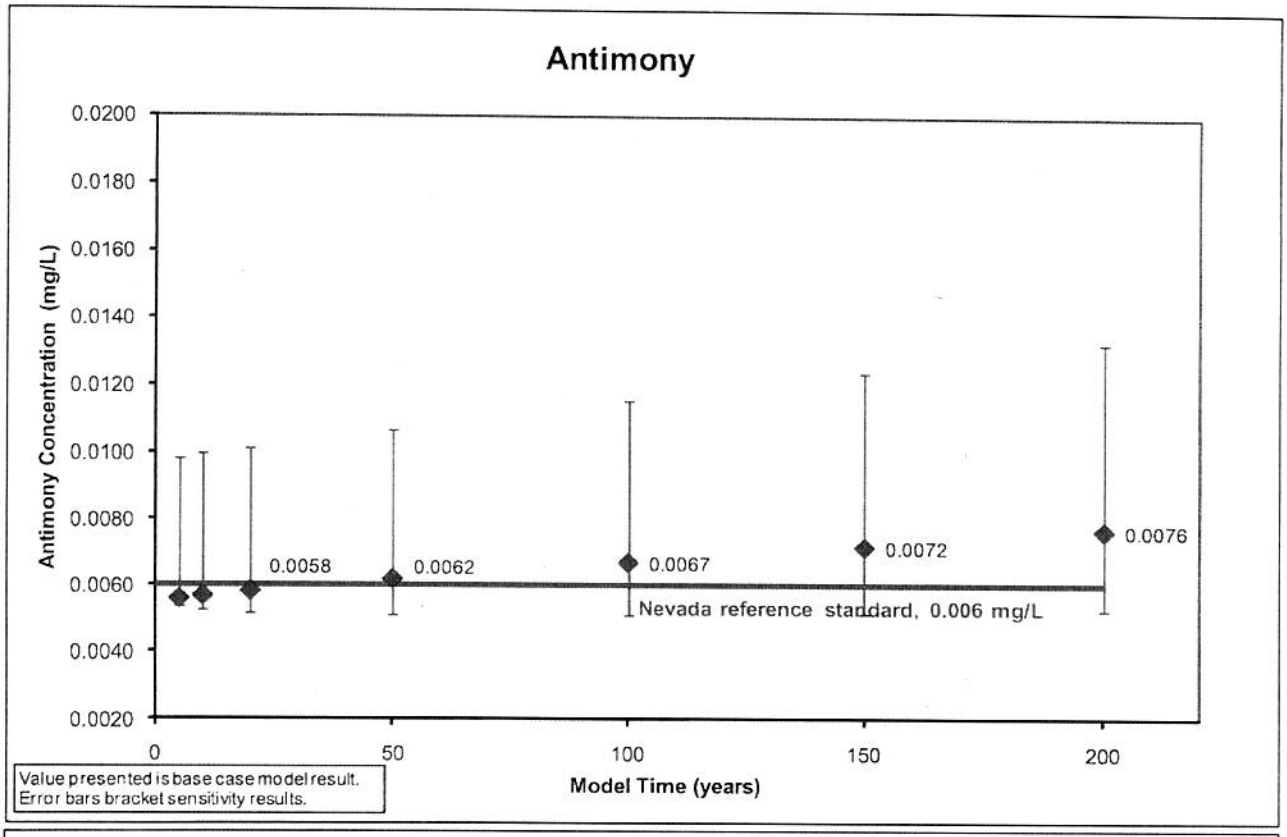

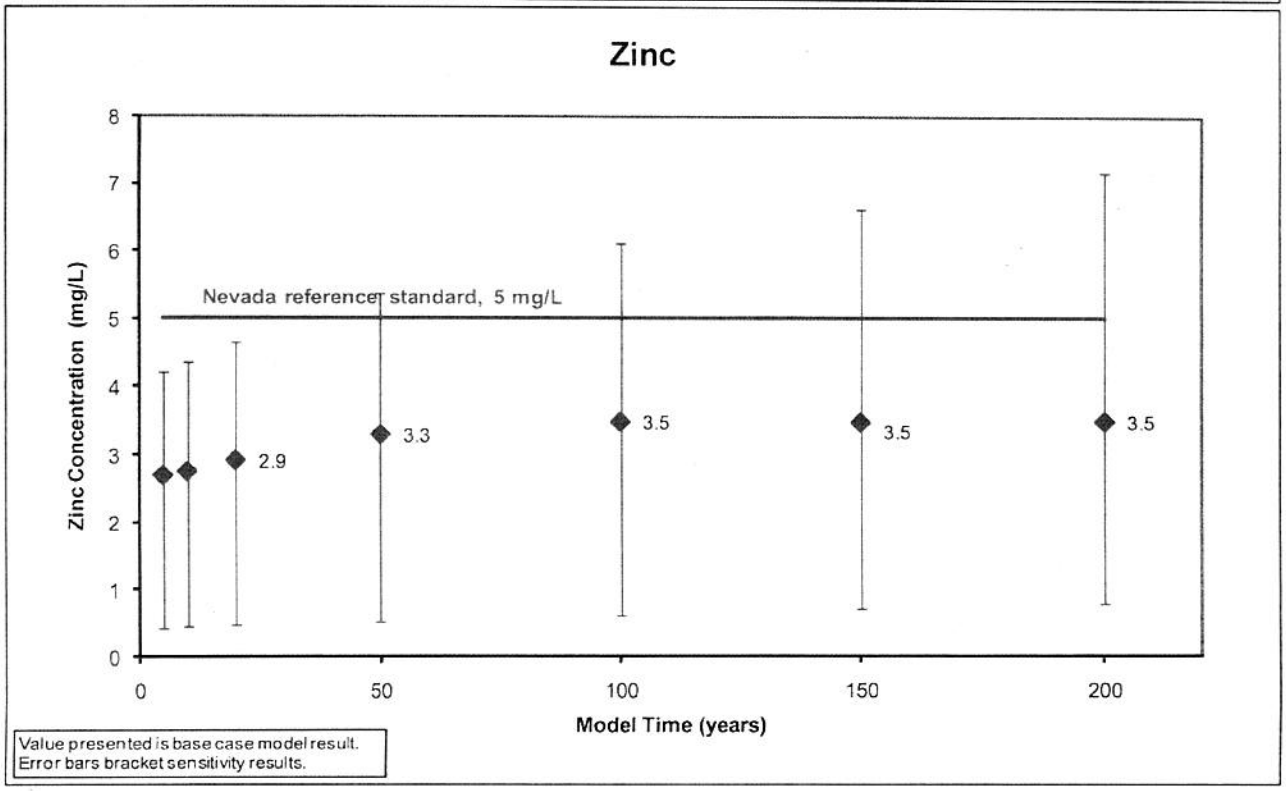

Schlumberger WATER SERVICES

ANTIMONY AND ZINC RESULTS			
CLIENT: EUREKA MOLY, LLC		PROJECT: MOUNT HOPE	
JOB: 2910		DRAWN: RN	CHECKED: PR
DATE: APRIL 2010		FIGURE: 6.4	

P:\2910 - MT HOPE 2009\CAD\2910-R-APRIL-2010\FIGURE 6.4.DWG

7 SUMMARY AND IMPLICATIONS FOR MINING

Post-closure water quality of the Mount Hope pit lake was evaluated based on the revised, local hydrogeologic model for the pit (Interflow and Montgomery, 2010). The water balance model predicts the final pit lake will act as a groundwater and surface water hydraulic sink, or "terminal lake", that is, that both groundwater and surface water gradients will be directed towards the pit both during filling and under long-term equilibrium conditions. Based on this result, no discharge from the lake is expected to occur.

The conceptual model developed for the Mount Hope pit lake geochemical predictions takes into account unique and site-specific geological, geochemical, and hydrologic factors. The conceptual model for pit filling includes direct precipitation onto the pit lake surface, pit wall runoff, and groundwater inflow. In addition, the geochemical model considers addition of solute introduced during pit wall submergence (i.e., flushing of solutes from the pit wall as the lake rises and lake water inundates the damaged rock zone of the wall). Detailed site-specific geological and geochemical data were used to characterize the influence of pit wall runoff and flushing (submergence), accounting for reaction with oxidized and weathered pit walls; scaled laboratory kinetic test data were used for this purpose. Only a small portion of the pit wall rock is considered potentially acid-generating; therefore, the pit wall rock runoff chemistry is dominated by rinsing of non-acid generating rock types. The only outflow from the pit lake is evaporation from the pit lake surface.

The geochemical model was used to predict pit lake chemistry at several time steps, ranging from 5 to 200 years post-closure, by mixing waters from the various inflow sources, evapoconcentrating the mixture, and then allowing the resulting water to equilibrate with specified mineral and gas species.

The base case simulation for the Mount Hope pit lake was designed to predict the most likely condition of future pit lake water quality. Because the pit lake is expected to act as a hydraulic sink, there will be no discharge from the pit to either groundwater or surface water; however, the pit lake water quality results have been compared to Nevada reference standards, for reference purposes only. These pit lake water quality predictions have been evaluated in terms of ecological risk, and are presented in a separate SLERA report (SRK, 2010).

The pH of the pit lake is predicted to be neutral to slightly alkaline, with a pH of approximately 7.7 su, throughout pit filling to 200 years post-closure. Total alkalinity is predicted to be present initially at moderate concentrations of approximately 55 mg/L as $CaCO_3$, and will increase with time. Sulfate concentrations are predicted to be low, ranging between 134 and 214 mg/L over the modeled time period.

Iron and aluminum concentrations are predicted to be below standard detection limits as a result of precipitation of secondary hydroxide mineral phases. Most trace metals/metalloid concentrations are low or below analytical detection; however, concentrations of fluoride, cadmium, and manganese are predicted to be present above Nevada reference standards during early pit lake filling and throughout the modeling period. Antimony concentrations are initially low, but are predicted to increase to just above the reference standard due to this evapoconcentration effect in the late stages of pit filling (by 50 years). In general, constituent concentrations in the pit lake are predicted to increase over time due to evapoconcentration.

Key model variables were modified from the base case to evaluate their sensitivity on predicted pit lake chemistry during the first 200 years of filling. The results of the pit lake water quality predictions were not overly sensitive to these runs in that the pit lake predictions were consistently neutral to slightly alkaline (pH greater than 7.0) with low to moderate alkalinity, and similar constituents of concern identified as exceeding reference standards throughout pit filling. In addition, some of the sensitivity runs identified zinc and thallium (the high TDS groundwater sensitivity model) as slightly exceeding reference standards during late-stage filling due to evapoconcentration in the pit lake. Results of these sensitivity runs do indicate that predicted pit lake water chemistry is mostly influenced by the chemistry of the groundwater and pit wall runoff. This is reflected in the model sensitivity to groundwater inflow contribution, pit wall runoff chemistry scaling, and the use of early-stage versus average HCT concentration data to represent pit wall runoff.

The sources of fluoride to the pit include both groundwater and pit wall rock rinsing. About half of the fluoride contribution from the wall rocks is leached from the quartz aplite porphyry material, exposed near the bottom of the pit. The primary source of antimony is groundwater inflow. In contrast, the only source of cadmium and manganese is pit wall rock flushing. The major contributing area for these constituents is the PAG-classified, argillic rhyolite tuff; this material is located high in the pit on the north to east pit walls.

It should be noted that these predicted concentrations are considered conservative because:

- The amount of PAG material exposed on the pit walls is a conservatively high estimate, due to limited available data in the vicinity of the final pit shell (Section 2.5.3).
- The specific surface area estimate for the pit walls is based on grain size data from waste rock piles; this is considered to be a conservative approximation that takes into consideration the range of grain-size material present in the fractured pit walls as well as the fine-grained materials which, over time, accumulate on pit benches. The effect is in a conservative level of scaling (30 percent decrease) for pit wall runoff chemistry (Section 3.4.2).
- Only a limited number of minerals were allowed (by the model setup) to precipitate in the pit lake, resulting in conservatively high concentrations of some dissolved constituents (Section 4.3.1).
- Various mechanisms of co-precipitation and adsorption, which in nature act to limit trace constituent concentrations, have not been included in the modeling either by design, to maintain conservative assumptions, or because thermodynamic data are not available (or thoroughly defensible) to define the behaviour in the geochemical model (Section 4.3.3).

Overall, water in the proposed pit lake is expected to be of generally good quality over the first 200 years of pit filling, with moderate, long-term alkalinity, low metals concentrations, and neutral to slightly alkaline pH.

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Appendix A1
Mount Hope final pit shell exposed plan view surface areas by geologic-geochemical material type

Appendix A.1

Mount Hope final pit shell exposed, plan-view surface areas by geologic-geochemical material type

*Apply percentages to derive chemistry for PIT WALL RUNOFF

		CUMULATIVE, PLAN-VIEW (2-D) PIT WALL EXPOSED ABOVE PIT LAKE ELEVATION																
		TOTAL	Early-phase Quartz Porphyry							Intermediate Phase Quartz Aplite Porphyry			Rhyolite				
Pit Lake Elevation (ft)	Units	TOTAL	Silica Quartz Porphyry	Potassic Quartz Porphyry	Potassic Quartz Porphyry (PAG)	Phyllic Quartz Porphyry	Phyllic Quartz Porphyry (PAG)	Argillic Quartz Porphyry	Biotite Quartz Porphyry	Silica Quartz Aplite Porphyry	Potassic Quartz Aplite Porphyry	Biotite Quartz Aplite Porphyry	Potassic Rhyolite	Potassic Rhyolite (PAG)	Phyllic Rhyolite	Argillic Rhyolite	Argillic Rhyolite (PAG)
4700	(acres)	728	37.53	129.30	5.30	4.87	0.50	0.86	0.06	54.84	18.07	25.85	28.50	4.30	3.36	68.97	68.70
4750	(acres)	718	37.53	129.30	5.30	4.87	0.50	0.86	0.06	52.34	18.07	18.45	28.50	4.30	3.36	68.97	68.70
4800	(acres)	714	37.53	129.30	5.30	4.87	0.50	0.86	0.06	50.64	18.07	15.95	28.50	4.30	3.36	68.97	68.70
4850	(acres)	708	37.53	129.30	5.30	4.87	0.50	0.86	0.06	46.04	18.07	14.45	28.50	4.30	3.36	68.97	68.70
4900	(acres)	702	37.53	129.30	5.30	4.87	0.50	0.86	0.06	42.27	18.05	12.54	28.50	4.30	3.36	68.97	68.70
4950	(acres)	697	37.53	129.30	5.30	4.87	0.50	0.86	0.06	40.32	18.01	10.13	28.50	4.30	3.36	68.97	68.70
5000	(acres)	691	37.53	129.30	5.30	4.87	0.50	0.86	0.06	38.26	17.97	7.15	28.50	4.30	3.36	68.97	68.70
5050	(acres)	685	37.53	129.30	5.30	4.87	0.50	0.86	0.06	35.88	17.87	4.75	28.50	4.30	3.36	68.97	68.70
5100	(acres)	679	37.53	129.30	5.30	4.87	0.50	0.86	0.06	31.75	17.76	3.61	28.50	4.30	3.36	68.97	68.70
5150	(acres)	672	37.52	129.30	5.30	4.87	0.50	0.86	0.06	27.36	17.66	2.82	28.50	4.30	3.36	68.97	68.70
5200	(acres)	665	36.66	129.30	5.30	4.87	0.50	0.86	0.06	23.21	17.56	2.06	28.50	4.30	3.36	68.97	68.70
5250	(acres)	658	34.39	129.30	5.30	4.87	0.50	0.86	0.06	20.26	17.46	1.32	28.50	4.30	3.36	68.97	68.70
5300	(acres)	650	31.10	129.30	5.30	4.87	0.50	0.86	0.06	18.45	17.38	0.65	28.50	4.30	3.36	68.97	68.70
5350	(acres)	642	29.29	129.30	5.30	4.87	0.50	0.86	0.05	16.38	17.36	0.00	28.50	4.30	3.36	68.97	68.70
5400	(acres)	634	27.35	129.08	5.30	4.87	0.50	0.86	0.00	14.15	17.34	0.00	28.50	4.30	3.36	68.97	68.70
5450	(acres)	625	25.37	128.83	5.30	4.87	0.50	0.86	0.00	11.82	17.23	0.00	28.50	4.30	3.36	68.97	68.70
5500	(acres)	615	23.30	128.53	5.30	4.87	0.50	0.86	0.00	9.70	15.88	0.00	28.50	4.30	3.36	68.97	68.70
5550	(acres)	590	21.54	127.92	5.30	4.87	0.50	0.86	0.00	7.77	16.44	0.00	28.50	4.30	3.36	68.97	68.70
5600	(acres)	597	19.87	126.68	5.30	4.87	0.50	0.86	0.00	5.06	15.70	0.00	28.50	4.30	3.36	68.97	68.70
5650	(acres)	587	18.42	125.29	5.30	4.87	0.50	0.86	0.00	2.69	14.62	0.00	28.50	4.30	3.36	68.97	68.70
5700	(acres)	576	16.40	123.01	5.30	4.87	0.50	0.86	0.00	0.98	13.57	0.00	28.50	4.30	3.36	68.97	68.70
5750	(acres)	566	15.34	119.06	5.30	4.87	0.50	0.86	0.00	0.22	12.39	0.00	28.50	4.30	3.36	68.97	68.70
5800	(acres)	555	13.93	115.12	5.30	4.87	0.50	0.86	0.00	0.02	11.12	0.00	28.50	4.30	3.36	68.97	68.70
5850	(acres)	543	12.56	111.80	5.30	4.87	0.50	0.86	0.00	0.00	8.17	0.00	28.50	4.30	3.36	68.97	68.70
5900	(acres)	531	11.64	108.18	5.30	4.87	0.50	0.86	0.00	0.00	5.28	0.00	28.50	4.30	3.36	68.97	68.70
5950	(acres)	518	11.14	103.24	4.83	4.87	0.50	0.86	0.00	0.00	3.46	0.00	28.50	4.30	3.36	68.97	68.70
6000	(acres)	505	10.62	97.57	4.35	4.87	0.50	0.86	0.00	0.00	2.47	0.00	28.50	4.30	3.36	68.97	68.70
6050	(acres)	491	8.83	90.93	4.24	4.87	0.50	0.86	0.00	0.00	1.68	0.00	28.39	4.30	3.36	68.97	68.70
6100	(acres)	477	7.91	84.69	4.24	4.87	0.50	0.86	0.00	0.00	1.01	0.00	28.04	4.30	3.36	68.97	68.70
6150	(acres)	461	5.64	78.27	4.24	4.87	0.50	0.86	0.00	0.00	0.54	0.00	27.50	4.30	3.36	68.97	68.70
6200	(acres)	444	3.84	69.65	4.24	4.87	0.50	0.86	0.00	0.00	0.20	0.00	26.77	4.30	3.36	68.97	68.70
6250	(acres)	429	2.75	63.43	3.92	4.87	0.50	0.86	0.00	0.00	0.01	0.00	25.61	4.30	3.36	68.97	68.70
6300	(acres)	414	1.89	57.92	3.92	4.81	0.50	0.86	0.00	0.00	0.00	0.00	23.49	4.30	3.33	68.97	68.70
6350	(acres)	399	1.17	54.06	3.92	4.79	0.50	0.85	0.00	0.00	0.00	0.00	21.13	3.60	2.72	68.71	68.70
6400	(acres)	383	0.61	50.89	3.92	4.79	0.50	0.85	0.00	0.00	0.00	0.00	17.93	2.89	1.91	67.70	68.70
6450	(acres)	367	0.20	46.81	3.92	4.87	0.42	0.85	0.00	0.00	0.00	0.00	17.11	2.65	1.06	64.82	68.19
6500	(acres)	350	0.00	43.80	3.13	4.79	0.50	0.85	0.00	0.00	0.00	0.00	16.54	2.39	0.28	61.88	67.38
6550	(acres)	332	0.00	40.59	2.32	4.79	0.50	0.85	0.00	0.00	0.00	0.00	15.98	2.05	0.15	59.66	65.34
6600	(acres)	313	0.00	37.67	1.47	4.79	0.50	0.85	0.00	0.00	0.00	0.00	15.42	1.62	0.15	57.63	62.81
6400	(acres)	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Original data provided by SRK, July 2009.

