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Spring Creek Mine
Drainage Control Plan

1.0 DISTURBED AREA RUNOFF CONTROL

All runoff from areas disturbed by mining will be treated to comply with applicable effluent limits under Montana Pollutant Discharge Elimination System (MPDES) Regulations, and in compliance with all applicable regulations under the Surface Mine Control and Reclamation Act (SMCRA) and the Administrative Rules of Montana (ARM) as promulgated by the Department of State Lands now Montana Department of Environmental Quality (MDEQ), Coal and Uranium Bureau. Disturbed area runoff will be controlled by a network of collection ditches, sediment control ponds and sediment traps. Appendix K, Exhibit 1 shows locations of all existing control facilities and planned facilities through the life of the mine. Discussion of each major structure type used in runoff control is presented below. The design methods and other pertinent information about these structures are included.

An evaluation of using mine pits versus sediment control structures for management of disturbed area runoff was conducted with the goal of minimizing disturbance related to anticipated sediment control structures. Although Spring Creek Mine (SCM) is committed to using mine pits to the extent practicable for sediment and runoff control, two factors compel the use of sediment control structures (in particular Ponds 48 and 50) in lieu of using mine pits for sediment control. These include:

1) Pond 48 (see Appendix K, Exhibit 1) will be necessary because the remnant southeast corner of Pit 2 currently being used for runoff and sediment control will require drainage control and MPDES regulations require an outfall downgradient of this disturbance. Therefore Pond 48 will be required to be constructed after the south end of Pit #6 has been backfilled to grade.

2) Pond 50 will be required in order to comply with MPDES regulations and an outfall must be present downstream of the anticipated mining disturbance in the Pearson Creek drainage.

1.1 Sediment Ponds

All sediment control ponds will, at a minimum, be constructed with sufficient capacity to fully contain runoff volumes resulting from a 10-year, 24-hour precipitation event or other event as directed by MDEQ, plus adequate storage volume for 3 years of sediment accumulation. Spillways are designed to convey the peak discharge from the 25-year, 24-hour precipitation event runoff. Ponds designed for the 25-year, 24-hour storm or greater will be considered a full retention pond and a spillway will not be designed or constructed. Appendix K, Exhibit 1 (Hydrologic Control Plan, During Mining) shows the locations of existing sediment ponds and the location of ponds planned for construction during future mining. Table K-1 lists existing and planned future sediment ponds along with pertinent information about pond sizing, design, and construction. Table K-1 includes pond sizing “As Computed” which are the results of runoff computations and sediment yields/volume computations. These values are the pond sizing as determined by the design storm computations. Table K-1 also presents “As Designed” information, which is the pond capacity computed for the final pond design. This takes into account the physical placement of the pond, any excess capacity designed into the pond and therefore, will be somewhat different than the “As

TABLE K-1. SEDIMENT POND INFORMATION

AS COMPUTED									AS DESIGNED		
STRUCTURE DESIGNATION	TOTAL DRAINAGE AREA (ACRES)	DISTURBED DRAINAGE AREA (ACRES)	NATIVE DRAINAGE AREA (ACRES)	RUNOFF CURVE NUMBER	DESIGN EVENT	RUNOFF VOLUME (AC-FT)	SEDIMENT VOLUME (AC-FT)	COMPUTATION METHOD	POND CAPACITY (AC-FT)	(10-12) WATER CAPACITY (AC-FT)	DEAD STORAGE CAPACITY (AC-FT)
POND 1	1810.0	1810.0	0.0	79	10-24	42.0	63.0	SCS Triangular Hydrograph	140.60	42.00	63.00
POND 2	175.0	175.0	0.0	73.2	25-24	13.7	1.9	TriHydro	19.50	17.61	1.89
POND 7	77.4	77.4	0.0	0.2*	100-24	4.4	0.1	Modified Rational	4.98	4.92	0.06
POND 48	3967.0	2677.4	1289.6	80	10-24	225.7	79.3	TriHydro	**	**	**
POND 50	68.0	68.0	0.0	83.5	10-24	2.6	1.4	TriHydro	10.02	8.66	1.36
POND 69	106.0	106.0	0.0	89/81	10-24	6.9	3.7	SCS Triangular Hydrograph	10.79	7.03	3.76
POND 71	25.5	25.5	0.0	90	25-24	2.9	0.5	SCS Triangular Hydrograph	3.79	3.28	0.91
POND 72	157.9	135.8	22.1	90	25-24	16.6	3.2	SCS Triangular Hydrograph	19.75	16.59	3.16
POND 91	13.9	13.9	0.0	87	10-24	1.2	0.3	SCS Triangular Hydrograph	1.50	1.22	0.28
POND 92	18.6	18.6	0.0	87	10-24	1.64	0.4	SCS Triangular Hydrograph	2.04	1.67	0.37
POND 93	14.8	14.8	0.0	87	10-24	1.3	0.3	SCS Triangular Hydrograph	1.60	1.30	0.30
POND 94	13.0	13.0	0.0	87	10-24	1.14	0.3	SCS Triangular Hydrograph	1.46	1.20	0.26
POND 95	27.2	27.2	0.0	87	10-24	2.4	0.6	SCS Triangular Hydrograph	3.00	2.40	0.56
POND 96	9.1	9.1	0.0	87	10-24	0.8	0.2	SCS Triangular Hydrograph	1.00	0.82	0.18
POND 97	3.1	3.1	0.0	87	10-24	0.27	0.1	SCS Triangular Hydrograph	0.33	0.27	0.06
POND 98	7.3	7.3	0.0	87	10-24	0.64	0.2	SCS Triangular Hydrograph	1.00	0.85	0.15
POND 99	21.3	21.3	0.0	87	10-24	1.87	0.43	SCS Triangular Hydrograph	2.30	1.87	0.43
POND 100	113.3	67.4	45.9	84	100-24	8.78	1.4	SCS Triangular Hydrograph	11.09	9.40	1.69
POND 101	23.7	13.3	10.4	77.8	100-24	1.15	0.3	SCS Triangular Hydrograph	1.59	1.27	0.32
POND 102	32.6	10.8	21.8	77.4	100-24	1.39	0.22	SCS Triangular Hydrograph	1.77	1.47	0.30
POND 103	3.9	3.9	0.0	87	10-24	0.34	0.08	SCS Triangular Hydrograph	0.41	0.34	0.18
POND 104	9.7	9.7	0.0	87	10-24	0.85	0.19	SCS Triangular Hydrograph	1.06	0.87	0.19
POND 105	2.7	2.7	0.0	87	10-24	0.23	0.05	SCS Triangular Hydrograph	0.36	0.31	0.05
POND 106	7.2	7.2	0.0	87	10-24	0.62	0.14	SCS Triangular Hydrograph	0.88	0.74	0.14
POND 107	4.2	4.2	0.0	87	10-24	0.39	0.08	SCS Triangular Hydrograph	0.53	0.45	0.08
POND 108	6.1	6.1	0.0	87	10-24	0.56	0.12	SCS Triangular Hydrograph	0.95	0.83	0.12
POND 109	9.7	9.7	0.0	87	10-24	0.85	0.19	SCS Triangular Hydrograph	1.17	0.98	0.19
POND 110	9.4	9.4	0.0	87	10-24	0.85	0.19	SCS Triangular Hydrograph	1.12	0.93	0.19
POND 111	47.5	47.5	0.0	87	10-24	4.17	0.94	SCS Triangular Hydrograph	9.42	8.44	0.98

