APPENDIX 11-EE

SOUTH BARBER CHANNEL POST-MINE HYDROLOGY & SEDIMENTOLOGY

(2 YR-6 HR, 10 YR-6 HR, 25 YR-6 HR, & 100 YR-6 HR STORM EVENTS)

September-04

South Barber Channel Post-mine Hydrology and Sedimentology

The hydrology model and drainage subdivisions are presented on Exhibit 11-75A. The alignment and details of the reclaimed channels are presented on Exhibit 11-76 and 11-76A thru 11-76E.

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General Information

Storm Information:

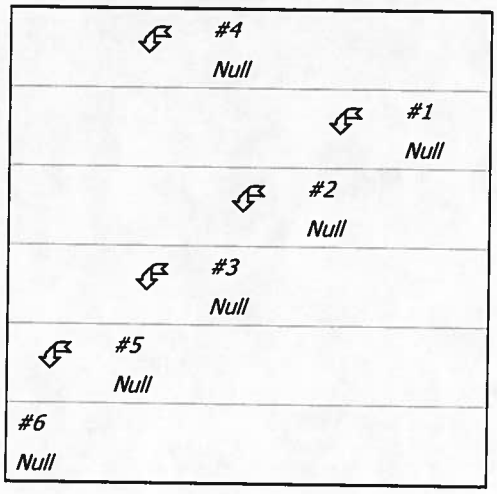
Storm Type:	NRCS Type II-60
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.800 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#2	0.227	0.332	
Null	#2	==>	#3	0.687	0.302	
Null	#3	==>	#5	0.000	0.000	Neck Drainage
Null	#4	==>	#5	0.000	0.000	
Null	#5	==>	#6	0.115	0.357	
Null	#6	==>	End	0.000	0.000	



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	8. Large gullies, diversions, and low flowing streams	1.27	35.00	2,762.00	3.37	0.227
#1	**Muskingum K:**					**0.227**
#2	8. Large gullies, diversions, and low flowing streams	0.75	48.00	6,414.00	2.59	0.687
#2	**Muskingum K:**					**0.687**
#5	8. Large gullies, diversions, and low flowing streams	1.99	35.00	1,756.05	4.23	0.115
#5	**Muskingum K:**					**0.115**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#4	231.600	231.600	22.65	2.88	51.7	23,571	0.00	0.00
#1	546.300	546.300	7.46	2.22	10.6	5,781	2.30	1.76
#2	173.400	719.700	23.93	5.00	46.7	17,433	1.21	0.59
#3	239.500	959.200	22.31	5.15	45.5	16,909	0.81	0.39
#5	0.000	1,190.800	31.40	8.03	97.2	23,265	0.52	0.25
#6	263.540	1,454.340	51.33	11.72	214.1	34,009	0.33	0.16

Particle Size Distribution(s) at Each Structure

Structure #4:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	100.000%
0.0020	100.000%
0.0010	0.000%

Structure #1:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	59.766%
0.0020	38.672%
0.0010	0.000%

Structure #2:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	93.464%
0.0020	88.652%
0.0010	0.000%

Structure #3 (Neck Drainage):

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.335%
0.0500	96.224%

Size (mm)	In/Out
0.0020	91.212%
0.0010	0.000%

Structure #5:

Size (mm)	In/Out
2.0000	100.000%
0.1000	99.689%
0.0500	98.232%
0.0020	95.885%
0.0010	0.000%

Structure #6:

Size (mm)	In/Out
2.0000	100.000%
0.1000	100.000%
0.0500	99.250%
0.0020	98.184%
0.0010	0.000%

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#4	1	231.600	0.608	0.000	0.000	88.100	M	22.65	2.881
	Σ	**231.600**						**22.65**	**2.881**
#1	1	546.300	1.780	0.000	0.000	81.800	M	7.46	2.224
	Σ	**546.300**						**7.46**	**2.224**
#2	1	173.400	0.580	0.000	0.000	89.800	M	23.35	2.775
	Σ	**719.700**						**23.93**	**4.999**
#3	1	239.500	1.231	0.000	0.000	75.700	M	0.48	0.148
	Σ	**959.200**						**22.31**	**5.147**
#5	1	0.000	0.000	0.000	0.000	1.000	0.00	0.000	
	Σ	**1,190.800**						**31.40**	**8.028**
#6	1	263.540	0.573	0.000	0.000	88.900	M	30.67	3.697
	Σ	**1,454.340**						**51.33**	**11.725**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#4	1	0.190	175.00	4.30	0.3890	1.0000	3	51.7	23,571	0.00	0.00
	Σ							**51.7**	**23,571**	**0.00**	**0.00**
#1	1	0.159	300.00	2.40	0.3580	1.0000	2	10.6	5,781	2.30	1.76
	Σ							**10.6**	**5,781**	**2.30**	**1.76**
#2	1	0.205	300.00	2.80	0.3940	1.0000	3	37.3	17,790	0.00	0.00
	Σ							**46.7**	**17,433**	**1.21**	**0.59**
#3	1	0.190	200.00	3.20	0.3150	1.0000	1	0.6	4,541	2.76	2.30
	Σ							**45.5**	**16,909**	**0.81**	**0.39**
#5	1	0.000	0.00	0.00	0.0000	1.0000	0	0.0	1	0.00	0.00
	Σ							**97.2**	**23,265**	**0.52**	**0.25**
#6	1	0.199	150.00	7.50	0.3930	1.0000	3	117.0	41,535	0.00	0.00
	Σ							**214.1**	**34,009**	**0.33**	**0.16**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	0.71	25.00	3,519.00	0.840	1.163
		8. Large gullies, diversions, and low flowing streams	1.62	137.00	8,464.10	3.810	0.617
#1	**1**	**Time of Concentration:**					**1.780**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	2.89	82.00	2,834.00	1.700	0.463
		8. Large gullies, diversions, and low flowing streams	1.01	13.00	1,282.05	3.020	0.117
#2	**1**	**Time of Concentration:**					**0.580**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	0.69	13.00	1,888.00	0.820	0.639
		8. Large gullies, diversions, and low flowing streams	0.71	38.00	5,373.00	2.520	0.592
#3	**1**	**Time of Concentration:**					**1.231**
#4	1	5. Nearly bare and untilled, and alluvial valley fans	2.73	43.00	1,575.00	1.650	0.265
		8. Large gullies, diversions, and low flowing streams	2.28	128.00	5,604.00	4.530	0.343
#4	**1**	**Time of Concentration:**					**0.608**
#6	1	5. Nearly bare and untilled, and alluvial valley fans	1.30	15.00	1,152.00	1.140	0.280
		8. Large gullies, diversions, and low flowing streams	3.21	182.00	5,676.14	5.370	0.293
#6	**1**	**Time of Concentration:**					**0.573**

