pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING PROGRAMS

EROSION AND SEDIMENTATION CONTROL PLAN
04/19/2021

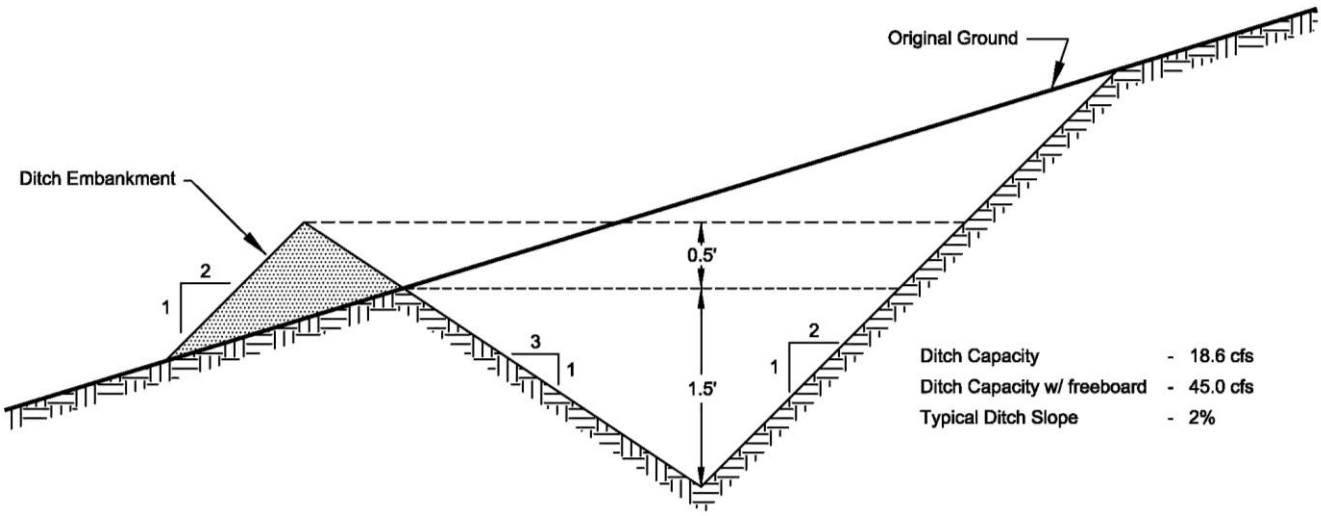
Diversion Controls

Provide a plan for the collection and conveyance of runoff from upslope undisturbed areas to a natural drainageway. Provide a separate general design for a temporary highwall diversion which limits the amount of runoff which can enter the pit (where applicable). Include design criteria, capacity calculations, profile of proposed channel slopes, typical cross-sections, required erosion resistant channel linings and applicable details on the Diversion/Collection Ditch Data Sheet.

Diversion controls (ditches) will be constructed as necessary to collect and convey runoff from upslope undisturbed areas to natural drainage ways. Design criteria, capacity calculations, ditch profiles, ditch cross-sections, required erosion resistant channel lining and applicable details for each proposed diversion ditch has been provided on the Diversion/Collection Ditch Data Sheets.

A general design for a temporary highwall diversion ditch which will limit the amount of runoff entering the pit has been provided. The temporary highwall diversion ditch will be constructed where site conditions warrant.

TEMPORARY HIGHWALL DIVERSION DITCH DESIGN



Notes: The temporary diversion ditch will be constructed above each highwall to channel unaffected runoff away from the pit area.

The temporary highwall diversion ditch design has been based on a 2 year/24 hour storm event for Somerset County.

The temporary highwall diversion ditch has been designed using the estimated maximum drainage area between the highwall and the permanent diversion ditch and/or diking.

Erosion and Sediment Control [§87.70, §87.106]

Provide a plan (E&S plan) for the control of erosion and sedimentation for lands within the permit area to be disturbed by surface mining activities. Include a detailed narrative describing the implementation of the plan, Best Management Practices (BMPs) to be used, and design and construction plans and specifications for each structure or facility used in the plan. The plan must be site specific for each phase or phases of mining. Include design criteria, capacity calculations, profile of proposed channel slopes, typical cross sections, required erosion resistant channel linings and applicable details on the Diversion/Collection Ditch Data Sheet for all collection ditches and dikes (if applicable). Provide documentation of the capacity of the existing drainage system and the effect proposed mining activities will have on the drainage.

Address the following in the E&S plan as applicable:

- Haul/Access roads - include proposed spacing of sediment traps, turnouts, culverts, check dams, etc.;
- Existing structures
- Excess spoil areas
- Coal ash beneficial use
- Sewage sludge/biosolids beneficial use

The proposed surface mining activity will be treated as a one-phase operation. Given the multiple coal seams and coal quality, mining activities will be tailored to meet current and future market demands and orders. The erosion and sedimentation control plan features will be constructed on an as needed basis as mine activities develop on the site. Mining activities will be conducted in a manner so as not to exceed the liability for the posted bond.

The erosion and sedimentation control plan for lands to be disturbed by surface mining activities within the permit area will consist of a series of diversion ditches to prevent unaffected runoff from entering the affected areas, along with multiple sediment ponds and associated collection ditches to collect runoff from all areas disturbed by the mining operation. All topsoil and spoil storage areas will be located within the footprint of the erosion and sedimentation control plan. Site specific features to be implemented during the mining operation are described in detail below.

Energy dissipators will be used to control erosion at the outlet of all pipe discharges from treatment facilities and/or sediment ponds. (See attached drawing – page 44)

Typical collection/diversion ditch plan-view and cross-section has been provided. (See attached drawing – page 45)

Level spreaders will be used as outlet control for all diversion ditches. (See attached drawing – page 46)

Earthen diking will be used to prevent surface runoff from leaving small affected areas of the site where ditches are not practical. (See attached drawing – page 47)

Compost filter sock may be used to control surface water from small affected areas below collection ditches, as necessary. (See attached drawing – page 48)

Straw bale barriers may be used to control surface runoff from small affected areas below collection ditches, as necessary. (See attached drawing – page 49)

Treatment Facilities

Provide a plan for the collection and treatment of pit water and include provisions for an automatic neutralization device. Include a construction and maintenance narrative, flow diagram, detailed plan view and cross-section drawings, design criteria, and design calculations (which include the proposed capacity) of the treatment facilities. Identify treatment chemicals to be used.

All water entering the pit will be pumped through a 4 inch flexable pipe to the designated treatment ponds were the water will be treated, if necessary, prior to discharge. Any necessary treatment will be applied prior to water entering the first pond to allow retention time for the chemical treatment process. As water passes to the second pond any solids should settle out as a result of the chemical treatment prior to discharge. The ponds will be constructed so that surface runoff does not enter the treatment facilities. The location of the treatment facilities are shown on the Exhibit 9.0 Operations Map. See the mine water treatment flow schematic provided below.

Mine Water Treatment Flow Schematic

Accumulation of water in pit
Pumped through a 4' flexible conduit
To the treatment ponds

⇩

Water enters the first treatment pond
through treatment system
(treatment type and delivery system
to be determined as necessary)

⇩

Discharge to the second treatment pond
Where any solids will settle prior to discharge

⇩

Does the water meets effluent standards

Water is recirculated through the system (as necessary) ⇦ **NO**

YES

⇩

Water is discharged

Treatment Facilities (cont.)

The treatment pond sizing calculations are based on a 10 year/24 hour storm event for Somerset County which has a rainfall of 4.3 inches. Treatment pond sizing calculations are shown below.

Area Computation for Treatment Ponds (assumes two (2) open pits at any given time)

(I) Maximum area of open pit =
100' x 250' = 25,000 ft^2 x 2 (pits) = 50,000 ft^2

(II) Maximum area between highwall and diversion ditch =
30' x 100' = 3,000 ft^2 x 2 (pits) = 6,000 ft^2

(III) Maximum area of spoil drainage into pit =
100' x 250' / 2= 12,250 ft^2 x 2 (pits) – 25,000 ft^2

Constant C = % runoff

(I) Open Pit – 50% (0.5)

(II) Area above highwall – 30% (0.3)

(III) Spoil drainage – 25% (0.25)

Rainfall Data (based on 10 year/24 hour rainfall for Somerset County = 4.3 inches)

0.36 Rainfall (4.3"/12" = ft./day)

0.25 Detention time 24 hours / 6 hours

1.33 Sludge storage factor = 1/3 of volume

Required Treatment Pond Volume

V = (50,000 ft^2) x (0.5) + (6,000 ft^2) x 0.3 + (25,000 ft^2) x 0.36 x 0.25 x 1.33

V = ((25,000) + (1,800) + (6,250)) x 0.36 x 0.25 x 1.33 = 3,956 cf^3

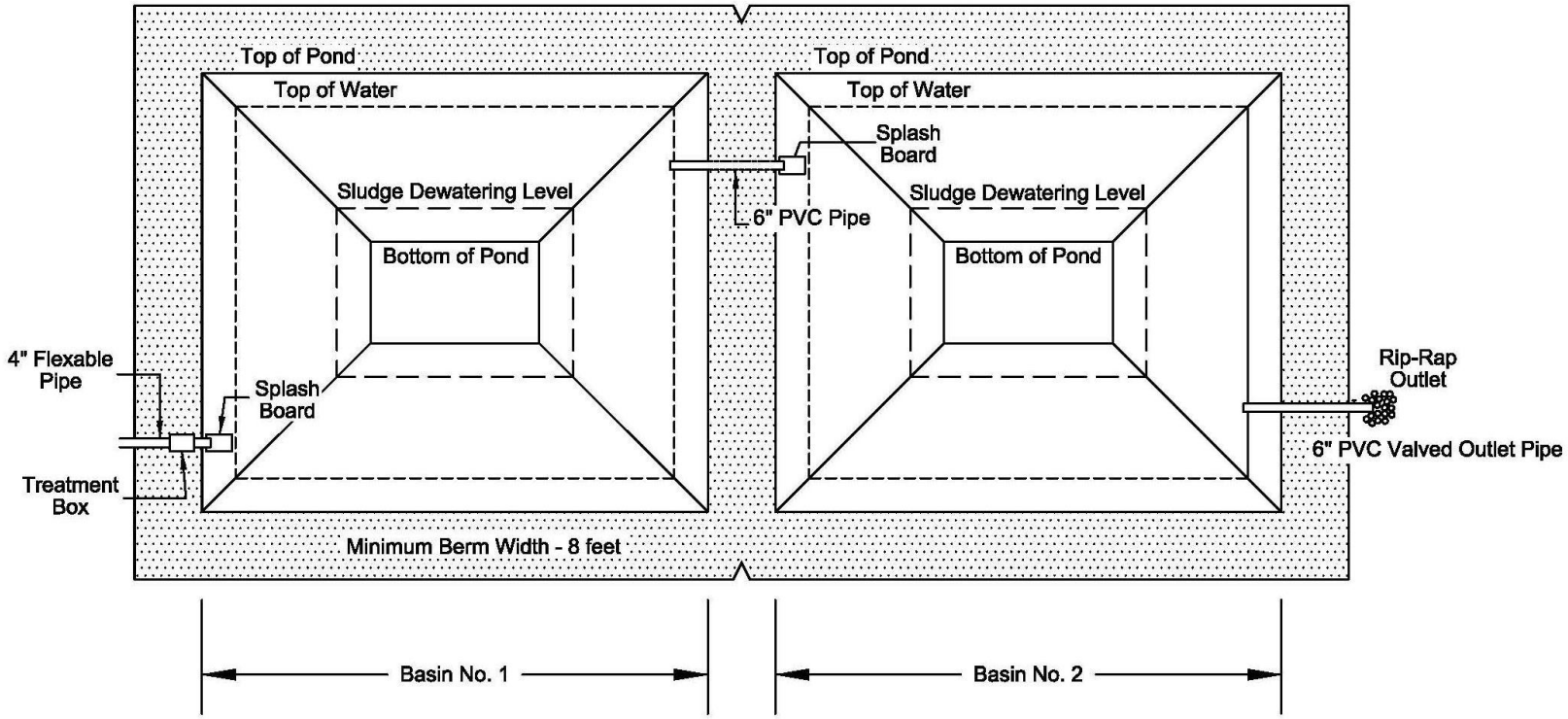
A completed Treatment Pond Certification Form 5600-PM-BMP0455 has been included for each set of treatment facilities to be constructed.

Treatment Facilities (cont.)

Treatment Pond Design Dimensions

Bottom Dimensions	**-**	**20.0 ft. (length) x 12.0 ft. (width)**
Top of Water Dimensions	**-**	**52.0 ft. (length) x 44.0 ft. (width)**
Top of Pond Dimensions	**-**	**60.0 ft. (length) x 52.0 ft. (width)**
Top of Water Capacity	**-**	**8,747 cubic feet**

TYPICAL TREATMENT POND DESIGN - PLAN-VIEW

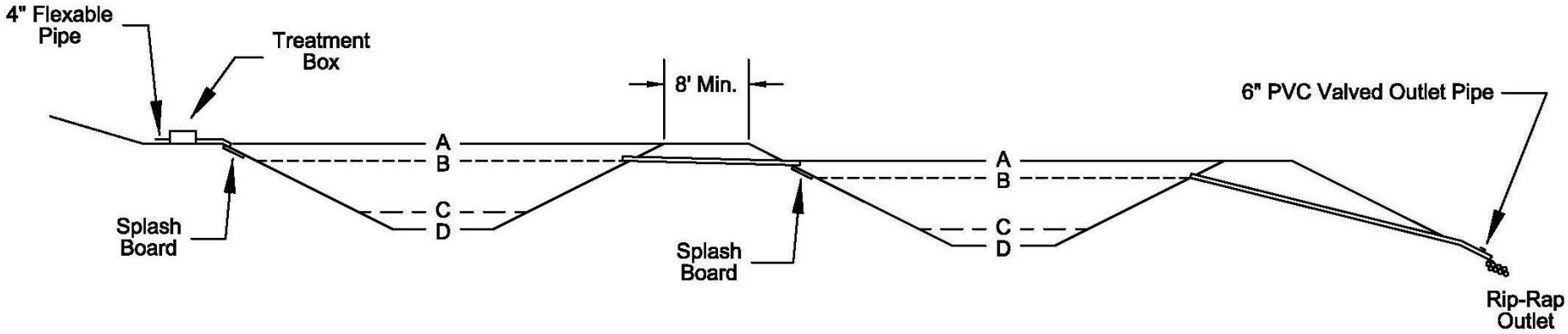


Notes: **All pond sideslopes will be a minimum of (2) horizontal to (1) vertical.**
As necessary the ponds will be lined with clay material found onsite.