* Runoff curve number is not applicable so a runoff coefficient was used.

** Detailed designs have not yet been drafted. Designs will be submitted to the MDEQ for review and approval prior to the commencement of construction

TABLE K-1. SEDIMENT POND INFORMATION (CONTINUED)

AS BUILT									
STRUCTURE DESIGNATION	POND CAPACITY (AC-FT)	(13-15) WATER CAPACITY (AC-FT)	SEDIMENT CAPACITY (AC-FT)	CONSTRUCTION DATE	ELIMINATION DATE	NORTHING	EASTING	ELEVATION (FT AMSL)	MPDES NO.
POND 1	100.77	37.77	63	1980	2025	412500	2680000	3631	001
POND 2	19.42	15.11	4.31	1980/90	2025	415500	2670000	3650	002
POND 7	5.16	3.62	1.54	1988	2025	415100	2676800	3636	
POND 48				2019	2025	409900	2678800	3585	015
POND 50	11.39	10.03	1.36	2021	2025	405460	2679032	3595	016
POND 69	9.24	6.89	2.35	2011	2025	418600	2669500	3730	
POND 71	5.26	4.75	0.51	2015	2025	411000	2675000	3680	
POND 72	17.88	15.08	2.8	2016	2025	409564	2675886	3684	
POND 91						408100	2669700	3775	019
POND 92						408000	2670500	3755	020
POND 93	3.40	1.30	0.30	2021	2025	408050	2670900	3750	021
POND 94	3.17	2.91	0.26	2020	2025	408000	2671400	3745	022
POND 95	3.69	3.12	0.57	2020	2025	407700	2672300	3720	023
POND 96	1.65	1.47	0.18	2020	2025	407500	2672800	3725	024
POND 97	0.45	0.35	0.10	2020	2025	407250	2673100	3710	025
POND 98	2.00	1.85	0.15	2020	2025	407100	2673300	3700	026
POND 99	5.48	5.05	0.43	2020	2025	406800	2674800	3670	027
POND 100	12.03	10.19	1.84	2020	2025	426400	2673000	3844	028
POND 101	1.89	1.56	0.33	2020	2025	424600	2673600	3895	029
POND 102						426300	2669600	3956	030
POND 103						406650	2675300	3665	031
POND 104						406540	3675575	3666	032
POND 105						406485	2676120	3660	033
POND 106						406170	2676875	3655	034
POND 107						405825	2677280	3635	035
POND 108						405820	2677820	3625	036
POND 109						405590	2678950	3610	037
POND 110						405500	2679310	3605	038
POND 111						408095	2679032	3671	039

Computed" values. A third subdivision of information presented in Table K-1 is the "As Built" information which presents specific construction details of the pond capacities, location, anticipated life, elevation and MPDES point numbers for the ponds.

Quarterly pond inspections are conducted to determine the condition of each pond. Section 7 "Pond Maintenance, Inspection and Reporting" presents a discussion and additional information regarding the ongoing maintenance of ponds and the determination of the adequacy of the ponds for their intended purpose as mining and the mine plan progress and change over time.

