14.24 MG
c. Runoff losses X_1 (see solution of eqs. 3 & 4, see Sheet 3); X_1 = 56.78 MG*
   This runoff consists of the following equations:

$$X_1 = \frac{0.3259\ i}{12"}\ \alpha \quad \text{Equation No. 1}$$

Where i = precipitation during the period of mine pool fluctuation
0.3259 = conversion factor from Acre Feet to Million Gallons

$$\alpha = 0.75C \times 1{,}292.8 + K \times 4{,}460.8 \quad \text{Equation No. 2}$$

C = Coefficient of runoff from areas above the Coal Measures
0.75 = Factor representing streambed losses, obtained from actual measurements made during the study period
K = Loss Coefficient for runoff within the Coal Measures

1,292.8 and 4,460.8 are the areas in acres for the watersheds above and within the Coal Measures, respectively.

Storage = Σ Inflow - Σ OUtflow = 14.24 MG + X_1 - 27.6 MG

= 14.24 MG + 56.78 MG - 27.6 MG = 43.42 MG

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* From Solution of Equations 3 & 4, see Sheet 4

TABLE B-II

SUMMARY OF FLOW RECORDS
NANTICOKE CREEK WATERSHED

DRAINAGE AREA SQ. MI.	1.34				0.61					0.30					
	FLOW IN GPM AT THE INDICATED STREAM MONITORING STATIONS														
DATE	N-8	N-8A	N-8B	N-6	N-9A	N-9	N-7	(N-6) + (N-7	N-5	N-13A	N-13	N-11	N-12	N-11 + N-12	N-10
9/10/73	120*			0	5	0	0	0	0	20	0	1	0	1	0
9/26/73	310*	180		0	–	55*	12	12	2.5*	–	150	6	10	16	12*
10/23/73	180*	8		0	70*	0	0	0	0	25	15	0	0	0	0
11/27/73	240	150**		0	220	35	0	0	2	100	60	4	6	10	3
11/28/73	790	380**		0	–	–	–	–	–	–	–	–	–		–
1/08/74	700	400**	125	0	290	330	–	–	–	180	160	–	–		–
2/05/74	850*	–	10	0	600	**	400*	400	380	280	180	15	8	23	20*
3/20/74	1,100	–	660	250	670	310	550	800	450	250	190	25*	40	65	80
4/30/74	398*	–	20	8	137*	110	110*	118	5**	95	95	10	450		15*
5/30/74	250		0	–	267	20	10**	–	10	70	50	5	5	10	40
6/26/74	250		0	–	137	20	0	–	30	45	20*	10	5	15	100
7/17/74	70*		0	0	70*	0	0	0	0	8	25*	0	0	0	0
8/21/74	40*		0	0	35*	0	0	0	0	9	0	0	0	0	0

* BASE FLOW (NO ANTICEDENT PRECIPITATION FOR AT LEAST 72 HOURS)
** ESTIMATED FLOW

TABLE B-III

RECORDED STREAMBED LOSSES

NANTICOKE CREEK WATERSHED

DATE	STREAM FLOW IN GPM FOR THE INDICATED STATIONS		STREAMBED LOSSES		PRECIPITATION IN INCHES	
	ABOVE COAL MEASURES †	WITHIN COAL MEASURES †	GPM	% OF INFLOW	ACCUM.	PARTIAL
	N-8+N-9A+N-13A	N-5				
(1)	(2)	(3)	(4) (2)-(3)	(5)	(6)	(7)
8/01/73	145*	0	145	100	0.00	
9/26/73	$\frac{310}{1.34}$x2.25=520.5	2.5	518.0	99.5	7.30	7.30
10/23/73	275	0	275	100	8.19	0.89
11/27/73	560	2	558	99.6	10.28	2.09
1/08/74	1,170	NOT REPORTED	877**	75	17.72	7.44
2/05/74	1,730*	380	1,350	78	20.61	2.89
3/20/74	2,020	450	1,570	77.7	24.42	3.81
4/30/74	630*	5	625	99.2	29.83	5.41
5/30/74	587	10	577	98.3	32.50	2.67
6/26/74	432	30	402	93.1	35.57	3.07
7/17/74	148*	0	148	100	37.24	1.67
8/21/74	84*	0	84	100	40.22	2.98