Treatment Facilities (cont.)

Treatment Pond Design Dimensions

TYPICAL TREATMENT POND DESIGN - CROSS SECTION



A - Top of Pond (Bottom + 10')
B - Water Level of Pond (Bottom + 8')
C - Sludge Storage Level Bottom + 2.4')
D - Bottom of Pond

Notes: **All pond sideslopes will be a minimum of (2) horizontal to (1) vertical.**
As necessary the ponds will be lined with clay material found onsite.

Treatment Facilities (cont.)

Describe the operation and maintenance requirements for the structure.

Maintenance of the treatment facility will consist of visual inspections conducted at least monthly for overall condition and specific condition of the major components, such as inlets, outlets, liners, embankments, and vegetation. Sludge from the treatment facility will be pumped from the pond with a vacuum truck or trash pump once the sludge material has reached the required cleanout elevation. The equipment to be utilized for pond cleaning will be manually placed/moved around the ponds in such a manner as to not contact or rest directly on the pond liner, except when a protective float is attached to the suction hose. Pumps and/or suction hoses will be placed/moved in the pond to be cleaned while suspended by cable from a boom or crane. These structures will be constructed any time that the treatment facility needs to be cleaned out. The sludge material will be taken to an approved Coal Refuse Disposal Area, owned and operated by Rosebud Mining Company for disposal.

Describe the timetable and plans for removal of the impoundment and reclamation of the area.

Treatment ponds will be removed after the all remaining open pits have been backfilled.

Sedimentation Ponds

Identify the proposed use(s) for each structure.

Sedimentation ponds will be used provide detention time for surface runoff from affected areas.

Provide a unique label for each structure and show location (to scale including embankments and outlet structures) on Exhibit 9 (and Exhibit 18 if structure will remain as part of the postmining land use.)

All sedimentation ponds have been labeled and are shown on the Exhibit 9 Operations Map. The ponds have been shown to scale and include embankments and outlet structures. Any pond that will remain as part of the post-mining land use will be shown on the Exhibit 18: Land Use and Reclamation Map.

Provide design report and detailed cross-sections and plan view scale drawings of the proposed structure which show: principal spillway, dewatering devices, embankment details (including maximum height, top width, and cutoff trench), crest of emergency spillway and existing ground.

A design report, detailed cross-section and plan-view scale drawings have been provided for each proposed sedimentation pond. The design report and drawings show the principal spillway, dewatering devices, embankment details, crest of emergency spillway, and existing ground.

Construction of the sedimentation ponds will be as follows; once the area has been grubbed, if necessary, topsoil will be removed and stored to be used as the final cover layer on the pond embankment. Any excess excavated material will be stockpiled adjacent to the sediment pond and planted with the permanent seed mixture described in Revegetation. The embankment material shall be free of roots, stumps, wood rubbish, stones greater than 6", frozen and/or other objectionable materials. The required cutoff trench will be excavated and the embankment will be constructed in 2 foot lifts and will be continuous over the entire length of the fill area. Compaction of the material will be achieved by the multiple passes of the bulldozer. The most permeable embankment material shall be placed in the downstream portions of the embankment. The dewatering pipe and principal spillway will either be installed concurrently or will excavated into the embankment. A bag of concrete will be poured around the principal spillway and dewatering pipes near the center of the pipes to form an anti-seep collar. If the pipes were placed in an excavated trench, the trench will be backfilled by placing clean fill in 6"-1' layers over the pipes and then will be tamped by hand or by a portable tamper. After a cover of approximately 3 feet is reached, the remaining trench will be covered in 1'-2' lifts until the trench has been backfilled. Upon final construction the top and outside slopes of the pond will be revegetated with the permanent seed mixture and any necessary rock lining of ditch inlets of spillways will be completed. Upon final construction the sedimentation ponds will be certified by a certified registered surveyor or engineer. A completed Sediment Pond Certification Form 5600-PM-BMP0408 has been included for each sediment pond to be constructed.

If the structure is located outside of the area covered by the geology and hydrology description contained in Modules 7 and 8, include a preliminary geology and hydrology report.

Not applicable.

Sedimentation Ponds (cont.)

Describe the potential effect on the structure from subsidence from underground mining.

Existing mapping indicates that mining on the Lower Kittanning Coal Seam (B) is located under a portion of the back sideslope of Sediment Pond 002 and under a small portion of the bottom / back sideslope of Sediment Pond 003. The interburden between the top of the coal seam and the bottom of the Sediment Pond 001 is estimated at 30 feet and 20 feet for Sediment Pond 003. Based on the lack of observed subsidence in the immediate area of the proposed ponds, the remaining pillar configurations of the mine works underlying the ponds, and the thickness of the interburden, there appears to be minimal potential from subsidence on the ponds. The bottom and back sideslopes of the ponds will be visually inspected for signs of subsidence during the pond certification process prior to introduction of surface runoff into the pond.

Mapping also indicates that mine works of the Lower Kittanning Coal Seam (B) may be encountered during the construction of Sediment Pond 004. Any workings encountered should be located above the water level of the proposed pond and therefore should not have any potential effect of the structure due to subsidence. In the event that mine works are daylighted during the construction of the sedimentation pond any openings encountered will be backfilled with material found onsite to a depth which stabilizes the area.

If the detailed design plans are not included with the initial submittal of this application, identify when the detailed design plans will be submitted. (**Note:** The detailed design plans must be approved by the Department before construction of the structure begins.)

Not applicable. Detailed design plans have been included with this submittal.

Describe the operation and maintenance requirements for the structure, including a dewatering timetable.

During active operations the ponds will be visually inspected on a weekly basis by on-site personnel for overall condition with specific inspections taking place at least once a month of the major components, such as inlets, outlets, liners, embankments and vegetation. A specific inspection will be completed on the ponds after major precipitation events, to determine any problems that may have occurred. Impoundments will be inspected every three months during site operations and the impoundment will be certified annually, with the certification, submitted to the Cambria District Office.

Post mining inspections will be visually inspected at least monthly for overall condition and specific condition of the major components, such as inlets, outlets, liners, embankments, and vegetation. Inspections will also occur during the post-mining period after all major rainfall events. Solids from the sediment ponds will be removed from the impoundments when the sediment/sludge levels reach the dewatering elevation. Solids from the sediment ponds will be cleaned out using excavators or other heavy equipment and taken to the topsoil storage area for use during the reclamation of the site.

All sediment ponds have been designed to dewater in no less than two (2) days and no more than seven (7) days. The dewatering discharge will be regulated by a 4-inch valve on the PVC dewatering pipe. The valve will normally be closed during storm events to allow for settling and clarification of the runoff water after storm events. Once the water is clear the valve will be opened to allow discharge of the stored water in a 2-7 day period. Once the pond has been dewater the valve will be closed until further discharge is required.

Sedimentation Ponds (cont.)

Describe the timetable and plans for removal of the impoundment and reclamation of the area.

Sediment ponds will be removed after the drainage area to the pond has been stabilized and the revegetation has been successfully reestablished. Generally the sediment ponds will be removed upon Stage 2 bond release, but may be moved sooner upon approval from the MCI.

Sedimentation Ponds

Sedimentation Pond 001 – Design Details

DESIGN CALCULATIONS

Sedimentation Pond Design

Site: Mine 78 Surface No. 3 Mine

Enter information in green cells only.

Project:	Mine 78 S3 Mine	Elevation		Dimensions	
Pond No.	Sed 001	Bottom	1928.0	L @ Princ.	102
Acres	4.2	Emerg.	1937.0	W @ Princ.	55
Req. Cap.	29,400	Princ.	1936.0	Cap @ Princ.	24,933
B. length	70.0	Top	1940.0	L @ Emerg	106
B. width	15.0	Dewater	4.2	W @ Emerg	60
Depth @ emerg	9.0	Dewat Elev.	1932.2	Cap @ Emerg	30,915
FSS	3.0	Dewat Elev.			
BSS	2.0	Depth	Cap @ Dewater		
RSS	2.0	4.2	8,520	L @ Top	118
LSS	2.0			W @ Top	75
Des. Cap	30,915	L @ Dewater	87		
Dewater-Cap	8,400	W @ Dewater	36		
Water in emerg	1.0				
D @ Princ	8.0				
D @ Top	12.0				

Pond Notes: Pond sizing based on 7,000 cubic feet of storage capacity per acre (as per DEP)

Dewatering level based on 2,000 cubic feet of stroage capacity per acre (as per DEP)

Pond Capacity Design based on the Prismoidal Formula = A(b) + 4A(m) + A(t) / 6 * L

Design capacity based on the depth at the crest of the Emergency Spillway

Sedimentation Ponds

Sedimentation Pond 001 – Design Details

PRINCIPAL SPILLWAY CALCULATIONS

Design Data :

Riser Diameter,D :	12	inch	
Riser Area, A :	0.785	sq.ft	
Depth from Max. Water Level to Riser Elevation, H :	1	feet	
Riser Circunference,L :	3.1416	feet	
Barrel Length,l :	80	feet	
Riser Construction :	0		
Barrel Diameter,d :	12	inch	
Barrel Area, a :	0.785	sq.ft	
Barrel Construction :	Corrugated Metal		
ad above the centerline of the outlet end of barrel,h :	10	feet	
Orifice Coefficient (sharp-edged), C :	0.6		
Weir Coefficient,C' :	3.1		
coefficient of minor losses, K_m :	1		
pipe friction coefficient, K_p :	$(5087n^{2)}/d^{4/3}$		0.075363
Manning's Coefficient of Roughness,n :	0.015		

Kp = [(5087)(0.000225)]/27.471 = 0.041662

Orifice Flow : $Q=CA\ (2gH)^{0.5}$

$Q = (0.6)(0.785)([(2)(32.2)(1.0)]^{0.5}) =$" 3.78 cfs

Weir Flow : $Q=C'LH^{1.5}$

$Q = (3.1)(3.14)([1.0]^{1.5}) =$" 9.74 cfs

Pipe Flow : $Q = a\ [(2gh)/(1+K_m+K_pL)]^{0.5}$

$Q = 0.7854([(2)(32.2)(10.00)]/(1+1.0+((0.042)(80.0)))^{0.5}) =$" 8.63 cfs

Sedimentation Ponds

Sedimentation Pond 001 – Design Details

DEWATERING CALCULATIONS

DEWATERING TIME Sedimentation Pond 001

POND DIMENSIONS :					
Bottom Width :	15 ft.	Emergency S'Way Crest :	1937	NOTE :	Dewatering time shown is minimum value. Time can be extended by adjusting valve.
Bottom Length :	70 ft.	Principal S'Way Elev. :	1936		
Side Slopes :	2 :1	Dewatering Device Elev. :	1932.2		
Bottom Elevation :	1928	Principal Spillway Dia. (in.) :	12		
		Dewatering Device Dia. (in.) :	4		

Elevation Ft.	Volume cu. ft.	Diff. Volume cu. ft.	Prin. Disch. CFS	DWD Disch. CFS	TOTAL Disch. CFS	AVG. Disch. CFS	TIME hrs.	ACCUM. TIME Hrs.
1937	27108		3.717	0.905	4.622			
		2625.167				4.053	0.180	0.180
1936.5	24482.83		2.628	0.856	3.485			
		2472.167				2.145	0.320	0.500
1936	22010.67		0.000	0.805	0.805			
		2323.167				0.778	0.830	1.330
1935.5	19687.5		0.000	0.750	0.750			
		2178.167				0.721	0.840	2.170
1935	17509.33		0.000	0.691	0.691			
		2037.167				0.659	0.859	3.029
1934.5	15472.17		0.000	0.626	0.626			
		1900.167				0.590	0.894	3.923
1934	13572		0.000	0.554	0.554			
		1767.167				0.512	0.958	4.881
1933.5	11804.83		0.000	0.471	0.471			
		1638.167				0.420	1.083	5.964
1933	10166.67		0.000	0.369	0.369			
		1513.167				0.298	1.412	7.376
1932.5	8653.5		0.000	0.226	0.226			
		1392.167				0.113	3.419	10.795
1932	7261.333		0.000	0.000	0.000			

Sedimentation Ponds

Sedimentation Pond 001 – Design Details

EMERGENCY SPIILWAY CALCULATIONS

Reference A Method for Estimating Volume and Rate of Runoff in Small Watersheds - SCS