Appendix A2
Mount Hope final pit shell exposed actual surface areas by geologic-geochemical material type

Appndix A.2

Mount Hope final pit shell exposed, actual suface areas by geologic-geochemical material type

*Apply percentages to derive chemistry for PIT WALL SUBMERGENCE

		CUMULATIVE, ACTUAL (3-D) PIT WALL EXPOSED BELOW PIT LAKE ELEVATION															
		TOTAL	Early-phase Quartz Porphyry							Intermediate Phase Quartz Aplite Porphyry			Rhyolite				
Pit Lake Elevation (ft)	Units	TOTAL	Silica Quartz Porphyry	Potassic Quartz Porphyry	Potassic Quartz Porphyry (PAG)	Phyllic Quartz Porphyry	Phyllic Quartz Porphyry (PAG)	Argillic Quartz Porphyry	Biotite Quart Porphyy	Silica Quartz Aplite Porphyry	Potassic Quartz Aplite Porphyry	Biotite Quartz Aplite Porphyry	Potassic Rhyolite	Potassic Rhyolite (PAG)	Phyllic Rhyolite	Argillic Rhyolite	Argillic Rhyolite (PAG)
4700	(acres)	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4750	(acres)	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	0.00	7.90	0.00	0.00	0.00	0.00	0.00
4800	(acres)	17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50	0.00	10.65	0.00	0.00	0.00	0.00	0.00
4850	(acres)	24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.20	0.00	13.40	0.00	0.00	0.00	0.00	0.00
4900	(acres)	32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.10	0.03	16.01	0.00	0.00	0.00	0.00	0.00
4950	(acres)	40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.19	0.09	19.21	0.00	0.00	0.00	0.00	0.00
5000	(acres)	49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.45	0.15	22.90	0.00	0.00	0.00	0.00	0.00
5050	(acres)	58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.14	0.31	25.99	0.00	0.00	0.00	0.00	0.00
5100	(acres)	65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.86	0.49	27.62	0.00	0.00	0.00	0.00	0.00
5150	(acres)	74	0.01	0.00	0.00	0.00	0.00	0.00	0.00	37.06	0.65	28.88	0.00	0.00	0.00	0.00	0.00
5200	(acres)	85	1.12	0.00	0.00	0.00	0.00	0.00	0.00	42.86	0.81	30.09	0.00	0.00	0.00	0.00	0.00
5250	(acres)	95	4.28	0.00	0.00	0.00	0.00	0.00	0.00	46.86	0.96	31.26	0.00	0.00	0.00	0.00	0.00
5300	(acres)	107	8.58	0.00	0.00	0.00	0.00	0.00	0.00	49.67	1.09	32.32	0.00	0.00	0.00	0.00	0.00
5350	(acres)	118	11.46	0.00	0.00	0.00	0.00	0.00	0.02	52.97	1.12	33.37	0.00	0.00	0.00	0.00	0.00
5400	(acres)	116	0.00	0.00	0.00	0.00	0.00	0.00	0.11	56.50	1.16	33.37	0.00	0.00	0.00	0.00	0.00
5450	(acres)	143	17.59	0.75	0.00	0.00	0.00	0.00	0.11	60.17	1.33	33.37	0.00	0.00	0.00	0.00	0.00
5500	(acres)	157	20.86	1.22	0.00	0.00	0.00	0.00	0.11	63.52	1.74	33.37	0.00	0.00	0.00	0.00	0.00
5550	(acres)	170	23.63	2.19	0.00	0.00	0.00	0.00	0.11	66.59	2.59	33.37	0.00	0.00	0.00	0.00	0.00
5600	(acres)	185	26.03	4.12	0.00	0.00	0.00	0.00	0.11	70.27	3.75	33.37	0.00	0.00	0.00	0.00	0.00
5650	(acres)	199	28.32	6.32	0.00	0.00	0.00	0.00	0.11	73.41	5.25	33.37	0.00	0.00	0.00	0.00	0.00
5700	(acres)	215	31.09	9.60	0.00	0.00	0.00	0.00	0.11	75.86	6.72	33.37	0.00	0.00	0.00	0.00	0.00
5750	(acres)	230	32.78	14.93	0.00	0.00	0.00	0.00	0.11	77.06	8.43	33.37	0.00	0.00	0.00	0.00	0.00
5800	(acres)	246	34.99	20.39	0.00	0.00	0.00	0.00	0.11	77.39	10.29	33.37	0.00	0.00	0.00	0.00	0.00
5850	(acres)	263	37.15	25.23	0.00	0.00	0.00	0.00	0.11	77.41	13.97	33.37	0.00	0.00	0.00	0.00	0.00
5900	(acres)	281	38.62	30.62	0.00	0.00	0.00	0.00	0.11	77.41	17.64	33.37	0.00	0.00	0.00	0.00	0.00
5950	(acres)	299	39.41	37.51	0.74	0.00	0.00	0.00	0.11	77.41	20.13	33.37	0.00	0.00	0.00	0.00	0.00
6000	(acres)	318	40.20	45.43	1.47	0.00	0.00	0.00	0.11	77.41	21.64	33.37	0.00	0.00	0.00	0.00	0.00
6050	(acres)	338	42.15	53.47	1.64	0.00	0.00	0.00	0.11	77.41	22.80	33.37	0.18	0.00	0.00	0.00	0.00
6100	(acres)	358	43.36	62.14	1.64	0.00	0.00	0.00	0.11	77.41	23.95	33.37	0.73	0.00	0.00	0.00	0.00
6150	(acres)	380	45.95	70.95	1.64	0.00	0.00	0.00	0.11	77.41	24.70	33.37	1.59	0.00	0.00	0.00	0.00
6200	(acres)	404	48.29	82.06	1.64	0.00	0.00	0.00	0.11	77.41	25.23	33.37	2.72	0.00	0.00	0.00	0.00
6250	(acres)	425	49.91	90.87	2.15	0.00	0.00	0.00	0.11	77.41	25.53	33.37	4.53	0.00	0.00	0.00	0.00
6300	(acres)	447	51.28	99.16	2.15	0.09	0.00	0.00	0.11	77.41	25.55	33.37	7.82	0.00	0.05	0.01	0.00
6350	(acres)	468	52.44	104.78	2.15	0.12	0.00	0.01	0.11	77.41	25.55	33.37	11.33	1.09	0.99	0.40	0.00
6400	(acres)	491	53.37	109.84	2.15	0.12	0.00	0.01	0.11	77.41	25.55	33.37	15.33	2.19	2.26	1.90	0.00
6450	(acres)	513	54.03	115.10	2.15	0.12	0.00	0.01	0.11	77.41	25.55	33.37	16.55	2.57	3.57	5.59	0.79
6500	(acres)	537	54.37	119.80	3.34	0.12	0.00	0.01	0.11	77.41	25.55	33.37	17.42	2.97	4.79	9.42	2.02
6550	(acres)	562	54.37	124.64	4.58	0.12	0.00	0.01	0.11	77.41	25.55	33.37	18.28	3.51	5.00	12.79	4.57
6600	(acres)	588	54.37	129.17	5.87	0.12	0.00	0.01	0.11	77.41	25.55	33.37	19.13	4.15	5.00	15.87	7.73
8400	(acres)	1002	54.37	203.13	11.53	7.26	0.82	1.27	0.11	77.41	25.55	33.37	42.60	6.55	5.23	98.48	95.64

Original data provided by SRK, July 2009.

Appendix A.2

Mount Hope final pit shell exposed, actual suface areas by geologic-geochemical material type

*Apply percentages to derive chemistry for PIT WALL SUBMERGENCE

		CUMULATIVE, ACTUAL (3-D) PIT WALL EXPOSED BELOW PIT LAKE ELEVATION																
		TOTAL	Early-phase Quartz Porphyry							Intermediate Phase Quartz Aplite Porphyry			Rhyolite				
Pit Lake Elevation (ft)	Units	TOTAL	Silica Quartz Porphyry	Potassic Quartz Porphyry	Potassic Quartz Porphyry (PAG)	Phyllic Quartz Porphyry	Phyllic Quartz Porphyry (PAG)	Argillic Quartz Porphyry	Biotib Quart Porphyy	Silica Quartz Aplite Porphyry	Potassic Quartz Aplite Porphyry	Biotite Quartz Aplite Porphyry	Potassic Rhyolite	Potassic Rhyolite (PAG)	Phyllic Rhyolite	Argillic Rhyolite	Argillic Rhyolite (PAG)
4700	(acres)	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4750	(acres)	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	0.00	7.90	0.00	0.00	0.00	0.00	0.00
4800	(acres)	17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50	0.00	10.65	0.00	0.00	0.00	0.00	0.00
4850	(acres)	24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.20	0.00	13.40	0.00	0.00	0.00	0.00	0.00
4900	(acres)	32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.10	0.03	16.01	0.00	0.00	0.00	0.00	0.00
4950	(acres)	40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.19	0.09	19.21	0.00	0.00	0.00	0.00	0.00
5000	(acres)	49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.45	0.15	22.90	0.00	0.00	0.00	0.00	0.00
5050	(acres)	58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.14	0.31	25.99	0.00	0.00	0.00	0.00	0.00
5100	(acres)	65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.86	0.49	27.62	0.00	0.00	0.00	0.00	0.00
5150	(acres)	74	0.01	0.00	0.00	0.00	0.00	0.00	0.00	37.06	0.65	28.88	0.00	0.00	0.00	0.00	0.00
5200	(acres)	85	1.12	0.00	0.00	0.00	0.00	0.00	0.00	42.86	0.81	30.09	0.00	0.00	0.00	0.00	0.00
5250	(acres)	95	4.28	0.00	0.00	0.00	0.00	0.00	0.00	46.86	0.96	31.26	0.00	0.00	0.00	0.00	0.00
5300	(acres)	107	8.58	0.00	0.00	0.00	0.00	0.00	0.00	49.67	1.09	32.32	0.00	0.00	0.00	0.00	0.00
5350	(acres)	118	11.46	0.00	0.00	0.00	0.00	0.00	0.02	52.97	1.12	33.37	0.00	0.00	0.00	0.00	0.00
5400	(acres)	116	0.00	0.00	0.00	0.00	0.00	0.00	0.11	56.50	1.16	33.37	0.00	0.00	0.00	0.00	0.00
5450	(acres)	143	17.59	0.75	0.00	0.00	0.00	0.00	0.11	60.17	1.33	33.37	0.00	0.00	0.00	0.00	0.00
5500	(acres)	157	20.86	1.22	0.00	0.00	0.00	0.00	0.11	63.52	1.74	33.37	0.00	0.00	0.00	0.00	0.00
5550	(acres)	170	23.63	2.19	0.00	0.00	0.00	0.00	0.11	66.59	2.59	33.37	0.00	0.00	0.00	0.00	0.00
5600	(acres)	185	26.03	4.12	0.00	0.00	0.00	0.00	0.11	70.27	3.75	33.37	0.00	0.00	0.00	0.00	0.00
5650	(acres)	199	28.32	6.32	0.00	0.00	0.00	0.00	0.11	73.41	5.25	33.37	0.00	0.00	0.00	0.00	0.00
5700	(acres)	215	31.09	9.60	0.00	0.00	0.00	0.00	0.11	75.86	6.72	33.37	0.00	0.00	0.00	0.00	0.00
5750	(acres)	230	32.78	14.93	0.00	0.00	0.00	0.00	0.11	77.06	8.43	33.37	0.00	0.00	0.00	0.00	0.00
5800	(acres)	246	34.99	20.39	0.00	0.00	0.00	0.00	0.11	77.39	10.29	33.37	0.00	0.00	0.00	0.00	0.00
5850	(acres)	263	37.15	25.23	0.00	0.00	0.00	0.00	0.11	77.41	13.97	33.37	0.00	0.00	0.00	0.00	0.00
5900	(acres)	281	38.62	30.62	0.00	0.00	0.00	0.00	0.11	77.41	17.64	33.37	0.00	0.00	0.00	0.00	0.00
5950	(acres)	299	39.41	37.51	0.74	0.00	0.00	0.00	0.11	77.41	20.13	33.37	0.00	0.00	0.00	0.00	0.00
6000	(acres)	318	40.20	45.43	1.47	0.00	0.00	0.00	0.11	77.41	21.64	33.37	0.00	0.00	0.00	0.00	0.00
6050	(acres)	338	42.15	53.47	1.64	0.00	0.00	0.00	0.11	77.41	22.80	33.37	0.18	0.00	0.00	0.00	0.00
6100	(acres)	358	43.38	62.14	1.64	0.00	0.00	0.00	0.11	77.41	23.95	33.37	0.73	0.00	0.00	0.00	0.00
6150	(acres)	380	45.95	70.95	1.64	0.00	0.00	0.00	0.11	77.41	24.70	33.37	1.59	0.00	0.00	0.00	0.00
6200	(acres)	404	48.29	82.06	1.64	0.00	0.00	0.00	0.11	77.41	25.23	33.37	2.72	0.00	0.00	0.00	0.00
6250	(acres)	425	49.91	90.87	2.15	0.00	0.00	0.00	0.11	77.41	25.53	33.37	4.53	0.00	0.00	0.00	0.00
6300	(acres)	447	51.28	99.16	2.15	0.09	0.00	0.00	0.11	77.41	25.55	33.37	7.82	0.00	0.05	0.01	0.00
6350	(acres)	468	52.44	104.78	2.15	0.12	0.00	0.01	0.11	77.41	25.55	33.37	11.33	1.09	0.99	0.40	0.00
6400	(acres)	491	53.37	109.84	2.15	0.12	0.00	0.01	0.11	77.41	25.55	33.37	15.33	2.19	2.26	1.90	0.00
6450	(acres)	513	54.03	115.10	2.15	0.12	0.00	0.01	0.11	77.41	25.55	33.37	16.55	2.57	3.57	5.59	0.79
6500	(acres)	537	54.37	119.80	3.34	0.12	0.00	0.01	0.11	77.41	25.55	33.37	17.42	2.97	4.79	9.42	2.02
6550	(acres)	562	54.37	124.64	4.58	0.12	0.00	0.01	0.11	77.41	25.55	33.37	18.26	3.51	5.00	12.79	4.57
6600	(acres)	588	54.37	129.17	5.87	0.12	0.00	0.01	0.11	77.41	25.55	33.37	19.13	4.15	5.00	15.87	7.73
8400	(acres)	1002	54.37	203.13	11.53	7.26	0.82	1.27	0.11	77.41	25.55	33.37	42.60	6.55	5.23	98.48	95.64

Original data provided by SRK, July 2009.