* BASE FLOW

** ESTIMATED AS 75% OF INFLOW

† SEE TABLE B-II

Between 9/20/73 and 11/25/73, mine pool level dropped from El. 575.5' to El. 573.2' {-2.3'}

Since the loss in pool level {-2.3'} is equal to the previous gain in pool level {+2.3'}, the mine pool storage for this period equals the mine pool storage of the previous 15 day period {see sketch on Sheet No. 1}

The total outflow for this period was:

From Askam borehole outflow mass curve {FIGURE 9} 142.905 - 46.655 = 96.25 MG
From Assumption No. 2, Sheet No. 1, unrecorded outflow 1.2MGD x 66 dys = 79.20 MG
Total outflow for the 66 day period = 175.45 MG

The total inflow for the period consists of:

a. Groundwater recharge {assumed to be included in the following items}
b. Streambed losses of base flow from above the Coal Measures:
From Tables B-II & B-III 430 GPM x 66 days x 1,440 = 40.87 MG
Diversion by Blue Coal Co. form Solomon Creek $\frac{270}{365}$ x 66 = 48.82 MG
SUB-TOTAL INFLOW = 89.69 MG
c. Runoff losses X_2 {see solution of equations 3 & 4, this Sheet} X_2 = 42.34 MG*
TOTAL INFLOW 132.03 MG
Storage = Σ outflow − Σ inflow = 175.45 − {89.69 + X_2} = 43.42 MG*
TOTAL INFLOW = 175.45 MG

Since storage between mine pool level El. 573.2' and 575.5' is equal to the storage level between mine pool El. 575.5' and 573.2'

$14.24 \times X_1 - 27.6 = 175.45 - \{89.69 + X_2\}$ . . . . . Equation No. 3
storage 1st period storage 2nd period

Also $\sum_1$ outflow − $\sum_1$ inflow = $\sum_2$ inflow − $\sum_1$ outflow
$\sum_2$ inflow + $\sum_1$ inflow = $\sum_1$ outflow + $\sum_2$ outflow

Therefore $X_2 + X_1 + 89.69 + 14.24 = 27.6 + 175.45 = 203.5$ MG
$X_1 + X_2 = 99.12$ MG . . . . . .

From precipitation Mass Curve {FIGURE 9} $i_1 = 4.05"$; $i_2 = 3.02"$

$X_1 = \frac{4.05}{12} \times 0.3259\ \alpha$ $X_2 = \frac{3.02}{12} \times 0.3259\ \alpha$

$\frac{X_1}{X_2} = \frac{4.05}{3.02} = 1.341$ . . . . . Equation No. 4

Therefore, $X_1 = 1.341\ X_2$

* For solution of equations 3 & 4, see Sheet 4.

Substituting the value obtained for X_1 from eq. No. 4 into eq. No. 3 and rearranging equation No. 3:

$1.341\ X_2 + X_2 = 99.12$; or $2.341\ X_2 = 99.12$; $X_2 = \frac{99.12}{2.341} = 42.34$ MG

$X_1 = 1.341\ X_2 = 1.341 \times 42.34 = 56.78$ MG

Storage = $\underbrace{175.45}_{\text{inflow}} - \underbrace{\{89.69 + 42.34\}}_{\text{outflow}} = 43.42$ MG

Substituting X_1 in equation No. 1:

$56.78 = \frac{0.3259 \times 4.05"}{12"}\ \alpha$; $\alpha = \frac{56.78 \times 12}{0.3259 \times 4.05} = 516.22$

Assuming C values in equation No. 2 are as tabulated below, the corresponding K values can be solved as shown:

From eq. no. 2 $\alpha = 0.75C \times 1{,}292.8 + K \times 4{,}460.8 = 516.22$

$$K = \frac{516.22 - 0.75C \times 1{,}292.8}{4{,}460.8}$$

ALLOCATION OF LOSSES TO SOURCES

	C	K	LOSS CONTRIBUTION IN MG: ABOVE COAL MEASURES 106.6475C	LOSS CONTRIBUTION IN MG: WITHIN THE COAL MEASURES 56.78 − 106.6475C
	0.20	0.072	21.33	35.45
	0.25	0.061	26.66	30.12
Assumed condition →	0.30	0.051	31.99	24.79
	0.35	0.040	37.33	19.45
	0.40	0.029	42.66	14.12
	0.45	0.018	47.99	8.79
	0.50	0.007	53.32	3.46
	0.55			

NOTE: Groundwater recharge is included in the above sources of inflow.