General Information

Storm Information:

Storm Type:	NRCS Type II-60
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#4	231.600	231.600	73.49	8.60	184.2	28,163	0.00	0.00
#1	546.300	546.300	40.98	10.81	67.0	7,667	3.36	2.51
#2	173.400	719.700	73.17	18.34	171.4	19,371	2.15	0.95
#3	239.500	959.200	77.76	20.57	186.4	18,143	2.57	1.18
#5	0.000	1,190.800	102.66	29.17	370.6	26,739	1.90	0.83
#6	263.540	1,454.340	165.85	39.71	764.7	39,347	1.36	0.61

General Information

Storm Information:

Storm Type:	NRCS Type II-60
Design Storm:	25 yr - 6 hr
Rainfall Depth:	1.600 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#4	231.600	231.600	110.59	12.73	288.6	29,672	0.00	0.00
#1	546.300	546.300	70.66	17.97	120.9	8,380	3.83	2.83
#2	173.400	719.700	109.71	28.82	270.8	19,965	2.58	1.12
#3	239.500	959.200	122.71	33.22	304.2	18,309	3.13	1.44
#5	0.000	1,190.800	158.51	45.95	592.8	27,637	2.42	1.04
#6	263.540	1,454.340	251.11	61.36	1,199.8	40,963	2.00	0.87

General Information

Storm Information:

Storm Type:	NRCS Type II-60
Design Storm:	100 yr - 6 hr
Rainfall Depth:	2.000 inches

Particle Size Distribution:

Size (mm)	PostMine-LoamySand	PreMine-LoamySand	PreMine-Badlands	LoamySand Postmining
2.0000	100.000%	100.000%	100.000%	0.000%
0.1000	26.500%	30.000%	83.500%	0.000%
0.0500	14.000%	17.000%	77.000%	0.000%
0.0020	11.000%	11.000%	56.000%	0.000%
0.0010	0.000%	0.000%	0.000%	0.000%

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#4	231.600	231.600	164.91	18.75	448.3	31,175	0.38	0.27
#1	546.300	546.300	117.66	29.12	210.8	9,057	4.29	3.15
#2	173.400	719.700	163.69	44.74	427.5	20,625	3.10	1.32
#3	239.500	959.200	191.75	52.79	495.6	18,627	3.76	1.74
#5	0.000	1,190.800	243.27	71.54	943.9	28,481	3.19	1.35
#6	263.540	1,454.340	377.10	93.98	1,876.0	42,598	2.88	1.23

South Barber Channel Sta. 13+91 to 20+70, Stability Design, 25yr-6hr Storm Event

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
15.00	3.0:1	3.0:1	3.4			

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	251.00 cfs	
Depth:	1.30 ft	
Top Width:	22.82 ft	
Velocity*:		
X-Section Area:	24.64 sq ft	
Hydraulic Radius:	1.060	
Froude Number*:		
Manning's n*:		
Dmin:	4.00 in	
D50:	12.00 in	
Dmax:	15.00 in	

Velocity and Manning's n calculations may not apply for this method.

South Barber Channel Sta. 13+91 to 20+70, Capacity Design, 100yr-6hr Storm Event

Material: Riprap

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
15.00	3.0:1	3.0:1	3.4	0.0400	1.00			15.0

	w/o Freeboard	w/ Freeboard
Design Discharge:	377.00 cfs	
Depth:	1.99 ft	2.99 ft
Top Width:	26.93 ft	32.93 ft
Velocity:	9.05 fps	
X-Section Area:	41.68 sq ft	
Hydraulic Radius:	1.511	
Froude Number:	1.28	