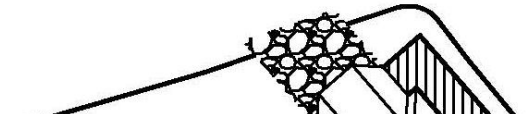
Sedimentation Ponds

Sedimentation Pond 001 – Design Details

PLAN-VIEW

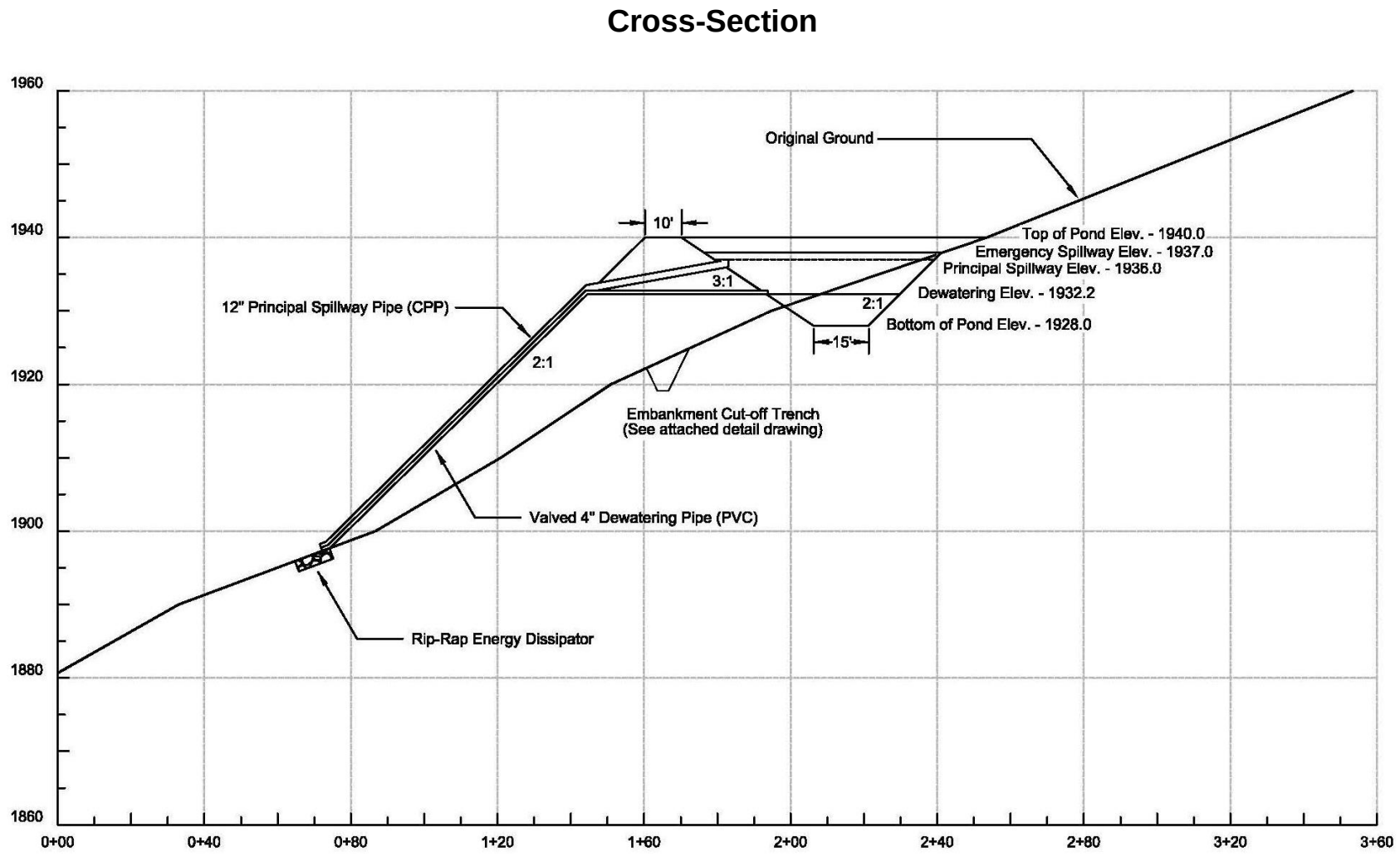
Sedimentation Pond (001)
Drainage Area - 4.2 acres
Required Capacity - 29,400 cubic feet
Design Capacity - 30,915 cubic feet

Emergency Spillway Bottom Width - 10.0 feet
Emergency Spillway Depth - 1.0 feet
Emergency Spillway Capacity - 24.0 cfs
Emergency Spillway Sideslopes - 2 (H) : 1 (V)



Sedimentation Ponds

Sedimentation Pond 001 – Design Details



Sedimentation Ponds

Sedimentation Pond 002 – Design Details

DESIGN CALCULATIONS

Sedimentation Pond Design

Site: Mine 78 Surface No. 3 Mine

Enter information in green cells only.

Project:	Mine 78 S3 Mine	Elevation		Dimensions	
Pond No.	Sed 002	Bottom	1797.0	L @ Princ.	250
Acres	24.9	Emerg.	1808.0	W @ Princ.	90
Req. Cap.	174,300	Princ.	1807.0	Cap @ Princ.	151,167
B. length	210.0	Top	1812.0	L @ Emerg	254
B. width	40.0	Dewater	4.5	W @ Emerg	95
Depth @ emerg	11.0	Dewat Elev.	1801.5	Cap @ Emerg	174,478
FSS	3.0	Dewat Elev.			
BSS	2.0	Depth	Cap @ Dewater		
RSS	2.0	4.5	50,659	L @ Top	270
LSS	2.0			W @ Top	115
Des. Cap	174,478	L @ Dewater	228		
Dewater-Cap	49,800	W @ Dewater	63		
Water in emerg	2.0				
D @ Princ	10.0				
D @ Top	15.0				

Pond Notes:

Pond sizing based on 7,000 cubic feet of storage capacity per acre (as per DEP)

Dewatering level based on 2,000 cubic feet of stroage capacity per acre (as per DEP)

Pond Capacity Design based on the Prismoidal Formula = A(b) + 4A(m) + A(t) / 6 * L

Design capacity based on the depth at the crest of the Emergency Spillway

Sedimentation Pond 002 – Design Details

PRINCIPAL SPILLWAY CALCULATIONS

Design Data :

Riser Diameter,D :	12	inch	
Riser Area, A :	0.785	sq.ft	
Depth from Max. Water Level to Riser Elevation, H :	1	feet	
Riser Circunference,L :	3.1416	feet	
Barrel Length,l :	80	feet	
Riser Construction :	0		
Barrel Diameter,d :	12	inch	
Barrel Area, a :	0.785	sq.ft	
Barrel Construction :	Corrugated Metal		
ad above the centerline of the outlet end of barrel,h :	7	feet	
Orifice Coefficient (sharp-edged), C :	0.6		
Weir Coefficient,C' :	3.1		
coefficient of minor losses, K_m :	1		
pipe friction coefficient, K_p :	$(5087n^{2)}/d^{4/3}$		0.075363
Manning's Coefficient of Roughness,n :	0.015		

Kp = [(5087)(0.000225)]/27.471 = 0.041662

Orifice Flow : $Q=CA\ (2gH)^{0.5}$

$Q = (0.6)(0.785)([(2)(32.2)(1.0)]^{0.5}) =$" 3.78 cfs

Weir Flow : $Q=C'LH^{1.5}$

$Q = (3.1)(3.14)([1.0]^{1.5}) =$" 9.74 cfs

Pipe Flow : $Q = a\ [(2gh)/(1+K_m+K_pL)]^{0.5}$

$Q = 0.7854([(2)(32.2)(7.00)]/(1+1.0+((0.042)(80.0)))]^{0.5}) =$" 7.22 cfs

Sedimentation Ponds

Sedimentation Pond 002 – Design Details

DEWATERING CALCULATIONS

DEWATERING TIME Sedimentation Pond 002

POND DIMENSIONS :		Emergency S'Way Crest :	1808	NOTE :	Dewatering time shown is
Bottom Width :	40 ft.	Principal S'Way Elev. :	1807		minimum value. Time can be
Bottom Length :	210 ft.	Dewatering Device Elev. :	1801.1		extended by adjusting valve.
Side Slopes :	2 :1	Principal Spillway Dia. (in.) :	12		
Bottom Elevation :	1797	Dewatering Device Dia. (in.) :	4		

Elevation Ft.	Volume cu. ft.	Diff. Volume cu. ft.	Prin. Disch. CFS	DWD Disch. CFS	TOTAL Disch. CFS	AVG. Disch. CFS	TIME hrs.	ACCUM. TIME Hrs.
1808	159998.7		3.717	1.085	4.802			
		10499.67				4.237	0.688	0.688
1807.5	149499		2.628	1.045	3.673			
		10165.67				2.338	1.208	1.896
1807	139333.3		0.000	1.003	1.003			
		9835.667				0.981	2.784	4.680
1806.5	129497.7		0.000	0.960	0.960			
		9509.667				0.937	2.819	7.500
1806	119988		0.000	0.914	0.914			
		9187.667				0.890	2.867	10.366
1805.5	110800.3		0.000	0.866	0.866			
		8869.667				0.841	2.930	13.296
1805	101930.7		0.000	0.816	0.816			
		8555.667				0.789	3.014	16.310
1804.5	93375		0.000	0.761	0.761			
		8245.667				0.732	3.127	19.438
1804	85129.33		0.000	0.703	0.703			
		7939.667				0.672	3.284	22.722
1803.5	77189.67		0.000	0.640	0.640			
		7637.667				0.605	3.510	26.232
1803	69552		0.000	0.569	0.569			
		7339.667				0.529	3.854	30.086
1802.5	62212.33		0.000	0.489	0.489			
		7045.667				0.440	4.446	34.532
1802	55166.67		0.000	0.392	0.392			
		6755.667				0.326	5.748	40.280
1801.5	48411		0.000	0.261	0.261			
		6469.667				0.131	13.761	54.041
1801	41941.33		0.000	0.000	0.000			

Sedimentation Ponds

Sedimentation Pond 002 – Design Details

EMERGENCY SPILLWAY CALCULATIONS

Mine 78 Surface No. 3 Mine
Sedimentation Pond No. 002

Reference A Method for Estimating Volume and Rate of Runoff in Small Watersheds - SCS

STORM ROUTING INFLOW

TYPE II Storm Distribution
Antecedent Moisture Condition (AMC) II

STORM =	**25**	Year
RAINFALL =	**4.30**	Inches
CN =	**85**	
RUNOFF =	2.73	Inches

a, Drainage Acres =	**24.9**
a, Drainage Area, Sq. Miles =	0.03890625
Y, Slope of Watershed =	**29.00**
S, Retention =	1.765
l, length of mainstream =	1438.4
L, Lag in Hours =	0.06691051
Tp ,Time to Peak =	0.11691051
Tb, Time of Base =	0.31215107
Ia, Initial Abstraction =	0.35294118

Peak Discharge = 109.27 cfs (Emergency Spillway)

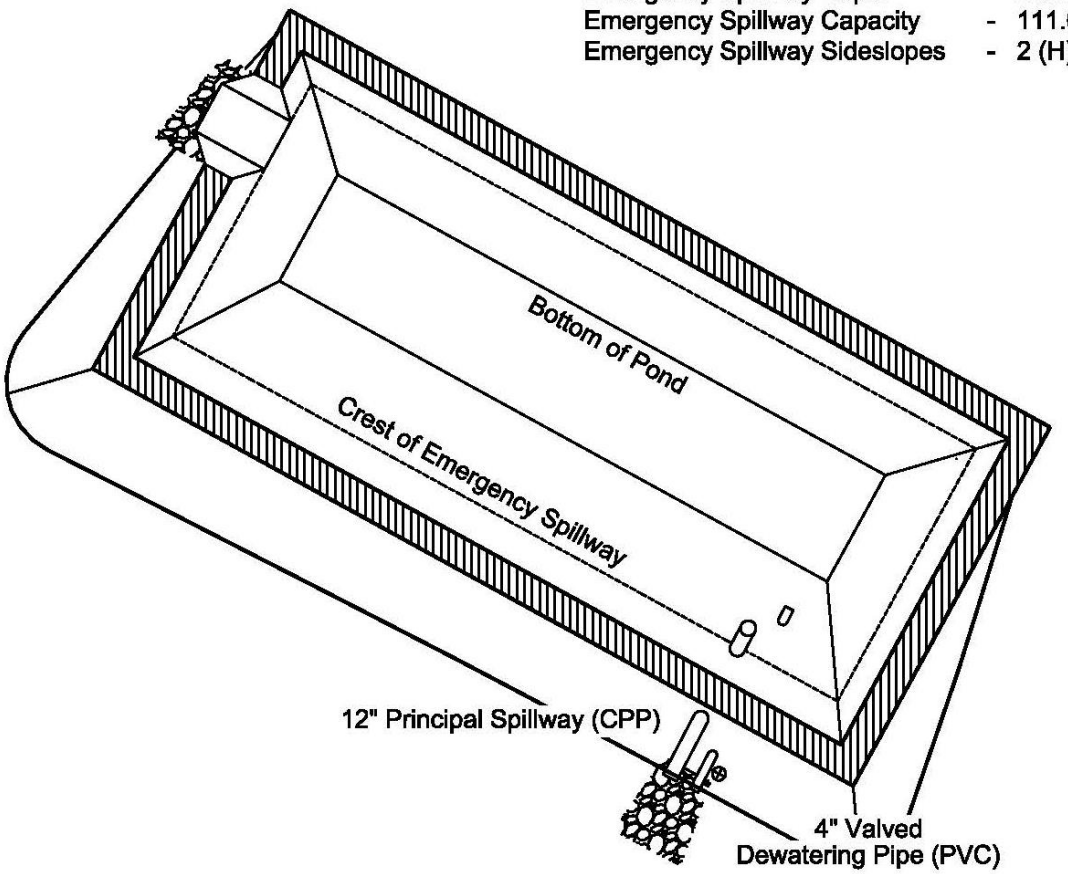
Sedimentation Ponds

Sedimentation Pond 001 – Design Details

PLAN-VIEW

Sedimentation Pond (002)
Drainage Area - 24.9 acres
Required Capacity - 174,300 cubic feet
Design Capacity - 174,478 cubic feet