Substitution of X in equation No. 1:

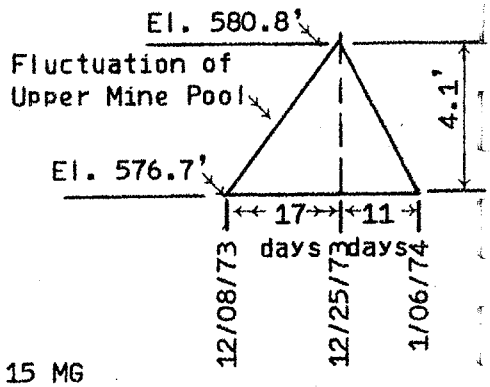
$$42.34 = \frac{0.3259 \times 3.02''}{12''}\alpha; \quad \alpha = \frac{42.34 \times 12''}{0.3259 \times 3.02''} = 516.22$$

ALLOCATION OF LOSSES TO SOURCES

$$\frac{0.3259 \times 3.02}{12''} \times \underbrace{0.75C \times 1{,}292.8 + K \times 4{,}460.8}_{\alpha} = 42.34$$

C	K	LOSS CONTRIBUTION IN MG	
		ABOVE COAL MEASURES 79.5248C	WITHIN COAL MEASURES 42.34 − 79.5248C
0.40*	0.029*	31.81	10.53

* see tabulated values, Sheet No. 4



Between 12/08/73 and 12/25/73, Mine Pool level fluctuated from El. 576.7' to El. 580.8' {+4.1' in 17 days}

The Total Outflow for this period was as follows:

From Askam borehole Mass Curve
452.405 − 180.255 MG = 272.15 MG
From assumption No. 2, Sheet 1; 1.2 x 17 days = 20.40 MG
TOTAL OUTFLOW = 292.55 MG

Precipitation for the period 4.36" {of which 1.27" is snow equivalent}

Between 12/25/73 and 1/06/74 Mine Pool Level dropped from El. 580.8' to El. 576.7' {-4.1' in eleven days}

The Total Outflow for this period was as follows:

From Askam borehole Mass Curve
654.255 − 452.405 = 201.85 MG
From assumption No. 2, Sheet 1; 1.2 x 11 days = 13.20 MG
TOTAL OUTFLOW = 215.05 MG

Precipitation for the period 1.25" {all snow equivalent}

For the aforementioned periods, the inflow consists of:

12/08/73 – 12/25/73

a. Groundwater recharge (included in the following items)
b. Streambed losses from base flow (above Coal Measures):
From Tables B-II & B-III, 555 GPM x 17 days x 1,440 = 13.59 MG
Diversion by BLue Coal Company from Solomon Creek $\frac{270}{365}$ x 17 = 12.58 MG
SUB-TOTAL INFLOW = 26.17 MG
c. Runoff losses X_1 (see solution of eqs. 3 & 4, this Sheet) X_1 = 361.00 MG
TOTAL INFLOW = 381.17 MG

12/25/73 – 1/06/74

a. Groundwater recharge (included in the following items)
b. Streambed losses from base flow (above Coal Measures)
From Table B-III, 555 GPM x 11 days x 1,440 = 8.79 MG
Diversion by Blue Coal COmpany from Solomon Creek $\frac{270}{365}$ x 11 = 8.14 MG
SUB-TOTAL INFLOW 16.93 MG
c. Runoff losses X_2 (see solution of eqs. 3 & 4, this Sheet) X_2 = 103.50 MG
TOTAL INFLOW 120.43 MG

From eq. No. 3

$$\frac{X_1 + X_2 + 26.17 + 16.93}{\sum_1^2 \text{Inflow}} = \frac{292.55 + 215.05}{\sum_1^2 \text{Outflow}} = 507.6$$

$$X_1 + X_2 = 507.6 - 43.1 = 464.5 \text{ MG}$$

From eq. No. 4

$$\frac{X_1}{X_2} = \frac{4.36''}{1.25''} = 3.488 \qquad X_1 = 3.488\, X_2$$

Substituting $X_1 = 3.488\, X_2$ in eq. No. 3

$$4.488\, X_2 = 464.5 \qquad X_2 = \frac{464.5}{4.488} = 103.498 \text{ MG}$$

$X_1 = 3.488 \times 103.498 = 361.00$ MG

Mine Pool storage between El. 576.7' and El. 580.8' =
$26.17 + 361.00 - 292.55 = 94.62$ MG