Appendix B
Mount Hope Pit filling water balance results, base case

Appendix B Base case pit filling water balance results

Year	Stage (ft amsl)	FLOW RATES (GPM)										RELATIVE PERCENT FLOWS							
		FLOW RATE per YEAR (gpm)						FLOW RATI per YEAR (gpm)				FLOW RATE per YEAR (percent)				PERCENT TOTAL GW INFLOW			
								Groundwater Inflows by Quadrant (gpm)								Groundwater Inflows by Quadrant			
		Precipitation	Runoff	Groundwater	Total Inflow	Evaporation	Net Inflow	NE	SE	SW	NW	Precipitation	Runoff	Groundwater	Total Inflow	NE	SE	SW	NW
1	4,794.02	6.3	174	285	465	-16	449	71	66	62	85	1.4%	37.4%	61.3%	100.0%	25%	23%	22%	30%
2	4,844.69	10.6	173	271	454	-26	427	67	63	60	81	2.3%	38.0%	59.6%	100.0%	25%	23%	22%	30%
3	4,880.90	14.3	171	264	449	-36	414	65	61	59	78	3.2%	38.1%	58.7%	100.0%	25%	23%	22%	30%
4	4,910.39	17.0	171	258	446	-43	403	64	61	58	76	3.8%	38.2%	57.9%	100.0%	25%	23%	22%	30%
5	4,935.28	19.7	170	254	443	-49	394	62	60	56	75	4.4%	38.3%	57.2%	100.0%	25%	24%	22%	30%
6	4,957.14	21.9	169	250	441	-55	386	61	60	55	73	5.0%	38.4%	56.6%	100.0%	24%	24%	22%	29%
7	4,977.37	23.3	169	246	438	-59	379	60	59	55	73	5.3%	38.5%	56.2%	100.0%	24%	24%	22%	30%
8	4,995.70	25.3	168	243	436	-63	372	59	58	54	72	5.8%	38.6%	55.6%	100.0%	24%	24%	22%	30%
9	5,013.05	26.4	168	239	433	-66	367	59	57	52	71	6.1%	38.7%	55.2%	100.0%	25%	24%	22%	30%
10	5,028.97	28.2	167	236	432	-71	361	59	56	52	70	6.5%	38.7%	54.7%	100.0%	25%	24%	22%	30%
11	5,043.72	30.0	167	233	430	-75	355	58	55	50	70	7.0%	38.8%	54.3%	100.0%	25%	24%	22%	30%
12	5,057.71	31.2	166	231	428	-78	350	57	55	50	69	7.3%	38.8%	53.9%	100.0%	25%	24%	22%	30%
13	5,071.15	32.0	166	228	426	-80	346	56	54	50	68	7.5%	39.0%	53.5%	100.0%	25%	24%	22%	30%
14	5,083.88	33.4	166	226	425	-84	341	55	54	49	68	7.9%	39.0%	53.2%	100.0%	24%	24%	22%	30%
15	5,095.76	35.2	165	224	424	-88	336	55	52	48	68	8.3%	39.0%	52.7%	100.0%	25%	23%	22%	30%
16	5,107.18	36.2	165	222	423	-91	332	55	52	47	67	8.6%	39.0%	52.4%	100.0%	25%	23%	21%	30%
17	5,118.15	37.2	165	220	421	-93	328	55	52	47	66	8.8%	39.0%	52.1%	100.0%	25%	24%	21%	30%
18	5,128.67	38.4	164	218	421	-96	324	54	52	46	66	9.1%	39.0%	51.8%	100.0%	25%	24%	21%	30%
19	5,138.83	39.4	164	216	420	-99	321	54	51	45	65	9.4%	39.0%	51.6%	100.0%	25%	24%	21%	30%
20	5,148.85	39.6	164	215	418	-99	319	54	51	44	65	9.5%	39.2%	51.4%	100.0%	25%	24%	21%	30%
21	5,158.51	40.7	163	213	418	-102	316	54	51	44	65	9.7%	39.1%	51.1%	100.0%	25%	24%	20%	31%
22	5,167.77	42.0	163	212	417	-105	312	53	51	43	65	10.1%	39.1%	50.9%	100.0%	25%	24%	20%	31%
23	5,176.65	43.2	163	211	417	-108	308	52	51	43	65	10.4%	39.0%	50.6%	100.0%	25%	24%	20%	31%
24	5,185.24	44.3	162	210	416	-111	305	53	51	42	64	10.6%	39.0%	50.4%	100.0%	25%	24%	20%	31%
25	5,193.67	44.8	162	209	416	-112	303	52	50	42	64	10.8%	39.0%	50.2%	100.0%	25%	24%	20%	31%
26	5,201.91	45.5	162	207	415	-114	301	52	50	42	63	11.0%	39.1%	50.0%	100.0%	25%	24%	20%	31%
27	5,209.79	46.9	162	206	415	-118	297	53	49	42	63	11.3%	39.0%	49.7%	100.0%	25%	24%	20%	31%
28	5,217.45	47.8	161	205	414	-120	294	53	48	42	63	11.5%	38.9%	49.5%	100.0%	26%	23%	20%	31%
29	5,224.93	48.6	161	204	414	-122	292	53	48	41	62	11.7%	38.9%	49.3%	100.0%	26%	23%	20%	31%
30	5,232.19	49.6	161	203	414	-124	289	54	48	41	61	12.0%	38.9%	49.1%	100.0%	26%	24%	20%	30%
31	5,239.25	50.6	161	202	413	-127	287	53	48	40	62	12.2%	38.8%	48.9%	100.0%	26%	24%	20%	31%
32	5,246.10	51.5	160	201	413	-129	284	52	47	40	62	12.5%	38.8%	48.7%	100.0%	26%	24%	20%	31%
33	5,252.82	52.2	160	200	413	-131	282	51	47	40	62	12.7%	38.8%	48.6%	100.0%	25%	24%	20%	31%
34	5,259.51	52.3	160	200	412	-131	281	51	47	40	62	12.7%	38.9%	48.5%	100.0%	25%	23%	20%	31%
35	5,266.11	52.6	160	199	411	-132	279	51	46	40	61	12.8%	38.9%	48.3%	100.0%	26%	23%	20%	31%
36	5,272.52	53.7	160	198	411	-135	276	51	47	40	60	13.1%	38.8%	48.1%	100.0%	26%	24%	20%	30%
37	5,278.77	54.6	159	197	411	-137	274	50	47	40	61	13.3%	38.8%	47.9%	100.0%	25%	24%	20%	31%
38	5,284.89	55.3	159	196	410	-139	272	49	46	40	61	13.5%	38.8%	47.8%	100.0%	25%	24%	20%	31%
39	5,290.90	55.9	159	195	410	-140	270	49	46	39	61	13.6%	38.8%	47.6%	100.0%	25%	24%	20%	31%
40	5,296.75	56.8	159	194	410	-143	267	49	46	39	61	13.9%	38.7%	47.4%	100.0%	25%	24%	20%	31%
41	5,302.47	57.7	158	193	410	-145	265	50	46	39	59	14.1%	38.7%	47.2%	100.0%	26%	24%	20%	31%
42	5,308.09	58.2	158	193	409	-146	263	50	46	38	59	14.2%	38.7%	47.1%	100.0%	26%	24%	20%	31%
43	5,313.64	58.6	158	192	409	-147	262	49	45	38	59	14.4%	38.7%	46.9%	100.0%	26%	24%	20%	31%
44	5,319.13	59.0	158	191	408	-148	260	49	45	37	59	14.5%	38.7%	46.8%	100.0%	26%	24%	20%	31%
45	5,324.49	59.8	158	190	408	-150	258	49	45	37	59	14.7%	38.7%	46.6%	100.0%	26%	23%	20%	31%
46	5,329.66	61.3	157	189	408	-154	254	49	44	38	59	15.0%	38.6%	46.4%	100.0%	26%	23%	20%	31%
47	5,334.74	61.9	157	189	408	-155	253	49	43	38	59	15.2%	38.5%	46.3%	100.0%	26%	23%	20%	31%
48	5,339.73	62.5	157	188	407	-157	251	49	42	38	58	15.3%	38.5%	46.1%	100.0%	26%	22%	20%	31%
49	5,344.61	63.3	157	187	407	-159	248	50	42	37	58	15.6%	38.5%	46.0%	100.0%	26%	23%	20%	31%
50	5,349.42	63.9	157	186	407	-160	247	49	42	37	58	15.7%	38.5%	45.8%	100.0%	26%	23%	20%	31%
51	5,354.16	64.4	156	186	406	-161	245	48	43	36	58	15.8%	38.5%	45.7%	100.0%	26%	23%	19%	32%
52	5,358.81	65.0	156	185	406	-163	243	47	43	36	59	16.0%	38.5%	45.5%	100.0%	26%	23%	19%	32%
53	5,363.44	65.2	156	184	405	-163	242	47	43	36	59	16.1%	38.5%	45.4%	100.0%	25%	23%	19%	32%
54	5,368.02	65.5	156	184	405	-164	241	47	43	36	58	16.2%	38.5%	45.3%	100.0%	26%	23%	19%	32%
55	5,372.52	66.1	156	183	405	-166	239	47	42	36	58	16.3%	38.5%	45.2%	100.0%	26%	23%	19%	32%
56	5,376.97	66.5	156	182	404	-167	237	47	41	35	58	16.5%	38.5%	45.0%	100.0%	26%	23%	20%	32%
57	5,381.33	67.1	156	181	404	-168	236	47	41	35	58	16.6%	38.5%	44.9%	100.0%				

Appendix B Base case pit filling water balance results

Year	Stage (ft amsl)	FLOW RATES (GPM)										RELATIVE PERCENT FLOWS							
		FLOW RATE per YEAR (gpm)						FLOW RATE per YEAR (gpm) Groundwater Inflows by Quadrant (gpm)				FLOW RATE per YEAR (percent)				PERCENT TOTAL GW INFLOW Groundwater Inflows by Quadrant			
		Precipitation	Runoff	Groundwater	Total Inflow	Evaporation	Net Inflow	NE	SE	SW	NW	Precipitation	Runoff	Groundwater	Total Inflow	NE	SE	SW	NW
1	4,794.02	6.3	174	285	465	-16	449	71	66	62	85	1.4%	37.4%	61.3%	100.0%	25%	23%	22%	30%
2	4,844.69	10.6	173	271	454	-26	427	67	63	60	81	2.3%	38.0%	59.6%	100.0%	25%	23%	22%	30%
3	4,880.90	14.3	171	264	449	-36	414	65	61	59	78	3.2%	38.1%	58.7%	100.0%	25%	23%	22%	30%
4	4,910.39	17.0	171	258	446	-43	403	64	61	58	76	3.8%	38.2%	57.9%	100.0%	25%	23%	22%	30%
5	4,935.28	19.7	170	254	443	-49	394	62	60	56	75	4.4%	38.3%	57.2%	100.0%	25%	24%	22%	30%
6	4,957.14	21.9	169	250	441	-55	386	61	60	55	73	5.0%	38.4%	56.6%	100.0%	24%	24%	22%	29%
7	4,977.37	23.3	169	246	438	-59	379	60	59	55	73	5.3%	38.5%	56.2%	100.0%	24%	24%	22%	30%
8	4,995.70	25.3	168	243	436	-63	372	59	58	54	72	5.8%	38.6%	55.6%	100.0%	24%	24%	22%	30%
9	5,013.05	26.4	168	239	433	-66	367	59	57	52	71	6.1%	38.7%	55.2%	100.0%	25%	24%	22%	30%
10	5,028.97	28.2	167	236	432	-71	361	59	56	52	70	6.5%	38.7%	54.7%	100.0%	25%	24%	22%	30%
11	5,043.72	30.0	167	233	430	-75	355	58	55	50	70	7.0%	38.8%	54.3%	100.0%	25%	24%	22%	30%
12	5,057.71	31.2	166	231	428	-78	350	57	55	50	69	7.3%	38.8%	53.9%	100.0%	25%	24%	22%	30%
13	5,071.15	32.0	166	228	426	-80	346	56	54	50	68	7.5%	39.0%	53.5%	100.0%	25%	24%	22%	30%
14	5,083.88	33.4	166	226	425	-84	341	55	54	49	68	7.9%	39.0%	53.2%	100.0%	24%	24%	22%	30%
15	5,095.76	35.2	165	224	424	-88	336	55	52	48	68	8.3%	39.0%	52.7%	100.0%	25%	23%	22%	30%
16	5,107.18	36.2	165	222	423	-91	332	55	52	47	67	8.6%	39.0%	52.4%	100.0%	25%	23%	21%	30%
17	5,118.15	37.2	165	220	421	-93	328	55	52	47	66	8.8%	39.0%	52.1%	100.0%	25%	24%	21%	30%
18	5,128.67	38.4	164	218	421	-96	324	54	52	46	66	9.1%	39.0%	51.8%	100.0%	25%	24%	21%	30%
19	5,138.83	39.4	164	216	420	-99	321	54	51	45	65	9.4%	39.0%	51.6%	100.0%	25%	24%	21%	30%
20	5,148.85	39.6	164	215	418	-99	319	54	51	44	65	9.5%	39.2%	51.4%	100.0%	25%	24%	21%	30%
21	5,158.51	40.7	163	213	418	-102	316	54	51	44	65	9.7%	39.1%	51.1%	100.0%	25%	24%	20%	31%
22	5,167.77	42.0	163	212	417	-105	312	53	51	43	65	10.1%	39.1%	50.9%	100.0%	25%	24%	20%	31%
23	5,176.65	43.2	163	211	417	-108	308	52	51	43	65	10.4%	39.0%	50.6%	100.0%	25%	24%	20%	31%
24	5,185.24	44.3	162	210	416	-111	305	53	51	42	64	10.6%	39.0%	50.4%	100.0%	25%	24%	20%	31%
25	5,193.67	44.8	162	209	416	-112	303	52	50	42	64	10.8%	39.0%	50.2%	100.0%	25%	24%	20%	31%
26	5,201.91	45.5	162	207	415	-114	301	52	50	42	63	11.0%	39.1%	50.0%	100.0%	25%	24%	20%	31%
27	5,209.79	46.9	162	206	415	-118	297	53	49	42	63	11.3%	39.0%	49.7%	100.0%	25%	24%	20%	31%
28	5,217.45	47.8	161	205	414	-120	294	53	48	42	63	11.5%	38.9%	49.5%	100.0%	26%	23%	20%	31%
29	5,224.93	48.6	161	204	414	-122	292	53	48	41	62	11.7%	38.9%	49.3%	100.0%	26%	23%	20%	31%
30	5,232.19	49.6	161	203	414	-124	289	54	48	41	61	12.0%	38.9%	49.1%	100.0%	26%	24%	20%	30%
31	5,239.25	50.6	161	202	413	-127	287	53	48	40	62	12.2%	38.8%	48.9%	100.0%	26%	24%	20%	31%
32	5,246.10	51.5	160	201	413	-129	284	52	47	40	62	12.5%	38.8%	48.7%	100.0%	26%	24%	20%	31%
33	5,252.82	52.2	160	200	413	-131	282	51	47	40	62	12.7%	38.8%	48.6%	100.0%	25%	24%	20%	31%
34	5,259.51	52.3	160	200	412	-131	281	51	47	40	62	12.7%	38.9%	48.5%	100.0%	25%	23%	20%	31%
35	5,266.11	52.6	160	199	411	-132	279	51	46	40	61	12.8%	38.9%	48.3%	100.0%	26%	23%	20%	31%
36	5,272.52	53.7	160	198	411	-135	276	51	47	40	60	13.1%	38.8%	48.1%	100.0%	26%	24%	20%	30%
37	5,278.77	54.6	159	197	411	-137	274	50	47	40	61	13.3%	38.8%	47.9%	100.0%	25%	24%	20%	31%
38	5,284.89	55.3	159	196	410	-139	272	49	46	40	61	13.5%	38.8%	47.8%	100.0%	25%	24%	20%	31%
39	5,290.90	55.9	159	195	410	-140	270	49	46	39	61	13.6%	38.8%	47.6%	100.0%	25%	24%	20%	31%
40	5,296.75	56.8	159	194	410	-143	267	49	46	39	61	13.9%	38.7%	47.4%	100.0%	25%	24%	20%	31%
41	5,302.47	57.7	158	193	410	-145	265	50	46	39	59	14.1%	38.7%	47.2%	100.0%	26%	24%	20%	31%
42	5,308.09	58.2	158	193	409	-146	263	50	46	38	59	14.2%	38.7%	47.1%	100.0%	26%	24%	20%	31%
43	5,313.64	58.8	158	192	409	-147	262	49	45	38	59	14.4%	38.7%	46.9%	100.0%	26%	24%	20%	31%
44	5,319.13	59.0	158	191	408	-148	260	49	45	37	59	14.5%	38.7%	46.8%	100.0%	26%	24%	20%	31%
45	5,324.49	59.8	158	190	408	-150	258	49	45	37	59	14.7%	38.7%	46.6%	100.0%	26%	24%	20%	31%
46	5,329.66	61.3	157	189	408	-154	254	49	44	38	59	15.0%	38.6%	46.4%	100.0%	26%	23%	20%	31%
47	5,334.74	61.9	157	189	408	-155	253	49	43	38	59	15.2%	38.5%	46.3%	100.0%	26%	23%	20%	31%
48	5,339.73	62.5	157	188	407	-157	251	49	42	38	58	15.3%	38.5%	46.1%	100.0%	26%	23%	20%	31%
49	5,344.61	63.3	157	187	407	-159	248	50	42	37	58	15.6%	38.5%	46.0%	100.0%	26%	22%	20%	31%
50	5,349.42	63.9	157	186	407	-160	247	49	42	37	58	15.7%	38.5%	45.8%	100.0%	26%	23%	20%	31%
51	5,354.16	64.4	156	186	406	-161	245	48	43	36	58	15.8%	38.5%	45.7%	100.0%	26%	23%	20%	31%
52	5,358.81	65.0	156	185	406	-163	243	47	43	36	59	16.0%	38.5%	45.5%	100.0%	26%	23%	19%	32%
53	5,363.44	65.2	156	184	405	-163	242	47	43	36	59	16.1%	38.5%	45.4%	100.0%	26%	23%	19%	32%
54	5,368.02	65.5	156	184	405	-164	241	47	43	36	58	16.2%	38.5%	45.3%	100.0%	25%	23%	19%	32%
55	5,372.52	66.1	156	183	405	-166	239	47	42	36	58	16.3%	38.5%	45.2%	100.0%	26%	23%	19%	32%
56	5,376.97	66.5	156	182	404	-167	237	47	41	35	58	16.5%	38.5%	45.0%	100.0%	26%	23%	19%	32%
57	5,381.33	67.1	156	181	404	-168	236	47	41	35	58	16.6%	38.5%	44.9%	100.0%	26%	23%	20%	32%