Emergency Spillway Bottom Width - 14.0 feet
Emergency Spillway Depth - 2.0 feet
Emergency Spillway Capacity - 111.0 cfs
Emergency Spillway Sideslopes - 2 (H) : 1 (V)



POND 001 DIMENSIONS

Bottom Length	-	210.0 feet
Bottom Width	-	40.0 feet
Depth at Dewatering Elev.	-	4.5 feet
Depth at P. Spillway Elev.	-	10.0 feet
Depth at E. Spillway Elev.	-	11.0 feet
Depth at Top of Pond Elev.	-	15.0 feet
Design Capacity	-	174,478 cubic feet

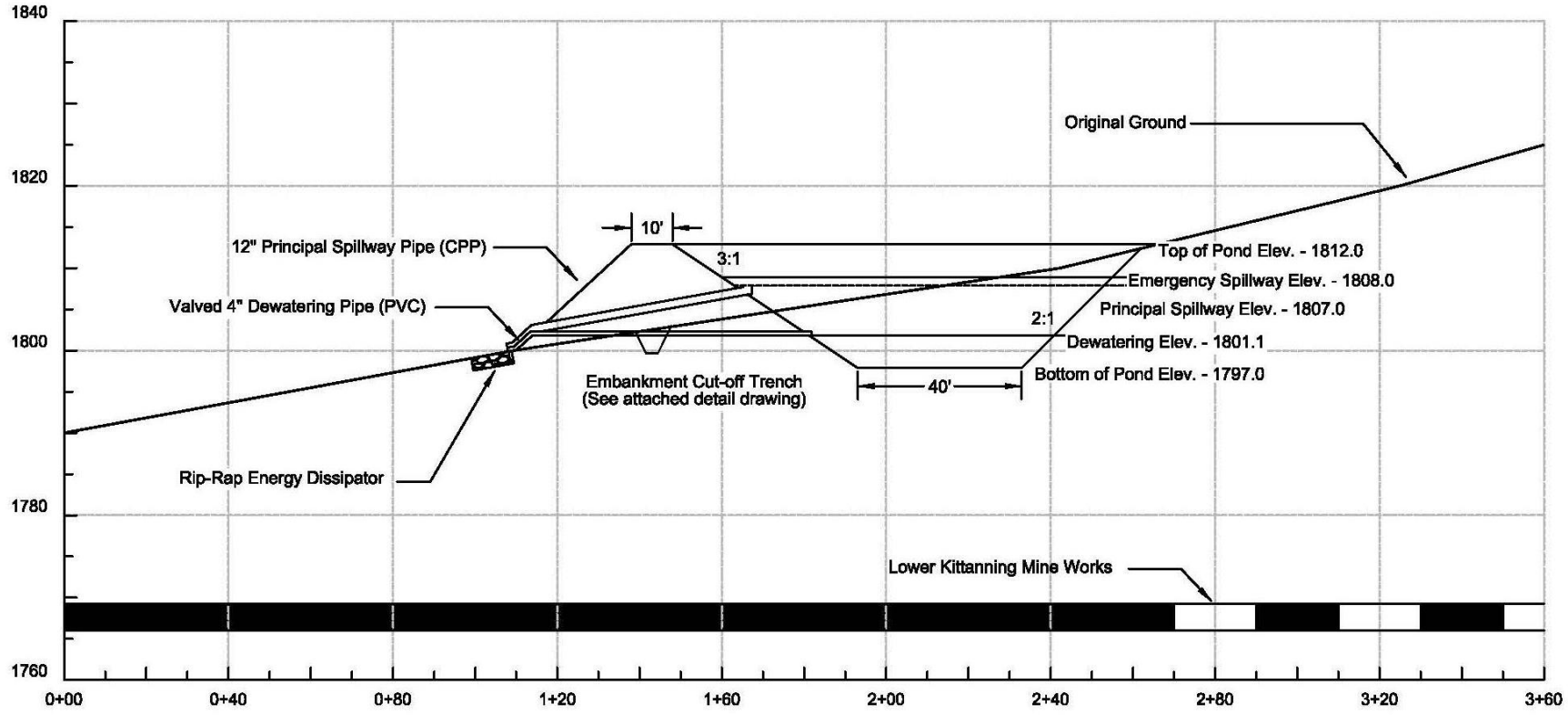
POND 001 ELEVATIONS

Bottom Elev.	-	1797.0
Dewatering Elev.	-	1801.5
P. Spillway Elev.	-	1807.0
E. Spillway Elev.	-	1808.0
Top of Pond Elev.	-	1812.0

Sedimentation Ponds

Sedimentation Pond 002 – Design Details

CROSS-SECTION



Sedimentation Ponds

Sedimentation Pond 003 – Design Details

DESIGN CALCULATIONS

Sedimentation Pond Design

Site: Mine 78 Surface No. 3 Mine

Enter information in green cells only.

Project:	Mine 78 S3 Mine	Elevation			Dimensions	
Pond No.	Sed 003	Bottom	1929.8		L @ Princ.	176
Acres	9.0	Emerg.	1939.8		W @ Princ.	60
Req. Cap.	63,000	Princ.	1938.8		Cap @ Princ.	54,540
B. length	140.0	Top	1943.0		L @ Emerg	180
B. width	15.0	Dewater	4.6		W @ Emerg	65
Depth @ emerg	10.0	Dewat Elev.	1934.4		Cap @ Emerg	65,667
FSS	3.0	Dewat Elev.				
BSS	2.0	Depth		Cap @ Dewater		
RSS	2.0	4.6		18,350	L @ Top	193
LSS	2.0				W @ Top	81
Des. Cap	65,667	L @ Dewater	158			
Dewater-Cap	18,000	W @ Dewater	38			
Water in emerg	1.2					
D @ Princ	9.0					
D @ Top	13.2					

Pond Notes:

Pond sizing based on 7,000 cubic feet of storage capacity per acre (as per DEP)

Dewatering level based on 2,000 cubic feet of stroage capacity per acre (as per DEP)

Pond Capacity Design based on the Prismoidal Formula = A(b) + 4A(m) + A(t) / 6 * L

Design capacity based on the depth at the crest of the Emergency Spillway

Sedimentation Pond 003 – Design Details

PRINCIPAL SPILLWAY CALCULATIONS

Design Data :

Riser Diameter,D :	12 inch	
Riser Area, A :	0.785 sq.ft	
Depth from Max. Water Level to Riser Elevation, H :	1 feet	
Riser Circunference,L :	3.1416 feet	
Barrel Length,l :	45 feet	
Riser Construction :	0	
Barrel Diameter,d :	12 inch	
Barrel Area, a :	0.785 sq.ft	
Barrel Construction :	Corrugated Plastic	
ad above the centerline of the outlet end of barrel,h :	9 feet	
Orifice Coefficient (sharp-edged), C :	0.6	
Weir Coefficient,C' :	3.1	
coefficient of minor losses, K_m :	1	
pipe friction coefficient, K_p :	$(5087n^{2)}/d^{4/3}$	0.075363
Manning's Coefficient of Roughness,n :	0.015	

Kp = [(5087)(0.000225)]/27.471 = 0.041662

Orifice Flow : $Q=CA\ (2gH)^{0.5}$

$Q = (0.6)(0.785)([(2)(32.2)(1.0)]^{0.5})$ =" 3.78 cfs

Weir Flow : $Q=C'LH^{1.5}$

$Q = (3.1)(3.14)([1.0]^{1.5})$ =" 9.74 cfs

Pipe Flow : $Q = a\ [(2gh)/(1+K_m+K_pL)]^{0.5}$

$Q = 0.7854([(2)(32.2)(9.00)]/(1+1.0+((0.042)(45.0))]^{0.5})$ =" 9.61 cfs

Sedimentation Ponds

Sedimentation Pond 003 – Design Details

DEWATERING CALCULATIONS

DEWATERING TIME Sedimentation Pond 003

POND DIMENSIONS :		Emergency S'Way Crest :	1939.8	NOTE :	Dewatering time shown is
Bottom Width :	15 ft.	Principal S'Way Elev. :	1938.8		minimum value. Time can be
Bottom Length :	140 ft.	Dewatering Device Elev. :	1934.4		extended by adjusting valve.
Side Slopes :	2 :1	Principal Spillway Dia. (in.) :	12		
Bottom Elevation :	1929.8	Dewatering Device Dia. (in.) :	4		

Elevation Ft.	Volume cu. ft.	Diff. Volume cu. ft.	Prin. Disch. CFS	DWD Disch. CFS	TOTAL Disch. CFS	AVG. Disch. CFS	TIME hrs.	ACCUM. TIME Hrs.
1939.8	57333.33		3.717	0.960	4.676			
		4833.167				4.109	0.327	0.327
1939.3	52500.17		2.628	0.914	3.542			
		4602.167				2.204	0.580	0.907
1938.8	47898		0.000	0.866	0.866			
		4375.167				0.841	1.445	2.352
1938.3	43522.83		0.000	0.816	0.816			
		4152.167				0.789	1.463	3.815
1937.8	39370.67		0.000	0.761	0.761			
		3933.167				0.732	1.492	5.306
1937.3	35437.5		0.000	0.703	0.703			
		3718.167				0.672	1.538	6.844
1936.8	31719.33		0.000	0.640	0.640			
		3507.167				0.605	1.612	8.456
1936.3	28212.17		0.000	0.569	0.569			
		3300.167				0.529	1.733	10.189
1935.8	24912		0.000	0.489	0.489			
		3097.167				0.440	1.954	12.143
1935.3	21814.83		0.000	0.392	0.392			
		2898.167				0.326	2.466	14.609
1934.8	18916.67		0.000	0.261	0.261			
		2703.167				0.131	5.750	20.359
1934.3	16213.5		0.000	0.000	0.000			
		2512.167				0.000	#DIV/0!	#DIV/0!
1933.8	13701.33		0.000	0.000	0.000			
		2325.167				0.000	#DIV/0!	#DIV/0!

Sedimentation Ponds

Sedimentation Pond 003 – Design Details

EMERGENCY SPILLWAY CALCULATIONS

Mine 78 Surface No. 3 Mine
Sedimentation Pond No. 003

Reference A Method for Estimating Volume and Rate of Runoff in Small Watersheds - SCS

STORM ROUTING INFLOW

TYPE II Storm Distribution
Antecedent Moisture Condition (AMC) II

STORM =	**25**	Year
RAINFALL =	**4.30**	Inches
CN =	**85**	
RUNOFF =	2.73	Inches

a, Drainage Acres =	**9.0**
a, Drainage Area, Sq. Miles =	0.0140625
Y, Slope of Watershed =	**33.00**
S, Retention =	1.765
l, length of mainstream =	781.1
L, Lag in Hours =	0.0384855
Tp ,Time to Peak =	0.0884855
Tb, Time of Base =	0.23625628
Ia, Initial Abstraction =	0.35294118

Peak DIscharge = 47.09 cfs (Emergency Spillway)

Sedimentation Ponds

Sedimentation Pond 003 – Design Details

PLAN-VIEW

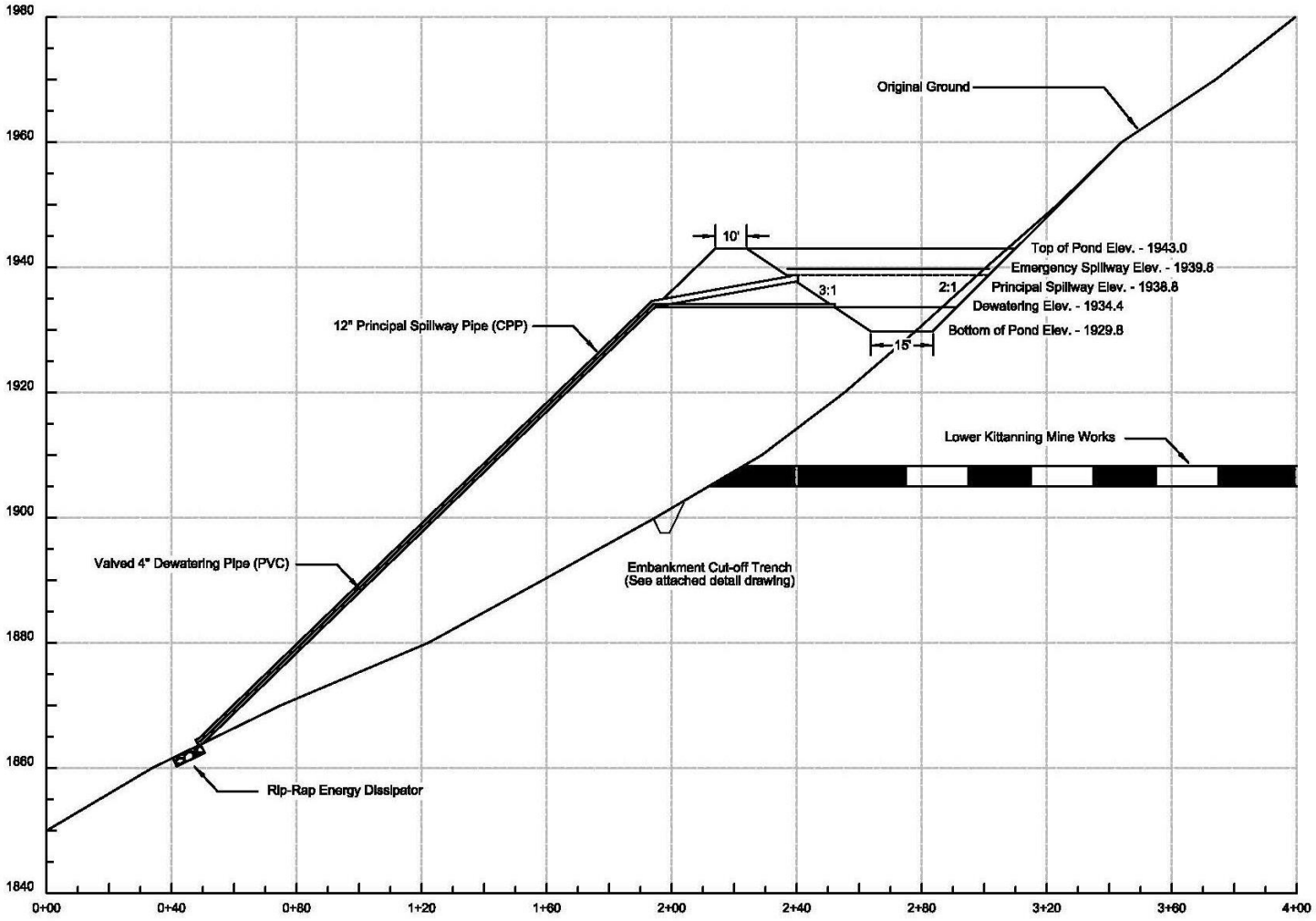
Sedimentation Pond (003)
Drainage Area - 9.0 acres
Required Capacity - 63,000 cubic feet
Design Capacity - 65,667 cubic feet

Emergency Spillway Bottom Width - 16.0 feet
Emergency Spillway Depth - 1.2 feet
Emergency Spillway Capacity - 51.0 cfs
Emergency Spillway Sideslopes - 2 (H) : 1 (V)

Sedimentation Ponds

Sedimentation Pond 003 – Design Details

CROSS-SECTION



Sedimentation Ponds

Sedimentation Pond 004 – Design Details

DESIGN CALCULATIONS

Sedimentation Pond Design

Site: Mine 78 Surface No. 3 Mine

Enter information in green cells only.

