

Appendix W

Monthly Water Balance Tables for the Design Wet and Dry Years

Table 17K.1 Monthly Runoff and Pumping Rate Estimation from Rose Pit During Climate Normal Condition

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Existing Condition													
Precipitation, in mm	50.0	39.0	54.2	51.9	54.1	83.3	116.1	107.7	94.4	77.3	75.5	54.5	858.1
Streamflow, in mm	7.5	3.7	1.9	1.0	81.3	95.3	87.8	78.3	77.9	61.1	29.2	14.6	539.6
Operational Condition (Assume 100% Runoff Coefficient; Area = 2796439 m²)													
Total Runoff, in m ³	33156	16570	8277	4600	361370	423857	390503	348230	346614	271695	129855	64944	2399671
Total Runoff, in mm	11.9	5.9	3.0	1.6	129.2	151.6	139.6	124.5	123.9	97.2	46.4	23.2	858.1
Groundwater Seepage to Pit, in m ³	118978	107464	118978	115140	118978	115140	118978	118978	115140	118978	115140	118978	1400870
Net Surface Water from Pit, in m ³	152134	124034	127255	119740	480348	538997	509481	467208	461754	390673	244995	183922	3800541
Net Surface Water from Pit, in mm	54.4	44.4	45.5	42.8	171.8	192.7	182.2	167.1	165.1	139.7	87.6	65.8	1359.1
Pumping Rate													
Total Runoff, in m ³ /hr	44.6	24.7	11.1	6.4	485.7	588.7	524.9	468.1	481.4	365.2	180.4	87.3	273.9
Groundwater Seepage to Pit, in m ³ /hr	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159,9167
Net Surface Water Discharge from Pit, in m ³ /hr	204.5	184.6	171.0	166.3	645.6	748.6	684.8	628.0	641.3	525.1	340.3	247.2	433.9

Table 17K.2 Monthly Runoff Estimation for Rose North Waste Rock Disposal Area During Climate Normal Condition

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	7.5	3.7	1.9	1.0	81.3	95.3	87.8	78.3	77.9	61.1	29.2	14.6	539.6
Operational Condition (Assume 75% Runoff Coefficient; Area = 1362542 m²)													
Total Runoff, in mm	8.9	4.4	2.2	1.2	96.9	113.7	104.7	93.4	93.0	72.9	34.8	17.4	643.6
Total Runoff, in m ³	12116	6055	3025	1681	132056	154891	142702	127254	126664	99286	47453	23732	876915

Table 17K.3 Monthly Runoff Estimation for Rose South Waste Rock Disposal Area During Climate Normal Condition

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	7.5	3.7	1.9	1.0	81.3	95.3	87.8	78.3	77.9	61.1	29.2	14.6	539.6
Operational Condition (Assume 75% Runoff Coefficient; Area = 5947274 m²)													
Total Runoff, in mm	8.9	4.4	2.2	1.2	96.9	113.7	104.7	93.4	93.0	72.9	34.8	17.4	643.6
Total Runoff, in m ³	52886	26430	13202	7337	576403	676073	622872	555443	552866	433367	207124	103588	3827591

Table 17K.4 Monthly Runoff Estimation for Crusher Yard During Climate Normal Condition

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	7.5	3.7	1.9	1.0	81.3	95.3	87.8	78.3	77.9	61.1	29.2	14.6	539.6
Operational Condition (Assume 90% Runoff Coefficient; Area = 64166.5 m²)													
Total Runoff, in mm	10.7	5.3	2.7	1.5	116.3	136.4	125.7	112.1	111.6	87.4	41.8	20.9	772.3
Total Runoff, in m ³	685	342	171	95	7463	8753	8064	7191	7158	5611	2682	1341	49556

Table 17K.5 Monthly Runoff Estimation for Mine Service Building During Climate Normal Condition

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	7.5	3.7	1.9	1.0	81.3	95.3	87.8	78.3	77.9	61.1	29.2	14.6	539.6
Operational Condition (Assume 90% Runoff Coefficient; Area = 70385.71 m²)													
Total Runoff, in mm	10.7	5.3	2.7	1.5	116.3	136.4	125.7	112.1	111.6	87.4	41.8	20.9	772.3
Total Runoff, in m ³	751	375	187	104	8186	9602	8846	7888	7852	6155	2942	1471	54359

Table 17K.6 Monthly Runoff Estimation for Processing Plant Area During Climate Normal Condition