1.1.1 Pond Design Methods

Runoff computations have been conducted by various methods since the inception of the mine in 1978 and have changed over time in response to the availability of more advanced techniques, suggestions by MDEQ or to match the situation with the most appropriate method. These methods include the modified rational method (runoff coefficient method), the computer model TRIHYDRO© (modified Soil Conservation Service (SCS) triangular hydrograph method), and the computer programs SEDCAD© 4.0 (Marshall, Schwab and Warner, 1998) and STORM (Office of Surface Mining, 1993). Current practice for the computation of runoff volume and peak discharge for each individual drainage is to use the SCS's triangular hydrograph method or other hydrologic model acceptable to MDEQ.

The input values to the models or equations are for some parameters, constant. For other parameters the values must be determined for the specific situation depending upon the method used and the site conditions being considered. The values typically used in the computations are presented below. All pond design detail sheets include the specific parameters used in computation associated with pond and spillway sizing and design.

The input rainfall depth for the various design storms is as follows:

Precipitation Amount =	100-yr, 24-hr =	3.35 inches
	50-yr, 24-hr =	2.90 inches
	25-yr, 24-hr =	2.75 inches
	10-yr, 24-hr =	2.19 inches

The precipitation amounts for the storms listed above were determined from the Nation Oceanic and Atmospheric Administration, National Weather Service, "Precipitation-Frequency Atlas of the Western United States, Volume I, Montana" (Miller, Frederick, and Tracy, 1973), and are a recognized standard for such engineering computations.

Typical runoff curve numbers used in computation of storm runoff volumes and peak discharges are as follows:

Runoff Curve Number (CN) = 72 to 80 for native range

and 80 to 89 for stripped areas.

Current practice for the determination of the CN is to first determine the specific hydrologic soils groups found within the watershed from soils maps of the particular watershed tributary to the facility being considered (Mine Permit Appendix A, Soils). Second, the land use condition is evaluated as agricultural, sage-grassland range, sage-grassland-juniper-ponderosa pine range, or disturbed from vegetation maps (Mine Permit Appendix B, Vegetation), mine plan maps (Mine Permit Volume 1), air photos and field inspection. The CN is then computed for each soil type and land use status, assuming an Antecedent Moisture Condition II (AMC II).

The land use status used in computing the CN is taken as the worst case (most disturbed) foreseeable under the existing mine plan. This approach provides for a design, which incorporates the highest anticipated runoff volume, peak discharge rates, and sediment production volumes. Typically the watershed is divided up into subwatersheds consistent with differing land use or CN. The runoff model is then run with the subdivided watershed to arrive at an estimated runoff volume and peak discharge for the design storm event.

The use of AMC II is a very conservative value for the semi-arid prairie of the intermountain west. The runoff volumes computed under AMC II are substantially higher than those computed under AMC I. Although AMC I provides more of an accurate reflection of the moisture conditions present in the Spring Creek Mine area, a substantial factor of safety in the total runoff volume is created through the use of AMC II.

The rainfall distribution used for modeling under most circumstances is the SCS Type II distribution, which is reflective of rainfall distribution associated with thunderstorms most common to the SCM mine area. This rainfall distribution results in the greatest peak flow for a given event when compared to other distributions potentially applicable to this area.

Additional unforeseen sediment control ponds beyond those shown on Appendix K, Exhibit 1, and listed in Table K-1, may be necessary and will be designed, permitted and constructed as needed. “As-Built” drawings, calculations and construction specifications will be forwarded to the MDEQ for approval and inclusion into the mining permit. Appendix Ka presents the design detail sheets for existing ponds and near term ponds, and the sizing computations for life-of-mine ponds. “As-Built” details for sediment ponds constructed to date are contained in Appendix Kb.

If revisions to the drainage control plan are necessary, the specific text applicable to the runoff control structure, and the design details can be placed into Appendix Ka. Following completion of the construction of the runoff control structure, the As-Built information may be placed into Appendix Kb. Any necessary changes to Appendix K, Exhibit 1 and the appropriate changes to applicable tables will also be submitted for insertion into the main body of Appendix K text. This method of organization should assist with maintaining an up to date permit document that allows relatively easy tracking of permitted facilities, and constructed facilities.

1.2 Sediment Traps

Sediment traps are used to control runoff and sediment at several locations at the SCM mine. Sediment traps are sediment control structures similar in function to ponds, but treated differently due to the following characteristics:

1) Traps are "secondary control structures" in that a pond meeting the criteria of ARM 17.24.639 must be present downstream thus preventing a trap from discharging directly to a receiving stream; except were their drainage area is less than approximately 10 acres, in which case a trap may be located as a primary discharge structure.

2) Traps with drainage areas of less than approximately 10 acres that can discharge directly to a receiving stream, should include information to be submitted to MDEQ demonstrating the trap is sized to contain the 10-year, 24-hour runoff volume, and has adequate sediment storage capacity.

3) When computing the runoff volume to a sediment pond, the storage volume contained in traps within the same drainage cannot be accounted for in sizing the pond. In addition, the routing effect of flow through a trap cannot be used in the determination of peak flow rates for design of downstream primary sediment control structures.