Appendix B Base case pit filling water balance results

Year	Stage (ft amsl)	FLOW RATES (GPM)										RELATIVE PERCENT FLOWS							
		FLOW RATE per YEAR (gpm)						FLOW RATE per YEAR (gpm)				FLOW RATE per YEAR (percent)				PERCENT TOTAL GW INFLOW			
								Groundwater Inflows by Quadrant (gpm)								Groundwater Inflows by Quadrant			
		Precipitation	Runoff	Groundwater	Total Inflow	Evaporation	Net Inflow	NE	SE	SW	NW	Precipitation	Runoff	Groundwater	Total Inflow	NE	SE	SW	NW
58	5,385.65	67.6	155	181	404	-169	234	47	41	35	57	16.7%	38.5%	44.8%	100.0%	26%	23%	19%	32%
59	5,389.92	67.9	155	180	403	-170	233	47	41	35	57	16.8%	38.5%	44.6%	100.0%	26%	23%	19%	32%
60	5,394.11	68.6	155	179	403	-172	231	46	41	35	57	17.0%	38.5%	44.5%	100.0%	26%	23%	20%	32%
61	5,398.25	69.1	155	179	403	-173	229	45	41	34	57	17.2%	38.5%	44.4%	100.0%	25%	23%	19%	32%
62	5,402.32	69.6	155	178	402	-175	228	46	41	34	57	17.3%	38.5%	44.2%	100.0%	26%	23%	19%	32%
63	5,406.32	70.4	155	177	402	-177	226	45	41	34	57	17.5%	38.4%	44.1%	100.0%	26%	23%	19%	32%
64	5,410.24	71.0	154	177	402	-178	224	45	41	34	56	17.7%	38.4%	44.0%	100.0%	25%	23%	19%	32%
65	5,414.11	71.6	154	176	402	-180	222	45	41	34	56	17.8%	38.4%	43.8%	100.0%	25%	23%	20%	32%
66	5,417.93	72.1	154	176	402	-181	221	45	41	34	55	17.9%	38.4%	43.7%	100.0%	26%	23%	20%	31%
67	5,421.67	72.9	154	175	402	-183	219	45	41	34	55	18.1%	38.3%	43.6%	100.0%	26%	23%	20%	32%
68	5,425.36	73.3	154	174	401	-184	217	44	41	34	56	18.3%	38.3%	43.4%	100.0%	25%	23%	20%	32%
69	5,429.03	73.5	154	174	401	-184	217	44	40	34	56	18.3%	38.3%	43.3%	100.0%	25%	23%	19%	32%
70	5,432.68	73.6	154	173	400	-185	216	44	40	34	55	18.4%	38.4%	43.3%	100.0%	26%	23%	19%	32%
71	5,436.30	73.8	154	173	400	-185	215	44	40	34	55	18.5%	38.4%	43.2%	100.0%	25%	23%	20%	32%
72	5,439.89	74.2	153	172	400	-186	214	43	40	34	55	18.6%	38.4%	43.1%	100.0%	25%	23%	20%	32%
73	5,443.44	74.6	153	172	399	-187	212	43	40	34	54	18.7%	38.4%	42.9%	100.0%	25%	23%	20%	32%
74	5,446.96	74.7	153	171	399	-187	212	43	40	34	54	18.7%	38.4%	42.9%	100.0%	25%	23%	20%	32%
75	5,450.43	75.4	153	170	399	-189	210	44	39	33	55	18.9%	38.4%	42.7%	100.0%	26%	23%	19%	32%
76	5,453.81	76.5	153	170	399	-192	207	44	38	33	55	19.2%	38.3%	42.6%	100.0%	26%	22%	19%	32%
77	5,457.12	77.2	152	169	399	-194	206	45	37	33	55	19.3%	38.2%	42.5%	100.0%	26%	22%	19%	32%
78	5,460.38	77.9	152	169	399	-195	204	45	37	32	55	19.5%	38.2%	42.3%	100.0%	27%	22%	19%	33%
79	5,463.60	78.4	152	169	399	-197	203	46	37	32	54	19.6%	38.1%	42.2%	100.0%	27%	22%	19%	32%
80	5,466.78	78.8	152	168	399	-198	201	45	36	32	54	19.8%	38.1%	42.1%	100.0%	27%	22%	19%	32%
81	5,469.92	79.2	152	167	399	-198	200	45	36	32	55	19.9%	38.1%	42.0%	100.0%	27%	22%	19%	33%
82	5,473.04	79.6	152	167	398	-200	199	43	37	32	55	20.0%	38.1%	41.9%	100.0%	26%	22%	19%	33%
83	5,476.12	79.9	152	167	398	-200	198	43	37	32	54	20.1%	38.1%	41.8%	100.0%	26%	22%	19%	33%
84	5,479.17	80.3	152	166	398	-201	196	43	38	32	54	20.2%	38.1%	41.7%	100.0%	26%	23%	19%	33%
85	5,482.18	80.6	151	166	398	-202	196	42	38	32	54	20.3%	38.1%	41.6%	100.0%	26%	23%	19%	32%
86	5,485.14	81.5	151	165	398	-204	194	42	37	32	54	20.5%	38.0%	41.5%	100.0%	26%	23%	19%	33%
87	5,488.08	81.6	151	165	398	-205	193	42	37	32	54	20.5%	38.0%	41.4%	100.0%	26%	23%	19%	33%
88	5,491.00	81.8	151	164	397	-205	192	42	37	31	54	20.6%	38.0%	41.4%	100.0%	26%	23%	19%	33%
89	5,493.90	82.1	151	164	397	-206	191	42	37	31	54	20.7%	38.1%	41.3%	100.0%	26%	23%	19%	33%
90	5,496.77	82.4	151	163	397	-207	190	42	37	31	53	20.8%	38.0%	41.2%	100.0%	26%	23%	19%	32%
91	5,499.61	82.8	151	163	397	-207	189	41	38	31	52	20.9%	38.0%	41.1%	100.0%	25%	24%	19%	32%
92	5,502.42	83.1	151	162	396	-208	188	42	38	31	52	21.0%	38.0%	41.0%	100.0%	26%	23%	19%	32%
93	5,505.19	83.9	150	162	396	-210	186	42	37	31	52	21.2%	38.0%	40.9%	100.0%	26%	23%	19%	32%
94	5,507.90	84.6	150	162	397	-212	185	41	38	31	52	21.3%	37.9%	40.8%	100.0%	25%	23%	19%	32%
95	5,510.59	84.9	150	161	396	-213	184	41	38	31	52	21.4%	37.9%	40.7%	100.0%	25%	24%	19%	32%
96	5,513.26	85.2	150	161	396	-214	182	41	38	30	52	21.5%	37.9%	40.6%	100.0%	25%	24%	19%	32%
97	5,515.90	85.6	150	160	396	-215	181	40	37	31	52	21.6%	37.9%	40.5%	100.0%	25%	23%	19%	33%
98	5,518.52	85.9	150	160	396	-215	180	41	37	30	53	21.7%	37.9%	40.4%	100.0%	25%	23%	19%	33%
99	5,521.12	86.1	150	160	396	-216	180	41	37	30	52	21.8%	37.9%	40.4%	100.0%	25%	23%	19%	33%
100	5,523.71	86.2	150	159	395	-216	179	40	37	30	52	21.8%	37.9%	40.3%	100.0%	25%	23%	19%	33%
110	5,548.27	88.1	149	157	395	-221	174	40	36	29	52	22.3%	37.8%	39.9%	100.0%	25%	23%	19%	33%
120	5,570.80	91.1	148	154	393	-229	165	39	36	29	50	23.2%	37.7%	39.1%	100.0%	25%	23%	19%	32%
130	5,591.03	95.1	147	151	393	-239	155	40	34	29	48	24.2%	37.4%	38.4%	100.0%	27%	22%	19%	32%
140	5,609.80	97.6	146	148	392	-245	147	37	34	28	49	24.9%	37.4%	37.7%	100.0%	25%	23%	19%	33%
150	5,627.17	100.2	146	145	391	-251	140	37	32	27	49	25.6%	37.3%	37.1%	100.0%	25%	22%	19%	34%
160	5,643.17	102.9	145	143	390	-258	132	37	31	26	49	26.4%	37.1%	36.5%	100.0%	26%	22%	18%	34%
170	5,657.97	105.5	144	140	390	-264	125	37	30	26	47	27.0%	36.9%	36.0%	100.0%	26%	21%	19%	34%
180	5,671.88	107.3	143	138	389	-269	120	37	29	26	46	27.6%	36.9%	35.5%	100.0%	27%	21%	19%	33%
190	5,684.63	110.1	143	136	389	-276	113	37	28	27	44	28.3%	36.7%	35.0%	100.0%	27%	21%	20%	33%
200	5,696.58	112.0	142	134	388	-281	108	37	26	27	44	28.8%	36.6%	34.6%	100.0%	26%	20%	20%	33%
210	5,707.80	113.7	142	132	388	-285	102	36	27	26	44	29.3%	36.5%	34.1%	100.0%	27%	20%	19%	33%
220	5,718.43	115.1	141	131	387	-289	98	35	26	25	44	29.8%	36.5%	33.8%	100.0%	27%	20%	19%	34%
230	5,728.41	116.8	141	129	386	-293	94	35	26	25	43	30.2%	36.4%	33.4%	100.0%	27%	21%	19%	34%
240	5,737.75	118.6	140	128	386	-297	89	34	27	24	42	30.7%	36.3%	33.0%	100.0%	27%	21%	19%	33%

Appendix B Base case pit filling water balance results

Year	Stage (ft amsl)	FLOW RATES (GPM)										RELATIVE PERCENT FLOWS							
		FLOW RATE per YEAR (gpm)						FLOW RATEper YEAR (gpm) Groundwater Inflows by Quadrant (gpm)				FLOW RATE per YEAR (percent)				PERCENT TOTAL GW INFLOW Groundwater Inflows by Quadrant			
		Precipitation	Runoff	Groundwater	Total Inflow	Evaporation	Net Inflow	NE	SE	SW	NW	Precipitation	Runoff	Groundwater	Total Inflow	NE	SE	SW	NW
820	5,904.27	148.3	131	99	379	-372	7	26	20	20	34	39.1%	34.6%	26.2%	100.0%	26%	20%	20%	34%
830	5,904.82	148.3	131	99	379	-372	7	26	20	20	34	39.2%	34.6%	26.2%	100.0%	26%	20%	20%	34%
840	5,905.36	148.5	131	99	379	-372	6	26	20	19	34	39.2%	34.6%	26.2%	100.0%	26%	20%	20%	34%
850	5,905.84	149.0	131	99	379	-374	6	26	20	19	34	39.3%	34.6%	26.1%	100.0%	26%	21%	20%	34%
860	5,906.24	149.2	131	99	379	-374	5	26	20	19	33	39.3%	34.5%	26.1%	100.0%	26%	21%	20%	34%
870	5,906.63	149.3	131	99	379	-374	5	26	20	19	33	39.4%	34.5%	26.1%	100.0%	26%	21%	20%	34%
880	5,907.00	149.3	131	99	379	-374	5	26	20	19	33	39.4%	34.5%	26.1%	100.0%	26%	21%	20%	34%
890	5,907.37	149.3	131	99	379	-374	5	26	20	19	33	39.4%	34.5%	26.1%	100.0%	26%	21%	20%	34%
900	5,907.72	149.4	131	99	379	-375	4	26	20	19	33	39.4%	34.5%	26.0%	100.0%	26%	21%	20%	34%
910	5,908.09	149.4	131	99	379	-375	4	26	20	19	33	39.4%	34.5%	26.0%	100.0%	26%	21%	20%	34%
920	5,908.45	149.3	131	99	379	-374	4	26	20	19	33	39.4%	34.5%	26.0%	100.0%	26%	21%	20%	34%
930	5,908.80	149.3	131	99	379	-374	4	26	20	19	33	39.4%	34.5%	26.0%	100.0%	26%	21%	20%	34%
940	5,909.14	149.5	131	99	379	-375	4	26	20	19	33	39.5%	34.5%	26.0%	100.0%	26%	21%	20%	34%
950	5,909.48	149.6	131	98	379	-375	4	26	20	19	33	39.5%	34.5%	26.0%	100.0%	26%	21%	20%	34%
960	5,909.78	149.7	131	98	379	-375	3	26	20	19	33	39.5%	34.5%	26.0%	100.0%	26%	21%	20%	34%
970	5,910.07	149.7	131	98	379	-375	3	26	20	19	33	39.5%	34.5%	26.0%	100.0%	26%	21%	20%	34%
980	5,910.37	149.7	131	98	379	-375	3	26	20	19	33	39.5%	34.5%	25.9%	100.0%	26%	21%	20%	34%
990	5,910.60	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	34%
1000	5,910.81	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	34%
1010	5,911.02	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	34%
1020	5,911.23	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	34%
1030	5,911.44	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	34%
1040	5,911.60	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	19%	33%
1050	5,911.60	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1060	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1070	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1080	5,911.60	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1090	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1100	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1110	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1120	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1130	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1140	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1150	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1160	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1170	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1180	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1190	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1200	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1210	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1220	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1230	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1240	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1250	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1260	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1270	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1280	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1290	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1300	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1310	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1320	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1330	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1340	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1350	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1360	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1370	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1380	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%

Appendix B Base case pit filling water balance results

Year	Stage (ft amsl)	FLOW RATES (GPM)										RELATIVE PERCENT FLOWS							
		FLOW RATE per YEAR (gpm)						FLOW RATE per YEAR (gpm) Groundwater Inflows by Quadrant (gpm)				FLOW RATE per YEAR (percent)				PERCENT TOTAL GW INFLOW Groundwater Inflows by Quadrant			
		Precipitation	Runoff	Groundwater	Total Inflow	Evaporation	Net Inflow	NE	SE	SW	NW	Precipitation	Runoff	Groundwater	Total Inflow	NE	SE	SW	NW
820	5,904.27	148.3	131	99	379	-372	7	26	20	20	34	39.1%	34.6%	26.2%	100.0%	26%	20%	20%	34%
830	5,904.82	148.3	131	99	379	-372	7	26	20	20	34	39.2%	34.6%	26.2%	100.0%	26%	20%	20%	34%
840	5,905.36	148.5	131	99	379	-372	6	26	20	19	34	39.2%	34.6%	26.2%	100.0%	26%	20%	20%	34%
850	5,905.84	149.0	131	99	379	-374	6	26	20	19	34	39.3%	34.6%	26.1%	100.0%	26%	21%	20%	34%
860	5,906.24	149.2	131	99	379	-374	5	26	20	19	33	39.3%	34.5%	26.1%	100.0%	26%	21%	20%	34%
870	5,906.63	149.3	131	99	379	-374	5	26	20	19	33	39.4%	34.5%	26.1%	100.0%	26%	21%	20%	34%
880	5,907.00	149.3	131	99	379	-374	5	26	20	19	33	39.4%	34.5%	26.1%	100.0%	26%	21%	20%	34%
890	5,907.37	149.3	131	99	379	-374	5	26	20	19	33	39.4%	34.5%	26.1%	100.0%	26%	21%	20%	34%
900	5,907.72	149.4	131	99	379	-375	4	26	20	19	33	39.4%	34.5%	26.1%	100.0%	26%	21%	20%	34%
910	5,908.09	149.4	131	99	379	-375	4	26	20	19	33	39.4%	34.5%	26.0%	100.0%	26%	21%	20%	34%
920	5,908.45	149.3	131	99	379	-374	4	26	20	19	33	39.4%	34.5%	26.0%	100.0%	26%	21%	20%	34%
930	5,908.80	149.3	131	99	379	-374	4	26	20	19	33	39.4%	34.5%	26.0%	100.0%	26%	21%	20%	34%
940	5,909.14	149.5	131	99	379	-375	4	26	20	19	33	39.5%	34.5%	26.0%	100.0%	26%	21%	20%	34%
950	5,909.48	149.6	131	98	379	-375	4	26	20	19	33	39.5%	34.5%	26.0%	100.0%	26%	21%	20%	34%
960	5,909.78	149.7	131	98	379	-375	3	26	20	19	33	39.5%	34.5%	26.0%	100.0%	26%	21%	20%	34%
970	5,910.07	149.7	131	98	379	-375	3	26	20	19	33	39.5%	34.5%	26.0%	100.0%	26%	21%	20%	34%
980	5,910.37	149.7	131	98	379	-375	3	26	20	19	33	39.5%	34.5%	25.9%	100.0%	26%	21%	20%	34%
990	5,910.60	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	34%
1000	5,910.81	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	34%
1010	5,911.02	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	34%
1020	5,911.23	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	34%
1030	5,911.44	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	34%
1040	5,911.60	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	34%
1050	5,911.60	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	19%	33%
1060	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1070	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1080	5,911.60	149.9	131	98	379	-376	3	26	20	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1090	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1100	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1110	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1120	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1130	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1140	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1150	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1160	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1170	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1180	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1190	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1200	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1210	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1220	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1230	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1240	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1250	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1260	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1270	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1280	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1290	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1300	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1310	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1320	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1330	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1340	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1350	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1360	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1370	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1380	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%