Project:	Mine 78 S3 Mine	Elevation			Dimensions	
Pond No.	Sed 004	Bottom	1961.8		L @ Princ.	171
Acres	10.1	Emerg.	1971.8		W @ Princ.	65
Req. Cap.	70,700	Princ.	1970.8		Cap @ Princ.	59,738
B. length	135.0	Top	1975.0		L @ Emerg	175
B. width	20.0	Dewater	4.5		W @ Emerg	70
Depth @ emerg	10.0	Dewat Elev.	1966.3		Cap @ Emerg	71,417
FSS	3.0	Dewat Elev.				
BSS	2.0	Depth	Cap @ Dewater			
RSS	2.0	4.5	20,402		L @ Top	188
LSS	2.0				W @ Top	86
Des. Cap	71,417	L @ Dewater	153			
Dewater-Cap	20,200	W @ Dewater	43			
Water in emerg	1.2					
D @ Princ	9.0					
D @ Top	13.2					

Pond Notes:

Pond sizing based on 7,000 cubic feet of storage capacity per acre (as per DEP)

Dewatering level based on 2,000 cubic feet of stroage capacity per acre (as per DEP)

Pond Capacity Design based on the Prismoidal Formula = A(b) + 4A(m) + A(t) / 6 * L

Design capacity based on the depth at the crest of the Emergency Spillway

Sedimentation Pond 004 – Design Details

PRINCIPAL SPILLWAY CALCULATIONS

Design Data :

Riser Diameter,D :	12	inch	
Riser Area, A :	0.785	sq.ft	
Depth from Max. Water Level to Riser Elevation, H :	1	feet	
Riser Circunference,L :	3.1416	feet	
Barrel Length,l :	45	feet	
Riser Construction :	0		
Barrel Diameter,d :	12	inch	
Barrel Area, a :	0.785	sq.ft	
Barrel Construction :	Corrugated Plastic		
ad above the centerline of the outlet end of barrel,h :	9	feet	
Orifice Coefficient (sharp-edged), C :	0.6		
Weir Coefficient,C' :	3.1		
coefficient of minor losses, K_m :	1		
pipe friction coefficient, K_p :	$(5087n^{2)}/d^{4/3}$		0.075363
Manning's Coefficient of Roughness,n :	0.015		

Kp = [(5087)(0.000225)]/27.471 = 0.041662

Orifice Flow : $Q=CA\ (2gH)^{0.5}$

Q = (0.6)(0.785)([(2)(32.2)(1.0)] $^{0.5}$) =" 3.78 cfs

Weir Flow : $Q=C'LH^{1.5}$

Q = (3.1)(3.14)([1.0] $^{1.5}$) =" 9.74 cfs

Pipe Flow : $Q = a\ [(2gh)/(1+K_m+K_pL)]^{0.5}$

Q = 0.7854([(2)(32.2)(9.00)]/(1+1.0+((0.042)(45.0))] $^{0.5}$) =" 9.61 cfs

Sedimentation Ponds

Sedimentation Pond 004 – Design Details

DEWATERING CALCULATIONS

DEWATERING TIME Sedimentation Pond 004

POND DIMENSIONS :		Emergency S'Way Crest :	1971.8	NOTE :	Dewatering time shown is
Bottom Width :	20 ft.	Principal S'Way Elev. :	1970.8		minimum value. Time can be
Bottom Length :	135 ft.	Dewatering Device Elev. :	1966.3		extended by adjusting valve.
Side Slopes :	2 :1	Principal Spillway Dia. (in.) :	12		
Bottom Elevation :	1961.8	Dewatering Device Dia. (in.) :	4		

Elevation Ft.	Volume cu. ft.	Diff. Volume cu. ft.	Prin. Disch. CFS	DWD Disch. CFS	TOTAL Disch. CFS	AVG. Disch. CFS	TIME hrs.	ACCUM. TIME Hrs.
1971.8	63333.33		3.717	0.969	4.685			
		5133.167				4.118	0.346	0.346
1971.3	58200.17		2.628	0.923	3.552			
		4902.167				2.214	0.615	0.961
1970.8	53298		0.000	0.876	0.876			
		4675.167				0.851	1.526	2.487
1970.3	48622.83		0.000	0.826	0.826			
		4452.167				0.799	1.547	4.035
1969.8	44170.67		0.000	0.773	0.773			
		4233.167				0.744	1.581	5.615
1969.3	39937.5		0.000	0.715	0.715			
		4018.167				0.684	1.631	7.247
1968.8	35919.33		0.000	0.653	0.653			
		3807.167				0.619	1.710	8.957
1968.3	32112.17		0.000	0.584	0.584			
		3600.167				0.545	1.835	10.792
1967.8	28512		0.000	0.506	0.506			
		3397.167				0.459	2.054	12.846
1967.3	25114.83		0.000	0.413	0.413			
		3198.167				0.352	2.520	15.366
1966.8	21916.67		0.000	0.292	0.292			
		3003.167				0.146	5.713	21.080
1966.3	18913.5		0.000	0.000	0.000			
		2812.167				0.000	#DIV/0!	#DIV/0!
1965.8	16101.33		0.000	0.000	0.000			
		2625.167				0.000	#DIV/0!	#DIV/0!

Sedimentation Ponds

Sedimentation Pond 004 – Design Details

EMERGENCY SPILLWAY CALCULATIONS

Mine 78 Surface No. 3 Mine
Sedimentation Pond No. 004

Reference A Method for Estimating Volume and Rate of Runoff in Small Watersheds - SCS

STORM ROUTING INFLOW

TYPE II Storm Distribution
Antecedent Moisture Condition (AMC) II

STORM =	25	Year	a, Drainage Acres =	10.1
RAINFALL =	4.30	Inches	a, Drainage Area, Sq. Miles =	0.01578125
CN =	85		Y, Slope of Watershed =	36.00
RUNOFF =	2.73	Inches	S, Retention =	1.765
			l, length of mainstream =	837.0
			L, Lag in Hours =	0.03894401
			Tp ,Time to Peak =	0.08894401
			Tb, Time of Base =	0.23748051
			Ia, Initial Abstraction =	0.35294118

Peak Discharge = 52.70 cfs (Emergency Spillway)

Sedimentation Ponds

Sedimentation Pond 004 – Design Details

PLAN-VIEW

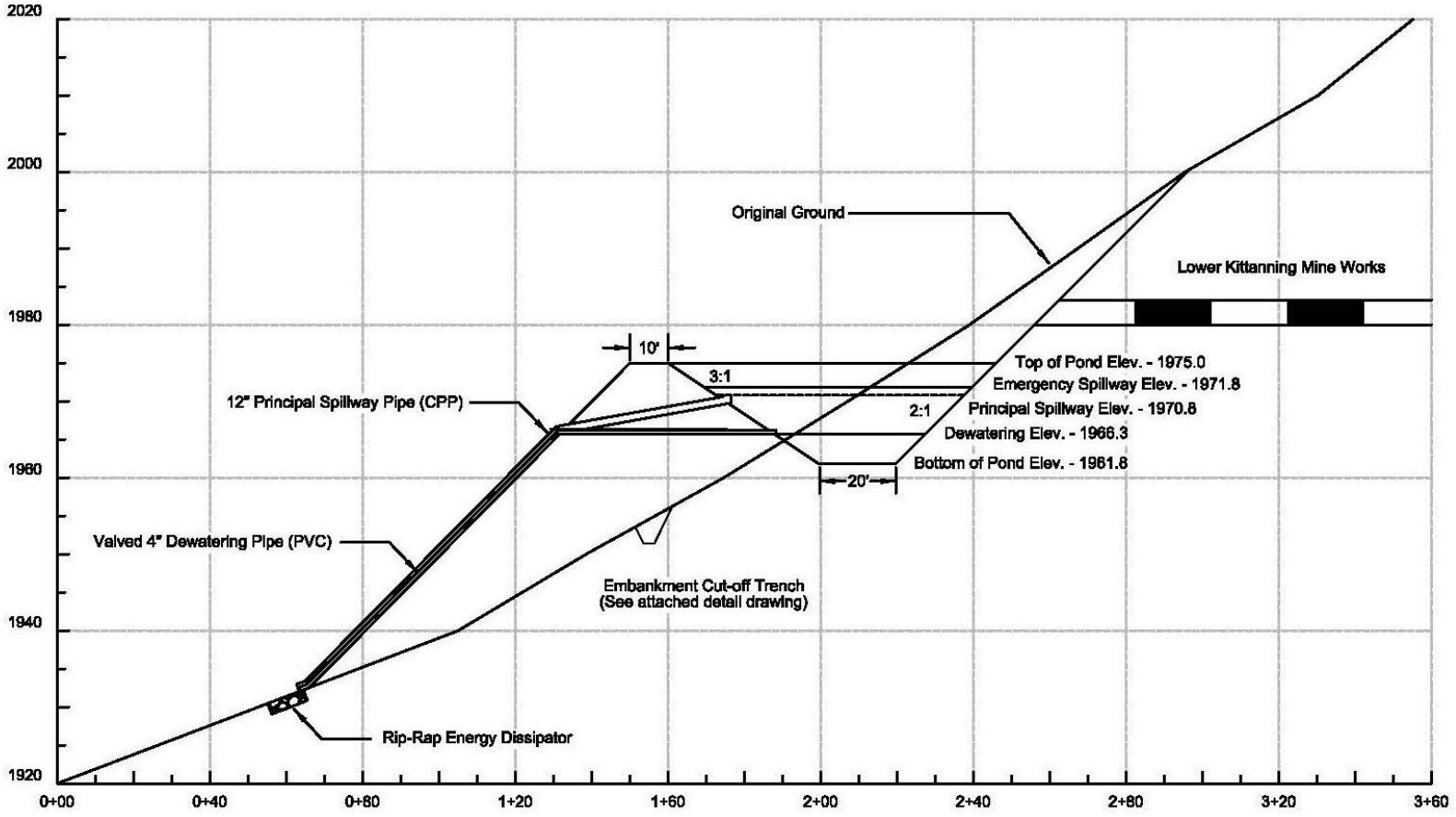
Sedimentation Pond (004)
Drainage Area - 10.1 acres
Required Capacity - 70,700 cubic feet
Design Capacity - 71,417 cubic feet

Emergency Spillway Bottom Width - 18.0 feet
Emergency Spillway Depth - 1.2 feet
Emergency Spillway Capacity - 58.0 cfs
Emergency Spillway Sideslopes - 2 (H) : 1 (V)

Sedimentation Ponds

Sedimentation Pond 004 – Design Details

CROSS-SECTION



Sedimentation Ponds

Sedimentation Pond 005 – Design Details

DESIGN CALCULATIONS

Sedimentation Pond Design

Site: Mine 78 Surface No. 3 Mine

Enter information in green cells only.