4) Structures with drainage areas of greater than approximately 10 acres and which may discharge to receiving streams directly are considered to be sediment ponds, and must meet the provisions of ARM 17.24.639.

Appendix K, Exhibit 1 shows the locations of all sediment traps at the mine.

Because of the localized and highly variable nature of siting sediment traps, anticipated locations of traps to be constructed in the future are not depicted on Appendix K, Exhibit 1. However, during mining, traps are anticipated to be used in the following situations:

1) In pit areas where mining is advancing from lowlands to uplands (e.g., Pit 4), use of traps (and ponds) is expected to be minimal as the pit itself will be used for sediment control.
2) On topsoiled reclamation areas, traps will be used in conjunction with BTCA to prevent offsite migration of topsoil. Traps will be the primary means of collecting sediment where drainages from reclamation areas transition into disturbed or previously reclaimed areas. Traps used in these instances will be determined on a case-by-case basis by monitoring vegetation growth and topsoil movement (loss) in each reclamation area.
3) Where pits advance across drainage divides (e.g., Pit 2 crosses into the Pearson Creek drainage), traps (and ponds where size requirements dictate) will be used in conjunction with BTCA to prevent sediment migration into undisturbed, down-gradient areas. Appendix K, Exhibit 1 depicts some conceptual locations of where these structures will be located.

2.0 DIVERSIONS

Two diversions currently exist within the mine permit area. One diversion is on the main stem of Spring Creek and one is upslope and to the west of the Railroad loop corridor. All diversions were approved under previous permits or permit revisions.

2.1 Diversion Design Methods

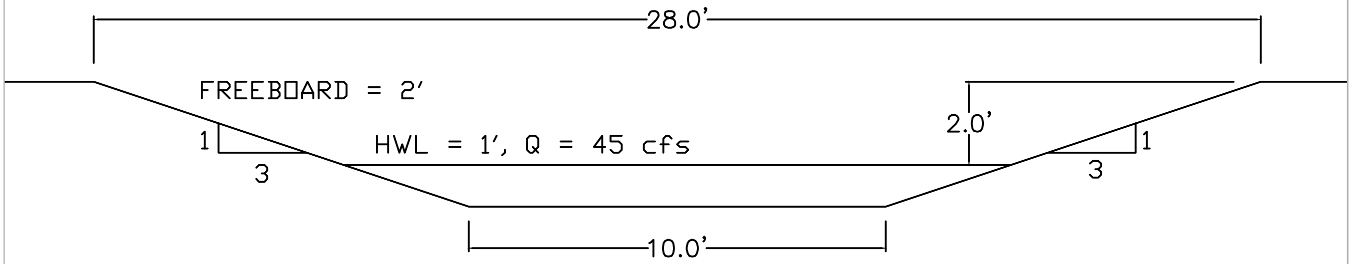
The current design procedure used by SCM for diversions is as follows. The watershed to be diverted is modeled with the runoff model SEDCAD© 4.0, or other equivalent runoff calculation model. The runoff modeling is conducted to determine the peak discharge for the design event. The computed peak discharge is then used as partial input for conducting channel hydraulics computations to determine optimum diversion geometry, slope, and location which provides sufficient flow capacity at non-erosive velocities.

SCM will prevent the contribution of additional suspended solids or other contaminants to stream flow passing through diversions. Whenever possible, diversions will be designed to be vegetatively lined for channel stability. Where design velocities indicate that vegetation will not provide sufficient protection against erosion, other means of channel stabilization will be used. Rock or straw-bale check dams or other types of sediment control measures will be employed when necessary to reduce velocities and sediment load. SCM will visually monitor the receiving channel downstream of the diversion for scour or deposition. Should significant scour or deposition become apparent, mitigative measures will be employed immediately.

All diversions will be designed, constructed, and maintained in compliance with the requirements and criteria of ARM 17.24.636 and ARM 17.24.637 as applicable. Table K-2 summaries existing and future anticipated diversions. Diversion design details and As-Built statistics are presented in Appendix Ka and Appendix Kb, respectively. Figure K-1 presents a typical cross-section of the Railroad Loop Diversion.

Table K-2. Diversions

Diversion Name	Diversion Length (ft)	Design Discharge (cfs)	Construct Date	Approximate Reclaim Date
Railroad Loop	3,200	45	1979	2025
Spring Creek 1	1,054	1,000	1979	2025



TYPICAL CROSS SECTION

SCALE: 1" = 5'

DIVERSION HYDRAULICS

CROSS SECTIONAL SHAPE	=	TRAPEZOIDAL
SIDE SLOPES	=	3 TO 1
CHANNEL SLOPE	=	.01 FT/FT
FREEBOARD	=	2 FT
DESIGN FLOW	=	45 CFS
FLOW DEPTH	=	1 FT
VELOCITY	=	3.7 FT/S
FROUDE NUMBER	=	0.65
APPROXIMATE LENGTH	=	3550 FT

Figure K-1. Railroad Loop Diversion As-Built

Revised 4/26/11; Reference - Application 183

3.0 UNDISTURBED AREA RUNOFF CONTROL

SCM will minimize exposure of undisturbed area runoff to mining disturbance through the use of diversions, as discussed above, and small upslope impoundments in selected areas. A single large impoundment exists within the South Fork of Spring Creek channel to provide flood control. This flood control impoundment is necessary to protect men and equipment as the mining and reclamation of Pit 1 progresses through the South Fork valley. The Carbone Flood Control Reservoir is located in the Spring Creek and North Fork Spring Creek Channels to provide protection for people and equipment performing mining activities within Pit 4. The Pearson Creek Incised Flood Control Reservoir is located in the Pearson Creek channel to provide protection for people and equipment performing mining activities within Pit 2. Design details for these reservoirs are presented in Appendix Ka. The As-Built information for the two flood control reservoirs is included in Appendix Kb.