Appendix B Base case pit filling water balance results

Year	Stage (ft amsl)	FLOW RATES (GPM)										RELATIVE PERCENT FLOWS							
		FLOW RATE per YEAR (gpm)						FLOW RATEper YEAR (gpm) Groundwater Inflows by Quadrant (gpm)				FLOW RATE per YEAR (percent)				PERCENT TOTAL GW INFLOW Groundwater Inflows by Quadrant			
		Precipitation	Runoff	Groundwater	Total Inflow	Evaporation	Net Inflow	NE	SE	SW	NW	Precipitation	Runoff	Groundwater	Total Inflow	NE	SE	SW	NW
250	5,746.60	119.8	140	126	386	-300	85	34	26	24	42	31.1%	36.2%	32.7%	100.0%	27%	21%	19%	33%
260	5,755.00	121.0	139	125	385	-303	82	33	26	23	42	31.4%	36.2%	32.4%	100.0%	27%	21%	19%	34%
270	5,762.84	122.8	139	123	385	-308	77	32	26	23	42	31.9%	36.1%	32.1%	100.0%	26%	21%	19%	34%
280	5,770.24	124.0	138	122	385	-311	74	32	26	23	42	32.2%	36.0%	31.8%	100.0%	26%	21%	19%	34%
290	5,777.34	124.8	138	121	384	-313	71	32	25	23	41	32.5%	36.0%	31.5%	100.0%	26%	21%	19%	34%
300	5,784.06	125.9	138	120	384	-316	68	32	25	23	40	32.8%	35.9%	31.3%	100.0%	27%	21%	19%	33%
310	5,790.36	127.3	137	119	384	-319	65	31	25	23	40	33.2%	35.8%	31.0%	100.0%	26%	21%	19%	33%
320	5,796.42	128.0	137	118	383	-321	62	31	25	23	39	33.4%	35.8%	30.8%	100.0%	26%	21%	19%	33%
330	5,802.06	129.4	137	117	383	-325	59	31	23	23	39	33.8%	35.7%	30.5%	100.0%	27%	20%	19%	34%
340	5,807.32	130.9	136	116	383	-328	55	32	22	23	39	34.1%	35.6%	30.3%	100.0%	28%	19%	20%	34%
350	5,812.34	131.6	136	115	383	-330	53	32	21	23	39	34.3%	35.6%	30.1%	100.0%	28%	18%	20%	34%
360	5,817.13	132.3	136	114	383	-332	51	32	21	22	38	34.6%	35.5%	29.9%	100.0%	28%	19%	20%	34%
370	5,821.65	133.3	136	114	383	-334	48	32	22	22	38	34.8%	35.4%	29.7%	100.0%	28%	19%	19%	34%
380	5,825.91	134.3	135	113	383	-337	46	31	22	22	38	35.1%	35.4%	29.5%	100.0%	28%	19%	20%	33%
390	5,829.94	135.1	135	112	383	-339	44	31	22	22	37	35.3%	35.3%	29.4%	100.0%	28%	19%	20%	33%
400	5,833.86	135.3	135	112	382	-339	43	31	22	22	37	35.4%	35.4%	29.2%	100.0%	28%	19%	20%	33%
410	5,837.65	135.8	135	111	382	-340	41	30	22	22	37	35.6%	35.3%	29.1%	100.0%	27%	20%	20%	33%
420	5,841.25	136.4	135	110	382	-342	40	30	22	22	37	35.7%	35.3%	28.9%	100.0%	27%	20%	20%	33%
430	5,844.65	137.2	135	110	382	-344	37	30	22	22	36	36.0%	35.3%	28.8%	100.0%	27%	20%	20%	33%
440	5,847.87	137.5	134	109	381	-346	36	30	21	22	36	36.1%	35.2%	28.6%	100.0%	27%	20%	20%	33%
450	5,850.90	138.6	134	109	381	-348	34	30	21	21	36	36.3%	35.2%	28.5%	100.0%	27%	20%	20%	33%
460	5,853.87	138.8	134	108	381	-348	33	30	21	21	36	36.4%	35.2%	28.4%	100.0%	27%	20%	20%	33%
470	5,856.73	139.2	134	108	381	-349	32	29	21	21	36	36.5%	35.2%	28.3%	100.0%	27%	20%	20%	33%
480	5,859.48	139.4	134	107	380	-350	31	29	21	21	36	36.6%	35.2%	28.2%	100.0%	27%	20%	20%	34%
490	5,862.14	139.7	134	107	380	-350	30	29	21	21	36	36.8%	35.2%	28.1%	100.0%	27%	20%	20%	34%
500	5,864.70	140.2	134	106	380	-351	29	28	21	21	36	36.9%	35.2%	28.0%	100.0%	27%	20%	20%	34%
510	5,867.11	140.7	133	106	380	-353	27	28	21	21	36	37.0%	35.1%	27.9%	100.0%	27%	20%	20%	34%
520	5,869.37	141.3	133	106	380	-354	26	28	21	21	36	37.2%	35.1%	27.8%	100.0%	26%	20%	19%	34%
530	5,871.50	141.9	133	105	380	-356	24	28	21	21	36	37.3%	35.0%	27.7%	100.0%	26%	20%	20%	34%
540	5,873.55	142.2	133	105	380	-357	23	27	21	21	36	37.4%	35.0%	27.6%	100.0%	26%	20%	20%	34%
550	5,875.51	142.6	133	104	380	-357	23	27	21	20	36	37.5%	35.0%	27.5%	100.0%	26%	20%	20%	34%
560	5,877.38	142.9	133	104	380	-358	22	27	21	20	36	37.6%	35.0%	27.4%	100.0%	26%	20%	19%	34%
570	5,879.16	143.3	133	104	380	-359	20	27	21	20	36	37.7%	34.9%	27.3%	100.0%	26%	20%	19%	34%
580	5,880.81	143.9	133	104	380	-361	19	27	21	20	36	37.9%	34.9%	27.3%	100.0%	26%	20%	19%	34%
590	5,882.41	144.1	132	103	380	-361	19	27	21	20	35	37.9%	34.9%	27.2%	100.0%	26%	20%	19%	34%
600	5,883.99	144.0	132	103	379	-361	18	27	21	20	35	38.0%	34.9%	27.1%	100.0%	26%	20%	19%	34%
610	5,885.47	144.4	132	103	379	-362	17	27	21	20	35	38.1%	34.9%	27.1%	100.0%	26%	20%	19%	34%
620	5,886.91	144.6	132	103	379	-363	17	27	21	20	35	38.1%	34.9%	27.0%	100.0%	26%	20%	19%	34%
630	5,888.23	145.2	132	102	380	-364	16	27	21	20	35	38.2%	34.8%	26.9%	100.0%	26%	20%	19%	34%
640	5,889.49	145.4	132	102	379	-365	15	27	21	20	35	38.3%	34.8%	26.9%	100.0%	26%	20%	19%	34%
650	5,890.67	145.8	132	102	380	-366	14	27	21	20	35	38.4%	34.8%	26.8%	100.0%	26%	20%	19%	34%
660	5,891.76	146.3	132	102	380	-367	13	26	21	20	35	38.5%	34.7%	26.8%	100.0%	26%	20%	19%	34%
670	5,892.79	146.7	132	101	380	-368	12	26	21	20	35	38.6%	34.7%	26.7%	100.0%	26%	20%	19%	34%
680	5,893.78	146.7	132	101	380	-368	12	26	21	20	35	38.6%	34.7%	26.7%	100.0%	26%	20%	19%	34%
690	5,894.71	147.0	132	101	380	-369	11	26	21	20	35	38.7%	34.6%	26.6%	100.0%	26%	20%	19%	34%
700	5,895.61	147.1	132	101	380	-369	11	26	21	20	35	38.8%	34.6%	26.6%	100.0%	26%	20%	20%	34%
710	5,896.49	147.3	132	101	380	-369	10	26	21	20	34	38.8%	34.6%	26.6%	100.0%	26%	20%	20%	34%
720	5,897.36	147.2	131	101	379	-369	10	26	21	20	34	38.8%	34.7%	26.5%	100.0%	26%	20%	20%	34%
730	5,898.20	147.2	131	100	379	-369	10	26	20	20	34	38.8%	34.7%	26.5%	100.0%	26%	20%	20%	34%
740	5,898.97	147.6	131	100	379	-370	9	26	20	20	34	38.9%	34.6%	26.5%	100.0%	26%	20%	20%	34%
750	5,899.72	147.7	131	100	379	-370	9	26	20	20	34	38.9%	34.6%	26.4%	100.0%	26%	20%	20%	34%
760	5,900.45	147.7	131	100	379	-370	9	26	20	20	34	39.0%	34.6%	26.4%	100.0%	26%	20%	20%	34%
770	5,901.16	147.7	131	100	379	-370	9	26	20	20	34	39.0%	34.6%	26.4%	100.0%	26%	20%	20%	34%
780	5,901.86	147.9	131	100	379	-371	8	26	20	20	34	39.0%	34.6%	26.3%	100.0%	26%	20%	20%	34%
790	5,902.50	148.1	131	100	379	-371	8	26	20	20	34	39.1%	34.6%	26.3%	100.0%	26%	20%	20%	34%
800	5,903.11	148.2	131	100	379	-371	7	26	20	20	34	39.1%	34.6%	26.3%	100.0%	26%	20%	20%	34%
810	5,903.69	148.3	131	99	379	-372	7	26	20	20	34	39.1%	34.6%	26.3%	100.0%	26%	21%	20%	34%

Appendix B Base case pit filling water balance results

Year	Stage (ft amsl)	FLOW RATES (GPM)										RELATIVE PERCENT FLOWS							
		FLOW RATE per YEAR (gpm)						FLOW RATEper YEAR (gpm) Groundwater Inflows by Quadrant (gpm)				FLOW RATE per YEAR (percent)				PERCENT TOTAL GW INFLOW Groundwater Inflows by Quadrant			
		Precipitation	Runoff	Groundwater	Total Inflow	Evaporation	Net Inflow	NE	SE	SW	NW	Precipitation	Runoff	Groundwater	Total Inflow	NE	SE	SW	NW
1390	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1400	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1410	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1420	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1430	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1440	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1450	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1460	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1470	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1480	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1490	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1500	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1510	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1520	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1530	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1540	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1550	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1560	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1570	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%
1580	5,911.60	149.9	131	98	379	-376	3	26	21	19	33	39.6%	34.5%	25.9%	100.0%	26%	21%	20%	33%

Original data source: Interflow and Montgomery, 2009. Updated 14 March 2010.

Appendix A.1 (continued)
Mount Hope final pit shell exposed, plan-view surface areas by geologic-geochemical material type
***Apply percentages to delve chemistry for PIT WALL RUNOFF**

		CUMULATIVE, PLAN-VIEW (2-D) PIT WALL EXPOSED ABOVE PIT LAKE ELEVATION										
		Vinini Formation										
Pit Lake Elevation (ft)	Units	Silica Vinini	Potassic Vinini	Potassic Vinini (PAG)	Phyllic Vinini	Phyllic Vinini (PAG)	Argillic Vinini	Argillic Vinini (PAG)	Biotite Vinini	Biotite Vinini (PAG)	Hornfels Vinini	Hornfels Vinini (PAG)
4700	(acres)	6.35	146.23	4.30	22.52	3.10	34.05	13.20	0.79	0.20	28.03	18.60
4750	(acres)	6.35	146.23	4.30	22.52	3.10	34.05	13.20	0.79	0.20	28.03	18.60
4800	(acres)	6.35	146.23	4.30	22.52	3.10	34.05	13.20	0.79	0.20	28.03	18.60
4850	(acres)	6.35	146.23	4.30	22.52	3.10	34.05	13.20	0.79	0.20	28.03	18.60
4900	(acres)	6.17	145.95	4.30	22.52	3.10	34.05	13.20	0.79	0.20	28.03	18.60
4950	(acres)	5.96	145.65	4.30	22.52	3.10	34.05	13.20	0.45	0.20	28.03	18.60
5000	(acres)	5.94	145.05	4.30	22.52	3.10	34.05	13.20	0.21	0.20	28.03	18.60
5050	(acres)	5.94	144.28	4.30	22.52	3.10	34.05	13.20	0.03	0.20	28.03	18.60
5100	(acres)	5.94	143.58	4.13	22.52	3.10	34.05	13.20	0.02	0.04	28.03	18.60
5150	(acres)	5.92	142.49	4.13	22.52	3.10	34.05	13.20	0.00	0.04	28.03	18.60
5200	(acres)	5.87	141.28	4.13	22.52	3.10	34.05	13.20	0.00	0.04	28.03	18.60
5250	(acres)	5.77	139.96	4.13	22.52	3.10	34.05	13.20	0.00	0.04	28.03	18.60
5300	(acres)	5.35	138.50	4.13	22.52	3.10	34.05	13.20	0.00	0.04	28.03	18.60
5350	(acres)	4.58	135.87	4.13	22.52	3.10	34.05	13.20	0.00	0.04	28.03	18.60
5400	(acres)	4.24	132.46	4.13	22.52	3.10	34.05	13.20	0.00	0.04	28.03	18.60
5450	(acres)	3.80	128.65	4.13	22.52	3.10	34.05	13.20	0.02	0.04	28.03	18.60
5500	(acres)	3.14	124.91	4.13	22.52	3.10	34.05	13.20	0.02	0.04	28.03	18.60
5550	(acres)	1.66	122.29	4.13	5.52	3.10	34.05	13.20	0.02	0.04	28.03	18.60
5600	(acres)	0.76	119.56	4.13	22.52	3.10	34.05	13.20	0.02	0.04	28.03	18.60
5650	(acres)	0.44	116.45	4.13	22.52	3.10	34.05	13.20	0.02	0.04	28.03	18.60
5700	(acres)	0.29	113.03	4.13	22.52	3.10	34.05	13.20	0.02	0.04	28.03	18.60
5750	(acres)	0.22	109.39	4.13	22.52	3.10	34.05	13.20	0.02	0.04	28.03	18.60
5800	(acres)	0.11	105.42	4.13	22.52	3.10	34.05	13.20	0.02	0.04	28.03	18.60
5850	(acres)	0.00	101.21	4.13	22.52	3.10	34.05	13.20	0.02	0.04	28.03	18.60
5900	(acres)	0.00	96.71	4.13	22.52	3.10	33.99	13.20	0.02	0.04	28.03	18.60
5950	(acres)	0.00	92.16	4.13	22.52	3.10	33.73	13.20	0.02	0.04	28.03	18.60
6000	(acres)	0.00	87.47	4.13	22.50	3.10	33.25	13.20	0.02	0.04	28.03	18.60
6050	(acres)	0.00	82.95	4.13	22.14	3.10	32.71	13.20	0.02	0.04	28.03	18.60
6100	(acres)	0.00	78.80	3.93	21.50	3.10	32.32	12.98	0.02	0.04	28.03	18.60
6150	(acres)	0.00	74.40	3.93	20.83	3.10	31.64	12.98	0.02	0.04	28.03	18.60
6200	(acres)	0.00	70.07	3.93	20.12	3.10	30.85	12.98	0.02	0.04	27.92	18.60
6250	(acres)	0.00	66.06	3.93	19.35	3.10	29.92	12.98	0.02	0.04	27.55	18.60
6300	(acres)	0.00	62.61	3.93	18.42	3.10	28.72	12.98	0.02	0.04	26.91	18.60
6350	(acres)	0.00	59.77	3.93	17.37	3.10	27.10	12.98	0.02	0.04	26.11	18.60
6400	(acres)	0.00	57.35	3.93	16.24	3.10	24.98	12.98	0.02	0.04	25.23	18.60
6450	(acres)	0.00	54.83	3.93	15.06	3.10	22.69	12.98	0.02	0.04	24.42	18.60
6500	(acres)	0.00	52.13	3.93	14.04	3.10	20.09	12.98	0.02	0.04	23.68	18.60
6550	(acres)	0.00	47.83	3.93	13.31	3.10	16.85	12.98	0.02	0.04	22.99	18.60
6600	(acres)	0.00	43.34	3.93	12.56	3.10	13.36	12.98	0.02	0.04	22.30	18.60
8400	(acres)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix C
Averaged humidity cell test data

Appendix C Averaged humidity cell test data used for geochemical modeling (continued)

Geologic-Geochemical Material Type		Vinini Formation										
		Silica Vinini	Potassic Vinini	Potassic Vinini (PAG)	Phyllic Vinini	Phyllic Vinini (PAG)	Argillic Vinini	Argillic Vinini (PAG)	Biotite Vinini	Biotite Vinini (PAG)	Hornfels Vinini	Hornfels Vinini (PAG)
HCT Cell #s		HCT 12	HCT 5	HCT 6	HCT 19	HCT 24	HCT 18, 9	HCT 31	HCT 5	HCT 6	HCT 19	HCT 24
Average HCT Specific Surface Area*	(m^2/kg)	15	43	43	19	23	36	101	43	43	19	23
Mass in HCT	*Kg*	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Average leachate volume	*liters*	0.71	0.66	0.65	0.68	0.72	0.68	0.73	0.66	0.65	0.68	0.72
pH	*su*	7.6	7.5	3.0	7.6	3.1	5.2	3.3	7.5	3.0	7.6	3.1
Alkalinity as $CaCO_3$	*mg/L*	38	27	0.0	30	0	20	0.0	27	0.0	30	0
Al	*mg/L*	0.029	0	3.5	0.026	43	0.77	21	0	3.5	0.025	43
Sb	*mg/L*	0.0032	0.0038	0.0061	0	0	0	0.0073	0.0038	0.0061	0	0
As	*mg/L*	0.29	0.014	0.22	0	0.015	0.0033	0.043	0.014	0.22	0	0.015
Ba	*mg/L*	0.0082	0.0096	0.012	0.019	0.031	0.014	0.015	0.0096	0.012	0.019	0.031
Be	*mg/L*	0	0	0.0092	0	0.023	0	0.0022	0	0.0092	0	0.023
Bi	*mg/L*	0	0	0	0	0	0	0	0	0	0	0
B	*mg/L*	0.67	0	0	0.62	0.097	0.30	0.099	0	0	0.62	0.097
Cd	*mg/L*	0	0.00088	0.012	0.0016	0.031	0.011	0.25	0.00088	0.012	0.0016	0.031
Ca	*mg/L*	8.6	14	178	21	36	45	15	14	178	21	36
Cl	*mg/L*	1.8	1.4	6.3	1.6	1.6	1.6	0.71	1.4	6.3	1.6	1.6
Cr	*mg/L*	0	0	0.051	0	0.016	0.0019	0.012	0	0.051	0	0.016
Co	*mg/L*	0	0	0.069	0	0.21	0.079	0.22	0	0.069	0	0.21
Cu	*mg/L*	0	0	4.6	0	3.6	0.10	2.2	0	4.6	0	3.6
F	*mg/L*	0.80	1.1	1.3	0.76	2.1	0.53	3.6	1.1	1.3	0.76	2.1
Ga	*mg/L*	0	0	0	0	0	0	0	0	0	0	0
Fe	*mg/L*	0.016	0	168	0.013	62	28	23	0	168	0.013	62
Pb	*mg/L*	0	0	0.19	0	0.083	0.040	0.019	0	0.19	0	0.083
Li	*mg/L*	0	0	0	0	0.19	0.039	0.068	0	0	0	0.19
Mg	*mg/L*	1.5	2.9	7.4	3.7	36	14	17	2.9	7.4	3.7	36
Mn	*mg/L*	0.012	0.067	4.0	0.069	4.1	68	1.0	0.067	4.0	0.069	4.1
Hg	*mg/L*	0.00014	0.00010	0.00015	0.000077	0.00010	0.00012	0.000093	0.00010	0.00015	0.000077	0.00010
Mo	*mg/L*	0.0092	0.46	0	0	0	0	0	0.46	0	0	0
Ni	*mg/L*	0	0	0.097	0	1.2	0.14	0.69	0	0.097	0	1.2
N(5)	*mg/L*	0	0	0	0	0	0	0	0	0	0	0
N(3)	*mg/L*	0.0076	0.054	0	0	0	0.014	0.0090	0.054	0	0	0
K	*mg/L*	3.1	5.4	4.1	4.6	11	4.0	16	5.4	4.1	4.6	11
Sc	*mg/L*	0	0	0	0	0	0	0	0	0	0	0
Se	*mg/L*	0.0046	0.0037	0.0033	0.0052	0.019	0.011	0.0047	0.0037	0.0033	0.0052	0.019
Ag	*mg/L*	0	0	0	0	0	0.0041	0	0	0	0	0
Na	*mg/L*	7.6	3.7	1.0	7.9	8.9	5.7	2.3	3.7	1.0	7.9	8.9
Sr	*mg/L*	0	0.064	0.095	0.060	0.099	0.079	0	0.064	0.095	0.060	0.099
S(6)	*mg/L*	10	37	1340	61	318	477	631	37	1340	61	1318
Tl	*mg/L*	0	0	0.012	0	0	0.0022	0.0016	0	0.012	0	0
Sn	*mg/L*	0	0	0	0	0	0	0	0	0	0	0
Ti	*mg/L*	0	0	0	0	0	0	0	0	0	0	0
V	*mg/L*	0	0	0.0075	0.0079	0.018	0.017	0.0091	0	0.0075	0.0079	0.018
Zn	*mg/L*	0.0065	0.057	1.4	0.015	4.8	26	1.3	0.057	1.4	0.015	4.8