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	7.5	3.7	1.9	1.0	81.3	95.3	87.8	78.3	77.9	61.1	29.2	14.6	539.6
Operational Condition (Assume 90% Runoff Coefficient; Area = 167073.9 m²)													
Total Runoff, in mm	10.7	5.3	2.7	1.5	116.3	136.4	125.7	112.1	111.6	87.4	41.8	20.9	772.3
Total Runoff, in m ³	1783	891	445	247	19431	22791	20998	18725	18638	14609	6982	3492	129032

Table 17K.7 Monthly Runoff and Pumping Rate Estimation of Rose Pit During Climate Normal Condition for 100-wetter year using Log Normal Prediction

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Existing Condition													
Precipitation, in mm	68.3	53.3	74.0	70.9	73.9	113.7	158.6	147.1	128.9	105.5	103.1	74.4	1171.7
Streamflow, in mm	10.2	5.1	2.5	1.4	111.0	130.1	119.9	106.9	106.4	83.4	39.9	19.9	736.8
Operational Condition (Assume 100% Runoff Coefficient; Area = 2796439 m²)													
Total Runoff, in m ³	45274	22626	11302	6281	493447	578773	533228	475504	473298	370997	177315	88680	3276726
Total Runoff, in mm	16.2	8.1	4.0	2.2	176.5	207.0	190.7	170.0	169.3	132.7	63.4	31.7	1171.7
Groundwater Seepage to Pit, in m ³	118978	107464	118978	115140	118978	115140	118978	118978	115140	118978	115140	118978	1400870
Net Surface Water from Pit, in m ³	164252	130090	130280	121421	612425	693913	652206	594482	588438	489975	292455	207658	4677596
Net Surface Water from Pit, in mm	58.7	46.5	46.6	43.4	219.0	248.1	233.2	212.6	210.4	175.2	104.6	74.3	1672.7
Pumping Rate													
Total Runoff, in m ³ /hr	60.9	33.7	15.2	8.7	663.2	803.9	716.7	639.1	657.4	498.7	246.3	119.2	374.1
Groundwater Seepage to Pit, in m ³ /hr	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9
Net Surface Water Discharge from Pit, in m ³ /hr	220.8	193.6	175.1	168.6	823.2	963.8	876.6	799.0	817.3	658.6	406.2	279.1	534.0

Table 17K.8 Monthly Runoff Estimation of Rose North Waste Rock Disposal Area for 100-wetter year using Log Normal Prediction

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	10.2	5.1	2.5	1.4	111.0	130.1	119.9	106.9	106.4	83.4	39.9	19.9	736.8
Operational Condition (Assume 75% Runoff Coefficient; Area = 1362542 m²)													
Total Runoff, in mm	12.1	6.1	3.0	1.7	132.3	155.2	143.0	127.5	126.9	99.5	47.6	23.8	878.8
Total Runoff, in m ³	16545	8268	4130	2295	180321	211502	194858	173764	172958	135574	64796	32406	1197418

Table 17K.9 Monthly Runoff Estimation of Rose South Waste Rock Disposal Area for 100-wetter year using Log Normal Prediction

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	10.2	5.1	2.5	1.4	111.0	130.1	119.9	106.9	106.4	83.4	39.9	19.9	736.8
Operational Condition (Assume 75% Runoff Coefficient; Area = 5947274 m²)													
Total Runoff, in mm	12.1	6.1	3.0	1.7	132.3	155.2	143.0	127.5	126.9	99.5	47.6	23.8	878.8
Total Runoff, in m ³	72215	36089	18027	10019	787072	923171	850525	758452	754933	591759	282826	141449	5226537

Table 17K.10 Monthly Runoff Estimation for Crusher Yard for 100-wetter year using Log Normal Prediction

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	10.2	5.1	2.5	1.4	111.0	130.1	119.9	106.9	106.4	83.4	39.9	19.9	736.8
Operational Condition (Assume 90% Runoff Coefficient; Area = 64166.5 m²)													
Total Runoff, in mm	14.6	7.3	3.6	2.0	158.8	186.3	171.6	153.0	152.3	119.4	57.1	28.5	1054.6
Total Runoff, in m ³	935	467	233	130	10190	11952	11012	9820	9774	7662	3662	1831	67668

Table 17K.11 Monthly Runoff Estimation for Mine Service Building for 100-wetter year using Log Normal Prediction