3.1 Upslope Ponds

Table K-3 summarizes undisturbed area runoff control ponds for the current term of permit and life-of-mine (through 2030). Design details for South Fork Spring Creek upslope ponds USP-8 through USP-17 are present in Appendix Ka.

The design procedure for upslope ponds is the same as for sediment ponds as outlined in Section 1.1.1 above, with one exception. Upslope ponds are not pollution control facilities and are therefore not subject to design sizing criteria applicable to sediment control ponds as outlined in ARM 17.24.639. The design storm event may vary depending upon the anticipated life of the facility and the risks to miners, mining and the environment should the ponds be filled and discharged. For flood control reservoirs, the spillway design is outlined in ARM 17.24.642(5).

A risk assessment will be performed to determine the design event needed for adequate protection. In general, the highest acceptable risk of discharge through the

Table K-3. Upslope Drainage Control Ponds

Pond No.	Capacity (Ac.-Ft)	Runoff Volume (Ac.-Ft.)	Drainage Area (Acres)	Runoff Curve No.	Basin Relief (Ft.)	Construction Date	Reclamation Date	Northing	Easting	Elevation (Ft. AMSL)
South Fork Dam	234.34	200.00	4420	75	1055	1993	2030	416500	2658100	3885
Carbone Dam	327	278.00	9920	64	920	2001	2030	424800	2662300	3850
PC Inc. Fld. Ctl.	104.85	103.62	1739	78	729	2021	2030	406150	2676515	3640

Notes:

[1] Upslope Ponds contain undisturbed runoff only. Therefore, no sediment capacity is required.

[2] Pond design drawings are located in Appendix Ka. Pond as-built drawings are located in Appendix Kb

spillway, during the structure's lifetime will be 40 percent. This is the acceptable risk of discharge, not the acceptable risk of structure failure. For most upslope facilities, discharge results in water flowing into the pit to be handled as pit water and treated through pit water treatment/storage ponds. The design storm return periods for the maximum risk level selected will be calculated from the following equation:

$P = 1-(1-1/t)^n$ (Linsley, Kohler and Paulhus, 1982)

Where:
- P = Probability design event will be equaled or exceeded at least once.
- t = Return Period (years)
- n = Lifetime of facility (years)

As an example: over any two year period, a 5 year recurrence precipitation event has approximately a 40 percent chance of being equaled or exceeded at least once. Therefore, given the criteria of 40 percent acceptable risk of discharge, the appropriate design storm for a structure intended to function for two years is the 5-year event. Though the pond storm design capacities may be variable, spillways will be constructed consistent with ARM 17.24.639 to pass the 25-year, 24-hour peak discharge. All upslope pond embankments will be constructed in compliance with the requirements of ARM 17.24.639. Where upslope pond discharge may cause unacceptable problems or risks to miners, mining, or the environment a lower acceptable risk level (higher protection level) may be applied on a case-by-case basis.

The risk approach to flood/upslope runoff controls sizing is advantageous for several reasons. Short-lived facilities are not overbuilt to arbitrary sizing criteria independent of risk. This minimizes cost, land disturbance, and reclamation liability while maintaining a reasonable level of protection for the mine and the environment.

Upslope ponds are constructed above mining disturbance and will not contain disturbed area runoff. Upslope ponds will be constructed and reclaimed as follows. The

“A” topsoil will be stripped to a depth of 6" over the area designated for disturbance and stockpiled in an appropriate topsoil stockpile location as described in Mine Permit Volume 1. The “B” horizon material will be used to construct the pond embankments if the material exhibits the proper engineering characteristics necessary for embankment construction. If the “B” material is not suitable as structural fill, it will be stripped and stockpiled, and suitable engineered embankment materials imported to construct the impoundment.

All disturbed areas, including embankments, ditches and spillways will be seeded to provide a stabilizing vegetative cover. Following construction, as-built information will be provided to the MDEQ. All upslope ponds will be either mined through or reclaimed consistent with information and commitments outlined in the approved mine and reclamation plan.

3.2 Diversions

Diversions are used to re-route undisturbed area runoff around disturbance areas, thus minimizing the contact of runoff with disturbed areas. See Section 2 for a full discussion of diversions.

4.0 COLLECTION AND CONVEYANCE DITCHES AND CULVERTS

Collection, conveyance and drainage ditches, in conjunction with the use of culverts, will be used to establish positive drainage from all roads and railroad facilities. Design and construction of these structures will be consistent with the requirements of ARM 17.24.605. Appendix K, Exhibit 1 shows the location of all culverts currently existing and all culverts anticipated during the current permit term. Appendix K, Exhibit 1 also presents, in tabular form, information regarding culvert size, design discharge, drainage area, location and material type.