Appendix C Averaged humidity cell test data

Geologic-Geochemical Material Type		Early-phase Quartz Porphyry							Quartz Aplite Porphyry			Rhyolite				
		Silica Quartz Porphyry	Potassic Quartz Porphyry	Potassic Quartz Porphyry (PAG)	Phyllic Quartz Porphyry	Phyllic Quartz Porphyry (PAG)	Argillic Quartz Porphyry	Biotite Quartz Porphyry	Silica Quartz Aplite Porphyry	Potassic Quartz Aplite Porphyry	Biotite Quartz Aplite Porphyry	Potassic Rhyolite	Potassic Rhyolite (PAG)	Phyllic Rhyolite	Argillic Rhyolite	Argillic Rhyolite (PAG)
HCT Cell #s		HCT 26	HCT 30	HCT 7, 29	HCT 16	HCT 14	HCT 2, 17	HCT 30	HCT 13, 22	HCT 23	HCT 23	HCT 25	HCT 28	HCT 25	HCT 1, 8	HCT 3, 4, 27
Average HCT Specific Surface Area*	(m^2/kg)	23	53	51	12	11	57	53	20	17	17	24	63	24	57	56
Mass in HCT	Kg	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Average leachate volume	liters	0.72	0.72	0.69	0.72	0.72	0.66	0.72	0.70	0.69	0.69	0.69	0.73	0.69	0.64	0.68
pH	su	6.8	5.7	4.6	6.8	3.7	6.7	5.7	5.5	5.8	5.8	5.6	5.2	5.8	6.7	3.6
Alkalinity as $CaCO_3$	mg/L	10	4.3	4.2	27	0.0	39	43	2.8	1.5	1.5	2.4	2.1	2.4	11	0.0
Al	mg/L	0	1.8	5.1	0	4.0	0.043	1.8	4.1	1.3	1.3	1.8	0.53	1.8	0.068	27
Sb	mg/L	0	0	0.0011	0	0	0	0	0	0	0	0	0	0	0	0
As	mg/L	0.010	0.0028	0.014	0.0033	0.0059	0.0076	0.0028	0.0023	0.0089	0.0089	0	0.0028	0	0.0090	0.17
Ba	mg/L	0.012	0.011	0.024	0	0.021	0.020	0.011	0.012	0.0057	0.0057	0	0.025	0	0	0.0078
Be	mg/L	0	0.0011	0.00052	0	0	0	0.0011	0	0.00065	0.00065	0.0012	0.00085	0.0012	0	0.0083
Bi	mg/L	0	0	0	0	0.17	0	0	0	0	0	0	0	0	0	0
B	mg/L	0.49	0.091	0.034	0.094	0.061	0.044	0.091	0.028	0	0	0.060	0	0.060	0.031	0
Cd	mg/L	0	0.0019	0.034	0.016	25	0.0017	0.0019	0.017	0.0020	0.00198	0.0014	0.031	0.0014	0.0014	0.95
Ca	mg/L	3.2	9.1	17	5.8	3.8	13	9.1	11	8.4	8.4	6.0	16	6.0	3.9	17
Cl	mg/L	1.3	1.5	1.3	1.4	1.7	1.7	1.5	1.5	1.2	1.2	0.78	1.3	0.78	4.2	2.0
Cr	mg/L	0	0	0	0	0.0044	0	0	0	0	0	0	0.0037	0	0	0.0067
Co	mg/L	0	0.0066	0.015	0	0.040	0	0.0066	0.019	0.0095	0.0095	0	0.11	0	0	0.10
Cu	mg/L	0	0	0.89	0	61	0	0	0.27	0	0	0	0.14	0	0	0.62
F	mg/L	0.79	7.1	12	0.66	1.2	3.3	7.1	12.3	4.9	4.9	8.1	0.72	8.1	8.1	6.7
Ga	mg/L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fe	mg/L	0.066	0.0098	0.28	0.0077	10	0.0069	0.0098	0.083	0.066	0.066	0.019	0.097	0.019	0.069	70
Pb	mg/L	0	0	0.27	0	0.74	0	0	0.01323	0	0	0	0.012	0	0	0.056
Li	mg/L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.066
Mg	mg/L	0.80	1.7	2.7	1.1	1.2	2.8	1.7	1.3	1.3	1.3	0.48	6.4	0.48	1.9	8.9
Mn	mg/L	0.034	0.56	1.1	0.14	0.50	0.61	0.56	0.44	0.72	0.72	4.3	51	4.3	0.058	32
Hg	mg/L	0.00014	0.00010	0.00010	0.00011	0.00016	0.00011	0.00010	0.00011	0.000067	0.000067	0.000071	0.00016	0.000071	0.00013	0.000083
Mo	mg/L	0	0.66	0.0095	0.012	0	0.063	0.66	0.0062	0	0	0	0	0	0.026	0
Ni	mg/L	0	0.014	0.034	0	0.050	0	0.014	0.027	0.012	0.012	0	0.11	0	0	0.14
N(5)	mg/L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N(3)	mg/L	0	0	0.011	0.014	0	0.035	0	0	0	0	0	0	0	0.039	0.027
K	mg/L	4.5	9.6	9.1	3.3	5.9	3.4	9.6	2.3	4.6	4.6	6.0	16	6.0	2.8	8.1
Sc	mg/L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Se	mg/L	0.0029	0	0.0015	0	0.00498	0	0	0	0	0	0	0.011	0	0	0.013
Ag	mg/L	0	0	0	0	0	0	0	0	0	0	0	0.0035	0	0	0
Na	mg/L	5.9	2.2	1.9	4.6	1.4	4.0	2.2	1.5	1.4	1.4	2.0	1.6	2.0	7.9	3.7
Sr	mg/L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.048
S(6)	mg/L	16.8	39	87	7.2	275	11	39	43	34	34	30	253	30	22	902
Tl	mg/L	0	0	0.00034	0	0.0012	0	0	0.00048	0	0	0.0015	0.0012	0.0015	0	0.0020
Sn	mg/L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ti	mg/L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V	mg/L	0	0	0	0	0	0	0	0	0	0	0	0.0073	0	0.0030	0.0087
Zn	mg/L	0.011	0.97	2.5	0.17	8.3	0.044	0.97	4.6	1.4	1.4	2.3	23	2.3	0.073	79

Values not detected at the analytical detection limit (non-detects) were set to zero for modeling, as shown.

Original data source: SRK, 2008

** Average specific surface area estimates calculated based on grain size distribution analyses (Appendix F).*

Appendix D
Mount Hope groundwater water quality data used in modeling

Appendix D Mount Hope groundwater water quality data used in modeling

Parameter	Units	Water Quality for Groundwater Zones:			
		SE	SW	NW	NE
		231P (605')	PDT-1	PDT-2	PDT-3
		2/26/2008	6/2/2009	7/20/2009	7/2/2009
pH	pH Units	8.24	7.75	7.04	7.57
Electrical Conductivity	µmhos/cm	560	410	410	510
Total Suspended Solids (TSS)	mg/L	N/A	<10	<10	<10
Total Dissolved Solids (TDS)	mg/L	350	280	280	340
Total Alkalinity	mg/L as $CaCO_3$	170	47	110	110
Bicarbonate (HCO3)	mg/L	200	58	140	130
Carbonate (CO3)	mg/L	2.4	<1.0	<1.0	<1.0
Hydroxide (OH)	mg/L	<1.0	<1.0	<1.0	<1.0
Chloride	mg/L	20	12	5.4	12
Fluoride	mg/L	2.2	2.4	0.99	2.2
Sulfate	mg/L	99	150	100	130
Nitrate + Nitrite Nitrogen	mg/L	N/A	<0.10	<0.10	<0.10
Nitrate Nitrogen	mg/L	<1.0	N/A	N/A	N/A
Nitrite Nitrogen	mg/L	<0.010	N/A	N/A	N/A
Anions	meq/L	6.1	4.54	4.58	5.29
Cations	meq/L	5.4	4.05	4.36	5.15
Error	%	6.1	5.7	2.5	1.3
Aluminum, Dissolved	mg/L	<0.045	<0.045	<0.045	<0.045
Antimony, Dissolved	mg/L	0.013	<0.0025	0.0051	0.015
Arsenic, Dissolved	mg/L	0.01	0.0064	0.058	0.069
Barium, Dissolved	mg/L	0.022	0.01	0.012	0.023
Beryllium, Dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth, Dissolved	mg/L	<0.10	<0.10	<0.10	<0.10
Boron, Dissolved	mg/L	<0.10	<0.10	<0.10	<0.10
Cadmium, Dissolved	mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Calcium, Dissolved	mg/L	70	50	63	72
Chromium, Dissolved	mg/L	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt, Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010
Copper, Dissolved	mg/L	<0.050	<0.050	<0.050	<0.050
Gallium, Dissolved	mg/L	<0.10	<0.10	<0.10	<0.10
Iron, Dissolved	mg/L	0.14	0.1	0.52	0.86
Lead, Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010
Lithium, Dissolved	mg/L	<0.10	<0.10	<0.10	<0.10
Magnesium, Dissolved	mg/L	13	6.8	7.8	9.6
Manganese, Dissolved	mg/L	0.34	0.019	0.28	0.43
Mercury, Dissolved	mg/L	0.00027	<0.00010	<0.00010	0.00023
Molybdenum, Dissolved	mg/L	0.038	0.033	0.019	0.014
Nickel, Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010
Phosphorus, Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50
Potassium, Dissolved	mg/L	3	2.1	2.4	8.4
Ryznar Stability Index	NA	N/A	N/A	N/A	N/A
Selenium, Dissolved	mg/L	<0.0050	<0.0050	<0.0050	<0.0050
Silver, Dissolved	mg/L	<0.0050	<0.0050	<0.0050	<0.0050
Sodium, Dissolved	mg/L	17	24	11	10
Strontium, Dissolved	mg/L	0.13	0.96	0.15	0.18
Thallium, Dissolved	mg/L	<0.0010	<0.0010	<0.0010	0.0025
Tin, Dissolved	mg/L	<0.10	<0.10	<0.10	<0.10
Titanium, Dissolved	mg/L	<0.10	<0.10	<0.10	<0.10
Vanadium, Dissolved	mg/L	<0.010	0.013	0.018	0.025
Zinc, Dissolved	mg/L	<0.010	0.038	0.19	<0.010

Notes:
N/A: Indicates sample not collected/analyzed.
< Indicates parameter not detected at the method detection limit (MDL). Value shown is the MDL.

Appendix E
Example pit wall runoff/submergence chemistry scaling calculation

Appendix E Pit wall runoff/submergence scaling calculation example

HCT data (example)				
	Effluent volume	0.75	L	*direct measurement from HCT test*
	Mass in HCT	1.5	kg	*direct measurement from HCT test*
	example specific surface area	20.0	m^2/kg	*value for each HCT calculated based on grain size distribution data*
Pit Wall Characteristics				
	density	2430	kg/m3	*estimated based on a grain density of 2.7 and 10% porosity*
	specific surface area	2.94	m^2/kg	estimated using scaling factor of 6.8 from the specific surface area of the HCT
	porosity in pit wall/benches	25%	%	estimated considering pit wall fractures and fine grained material on benches

Step 1: Normalize HCT chemical data based on HCT mass, HCT leachate volume, and HCT specific surface area estimate.

Normalized HCT (mg/m2) ***= HCT concentration (mg/L) x HCT leachate volume (L) / HCT mass (kg) / HCT specific surface area (m2/kg)***

HCT chemistry	1.0	mg/L	HCT data result (example data for calculation)
normalized by volume	0.75	mg	multiply HCT concentration times leachate volume
normalized by mass	0.50	mg/kg	divide result by HCT mass
normalized by specific surface area	**0.025**	**mg/m2**	divide result by specific surface area estimate

Step 2: Scale to pit wall rock based on normalized HCT concentration, and pit wall rock surface area and contact water volume

Scaled Concentration (mg/L) ***= Normalized HCT data (mg/m2) x [Pit wall rock surface area (m2)] / [Water volume in rock pore space (L)]***

= Normalized HCT data (mg/m2) x [Pit wall specific surface area (m2/kg) x Mass of wall rock (kg)] / [Mass of wall rock (kg) / Rock density (kg/m3) x porosity (%)]

= Normalized HCT data (mg/m2) x Pit wall specific surface area (m2/kg) x Rock density (kg/m3) / porosity (%)

Normalized HCT chemistry	0.025	mg/m2	Normalized concentration from Step 1
scaled to pit wall specific surface area	0.074	mg/kg	multiply by pit wall specific surface area
scaled by pit wall rock density	0.18	mg/L	multiply by pit wall rock density
adjusted by porosity	**0.71**	**mg/L**	divide by porosity
	0.71	**mg/L**	**Scaled concentration is approximately 70 percent of HCT concentrations**

Appendix F1
HCT grain size data and surface area calculations

Appendix F1 Summary Table: HCT Surface Area Estimates based on grain size data calculations (HCT 1-31)

HCT#	Lithology	Alteration	SPECIFIC SURFACE AREA (m^2/kg)
HCT-1	rhyolite tuff	argillic	5.7
HCT-2	quartz porphyry	argillic	27.2
HCT-3	rhyolite tuff	argillic	88.3
HCT-4	rhyolite tuff	argillic	51.6
HCT-8	rhyolite tuff	argillic	11.2
HCT-9	Vinini Formation	argillic	39.8
HCT-17	quartz porphyry	argillic	58.2
HCT-18	Vinini Formation	argillic	14.5
HCT-27	rhyolite tuff	argillic	53.2
HCT-31	Vinini Formation	argillic	101
HCT-14	quartz porphyry	phyllic	11.4
HCT-16	quartz porphyry	phyllic	12.3
HCT-19	Vinini Formation	phyllic	19.3
HCT-24	Vinini Formation	phyllic	23.1
HCT-25	rhyolite tuff	phyllic	23.6
HCT-28	rhyolite tuff	phyllic	62.9
HCT-5	Vinini Formation	potassic	42.9
HCT-6	Vinini Formation	potassic	23.4
HCT-7	quartz porphyry	potassic	15.1
HCT-23	quartz aplite porphyry	potassic	16.9
HCT-29	quartz porphyry	potassic	59.6
HCT-30	quartz porphyry	potassic	53.1
HCT-20	Vinini Formation	propylitic	13.7
HCT-21	Vinini Formation	propylitic	8.1
HCT-12	Vinini Formation	silicic	14.8
HCT-13	quartz aplite porphyry	silicic	27.5
HCT-15	quartz porphyry	silicic	15.3
HCT-22	quartz aplite porphyry	silicic	12.2
HCT-26	quartz porphyry	silicic	22.9

Statistics of Specific SA	Median (m2/kg)
by alteration type	Values
argillic	45.7
phyllic	21.2
potassic	33.1
silicic	15.3
MEDIAN	***27.2***

These values calculated using MDAG Grain 3 spreadsheet to calculate specific surface area based on grain size distributions, assuming spheres.

This table presents a summary of specific surface area estimates for each HCT, based on grain size analyses (HCT 1 - 31). Individual grain size results and calculations for HCT 1-31 are provided in the sheets following this summary.

Appendix F1 Summary Table: HCT Surface Area Estimates based on grain size data calculations (H

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	2	0.0001	0	4	5.55556E-08
	1.7	0.639	2	1.85	0.000767568
	0.85	0.163	1.7	1.275	0.000284096
	0.42	0.074	0.85	0.635	0.000258968
	0.212	0.046	0.42	0.316	0.000323488
	0.15	0.016	0.212	0.181	0.00019644
	0.075	0.025	0.15	0.1125	0.000493827
	0.053	0.009	0.075	0.064	0.0003125
	0.076	0	0.053	0.152	0
	0.054	0	0.053	0.108	0
	0.04	0.005208	0.053	0.0465	0.000248889
	0.029	0.00168	0.04	0.0345	0.000108213
	0.022	0.00448	0.029	0.0255	0.000390414
	0.018	0.00952	0.022	0.02	0.001057778
	0.014	0.00504	0.018	0.016	0.0007
	0.01	0.00112	0.014	0.012	0.000207407
	0.007	0.00056	0.01	0.0085	0.000146405
	0.005	0	0.007	0.006	0
	0.003	0	0.007	0.005	0
	0.001	0.000392	0.007	0.004	0.000217778
Passing Finest Mesh (set Diameter = 0)	0	0	0.001	0.0005	0
	Total for Sample:	1.0001			0.005713825
	Surface Area per kg:				**5.71**

Appendix F1 Summary Table: HCT Surface Area Estimates based on grain size data calculations (H

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	2	0.0001	0	4	5.55556E-08
	1.7	0.586	2	1.85	0.000703904
	0.85	0.177	1.7	1.275	0.000308497
	0.42	0.092	0.85	0.635	0.00032196
	0.212	0.055	0.42	0.316	0.000386779
	0.15	0.018	0.212	0.181	0.000220994
	0.075	0.024	0.15	0.1125	0.000474074
	0.053	0.008	0.075	0.064	0.000277778
	0.076	0	0.053	0.152	0
	0.054	0	0.053	0.108	0
	0.04	0.00664	0.053	0.0465	0.000317324
	0.029	0.004	0.04	0.0345	0.000257649
	0.022	0.0048	0.029	0.0255	0.000418301
	0.016	0.0056	0.022	0.019	0.000654971
	0.012	0.004	0.016	0.014	0.000634921
	0.009	0.004	0.012	0.0105	0.000846561
	0.006	0.0016	0.009	0.0075	0.000474074
	0.005	0.0016	0.006	0.0055	0.000646465
	0.003	0.0016	0.005	0.004	0.000888889
	0.001	0.0024	0.003	0.002	0.002666667
Passing Finest Mesh (set Diameter = 0)	0	0.00376	0.001	0.0005	0.016711111
	Total for Sample:	1.0001			0.027210972
	Surface Area per kg:				**27.21**

Appendix F1 Summary Table: HCT Surface Area Estimates based on grain size data calculations (H

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	2	0.0001	0	4	5.55556E-08
	1.7	0.109	2	1.85	0.000130931
	0.85	0.269	1.7	1.275	0.000468845
	0.42	0.114	0.85	0.635	0.00039895
	0.212	0.1	0.42	0.316	0.000703235
	0.15	0.037	0.212	0.181	0.000454266
	0.075	0.068	0.15	0.1125	0.00134321
	0.053	0.025	0.075	0.064	0.000868056
	0.07	0	0.053	0.14	0
	0.053	0	0.053	0.106	0
	0.038	0.029468	0.053	0.0455	0.001439219
	0.03	0.06116	0.038	0.034	0.003997386
	0.025	0.10564	0.03	0.0275	0.008536566
	0.018	0.0278	0.025	0.0215	0.002873385
	0.013	0.00556	0.018	0.0155	0.000797133
	0.009	0.00556	0.013	0.011	0.001123232
	0.007	0.00556	0.009	0.008	0.001544444
	0.005	0.00556	0.007	0.006	0.002059259
	0.003	0	0.005	0.004	0
	0.002	0.00556	0.005	0.0035	0.003530159
	0.001	0	0.002	0.0015	0
Passing Finest Mesh (set Diameter = 0)	0	0.026132	0.002	0.001	0.058071111
	Total for Sample:	1.0001			0.088339442
	Surface Area per kg:				**88.33**

Appendix F1 Summary Table: HCT Surface Area Estimates based on grain size data calculations (H

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m²)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	2	0.0001	0	4	5.55556E-08
	1.7	0.506	2	1.85	0.000607808
	0.85	0.197	1.7	1.275	0.000343355
	0.42	0.114	0.85	0.635	0.00039895
	0.212	0.056	0.42	0.316	0.000393812
	0.15	0.017	0.212	0.181	0.000208717
	0.075	0.028	0.15	0.1125	0.000553086
	0.053	0.013	0.075	0.064	0.000451389
	0.071	0	0.053	0.142	0
	0.052	0.00138	0.053	0.0525	5.84127E-05
	0.037	0.00276	0.052	0.0445	0.000137928
	0.029	0.01104	0.037	0.033	0.000743434
	0.021	0.00552	0.029	0.025	0.000490667
	0.016	0.01104	0.021	0.0185	0.001326126
	0.012	0.01242	0.016	0.014	0.001971429
	0.009	0.005934	0.012	0.0105	0.001255873
	0.007	0.00414	0.009	0.008	0.00115
	0.005	0.00138	0.007	0.006	0.000511111
	0.003	0.00138	0.005	0.004	0.000766667
	0.002	0.00138	0.003	0.0025	0.001226667
	0.001	0.00276	0.002	0.0015	0.004088889
Passing Finest Mesh (set Diameter = 0)	0	0.007966	0.001	0.0005	0.03496
	Total for Sample:	1.0001			0.051644275
	Surface Area per kg:				**51.64**