Substituting X_1 in eq. No. 1

$$361.00 = \frac{4.36''}{12''} \times 0.3259\, \alpha$$

$$\alpha = \frac{361 \times 12}{4.36 \times 0.3259} = 3{,}048.72$$

Assuming C values in equation No. 2 are as tabulated below, the corresponding K values can be solved as shown:

From eq. No. 2 $\alpha = 0.75C \times 1{,}292.8 + K \times 4{,}460.8 = 3{,}048.72$

$$K = \frac{3{,}048.72 - 0.75C \times 1{,}292.8}{4{,}460.8}$$

ALLOCATION OF LOSSES TO SOURCES

C	K	LOSS CONTRIBUTION IN MG	
		ABOVE COAL MEASURES 114.8107 x C	WITHIN COAL MEASURES 361 - 114.8107C
0.20	0.640	22.96	338.04
0.25	0.629	28.70	332.30
0.30	0.618	34.44	326.56
0.35	0.607	40.18	320.82
0.40	0.597	45.92	315.08
0.45	0.586	51.66	309.34
0.50	0.575	57.41	303.59
0.55	0.564	63.15	297.85
0.56	0.562	64.92	296.08

DISCUSSION:

Comparison between K values, tabulated above and the values tabulated in Sheet No. 4 indicate a large difference in K values for the same selected C values. This large difference is predominantly attributed to the seasonal variation in climatic conditions and soil cover.

The values tabulated on this Sheet represent snow cover and frozen ground conditions in the entire drainage area as well as minimum evapotranspiration in the part of the watershed above the Coal Measures.

The values tabulated in Sheet No. 4 represent predominantly a pre-Fall condition. Under these conditions, streambed losses from the 2.02 sq. mi. drainage area above the Coal Measures, contribute more losses of water into the mine pools than runoff over the 6.97 sq. mi. of the drainage area within the Coal Measures.

CONCLUSIONS: On the basis of the aforementioned discussion, the following conclusions were derived:

1. The runoff factor C during the Fall and Winter periods is larger than the same factor during the balance of the year. The increase in factor C is predominantly attributed to the decrease in the evapotranspiration in the Fall and Winter seasons. Flow records at the established monitoring stations indicate that streambed losses are 75% of the runoff from above the Coal Measures.

2. The loss factor K from runoff over areas within the Coal Measures is considerably larger during the Winter period than during the balance of the year. This larger value for factor K is attributed to the snow cover and frozen ground conditions that prevail during the Winter periods.

3. On the basis of the sample calculations, the selected values for factors C and K are tabulated in Sheet 8A.

NOTE: Normal average precipitation (assumed water equivalent) in December thru March = 9.01". Normal total precipitation at Avoca (34.81")
$\frac{9.01"}{34.81"} \times 100 = 25.88\%$ of total annual precipitation. No. of days with Temperature below $32^0F = 139$

ITEM	MAGNITUDE OF ITEMS FOR THE INDICATED MONTHS												TOTAL
	O	N	D	J	F	M	A	M	J	J	A	S	
FACTOR C	0.56 (180 days)						0.40 (185 days)						
FACTOR K	0.029		0.56 (139 days)				0.029 (226 days)						
MEAN MONTHLY PRECIPITATION IN INCHES (6)	1.70*	1.57*	6.43*	3.28	1.54	5.61	2.65	2.57	3.45	3.66	2.31*	5.07*	39.87
α = 0.75C x 1,292.8 +K x 4,460.8	672.34		3,041.02				517.20						
Million Gallons $0.3259 \times \frac{1}{12} \alpha$ Tot. Runoff losses	31.04	28.67	531.05	270.89	127.18	463.32	37.52	36.10	48.88	51.41	32.45	71.21	1,729.52
FROM ABOVE COAL MEASURES LOSSES IN MG	25.07	23.15	94.82	48.37	22.71	82.73	27.91	27.07	36.66	38.55	24.33	53.40	504.77

* 1973, all other precipitation data is from 1974 (Sta. Wilkes-Barre NE4).

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