Culverts are sized to convey the peak discharge from the 10-year, 24-hour storm unless the end area is greater than 35 square feet in which case the culverts are sized to convey the 25-year, 24-hour storm. Culvert sizing is determined via the computation of peak discharge using computational models (SEDCAD© 4.0 or equivalent) as described earlier for sediment pond sizing. Results of the modeling are then used to determine culvert installation, size and slope adequate to convey the design flow without impounding water at the inlet. See the table on Appendix K, Exhibit 1 for culvert sizing information.

Collection and conveyance ditches along roads and ditches are sized to convey the 10-year, 24-hour storm peak discharge with a minimum of 1-foot of freeboard. Drainage ditches will typically be "vee" ditches to allow for construction and cleaning with a motor grader or bulldozer. A typical cross-section is shown on Figure K-2. The design capacities of ditches are determined using Manning's equation for open channel rough earth channels. Appendix K, Exhibit 1 shows the locations and direction of flow for all existing drainage ditches.

5.0 WATER STORAGE RESERVOIRS

There are three water storage reservoirs which store water for the mine facility complex and haul road dust suppression. These reservoirs are dedicated to water storage for use on the mine site and are not designed or intended to serve as water treatment facilities or runoff control facilities. Table K-4 outlines the characteristics of these reservoirs and the following text discusses each pond and operation procedures.

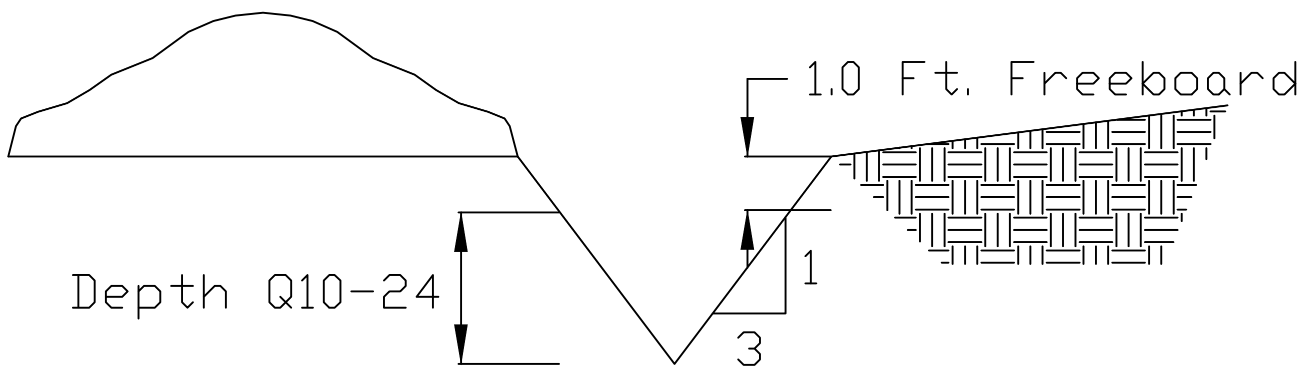


Figure K-2. Typical Conveyance Ditch, Cross-Section

Revised 4/26/11; Reference - Application 183

Table K-4. Water Storage Ponds

POND NAME	STORAGE VOLUME (AC-FT)	CONSTRUCTION DATE	RECLAMATION DATE	NORTHING	EASTING	ELEVATION (FT AMSL)
2a	19	1991	2025	415500	2678000	3548
Trap 22	52	2001	2025	417500	2672100	3630
Trap 23	100	2012	2025	419500	2669150	3735

5.1 Trap 22

Trap 22 is operated as a dust suppression water storage facility. Water sources for the pond include water pumped from Pond 2a and some disturbed area runoff as shown on Appendix K, Exhibit 1. Water is pumped from the pond into water trucks for application to haul roads and heavy equipment work areas. Water levels can fluctuate over short periods of time depending on water used and demand. The pond is lined with an impermeable synthetic plastic reservoir liner material to prevent water loss and aquifer communication.

5.2 Storage Pond 2a

Pond 2a is located adjacent to Pond 2. Pond 2a receives a small quantity of surface runoff but is principally supplied with water from mine pit pumping. Pond 2a is not a water treatment facility and does not discharge to any receiving stream. Pit water can be pumped to Pond 2a from both Pit 1 and Pit 2 via Trap 9 as a relay/collection point and second pumping station.

Water use from Pond 2a is on-demand and primarily for dust suppression. A permanent pumping station located at Pond 2a pumps water to a water truck loadout. Large water fluctuations are possible depending upon use rate. The pond is lined with a minimum of 1 foot of compacted clay to prevent leakage and aquifer conmunication.

5.3 Trap 23

Trap 23 is operated as a dust suppression water storage facility. Water sources for the pond include water pumped from mine pits, Pond 2a and some surrounding area runoff as shown on Appendix K, Exhibit 1. Water is pumped from the pond into water trucks for application to haul roads and heavy equipment work areas. Water levels can fluctuate over short periods of time depending on water used and demand. The pond is lined with an impermeable synthetic plastic reservoir liner material to prevent water loss and aquifer communication.