Appendix F1 Summary Table: HCT Surface Area Estimates based on grain size data calculations (H

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	2	0.0001	0	4	5.55556E-08
	1.7	0.427	2	1.85	0.000512913
	0.85	0.204	1.7	1.275	0.000355556
	0.42	0.076	0.85	0.635	0.000265967
	0.212	0.055	0.42	0.316	0.000386779
	0.15	0.016	0.212	0.181	0.00019644
	0.075	0.023	0.15	0.1125	0.000454321
	0.053	0.009	0.075	0.064	0.0003125
	0.068	0	0.053	0.136	0
	0.048	-0.00912	0.053	0.0505	0
	0.035	0.0076	0.053	0.044	0.000383838
	0.026	0.019	0.035	0.0305	0.001384335
	0.021	0.0418	0.026	0.0235	0.003952719
	0.017	0.0722	0.021	0.019	0.008444444
	0.013	0.0418	0.017	0.015	0.006192593
	0.01	0.00152	0.013	0.0115	0.00029372
	0.007	0.00114	0.01	0.0085	0.000298039
	0.005	0	0.007	0.006	0
	0.003	0.0038	0.007	0.005	0.001688889
	0.002	0.0038	0.003	0.0025	0.003377778
	0.001	0	0.002	0.0015	0
Passing Finest Mesh (set Diameter = 0)	0	0.00646	0.002	0.001	0.014355556
	Total for Sample:	1.0001			0.042856441
	Surface Area per kg:				**42.85**

Appendix F1 Summary Table: HCT Surface Area Estimates based on grain size data calculations (H

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	2	0.0001	0	4	5.55556E-08
	1.7	0.554	2	1.85	0.000665465
	0.85	0.182	1.7	1.275	0.000317211
	0.42	0.087	0.85	0.635	0.000304462
	0.212	0.054	0.42	0.316	0.000379747
	0.15	0.023	0.212	0.181	0.000282382
	0.075	0.035	0.15	0.1125	0.000691358
	0.053	0.014	0.075	0.064	0.000486111
	0.078	0	0.053	0.156	0
	0.057	0	0.053	0.114	0
	0.042	0.015606	0.053	0.0475	0.000730105
	0.032	0.00714	0.042	0.037	0.000428829
	0.023	0.00612	0.032	0.0275	0.000494545
	0.017	0.0051	0.023	0.02	0.000566667
	0.013	0.00408	0.017	0.015	0.000604444
	0.009	0.00306	0.013	0.011	0.000618182
	0.007	0.00102	0.009	0.008	0.000283333
	0.005	0.00204	0.007	0.006	0.000755556
	0.003	0.00204	0.005	0.004	0.001133333
	0.002	0.00102	0.003	0.0025	0.000906667
	0.001	0.00102	0.002	0.0015	0.001511111
Passing Finest Mesh (set Diameter = 0)	0	0.002754	0.001	0.0005	0.01224
	Total for Sample:	1.0001			0.023399565
	Surface Area per kg:				**23.40**

Appendix F1 Summary Table: HCT Surface Area Estimates based on grain size data calculations (H

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	2	0.0001	0	4	5.55556E-08
	1.7	0.844	2	1.85	0.000773574
	0.85	0.15	1.7	1.275	0.000261438
	0.42	0.083	0.85	0.635	0.000290464
	0.212	0.051	0.42	0.316	0.00035865
	0.15	0.014	0.212	0.181	0.000171885
	0.075	0.025	0.15	0.1125	0.000493827
	0.053	0.007	0.075	0.064	0.000243056
	0.078	0	0.053	0.156	0
	0.056	0	0.053	0.112	0
	0.041	0.005876	0.053	0.047	0.000277825
	0.03	0.00312	0.041	0.0355	0.000195305
	0.023	0.00312	0.03	0.0265	0.000261635
	0.017	0.00312	0.023	0.02	0.000346667
	0.013	0.00364	0.017	0.015	0.000539259
	0.009	0.0026	0.013	0.011	0.000525253
	0.007	0.00208	0.009	0.008	0.000577778
	0.005	0.00104	0.007	0.006	0.000385185
	0.003	0.00052	0.005	0.004	0.000288889
	0.001	0.00052	0.003	0.002	0.000577778
	0.001	-0.00156	0.001	0.002	0
Passing Finest Mesh (set Diameter = 0)	0	0.001924	0.001	0.0005	0.008551111
	Total for Sample:	1.0001			0.015119632
	Surface Area per kg:				**15.12**

Appendix F1 Summary Table: HCT Surface Area Estimates based on grain size data calculations (H

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	2	0.0001	0	4	5.55556E-08
	1.7	0.597	2	1.85	0.000717117
	0.85	0.147	1.7	1.275	0.000256209
	0.42	0.085	0.85	0.635	0.000297463
	0.212	0.051	0.42	0.316	0.00035865
	0.15	0.021	0.212	0.181	0.000257827
	0.075	0.022	0.15	0.1125	0.000434568
	0.053	0.009	0.075	0.064	0.0003125
	0.074	0	0.053	0.148	0
	0.053	0	0.053	0.106	0
	0.039	0.008568	0.053	0.046	0.000413913
	0.031	0.01904	0.039	0.035	0.001208889
	0.023	0.00544	0.031	0.027	0.000447737
	0.019	0.02992	0.023	0.021	0.003166138
	0.014	0	0.019	0.0165	0
	0.01	0	0.019	0.0145	0
	0.007	0.00136	0.019	0.013	0.000232479
	0.004	0.00136	0.007	0.0055	0.000549495
	0.003	0	0.004	0.0035	0
	0.001	0	0.004	0.0025	0
Passing Finest Mesh (set Diameter = 0)	0	0.002312	0.004	0.002	0.002568889
	Total for Sample:	1.0001			0.011221928
	Surface Area per kg:				**11.22**

Appendix F1 Summary Table: HCT Surface Area Estimates based on grain size data calculations (H

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	2	0.0001	0	4	5.55556E-08
	1.7	0.522	2	1.85	0.000627027
	0.85	0.134	1.7	1.275	0.000233551
	0.42	0.087	0.85	0.635	0.000304462
	0.212	0.063	0.42	0.316	0.000443038
	0.15	0.028	0.212	0.181	0.000343769
	0.075	0.04	0.15	0.1125	0.000790123
	0.053	0.02	0.075	0.064	0.000694444
	0.074	0	0.053	0.148	0
	0.055	0	0.053	0.11	0
	0.04	0.021836	0.053	0.0465	0.001043536
	0.031	0.01696	0.04	0.0355	0.001061659
	0.023	0.01696	0.031	0.027	0.001395885
	0.017	0.01484	0.023	0.02	0.001648889
	0.013	0.00636	0.017	0.015	0.000942222
	0.009	0.00636	0.013	0.011	0.001284848
	0.007	0.00424	0.009	0.008	0.001177778
	0.004	0	0.007	0.0055	0
	0.003	0.00424	0.007	0.005	0.001884444
	0.002	0.00424	0.003	0.0025	0.003768889
Passing Finest Mesh (set Diameter = 0)	0	0.009964	0.002	0.001	0.022142222
	Total for Sample:	1.0001			0.039786844
	Surface Area per kg:				**39.78**

Appendix F1 Summary Table: HCT Surface Area Estimates based on grain size data calculations (H·

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.36853E-08
#10	2	51.4	2.38	2.19	0.052156266
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	31.3	2	1.42	0.048982796
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	8.2	0.84	0.67	0.020563847
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	4.7	0.5	0.355	0.02942097
#80	0.177		0.21	0.1935	0
#100	0.149	1.3	0.21	0.1795	0.016094089
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	2.1	0.149	0.1115	0.041853513
#250	0.062		0.074	0.068	0
#270	0.053	0.7	0.074	0.0635	0.024496938
	0.046	0.2806	0.053	0.0495	0.012597082
	0.033	0.2277	0.046	0.0395	0.012810127
	0.024	0.3427	0.033	0.0285	0.026721248
	0.017	0.2277	0.024	0.0205	0.024682927
	0.013	0	0.017	0.015	0
	0.009	0.115	0.017	0.013	0.01965812
	0.006	0.1127	0.009	0.0075	0.033392593
	0.004	0.115	0.006	0.005	0.051111111
	0.003	0.115	0.004	0.0035	0.073015873
	0.001	0.2277	0.004	0.0025	0.2024
Passing Finest Mesh (set Diameter = 0)	0	0.5359	0.003	0.0015	0.793925926
	Total for Sample:	100.0001			1.48388346
	Surface Area per kg:				**14.84**

GRAIN 3.0®,™

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	48.2	2.38	2.19	0.048909183
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	26.3	2	1.42	0.041158059
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	6	0.84	0.67	0.019900498
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	5.8	0.5	0.355	0.036306729
#80	0.177		0.21	0.1935	0
#100	0.149	1.4	0.21	0.1795	0.017332095
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	3	0.149	0.1115	0.059790732
#250	0.062		0.074	0.068	0
#270	0.053	1.4	0.074	0.0635	0.048993876
	0.039	1.4694	0.053	0.046	0.070985507
	0.029	0.79	0.039	0.034	0.051633987
	0.021	1.106	0.029	0.025	0.098311111
	0.016	0.948	0.021	0.0185	0.113873874
	0.012	0.948	0.016	0.014	0.15047619
	0.009	0.632	0.012	0.0105	0.133756614
	0.006	0.316	0.009	0.0075	0.09362963
	0.004	0.316	0.006	0.005	0.140444444
	0.003	0.158	0.004	0.0035	0.10031746
	0.001	0.474	0.004	0.0025	0.421333333
Passing Finest Mesh (set Diameter = 0)	0	0.7426	0.003	0.0015	1.100148148
	Total for Sample:	100.0001			2.747301519
	Surface Area per kg:				**27.47**

GRAIN 3.0©,™

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	45.2	2.38	2.19	0.045865043
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	23.2	2	1.42	0.036306729
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	11.4	0.84	0.67	0.037810945
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	6.5	0.5	0.355	0.040688576
#80	0.177		0.21	0.1935	0
#100	0.149	2.1	0.21	0.1795	0.025998143
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	3.1	0.149	0.1115	0.061783757
#250	0.062		0.074	0.068	0
#270	0.053	1.2	0.074	0.0635	0.041994751
	0.038	0.9198	0.053	0.0455	0.044923077
	0.028	0.73	0.038	0.033	0.049158249
	0.021	1.022	0.028	0.0245	0.092698413
	0.017	3.066	0.021	0.019	0.358596491
	0.013	1.168	0.017	0.015	0.173037037
	0.009	0	0.013	0.011	0
	0.007	0	0.013	0.01	0
	0.005	0	0.013	0.009	0
	0.003	0	0.013	0.008	0
	0.001	0.146	0.013	0.007	0.046349206
Passing Finest Mesh (set Diameter = 0)	0	0.2482	0.013	0.0065	0.084854701
	Total for Sample:	100.0001			1.140065165

Surface Area per kg: **11.40**

GRAIN 3.0©,™

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.56853E-08
#10	2	48.6	2.38	2.19	0.049315068
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	23.2	2	1.42	0.036306729
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	6.5	0.84	0.67	0.021558872
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	6.6	0.5	0.355	0.041314554
#80	0.177		0.21	0.1935	0
#100	0.149	2.8	0.21	0.1795	0.034664191
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	5.2	0.149	0.1115	0.10363727
#250	0.062		0.074	0.068	0
#270	0.053	2.2	0.074	0.0635	0.076990376
	0.044	1.2446	0.053	0.0485	0.057026346
	0.032	0.4263	0.044	0.038	0.024929825
	0.023	0.8575	0.032	0.0275	0.069292929
	0.017	0.5684	0.023	0.02	0.063155556
	0.013	0.5684	0.017	0.015	0.084207407
	0.009	0.1421	0.013	0.011	0.028707071
	0.006	0.2842	0.009	0.0075	0.084207407
	0.005	0.1421	0.006	0.0055	0.057414141
	0.003	0.2842	0.005	0.004	0.157888889
	0.001	0.0392	0.005	0.003	0.029037037
Passing Finest Mesh (set Diameter = 0)	0	0.343	0.003	0.0015	0.508148148
	Total for Sample:	100.0001			1.527801864

Surface Area per kg: **15.28**

GRAIN 3.0©,TM

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	43.1	2.38	2.19	0.043734145
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	21.5	2	1.42	0.033646322
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	11.6	0.84	0.67	0.038474295
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	9.2	0.5	0.355	0.057589984
#80	0.177		0.21	0.1935	0
#100	0.149	1.8	0.21	0.1795	0.019808109
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	3.6	0.149	0.1115	0.071748879
#250	0.062		0.074	0.068	0
#270	0.053	1.4	0.074	0.0635	0.048993876
	0.051	0.528	0.053	0.052	0.022564103
	0.037	0.32	0.051	0.044	0.016161616
	0.029	1.44	0.037	0.033	0.096969697
	0.023	3.04	0.029	0.026	0.25982906
	0.018	2.08	0.023	0.0205	0.225474255
	0.013	0	0.018	0.0155	0
	0.009	0	0.018	0.0135	0
	0.007	0.16	0.018	0.0125	0.028444444
	0.005	0	0.007	0.006	0
	0.003	0	0.007	0.005	0
	0.001	0.16	0.007	0.004	0.088888889
Passing Finest Mesh (set Diameter = 0)	0	0.272	0.007	0.0035	0.172698413
	Total for Sample:	100.0001			1.225026134
	Surface Area per kg:				**12.25**

GRAIN 3.0©,TM

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	21	2.38	2.19	0.02130898
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	23.5	2	1.42	0.036776213
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	13.2	0.84	0.67	0.043781095
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	7.7	0.5	0.355	0.048200313
#80	0.177		0.21	0.1935	0
#100	0.149	3	0.21	0.1795	0.037140204
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	4.4	0.149	0.1115	0.087693074
#250	0.062		0.074	0.068	0
#270	0.053	3.1	0.074	0.0635	0.108486439
	0.048	0.241	0.053	0.0505	0.010605061
	0.035	1.446	0.048	0.0415	0.077429719
	0.027	4.338	0.035	0.031	0.310967742
	0.021	6.748	0.027	0.024	0.624814815
	0.016	4.82	0.021	0.0185	0.578978979
	0.012	0.964	0.016	0.014	0.153015873
	0.009	1.446	0.012	0.0105	0.306031746
	0.006	0.482	0.009	0.0075	0.142814815
	0.004	0.482	0.006	0.005	0.214222222
	0.003	0	0.004	0.0035	0
	0.001	0.964	0.006	0.0035	0.612063492
Passing Finest Mesh (set Diameter = 0)	0	2.169	0.004	0.002	2.41
	Total for Sample:	100.0001			5.824330828

Surface Area per kg: **58.24**

GRAIN 3.0©,™

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	28.5	2.38	2.19	0.02891933
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	38.9	2	1.42	0.060876369
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	15.2	0.84	0.67	0.050414594
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	8.3	0.5	0.355	0.051956182
#80	0.177		0.21	0.1935	0
#100	0.149	2.6	0.21	0.1795	0.032188177
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	2.8	0.149	0.1115	0.055804684
#250	0.062		0.074	0.068	0
#270	0.053	0.8	0.074	0.0635	0.0279965
	0.047	0.7975	0.053	0.05	0.035444444
	0.034	0.2668	0.047	0.0405	0.014639232
	0.024	0.4031	0.034	0.029	0.030888889
	0.017	0.1334	0.024	0.0205	0.014460705
	0.013	0.1334	0.017	0.015	0.019762963
	0.009	0.1334	0.013	0.011	0.026949495
	0.006	0.1363	0.009	0.0075	0.040385185
	0.005	0.1334	0.006	0.0055	0.05389899
	0.003	0.1334	0.005	0.004	0.074111111
	0.001	0.1334	0.005	0.003	0.099814815
Passing Finest Mesh (set Diameter = 0)	0	0.4959	0.003	0.0015	0.734666667
	Total for Sample:	100.0001			1.452178378

Surface Area per kg: **14.52**

GRAIN 3.0©,™

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh With Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	29.6	2.38	2.19	0.030035515
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	32.7	2	1.42	0.051173709
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	16.8	0.84	0.67	0.055721393
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	9.8	0.5	0.355	0.061345853
#80	0.177		0.21	0.1935	0
#100	0.149	2.9	0.21	0.1795	0.035902197
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	3.5	0.149	0.1115	0.069755855
#250	0.062		0.074	0.068	0
#270	0.053	1.2	0.074	0.0635	0.041994751
	0.046	0.931	0.053	0.0495	0.041795735
	0.033	0.2765	0.046	0.0395	0.015555556
	0.024	0.1365	0.033	0.0285	0.010643275
	0.017	0.413	0.024	0.0205	0.044769648
	0.012	0.1365	0.017	0.0145	0.02091954
	0.009	0.273	0.012	0.0105	0.057777778
	0.006	0.14	0.009	0.0075	0.041481481
	0.004	0.1365	0.006	0.005	0.060666667
	0.003	0.1365	0.004	0.0035	0.086666667
	0.001	0.2765	0.004	0.0025	0.245777778
Passing Finest Mesh (set Diameter = 0)	0	0.644	0.003	0.0015	0.954074074
	Total for Sample:	100.0001			1.926057517

Surface Area per kg: **19.26**

GRAIN 3.0©,TM

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	34.2	2.38	2.19	0.034703196
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	35.3	2	1.42	0.055242567
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	11.6	0.84	0.67	0.038474295
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	7.7	0.5	0.355	0.048200313
#80	0.177		0.21	0.1935	0
#100	0.149	2.2	0.21	0.1795	0.02723615
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	3.5	0.149	0.1115	0.069755855
#250	0.062		0.074	0.068	0
#270	0.053	1.5	0.074	0.0635	0.052493438
	0.045	0.848	0.053	0.049	0.03845805
	0.032	0.532	0.045	0.0385	0.030707071
	0.024	0.664	0.032	0.028	0.052698413
	0.017	0.532	0.024	0.0205	0.057669377
	0.013	0.268	0.017	0.015	0.039703704
	0.009	0.132	0.013	0.011	0.026666667
	0.006	0.132	0.009	0.0075	0.039111111
	0.005	0.268	0.006	0.0055	0.108282828
	0.003	0.264	0.005	0.004	0.146666667
	0.001	0.04	0.005	0.003	0.02962963
Passing Finest Mesh (set Diameter = 0)	0	0.32	0.003	0.0015	0.474074074
	Total for Sample:	100.0001			1.36977345