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	10.2	5.1	2.5	1.4	111.0	130.1	119.9	106.9	106.4	83.4	39.9	19.9	736.8
Operational Condition (Assume 90% Runoff Coefficient; Area = 70385.71 m²)													
Total Runoff, in mm	14.6	7.3	3.6	2.0	158.8	186.3	171.6	153.0	152.3	119.4	57.1	28.5	1054.6
Total Runoff, in m ³	1026	513	256	142	11178	13111	12079	10771	10722	8404	4017	2009	74227

Table 17K.12 Monthly Runoff Estimation for Processing Plant Area for 100-wetter year using Log Normal Prediction

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	10.2	5.1	2.5	1.4	111.0	130.1	119.9	106.9	106.4	83.4	39.9	19.9	736.8
Operational Condition (Assume 90% Runoff Coefficient; Area = 167073.9 m²)													
Total Runoff, in mm	14.6	7.3	3.6	2.0	158.8	186.3	171.6	153.0	152.3	119.4	57.1	28.5	1054.6
Total Runoff, in m ³	2434	1217	608	338	26533	31121	28672	25568	25450	19949	9534	4768	176192

Table 17K.13 Monthly Runoff and Pumping Rate Estimation from Rose Pit for 100-dryer year using Log Normal Prediction

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Existing Condition													
Precipitation, in mm	36.3	28.3	39.3	37.7	39.3	60.4	84.2	78.2	68.5	56.1	54.8	39.5	622.6
Streamflow, in mm	5.4	2.7	1.4	0.8	59.0	69.1	63.7	56.8	56.5	44.3	21.2	10.6	391.5
Operational Condition (Assume 100% Runoff Coefficient; Area = 2796439 m²)													
Total Runoff, in m ³	24054	12021	6005	3337	262170	307504	283306	252637	251464	197112	94208	47116	1740933
Total Runoff, in mm	8.6	4.3	2.1	1.2	93.8	110.0	101.3	90.3	89.9	70.5	33.7	16.8	622.6
Groundwater Seepage to Pit, in m ³	118978	107464	118978	115140	118978	115140	118978	118978	115140	118978	115140	118978	1400870
Net Surface Water from Pit, in m ³	143032	119485	124983	118477	381148	422644	402284	371615	366604	316090	209348	166094	3141803
Net Surface Water from Pit, in mm	51.1	42.7	44.7	42.4	136.3	151.1	143.9	132.9	131.1	113.0	74.9	59.4	1123.5
Pumping Rate													
Total Runoff, in m ³ /hr	32.3	17.9	8.1	4.6	352.4	427.1	380.8	339.6	349.3	264.9	130.8	63.3	198.7
Groundwater Seepage to Pit, in m ³ /hr	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9167
Net Surface Water Discharge from Pit, in m ³ /hr	192.2	177.8	168.0	164.6	512.3	587.0	540.7	499.5	509.2	424.9	290.8	223.2	358.7

Table 17K.14 Monthly Runoff Estimation for Rose North Waste Rock Disposal Area for 100-dryer year using Log Normal Prediction

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	5.4	2.7	1.4	0.8	59.0	69.1	63.7	56.8	56.5	44.3	21.2	10.6	391.5
Operational Condition (Assume 75% Runoff Coefficient; Area = 1362542 m²)													
Total Runoff, in mm	6.5	3.2	1.6	0.9	70.3	82.5	76.0	67.8	67.4	52.9	25.3	12.6	466.9
Total Runoff, in m ³	8790	4393	2194	1220	95805	112371	103529	92321	91893	72031	34427	17218	636192

Table 17K.15 Monthly Runoff Estimation for Rose South Waste Rock Disposal Area for 100-dryer year using Log Normal Prediction

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	5.4	2.7	1.4	0.8	59.0	69.1	63.7	56.8	56.5	44.3	21.2	10.6	391.5
Operational Condition (Assume 75% Runoff Coefficient; Area = 5947274 m²)													
Total Runoff, in mm	6.5	3.2	1.6	0.9	70.3	82.5	76.0	67.8	67.4	52.9	25.3	12.6	466.9
Total Runoff, in m ³	38368	19174	9578	5323	418174	490483	451886	402968	401098	314403	150266	75152	2776872

Table 17K.16 Monthly Runoff Estimation for Crusher Yard for 100-dryer year using Log Normal Prediction