6.0 PIT AND RESERVOIR DEWATERING

Water accumulated in the mine pits will typically be handled as dust suppression water. Pit water will be pumped to the water storage reservoir system including Trap 22, Trap 23 or Pond 2a. Pit water may also be pumped directly to water trucks for application on haul roads as a means of dust suppression. In the event that pit pumpage exceeds the water storage system capacity, pit water may be pumped and stored in traps. Pit water may also be pumped into the Pond 1 system to use the excess storage capacity of this facility. Pond 1 has a capacity of 100.8 ac-ft. The design runoff volume for the current mine drainage system due to pit development, additional ponds and flow re-rerouting, is 42.0 ac-ft. This provides 58 ac-ft. of storage without encroaching on the storage capacity needed for runoff control. Water may also be pumped to sediment ponds but will be limited to the volume which fills the available dead storage (sediment storage and excess capacity), leaving the volume necessary to contain the design runoff event empty.

Water collected in the South Fork Flood Control Reservoir in excess of the dead storage volume (10.57 ac-ft), will be released from the reservoir via the reservoir outlet system. Water in excess of the storage volume will be discharged directly to the undisturbed portion of the South Fork of Spring Creek or allowed to flow into the mine pit and handled as pit water.

7.0 POND MAINTENANCE, INSPECTION, AND REPORTING

7.1 Pond Maintenance

All ponds will be maintained in good working condition, including embankment integrity, outlet works function, and spillway condition. Accumulated sediment will be removed when the sediment storage volume is depleted by 60 percent. SCM will install a staff gauge in each sediment pond to allow for the assessment of sediment volume, water depth and remaining storage capacity without the need of conducting a bathymetric survey to make such determinations. When a sediment pond is cleaned for any reason, SCM will survey the pond following cleaning to verify that the required storage volumes have been restored. This information will be reported to the MDEQ in the annual Hydrology Report.

7.2 Pond Inspections

All ponds will be inspected at least on a quarterly basis as required by ARM 17.24.639. The inspections will be recorded in a format compatible with the format requested by the MDEQ. The results of pond inspections will be reported annually in the annual Hydrology Report to MDEQ, and will include a summary of the current status of each pond with respect to the “As-Built” volume, the current sediment volume contained in the pond, the current drainage area and runoff regulatory requirements, if any. This procedure will allow for at least an annual review of the adequacy of the sediment pond network, and provide a means of compliance assessment.

Structures meeting the criteria of CFR 77.216 (MSHA Structure) will be inspected in compliance with all applicable regulatory requirements for such structures.

8.0 POSTMINE HYDROLOGIC CONTROL PLAN

Many of the same measures used to control sediment during mining may also be used for postmining hydrologic control. This section will contain a discussion on the different methods available to SCM for controlling postmine sediment. The determination of the technique used depends on the current situation at the mine and may vary due to location and unique circumstances. During mining operations, it may be determined that one or all of the methods discussed in this section is necessary to control sediment during mining. Also, it may be determined that the best technology currently available (BTCA) has changed. In either of these situations, all tables and text in this appendix will be updated to reflect current information.

Appendix K, Exhibit 1 (Hydrologic Control Plan), displays sediment control structures planned for use during the life of mine period. Table K-5 shows the ponds that are currently proposed for construction in the future as part of the sediment control plan. The construction date and date of proposed design submittal were determined by reviewing the mining and reclamation progression. Each of the ponds will be constructed to treat runoff conditions created by the reclamation of an area of the mine.

Table K-5. Future Planned Sediment Control Ponds

Pond ID	SC-1	SC-2	SC-3	SC-4	SC-5	Pond 48	Pond 50
Drainage ID	P-1	P-2	P-3	P-4	P-5	P-6	P-8
Proposed Design Submittal Date	2025	2025	2025	2015	2025	2015	2016
Date Of Construction	2025	2025	2025	2015	2025	2015	2016
Drainage Area (acres)	530	48	78	1547	615	3967	1794

8.1 Sediment Control Ponds

As with existing sediment control ponds, future sediment control ponds will be sized according to ARM 17.24.639. Use of the modeling program SEDCAD© 4.0 (or other hydrologic models acceptable to MDEQ) will determine the maximum discharge, and total runoff volume. The pond design methods discussed in Section 1.1.1 will be used in the design of future sediment ponds.

The ponds constructed for postmining use will remain classified as sediment control ponds until post-reclamation sediment control is implemented (see Section 8.2). At this point, the ponds will be removed.

8.2 Western Alkalinity Drainage Control

Under the new determination by the Environmental Protection Agency (EPA), SCM may now meet the requirements of the Western Alkalinity Coal Mining subpart (40 CFR 424.82) for sediment control on reclaimed lands. According to the development document developed by the EPA, SCM must meet the following requirements to be considered by the new rule:

- The mine must be located west of the 100th meridian west longitude;
- The location must be in an arid or semiarid environment with less than 26 inches of annual precipitation;
- The pH of the mine drainage must be equal to or greater than 6.0, and;
- The total iron concentration must be less than 10 mg/L.

This new subpart was derived from the need of sediment control from reclaimed areas that do not affect the overall hydrologic balance of the disturbed area. The new rule maintains the amount of effluent at or below premine conditions.