Project:	Mine 78 S3 Mine	Elevation			Dimensions	
Pond No.	Sed 005	Bottom		2000.0	L @ Princ.	102
Acres	4.4	Emerg.		2009.0	W @ Princ.	55
Req. Cap.	30,800	Princ.		2008.0	Cap @ Princ.	24,933
B. length	70.0	Top		2012.0	L @ Emerg	106
B. width	15.0	Dewater		4.3	W @ Emerg	60
Depth @ emerg	9.0	Dewat Elev.		2004.3	Cap @ Emerg	30,915
FSS	3.0	Dewat Elev.				
BSS	2.0	Depth	Cap @ Dewater			
RSS	2.0	4.3		8,835	L @ Top	118
LSS	2.0				W @ Top	75
Des. Cap	30,915	0	87			
Dewater-Cap	8,800	W @ Dewater	37			
Water in emerg	1.0					
D @ Princ	8.0					
D @ Top	12.0					

Pond Notes:

Pond sizing based on 7,000 cubic feet of storage capacity per acre (as per DEP)

Dewatering level based on 2,000 cubic feet of stroage capacity per acre (as per DEP)

Pond Capacity Design based on the Prismoidal Formula = A(b) + 4A(m) + A(t) / 6 * L

Design capacity based on the depth at the crest of the Emergency Spillway

Sedimentation Pond 005 – Design Details

PRINCIPAL SPILLWAY CALCULATIONS

Principal Spillway Design 005

Design Data :

Riser Diameter,D :	12	inch	
Riser Area, A :	0.785	sq.ft	
Depth from Max. Water Level to Riser Elevation, H :	1	feet	
Riser Circunference,L :	3.1416	feet	
Barrel Length,l :	45	feet	
Riser Construction :	0		
Barrel Diameter,d :	12	inch	
Barrel Area, a :	0.785	sq.ft	
Barrel Construction :	Corrugated Plastic		
ad above the centerline of the outlet end of barrel,h :	9	feet	
Orifice Coefficient (sharp-edged), C :	0.6		
Weir Coefficient,C' :	3.1		
coefficient of minor losses, K_m :	1		
pipe friction coefficient, K_p :	$(5087n^{2)}/d^{4/3}$		0.075363
Manning's Coefficient of Roughness,n :	0.015		

Kp = [(5087)(0.000225)]/27.471 = 0.041662

Orifice Flow : $Q=CA\ (2gH)^{0.5}$

$Q = (0.6)(0.785)([(2)(32.2)(1.0)]^{0.5}) =$" 3.78 cfs

Weir Flow : $Q=C'LH^{1.5}$

$Q = (3.1)(3.14)([1.0]^{1.5}) =$" 9.74 cfs

Pipe Flow : $Q = a\ [(2gh)/(1+K_m+K_pL)]^{0.5}$

$Q = 0.7854([(2)(32.2)(9.00)]/(1+1.0+((0.042)(45.0))]^{0.5}) =$" 9.61 cfs

DEWATERING CALCULATIONS

DEWATERING TIME Sedimentation Pond 005

POND DIMENSIONS :			Emergency S'Way Crest :	2009	NOTE : Dewatering time shown is minimum value. Time can be extended by adjusting valve.
Bottom Width :	15 ft.		Principal S'Way Elev. :	2008	
Bottom Length :	70 ft.		Dewatering Device Elev. :	2004.3	
Side Slopes :	2 :1		Principal Spillway Dia. (in.) :	12	
Bottom Elevation :	2000		Dewatering Device Dia. (in.) :	4	

Elevation Ft.	Volume cu. ft.	Diff. Volume cu. ft.	Prin. Disch. CFS	DWD Disch. CFS	TOTAL Disch. CFS	AVG. Disch. CFS	TIME hrs.	ACCUM. TIME Hrs.
2009	27108		3.717	0.895	4.612			
		2625.167				4.043	0.180	0.180
2008.5	24482.83		2.628	0.846	3.474			
		2472.167				2.134	0.322	0.502
2008	22010.67		0.000	0.794	0.794			
		2323.167				0.767	0.842	1.344
2007.5	19687.5		0.000	0.739	0.739			
		2178.167				0.709	0.854	2.198
2007	17509.33		0.000	0.679	0.679			
		2037.167				0.646	0.877	3.074
2006.5	15472.17		0.000	0.613	0.613			
		1900.167				0.575	0.917	3.991
2006	13572		0.000	0.538	0.538			
		1767.167				0.495	0.991	4.982
2005.5	11804.83		0.000	0.452	0.452			
		1638.167				0.399	1.141	6.123
2005	10166.67		0.000	0.346	0.346			
		1513.167				0.265	1.586	7.708
2004.5	8653.5		0.000	0.185	0.185			
		1392.167				0.092	4.188	11.896

Sedimentation Ponds

Sedimentation Pond 005 – Design Details

EMERGENCY SPILLWAY CALCULATIONS

Mine 78 Surface No. 3 Mine
Sedimentation Pond No. 005

Reference A Method for Estimating Volume and Rate of Runoff in Small Watersheds - SCS

STORM ROUTING INFLOW

TYPE II Storm Distribution
Antecedent Moisture Condition (AMC) II

STORM =	**25**	Year
RAINFALL =	**4.30**	Inches
CN =	**85**	
RUNOFF =	2.73	Inches

a, Drainage Acres =	**4.4**
a, Drainage Area, Sq. Miles =	0.006875
Y, Slope of Watershed =	**21.00**
S, Retention =	1.765
l, length of mainstream =	508.4
L, Lag in Hours =	0.03421884
Tp ,Time to Peak =	0.08421884
Tb, Time of Base =	0.22486431
Ia, Initial Abstraction =	0.35294118

Peak Discharge = 23.31 cfs (Emergency Spillway)

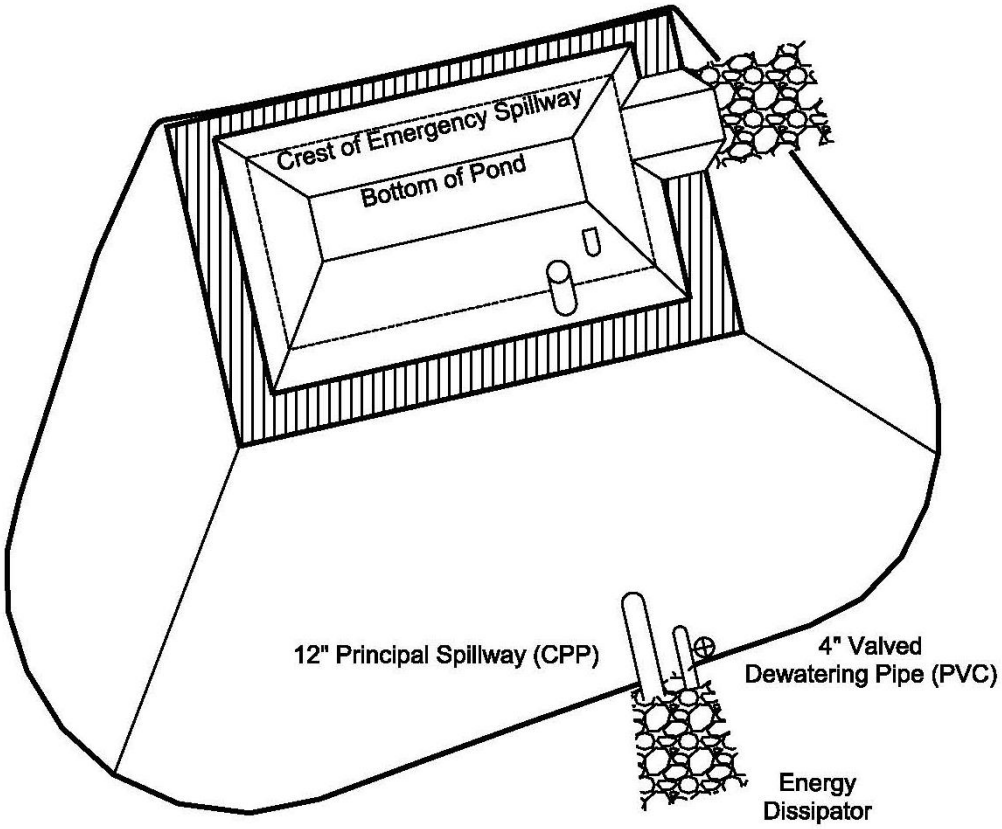
Sedimentation Ponds

Sedimentation Pond 005 – Design Details

PLAN-VIEW

Sedimentation Pond (005)
Drainage Area - 4.4 acres
Required Capacity - 30,800 cubic feet
Design Capacity - 30,915 cubic feet

Emergency Spillway Bottom Width - 10.0 feet
Emergency Spillway Depth - 1.0 feet
Emergency Spillway Capacity - 24.0 cfs
Emergency Spillway Sideslopes - 2 (H) : 1 (V)



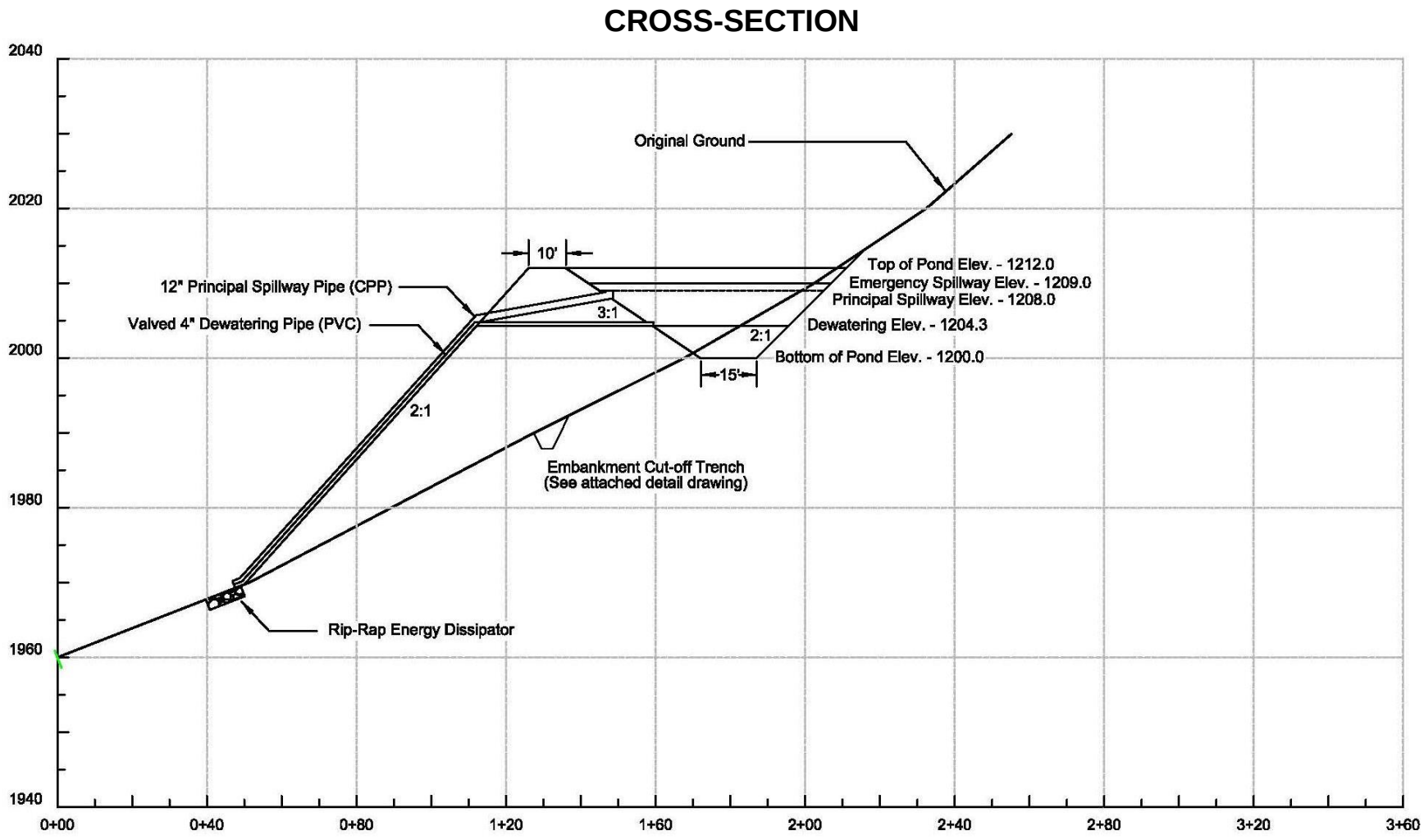
Bottom Elev. - 2000.0
Dewatering Elev. - 2004.3
P. Spillway Elev. - 2008.0
E. Spillway Elev. - 2009.0
Top of Pond Elev. - 2012.0

POND 004 DIMENSIONS

Bottom Length - 70.0 feet
Bottom Width - 15.0 feet
Depth at Dewatering Elev. - 4.3 feet
Depth at P. Spillway Elev. - 8.0 feet
Depth at E. Spillway Elev. - 9.0 feet
Depth at Top of Pond Elev. - 12.0 feet
Design Capacity - 30,915 feet