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	5.4	2.7	1.4	0.8	59.0	69.1	63.7	56.8	56.5	44.3	21.2	10.6	391.5
Operational Condition (Assume 90% Runoff Coefficient; Area = 64166.5 m²)													
Total Runoff, in mm	7.7	3.9	1.9	1.1	84.4	99.0	91.2	81.3	80.9	63.4	30.3	15.2	560.3
Total Runoff, in m ³	497	248	124	69	5414	6350	5851	5217	5193	4071	1946	973	35952

Table 17K.17 Monthly Runoff Estimation for Mine Service Building for 100-dryer year using Log Normal Prediction

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	5.4	2.7	1.4	0.8	59.0	69.1	63.7	56.8	56.5	44.3	21.2	10.6	391.5
Operational Condition (Assume 90% Runoff Coefficient; Area = 70385.71 m²)													
Total Runoff, in mm	7.7	3.9	1.9	1.1	84.4	99.0	91.2	81.3	80.9	63.4	30.3	15.2	560.3
Total Runoff, in m ³	545	272	136	76	5939	6966	6418	5723	5696	4465	2134	1067	39437

Table 17K.18 Monthly Runoff Estimation for Processing Plant Area for 100-dryer year using Log Normal Prediction

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Existing Condition													
Streamflow, in mm	5.4	2.7	1.4	0.8	59.0	69.1	63.7	56.8	56.5	44.3	21.2	10.6	391.5
Operational Condition (Assume 90% Runoff Coefficient; Area = 167073.9 m²)													
Total Runoff, in mm	7.7	3.9	1.9	1.1	84.4	99.0	91.2	81.3	80.9	63.4	30.3	15.2	560.3
Total Runoff, in m ³	1293	646	323	179	14097	16535	15234	13584	13521	10599	5066	2533	93611

Table 17K.19 TMF Monthly Water Balance Results

Parameter	Unit	Starter TMF			Final TMF					
		100 Yr Dry	Mean	100 Yr Wet	100 Yr Dry	Mean	100 Yr Wet	100 Yr Dry	Mean	100 Yr Wet
		value	value	value	value	value	value	value	value	value
Iron concentrate production	Mt/year	8	8	8	8	8	8	16	16	16
Ore production rate	Mt/year	21.2	21.2	21.2	21.2	21.2	21.2	42.4	42.4	42.4
Precipitation	mm/year	623	858	1172	623	858	1172	623	858	1172
Lake evaporation	mm/year	367	350	271	367	350	271	367	350	271
Collecting Watershed Area	ha	282	282	282	763	763	763	763	763	763
Required recycled water to mill	m ³ /month	1,096,510	1,096,510	1,096,510	1,096,510	1,096,510	1,096,510	2,452,220	2,452,220	2,452,220
Month		Surplus (Deficit)	Surplus (Deficit)	Surplus (Deficit)	Surplus (Deficit)	Surplus (Deficit)	Surplus (Deficit)	Surplus (Deficit)	Surplus (Deficit)	Surplus (Deficit)
October		(30,040)	22,862	96,722	169,533	312,669	512,511	(221,213)	(78,077)	121,765
November		(79,297)	(53,930)	(20,036)	35,408	104,042	195,749	(355,339)	(286,704)	(194,997)
December		(147,046)	(147,046)	(147,046)	(147,046)	(147,046)	(147,046)	(537,793)	(537,793)	(537,793)
January		(147,046)	(147,046)	(147,046)	(147,046)	(147,046)	(147,046)	(537,793)	(537,793)	(537,793)
February		(145,546)	(145,546)	(145,546)	(145,546)	(145,546)	(145,546)	(536,293)	(536,293)	(536,293)
March		(147,046)	(147,046)	(147,046)	(147,046)	(147,046)	(147,046)	(537,793)	(537,793)	(537,793)
April		107,173	202,877	330,755	539,934	798,879	1,144,874	149,188	408,133	754,128
May		161,650	295,626	480,989	688,186	1,050,681	1,552,213	297,440	659,934	1,161,467
June		(194,792)	(129,708)	(12,588)	(277,082)	(100,988)	215,902	(667,829)	(491,734)	(174,844)
July		(147,210)	(59,607)	89,192	(147,489)	89,537	492,136	(538,236)	(301,209)	101,390
August		(120,776)	(40,735)	91,610	(75,969)	140,597	498,679	(466,715)	(250,149)	107,933
September		(71,524)	(3,775)	101,033	56,440	239,745	523,323	(334,306)	(151,001)	132,577
Toatal		(961,500)	(353,074)	570,993	402,277	2,048,478	4,548,703	(4,286,682)	(2,640,479)	(140,253)