The subpart specifies that operators must submit a site specific Sediment Control Plan to the permitting authority (in this case MDEQ) that is designed to prevent an increase in the average annual sediment yield from pre-mined, undisturbed conditions. The Sediment Control Plan must be approved by the MDEQ and be incorporated into the mines' MPDES permit as an effluent limitation. The Sediment Control Plan must identify best management practices (BMPs) using watershed models and must also describe design specifications, construction specifications, maintenance schedules, criteria for inspection, as well as expected performance and longevity of the BMPs.

Prior to final sediment control release, SCM will submit a Sediment Control Plan to MDEQ for approval (and inclusion in the mines' MPDES permit) that specifies BMPs to be implemented throughout the post-reclamation landscape. Appendix K, Exhibit 2, depicts conceptual locations of BMPs on the post-reclamation landscape (on post-mining topography). Exhibit 2 will be updated with specifics (e.g., BMP type, location and timing) upon approval of the Sediment Control Plan and will be updated with as-builts of BMPs as they are constructed. BMPs are discussed in more detail in Section 8.3.

8.3 Best Management Practices

SCM currently implements best management practices (BMPs) to control sediment at the mine site. The Western Alkaline subpart stresses the continued use of these techniques to create hydrologic characteristics that are close to the premine state. According to the EPA's Western Alkaline Coal Mining Subcategory Development Document, BMP's can be managed by using managerial practices or structural BMP's.

Managerial practices implement the use of planning and design to reduce erosion within the reclaimed area. The following list of managerial BMPs was compiled in the EPA's development document:

- Minimizing the area of disturbance
- Using appropriate BMPs for site-specific conditions

- Timely placement of BMPs
- Controlling sediment at the source
- Reclaiming areas as soon as possible
- Periodic inspections, maintenance and replacement

The above managerial techniques are meant to improve the overall efficiency and effectiveness of the hydrologic control system. Reviewing the reclamation progression and modeling the disturbed area using SEDCAD© 4.0 will help to implement these practices correctly.

The EPA also summarizes the structural BMPs that may be used to control sediment. As stated in the list above, not all of the structural BMPs may be appropriate for each location or time. When planning to implement a structural BMP, SCM will review the situation and determine which structure best meets the needs of the sediment control plan. The structures that may be included in the Sediment Control Plan for use by SCM are listed below:

Rock Riprap – Flagstone or other rock riprap may be used in the stream channel to reduce water velocity and promote sediment deposition.

Straw Bales – Straw bales will be used by SCM to inhibit sediment runoff at the toe of medium slopes.

Deep Ripping – SCM may use deep ripping to increase infiltration in clays or highly compacted soils.

Contour Berms – The use of contour berms will be implemented to divert flow in an erosive area. If the berms are to remain for a period greater than one year, they will be vegetated to reduce sediment transport.

Diversion Channels – Diversion channels will be used to divert runoff around selected areas. The diversion channels will be designed to convey flow from a 10-year, 24-hour storm event as outlined in ARM 17.24.636.

Check Dams – Check dams will be placed in channels to reduce erosion by decreasing flow velocities. The check dams will be sized to pass the flow from a 10-year, 24-hour storm event.

Mulch – In areas where temporary soil stabilization is required, mulch may be used. According to the EPA development document, mulch will "increase infiltration, retain water, add surface roughness, decrease runoff, protect soil surface from erosive action of raindrops, and to enhance seedbed for vegetative growth."

Geotextiles – Geotextiles may be used in channels or diversions where erosion is present. If used, the material may be removed before or during the removal of the channel.

Roughened Surface – SCM may implement the practice of roughening the surface to increase infiltration in selected areas.

Sediment Traps – Sediment traps may be used to receive sediment in selected drainages. The postmining sediment traps will adhere to the same rules as outlined in section 1.2 of this document.

Complex Slope – When grading the reclaimed land, SCM will develop a complex slope as outlined in their postmine topography design. The complex slope includes a convex upper slope, straight middle slope, and concave lower slope. By grading complex slopes, the profile becomes more stable and the sediment deposits at the bottom of the slope.

Drainage to Pit – In necessary areas, runoff may be drained to the mine pit. When reclaiming this pit, an appropriate structure will be placed downstream for postmine sediment control.

Cover Crop – Cover crops may be used to establish vegetation in erosive areas.

Regrading – To reduce sediment loss in designated areas, SCM may use regrading to achieve more stable slope profiles.

Livestock Grazing – In areas of established vegetation, livestock grazing may be used to improve postmine sediment control. According to the EPA development document, "Controlled livestock grazing can have positive sediment control impacts on reclaimed areas, such as increasing vegetation cover and production, creating surface roughening, promoting soil formation, and increasing soil microbial populations, all of which serve to control erosion and sedimentation."

Irrigation – If the establishment of vegetation is being hindered by limited amounts of precipitation, irrigation may be used to improve plant growth.

Landscape Configuration – SCM will use the design of postmine topography to establish stable gradients and to closely reflect premine conditions.

Revegetation – SCM will revegetate all reclaimed lands. The EPA development document states that revegetation, "adds soil stability and surface roughness, reduces rainfall erosion, and physically secures soil making it less erosive."

9.0 REFERENCES

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