Sedimentation Ponds

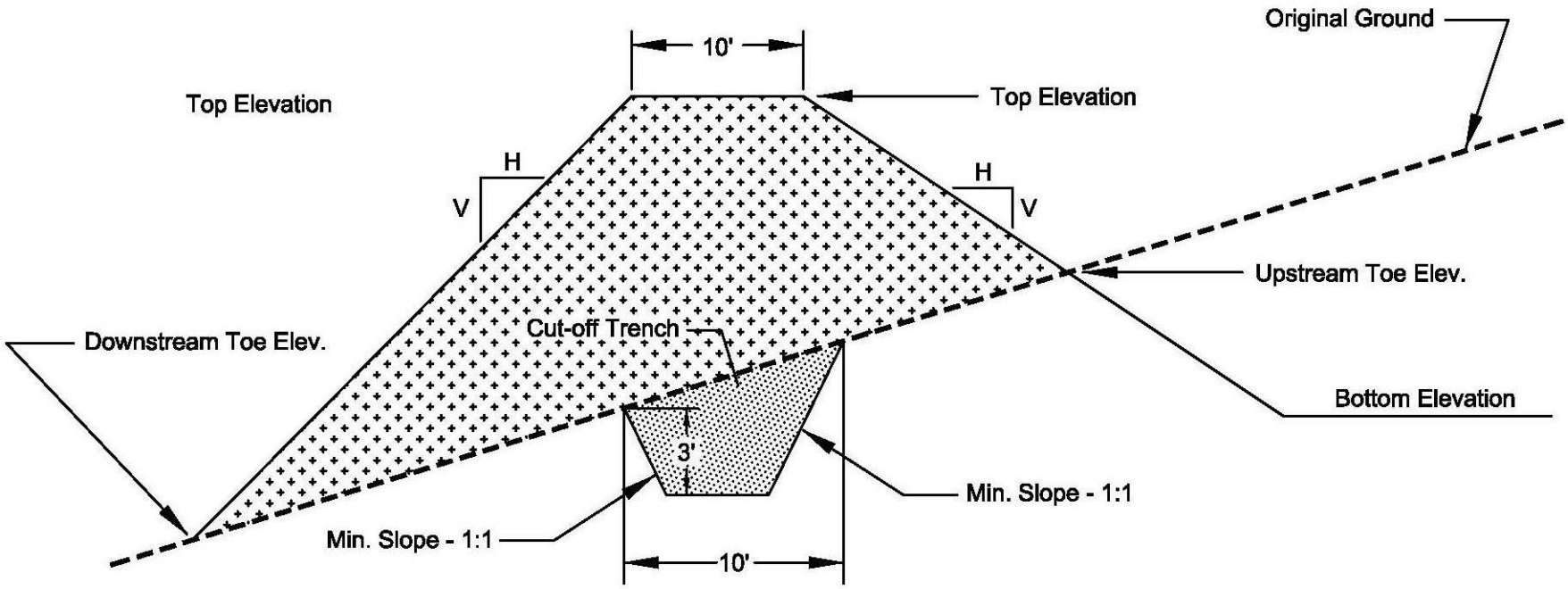
Sedimentation Pond 005 – Design Details



Sedimentation Ponds

Design Details

EMBANKMENT & CUT-OFF TRENCH DESIGN

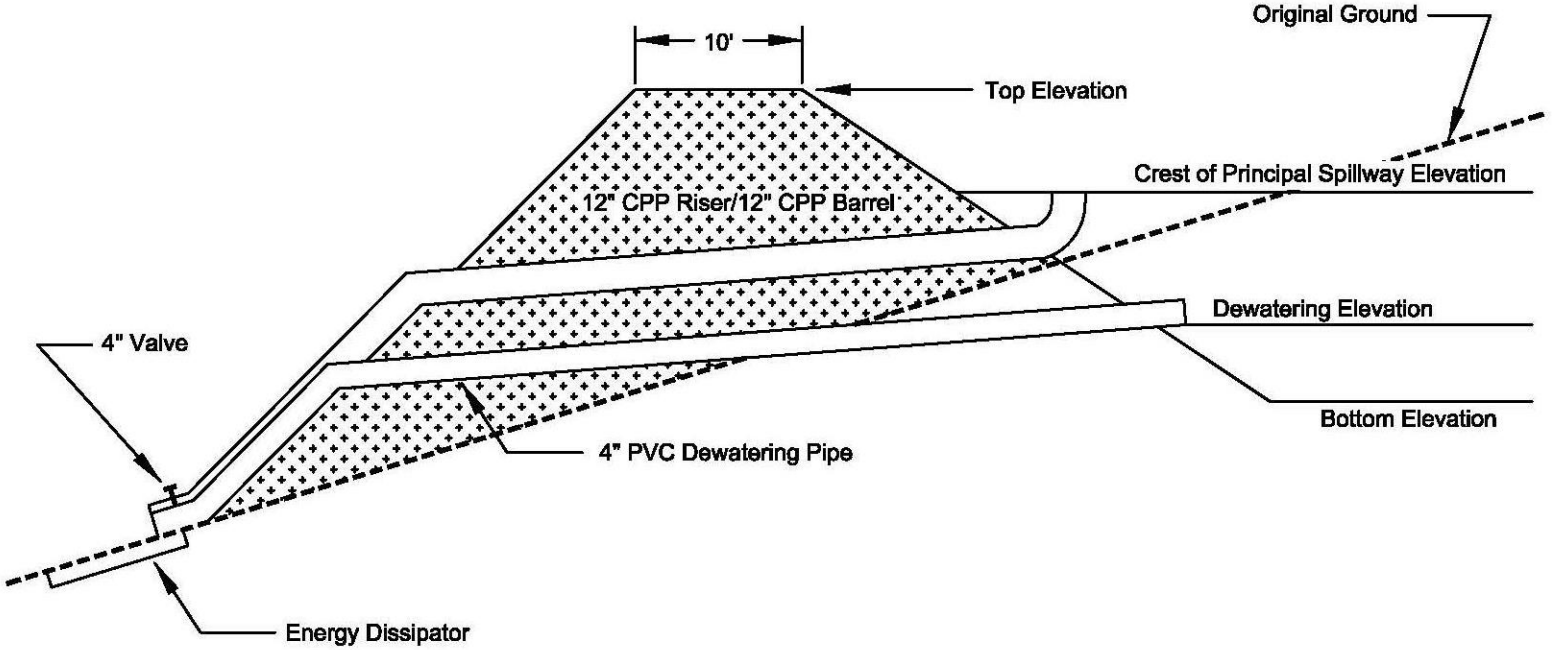


Notes: The sum of the inside and outside embankment slopes will be equal to or greater than 5 (horizontal) to 1 (vertical).
Top width of embankment will be a minimum of 10 feet.
Drawing not to scale.

Sedimentation Ponds

Design Details

PRINCIPAL SPILLWAY & DEWATERING DESIGN

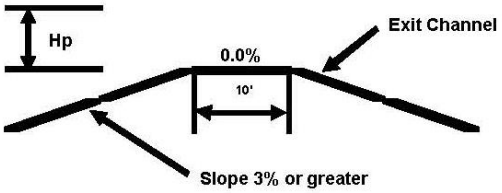


Notes: The principal spillway and dewatering pipes will be extended down the embankment until original ground.
Drawing not to scale.

Sedimentation Ponds

Design Details

DESIGN DATA FOR EARTH SPILLWAY

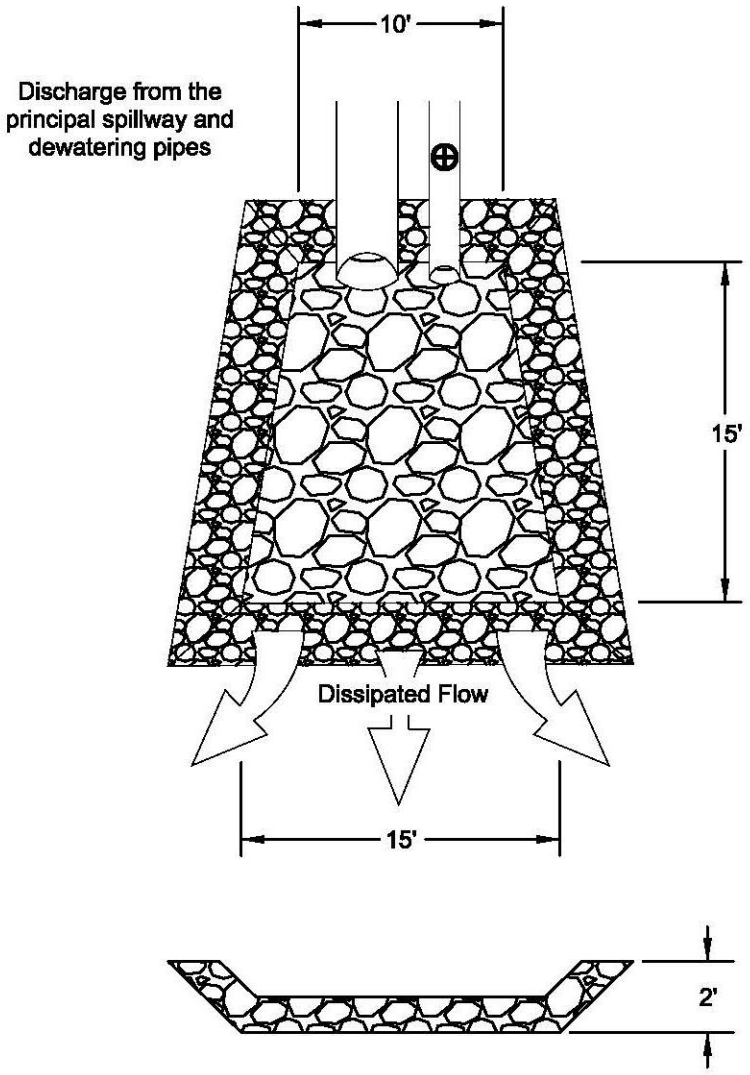


Side Slopes = 2:1
n (Mannings) = 0.04
Q = discharge (cfs)
Hp = height of pool above emergency spillway crest
S min - minimum exit channel slope
S max - minimum exit channel slope

(ft)		Spillway Bottom Width (ft.)											
Hp		8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0
1.0	Q	20.0	24.0	29.0	33.0	38.0	42.0	47.0	51.0	56.0	61.0	63.0	68.0
	VC	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	Smin	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	Smax	11.0	11.0	10.6	10.6	10.1	10.5	10.1	10.1	10.1	9.8	10.2	10.1
1.2	Q	28.0	33.0	40.0	45.0	51.0	58.0	64.0	69.0	76.0	80.0	86.0	92.0
	VC	4.4	4.4	4.4	4.4	4.4	4.5	4.5	4.5	4.5	4.5	4.5	4.5
	Smin	2.9	2.9	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
	Smax	7.4	7.6	7.4	7.4	7.4	6.9	7.1	7.1	6.9	7.3	7.1	7.1
1.4	Q	37.0	44.0	51.0	59.0	66.0	74.0	82.0	90.0	96.0	103.0	111.0	119.0
	VC	4.7	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.9	4.9	4.9
	Smin	2.8	2.7	2.7	2.7	2.7	2.7	2.7	2.6	2.6	2.6	2.6	2.6
	Smax	5.7	5.6	5.3	5.4	5.4	5.2	5.1	5.1	5.1	5.1	5.1	5.1
1.6	Q	46.0	56.0	65.0	75.0	84.0	94.0	104.0	112.0	122.0	132.0	142.0	149.0
	VC	5.0	5.1	5.1	5.1	5.1	5.2	5.2	5.2	5.2	5.2	5.2	5.2
	Smin	2.6	2.6	2.6	2.6	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	Smax	4.6	4.4	4.2	4.1	4.1	4.0	3.9	3.9	3.9	3.8	3.8	3.9
1.8	Q	58.0	69.0	81.0	93.0	104.0	116.0	127.0	138.0	150.0	160.0	171.0	182.0
	VC	5.3	5.4	5.4	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.6
	Smin	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
	Smax	3.7	3.5	3.4	3.3	3.3	3.1	3.2	3.1	3.1	3.1	3.1	3.1
2.0	Q	71.0	83.0	97.0	111.0	125.0	138.0	153.0	164.0	178.0	193.0	204.0	218.0
	VC	5.6	5.7	5.7	5.7	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.9
	Smin	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3
	Smax	3.0	2.9	2.8	2.7	2.7	2.6	2.6	2.6	2.5	2.5	2.5	2.5

Erosion and Sedimentation Control

ENERGY DISSIPATOR



The energy dissipator will be lined with R-3 and R-4 rip-rap to a depth of approximately 1 foot. FS-2 will be used as an under layer to prevent scouring. Drawing not to scale.

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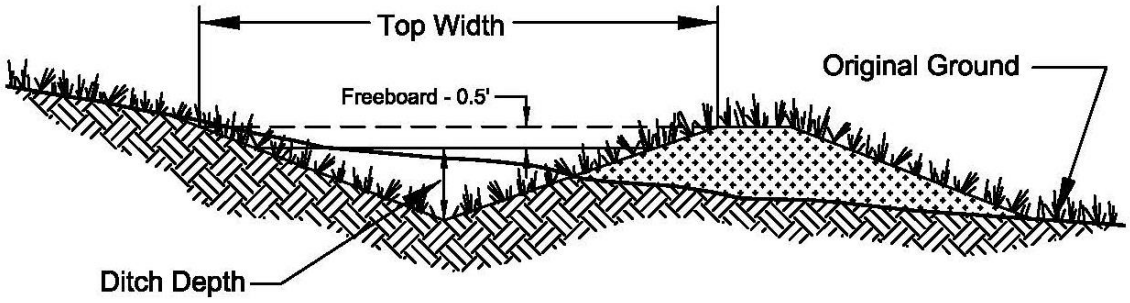
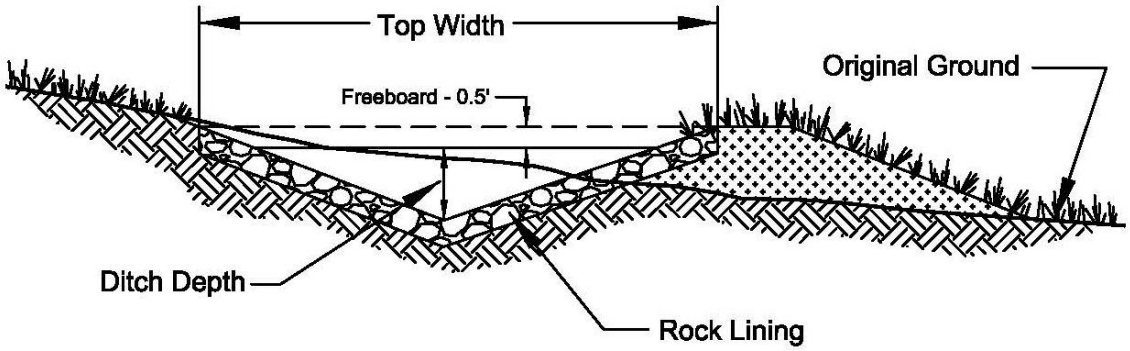
Erosion and Sedimentation Control

TYPICAL DITCH CROSS-SECTION



GRASS LINED DITCH

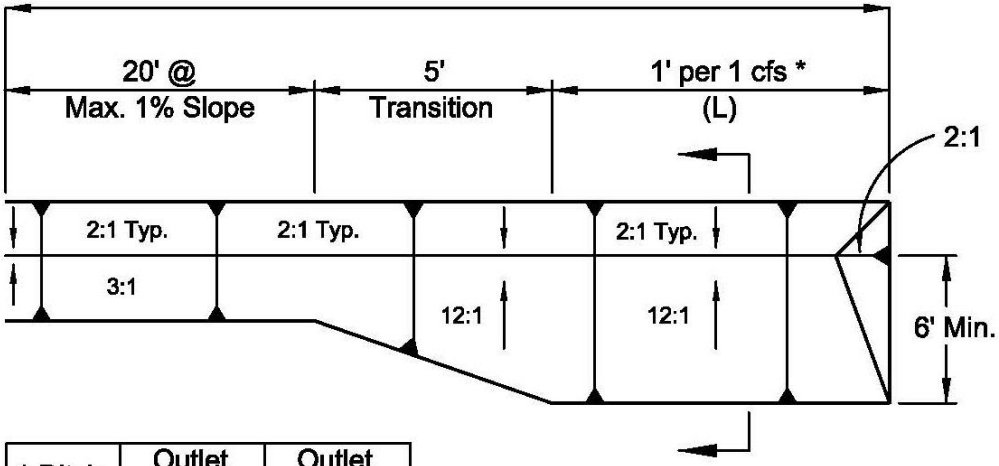


ROCK LINED DITCH

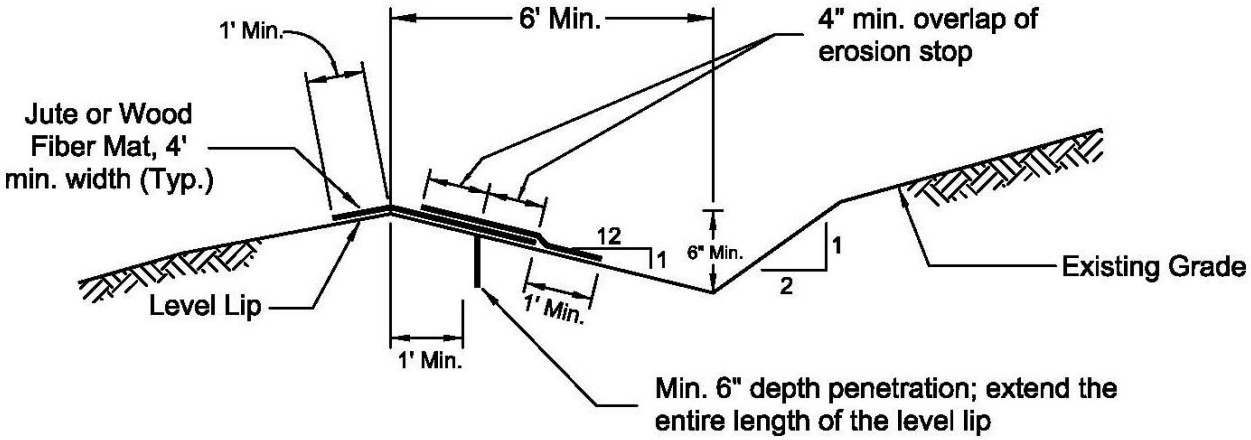
Erosion and Sedimentation Control

LEVEL SPREADER DESIGN

Plan-View



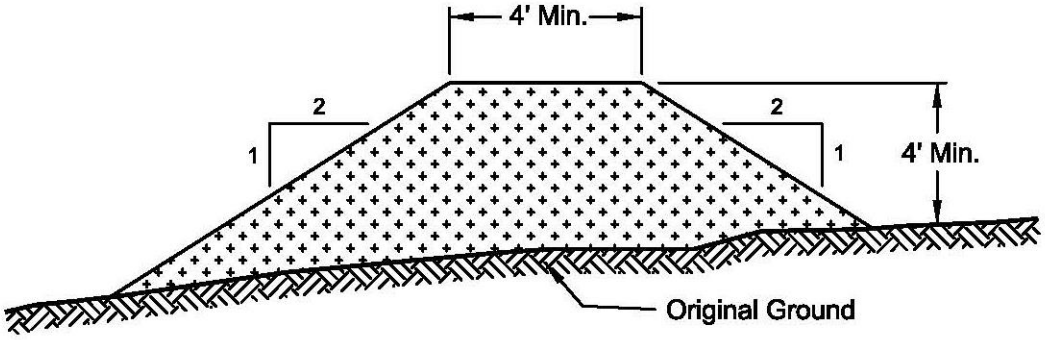
* Ditch	Outlet Velocity	Outlet Length
DD-1	4.8 fps	5 feet
DD-2	7.5 fps	8 feet
DD-3	4.8 fps	5 feet



Cross-Section

Erosion and Sedimentation Control

EARTHEN DIKING DESIGN



Cross-Section of Earthen Dike

Earthen diking will be used at various locations to convey runoff from unaffected areas away from the affected area and/or to prevent affected surface runoff from leaving the disturbed area.

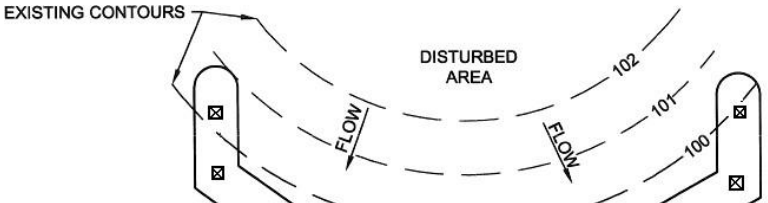
The Earthen diking will be constructed out of subsoil found onsite and will be graded anf vegetated with the permanent seed mixture upon final construction.

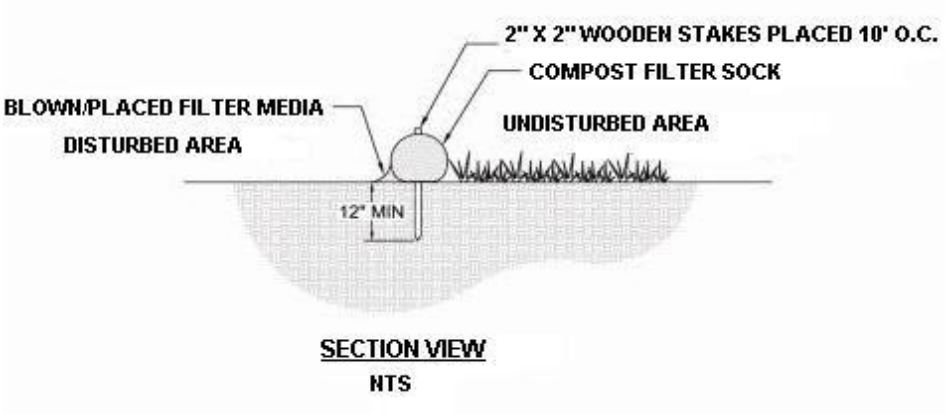
The earthen diking will have a minimum top width to 4 feet and will be a minimum of 4 feet high, with 2:1 sideslopes.

The earthen diking will be inspected on a regular basis and after every rainfall with any required maintenance being completed upon discovery.

Erosion and Sedimentation Control

COMPOST FILTER SOCK





Compost filter sock shall be placed at existing level grade. Both ends of the sock shall be extended at least 8 feet up slope at 45 degrees to the main sock alignment

Traffic shall not be permitted to cross filter socks.

Accumulated sediment shall be removed when it reaches half the aboveground height of the sock and disposed in the manner described elsewhere in the plan.

Socks shall be inspected weekly and after each runoff event. Damaged socks shall be repaired according to manufacturer's specifications or replaced within 24 hours of inspection.

Biodegradable filter socks shall be replaced after 6 months; photodegradable socks after 1 year. Polypropylene socks shall be replaced according to manufacturer's recommendations.

Upon stabilization of the area tributary to the sock, stakes shall be removed. The sock may be left in place and vegetated or removed. In the latter case, the mesh shall be cut open and the mulch spread as a soil supplement.

Erosion and Sedimentation Control

STRAW BALE BARRIER DESIGN

Maximum Slope Lengths for Straw Bale Barrier

Percent Slope	Maximum slope length above barrier (feet)
2% or less	250

Class C Dams

A separate permit is required for impoundments that meet one or more of the following:

1) a contributory drainage area exceeding 100 acres;
2) a depth of water measured by the upstream toe of the dam at maximum storage elevation exceeding 15 feet;
3) an impounding capacity at maximum storage elevation exceeding 50 acre-feet.

Not applicable.

Haul Roads/Access Roads

Provide the following information for each road to be constructed, reconstructed or used in the operation:

Note: Activities proposed to be conducted under General Permit for Temporary Road Crossings (BMR-GP-101) and
General Permit for Access Road Crossings (BMR-GP-102) must include a completed Notification Form, with attachments, for the respective General Permit (i.e., Form 5600-FM-MR0054 for BMR-GP-101 and Form 5600-FM-MR0059 for BMR-GP-102). BMR-GP-102 may not be used for haul roads.

A narrative description of the location and show the location on Exhibit 9 (and Exhibit 18 if road will remain as part of postmining land use);

Although access to the larger proposed mining areas will utilize existing haul/access roads permitted as part of the Mine 78 (CMAP No. 56841328) deep mine, new entrance roads (haul roads) will be constructed to the small proposed mining areas in the northwest and northcentral portions of the permit boundary. Take-off points for proposed access to the larger mining areas, along with the location of the new haul roads have been noted on the Exhibit 9: Operations Map.

Haul Road No. 1 – this haul road will provide access to the small northwestern portion of the mining area off of Hoffman Farm Road.

Haul Road No. 2 – this haul road will consist of the construction of a small section of road which will cross Collection Ditch (CD-9). A 24" corrugated metal pipe will be used to channel CD-9 under the haul road. This road will be a spur off of an existing road within the Mine 78 Deep Mine permit.

Description and typical cross-sections which show the construction of the road including existing ground, road widths, surfacing materials, grades, slopes, culverts, bridges, outlet protection and other drainage controls;

See the attached typical haul road cross-section and rock entrance design sheets. .

Measures to control and prevent erosion and sedimentation; include proposed spacing of sediment traps, turnouts, culverts, check dams, etc.;

Given the proposed length of the haul roads to be constructed, less than 100 feet, no sediment traps, turnouts, or check dams will be necessary. As noted, a 24" corrugated metal pipe will be used to channel Collection Ditch (CD-9) beneath Haul Road No. 2.

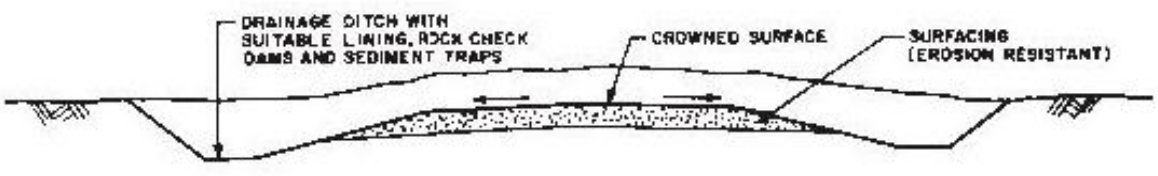
Haul Roads/Access Roads (cont.)

Plan for reclamation after mining is completed;

Reclamation of the haul roads will take place upon completion of coal removal and site reclamation. Prior to the spreading of topsoil, any stone and/or culverts will be removed, berms will be regraded and the area regraded to approximate original contour. Topsoil will then replaced and the area seeded with the approved seed mixture.

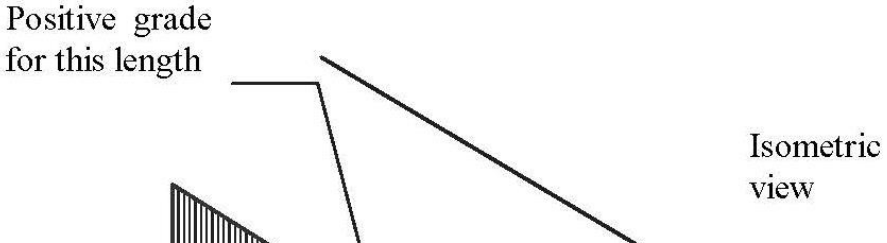
Haul Roads/Access Roads (cont.)

TYPICAL HAUL ROAD CROSS_SECTION



Haul Roads/Access Roads

ROCK CONSTRUCTION ENTRANCE



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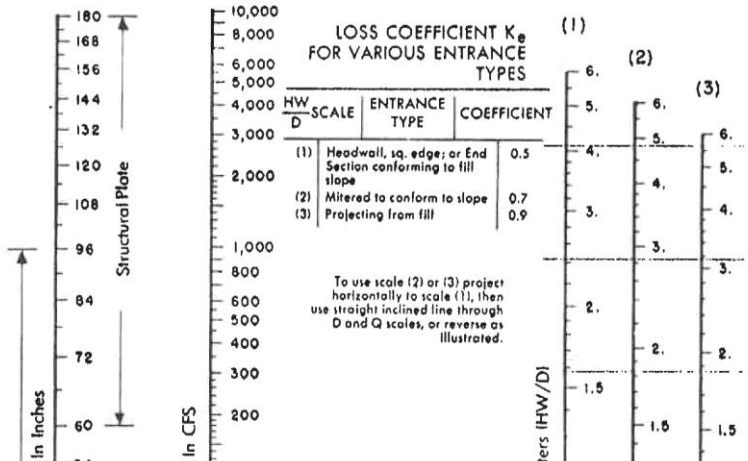
Haul Roads/Access Roads

HAUL ROAD NO. 2 CMP SIZING



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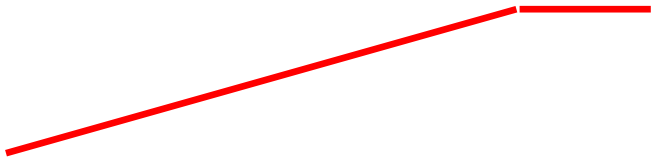

Diameter of Pipe (ft) = 2’

HW/D (ft) = 0.92’

HW (ft) = 1.84’

Coal ash beneficial use/Sewage sludge/biosolids beneficial use.

Not applicable.