Surface Area per kg: **13.70**

GRAIN 3.0©,TM

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	30	2.38	2.19	0.0304414
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	35	2	1.42	0.054773083
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	13.9	0.84	0.67	0.046102819
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	8.5	0.5	0.355	0.053208138
#80	0.177		0.21	0.1935	0
#100	0.149	2.8	0.21	0.1795	0.034664191
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	4.3	0.149	0.1115	0.095665172
#250	0.062		0.074	0.068	0
#270	0.053	1.5	0.074	0.0635	0.052493438
	0.047	1.0815	0.053	0.05	0.048066667
	0.034	0.7245	0.047	0.0405	0.039753086
	0.025	0.434	0.034	0.0295	0.032693032
	0.018	0.5775	0.025	0.0215	0.059689922
	0.013	0.147	0.018	0.0155	0.021075269
	0.009	0.1435	0.013	0.011	0.028989899
	0.007	0	0.009	0.008	0
	0.005	0	0.009	0.007	0
	0.003	0.2905	0.009	0.006	0.107592593
	0.001	0.042	0.009	0.005	0.018666667
Passing Finest Mesh (set Diameter = 0)	0	0.0595	0.003	0.0015	0.088148148
	Total for Sample:	100.0001			0.812023571
	Surface Area per kg:				**8.12**

GRAIN 3.0©,TM

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	23.5	2.38	2.19	0.023845764
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	32.7	2	1.42	0.051173709
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	10.1	0.84	0.67	0.033499171
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	7.9	0.5	0.355	0.049452269
#80	0.177		0.21	0.1935	0
#100	0.149	6.6	0.21	0.1795	0.081708449
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	10.4	0.149	0.1115	0.207274539
#250	0.062		0.074	0.068	0
#270	0.053	3.5	0.074	0.0635	0.122484689
	0.043	1.8762	0.053	0.048	0.086861111
	0.033	1.3886	0.043	0.038	0.081204678
	0.024	0.5565	0.033	0.0285	0.043391813
	0.017	0.5565	0.024	0.0205	0.060325203
	0.013	0.2756	0.017	0.015	0.04082963
	0.009	0	0.013	0.011	0
	0.006	0.2809	0.013	0.0095	0.065707602
	0.004	0	0.006	0.005	0
	0.003	0	0.006	0.0045	0
	0.001	0	0.006	0.0035	0
Passing Finest Mesh (set Diameter = 0)	0	0.3657	0.006	0.003	0.270888889
	Total for Sample:	100.0001			1.219647564
	Surface Area per kg:				**12.19**

GRAIN 3.0©,TM

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	31.6	2.38	2.19	0.032064942
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	37.2	2	1.42	0.058215962
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	7.7	0.84	0.67	0.025538972
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	6.5	0.5	0.355	0.040688576
#80	0.177		0.21	0.1935	0
#100	0.149	2.2	0.21	0.1795	0.02723615
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	5	0.149	0.1115	0.099651221
#250	0.062		0.074	0.068	0
#270	0.053	2.2	0.074	0.0635	0.076990376
	0.039	1.5656	0.053	0.046	0.07563285
	0.03	1.216	0.039	0.0345	0.078325282
	0.022	1.216	0.03	0.026	0.103931624
	0.016	0.912	0.022	0.019	0.106666667
	0.012	0.76	0.016	0.014	0.120634921
	0.009	0.608	0.012	0.0105	0.128677249
	0.006	0.456	0.009	0.0075	0.135111111
	0.005	0.304	0.006	0.0055	0.122828283
	0.003	0	0.005	0.004	0
	0.001	0.304	0.005	0.003	0.225185185
Passing Fines: Mesh (set Diameter = 0)	0	0.2584	0.005	0.0025	0.229688889
	Total for Sample:	100.0001			1.387068305

Surface Area per kg: **16.87**

GRAIN 3.0©.TM

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	40.1	2.38	2.19	0.040690005
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	19.6	2	1.42	0.030672926
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	15.2	0.84	0.67	0.050414594
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	9.1	0.5	0.355	0.056964006
#80	0.177		0.21	0.1935	0
#100	0.149	3.1	0.21	0.1795	0.038378211
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	4.2	0.149	0.1115	0.083707025
#250	0.062		0.074	0.068	0
#270	0.053	1.5	0.074	0.0635	0.052493438
	0.051	0.3744	0.053	0.052	0.016
	0.037	0.432	0.051	0.044	0.021818182
	0.028	0.864	0.037	0.0325	0.059076923
	0.021	0.864	0.028	0.0245	0.078367347
	0.016	0.864	0.021	0.0185	0.103783784
	0.012	1.152	0.016	0.014	0.182857143
	0.009	0.576	0.012	0.0105	0.121904762
	0.006	0.72	0.009	0.0075	0.213333333
	0.004	0.1008	0.006	0.005	0.0448
	0.003	0.144	0.004	0.0035	0.091428571
	0.001	0.432	0.006	0.0035	0.274285714
Passing Finest Mesh (set Diameter = 0)	0	0.6768	0.004	0.002	0.752
	Total for Sample:	100.0001			2.312978012
	Surface Area per kg:				**23.13**

GRAIN 3.0©,TM

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	27.2	2.38	2.19	0.027600203
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	33.4	2	1.42	0.052269171
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	15	0.84	0.67	0.049751244
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	9.1	0.5	0.355	0.056964006
#80	0.177		0.21	0.1935	0
#100	0.149	3.3	0.21	0.1795	0.040854225
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	3.8	0.149	0.1115	0.075734928
#250	0.062		0.074	0.068	0
#270	0.053	1.3	0.074	0.0635	0.045494313
	0.038	1.0074	0.053	0.0455	0.049201465
	0.028	0.552	0.038	0.033	0.037171717
	0.02	0.552	0.028	0.024	0.051111111
	0.015	0.828	0.02	0.0175	0.105142857
	0.012	1.242	0.015	0.0135	0.204444444
	0.009	0.966	0.012	0.0105	0.204444444
	0.006	0.69	0.009	0.0075	0.204444444
	0.004	0.138	0.006	0.005	0.061333333
	0.003	0.138	0.004	0.0035	0.087619048
	0.001	0.276	0.004	0.0025	0.245333333
Passing Finest Mesh (set Diameter = 0)	0	0.5106	0.003	0.0015	0.756444444
	Total for Sample:	100.0001			2.355358779
	Surface Area per kg:				**23.55**

GRAIN 3.0©,™

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	38.3	2.38	2.19	0.038863521
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	29.5	2	1.42	0.046165884
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	11.9	0.84	0.67	0.03946932
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	7.8	0.5	0.355	0.048826291
#80	0.177		0.21	0.1935	0
#100	0.149	2.8	0.21	0.1795	0.034664191
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	3.3	0.149	0.1115	0.065769806
#250	0.062		0.074	0.068	0
#270	0.053	1.1	0.074	0.0635	0.038495188
	0.041	0.6625	0.053	0.047	0.031323877
	0.03	0.6572	0.041	0.0355	0.04113928
	0.022	0.5247	0.03	0.026	0.044846154
	0.016	0.5247	0.022	0.019	0.061368421
	0.012	0.3922	0.016	0.014	0.062253968
	0.009	0.5194	0.012	0.0105	0.109925926
	0.006	0.3975	0.009	0.0075	0.117777778
	0.004	0.3498	0.006	0.005	0.155466667
	0.003	0.265	0.004	0.0035	0.168253968
	0.001	0.5247	0.004	0.0025	0.4664
Passing Finest Mesh (set Diameter = 0)	0	0.4823	0.003	0.0015	0.714518519
	Total for Sample:	100.0001			2.285528805
	Surface Area per kg:				**22.86**

GRAIN 3.0©,™

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	10.4	2.38	2.19	0.010553019
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	20.6	2	1.42	0.032237872
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	13.3	0.84	0.67	0.044112769
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	10.2	0.5	0.355	0.063849765
#80	0.177		0.21	0.1935	0
#100	0.149	3.8	0.21	0.1795	0.047044259
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	6.2	0.149	0.1115	0.123567514
#250	0.062		0.074	0.068	0
#270	0.053	2.9	0.074	0.0635	0.101487314
	0.05	1.956	0.053	0.0515	0.084401294
	0.037	2.608	0.05	0.0435	0.133231162
	0.029	9.128	0.037	0.033	0.614680135
	0.024	14.344	0.029	0.0265	1.202851153
	0.017	1.304	0.024	0.0205	0.141355014
	0.013	0	0.017	0.015	0
	0.009	0	0.017	0.013	0
	0.006	0	0.017	0.0115	0
	0.004	0.652	0.017	0.0105	0.137989418
	0.003	0.652	0.004	0.0035	0.413968254
	0.001	0	0.017	0.009	0
Passing Finest Mesh (set Diameter = 0)	0	1.956	0.004	0.002	2.173333333
	Total for Sample:	100.0001			5.324662322
	Surface Area per kg:				**53.25**

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A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	17.5	2.38	2.19	0.017757484
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	22.1	2	1.42	0.03458529
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	12.4	0.84	0.67	0.041127695
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	10.9	0.5	0.355	0.068231612
#80	0.177		0.21	0.1935	0
#100	0.149	5.4	0.21	0.1795	0.066852368
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	6.7	0.149	0.1115	0.133532636
#250	0.062		0.074	0.068	0
#270	0.053	2.6	0.074	0.0635	0.090988626
	0.052	2.688	0.053	0.0525	0.113777778
	0.038	1.792	0.052	0.045	0.088493827
	0.028	1.792	0.038	0.033	0.120673401
	0.02	2.24	0.028	0.024	0.207407407
	0.015	2.688	0.02	0.0175	0.341333333
	0.012	3.136	0.015	0.0135	0.516213992
	0.008	2.24	0.012	0.01	0.497777778
	0.006	1.344	0.008	0.007	0.426666667
	0.004	0.896	0.006	0.005	0.398222222
	0.003	0.896	0.004	0.0035	0.568888889
	0.001	0.896	0.006	0.0035	0.568888889
Passing Finest Mesh (set Diameter = 0)	0	1.792	0.004	0.002	1.991111111
	Total for Sample:	100.0001			3.29253105
	Surface Area per kg:				**62.93**

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A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
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Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	22.1	2.38	2.19	0.022425165
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	21.5	2	1.42	0.033646322
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	14.6	0.84	0.67	0.048424544
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	11.6	0.5	0.355	0.072613459
#80	0.177		0.21	0.1935	0
#100	0.149	4.5	0.21	0.1795	0.055710306
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	6.2	0.149	0.1115	0.123567514
#250	0.062		0.074	0.068	0
#270	0.053	2	0.074	0.0635	0.069991251
	0.052	2.975	0.053	0.0525	0.125925926
	0.038	0.7	0.052	0.045	0.034567901
	0.027	0.7	0.038	0.0325	0.047963248
	0.02	0.7	0.027	0.0235	0.066193853
	0.014	1.75	0.02	0.017	0.22875817
	0.011	2.1	0.014	0.0125	0.373333333
	0.008	1.75	0.011	0.0095	0.409356725
	0.006	2.1	0.008	0.007	0.666666667
	0.004	1.75	0.006	0.005	0.777777778
	0.003	0.7	0.004	0.0035	0.444444444
	0.001	0.35	0.006	0.0035	0.222222222
Passing Finest Mesh (set Diameter = 0)	0	1.925	0.004	0.002	2.138888889
	Total for Sample:	100.0001			5.962377764
	Surface Area per kg:				**59.62**

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A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
Company:
Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.66853E-08
#10	2	20.7	2.38	2.19	0.021004566
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	22.2	2	1.42	0.034741784
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	15.1	0.84	0.67	0.050082919
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	11.2	0.5	0.355	0.070109546
#80	0.177		0.21	0.1935	0
#100	0.149	4.4	0.21	0.1795	0.0544723
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	6	0.149	0.1115	0.119581465
#250	0.062		0.074	0.068	0
#270	0.053	2.1	0.074	0.0635	0.073490814
	0.049	0.915	0.053	0.051	0.039869281
	0.035	0.366	0.049	0.042	0.019365079
	0.026	1.464	0.035	0.0305	0.106666667
	0.019	1.83	0.026	0.0225	0.180740741
	0.014	2.562	0.019	0.0165	0.345050505
	0.011	3.294	0.014	0.0125	0.5856
	0.008	3.294	0.011	0.0095	0.770526316
	0.006	1.464	0.008	0.007	0.464761905
	0.004	0.732	0.006	0.005	0.325333333
	0.002	0.6771	0.004	0.003	0.501555556
	0.001	0.732	0.006	0.0035	0.464761905
Passing Finest Mesh (set Diameter = 0)	0	0.9699	0.004	0.002	1.077666667
	Total for Sample:	100.0001			5.305381394
	Surface Area per kg:				**53.05**

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A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Project:
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Sample:
Comments:

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt Retained On Sieve (g)	Last Mesh with Wt > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m²)
	100	0	0	200	0
	50	0	0	100	0
	25	0	0	50	0
	19	0	0	38	0
	13	0	0	26	0
	9.5	0	0	19	0
	6.7	0	0	13.4	0
#4	4.75	0	0	9.5	0
#5	4	0	0	8	0
#6	3.36	0	0	6.72	0
#7	2.83	0	0	5.66	0
#8	2.38	0.0001	0	4.76	4.56853E-08
#10	2	17.4	2.38	2.19	0.017656012
#12	1.68		2	1.84	0
#14	1.41		2	1.705	0
#16	1.19		2	1.595	0
#18	1		2	1.5	0
#20	0.84	20.5	2	1.42	0.032081377
#25	0.71		0.84	0.775	0
#30	0.59		0.84	0.715	0
#35	0.5	13.3	0.84	0.67	0.044112769
#40	0.42		0.5	0.46	0
#45	0.35		0.5	0.425	0
#50	0.297		0.5	0.3985	0
#60	0.25		0.5	0.375	0
#70	0.21	10.8	0.5	0.355	0.067605634
#80	0.177		0.21	0.1935	0
#100	0.149	4.1	0.21	0.1795	0.050758279
#120	0.125		0.149	0.137	0
#140	0.105		0.149	0.127	0
#170	0.088		0.149	0.1185	0
#200	0.074	5.5	0.149	0.1115	0.109616343
#250	0.062		0.074	0.068	0
#270	0.053	2.5	0.074	0.0635	0.087489064
	0.05	0.6993	0.053	0.0515	0.030174757
	0.036	1.036	0.05	0.043	0.053540052
	0.026	1.036	0.036	0.031	0.074265233
	0.019	2.072	0.026	0.0225	0.204641975
	0.014	1.554	0.019	0.0165	0.209292929
	0.011	4.144	0.014	0.0125	0.736711111
	0.008	4.144	0.011	0.0095	0.969356725
	0.006	4.144	0.008	0.007	1.315555556
	0.004	1.554	0.006	0.005	0.390666667
	0.003	0.518	0.004	0.0035	0.328888889
	0.001	1.036	0.006	0.0035	0.857777778
Passing Finest Mesh (set Diameter = 0)	0	3.9627	0.004	0.002	4.403
	Total for Sample:	100.0001			10.08319
	Surface Area per kg:				**100.83**

Appendix F2
Pit wall grain size data estimates and surface area calculations

Appendix F2 Summary Table: Pit wall surface area estimates based on literature grain size data

Approach:

A literature review was performed to obtain estimates for grain size distributions representative of pit walls and benches for the purpose of geochemical modeling. Due to the lack of information directly related to pit walls, it was assumed that waste rock pile grain size distributions would be used to approximate materials in pit walls and accumulation on benches over the time period of the geochemical model. The first literature source (Munroe et al., 1999) contained grain size distributions for 4 waste rock piles, and the other source (Shaw et al., 2002) reported an average specific surface area estimate for waste rock piles. The 4 grain size distribution data sets were used to calculate specific surface areas using the Grain 3.0 spreadsheet (mdag publishing). These data sheets are attached to this appendix. An overall average specific surface area estimate of 4.0 m2/kg was calculated using all data sources.

For the purpose of scaling laboratory chemical data, the average specific surface area estimate for waste rock piles was compared to the median value of specific surface area estimates measured in humidity cell tests (HCTs) of 27 m2/kg (Appendix F1). The ratio of these values (6.8) was used to represent the relationship between laboratory (HCTs) conditions and field conditions (pit wall). The scaling calculations are shown in Appendix E.

	Specific surface area	units	Notes:
Average value for four waste rock piles	3.6	m^2/kg	Average of four waste rock piles (Munroe et al, 1999):
Reported value for one waste rock pile	5.9	m^2/kg	Reported literature value for waste rock piles (Shaw et al, 2002)
Average value for five waste rock piles	4.0	m^2/kg	Average of 5 waste rock piles (Munroe, 2002; Shaw, 1999):
Median HCT specific surface area value	27	m^2/kg	Median value of HCT SpSA (4 lithologies):
Lab:Field factor used for scaling (see Appendix E)	**6.8**		**Ratio of specific surface area estimates (HCT:WRP)**

References:

Munroe, E.A., McLemore, V.T., and Kyle, P. 1999. Waste rock pile characterization, heterogeneity, and geochemical anomalies in the Hillsboro Mining District, Sierra County, New Mexico. Journal of Geochemical Exploration (67) pp. 391-405.

Shaw, S., Wels, C., Robertson, A. & Lorinczi, G., 2002. "Physical and Geochemical Characterization of Mine Rock Piles at the Questa mine, New Mexico". In Tailings and Mine Waste '02, proceedings of the Ninth International Conference on Tailings and Mine Waste, Fort Collins, Colorado, USA, 27-30. January 2002, pp. 447-458.

WRP-A (Munroe 1999)

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Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100,000	57.7	0	200000.000	6.41111E-07
	50	0	100000	50025.000	0
	25	0	100000	50012.500	0
	19	0	100000	50009.500	0
	13	0	100000	50006.500	0
	9.5	0	100000	50004.750	0
	6.7	0	100000	50003.350	0
#4	4.75	0	100000	50002.375	0
#5	4		100000	50002.000	0
#6	3.36	0	100000	50001.680	0
#7	2.83	0	100000	50001.415	0
#8	2.38	0	100000	50001.190	0
#10	2	0	100000	50001.000	0
#12	1.68	0	100000	50000.840	0
#14	1.41	0	100000	50000.705	0
#16	1.19	0	100000	50000.595	0
#18	1	7	100000	50000.500	3.11108E-07
#20	0.84	0	1	0.920	0
#25	0.71	0	1	0.855	0
#30	0.59	0	1	0.795	0
#35	0.5	9.7	1	0.750	0.028740741
#40	0.42	0	0.5	0.460	0
#45	0.35	0	0.5	0.425	0
#50	0.297	0	0.5	0.399	0
#60	0.25	10.5	0.5	0.375	0.062222222
#70	0.21	0	0.25	0.230	0
#80	0.177	0	0.25	0.214	0
#100	0.149	0	0.25	0.200	0
#120	0.125	7.1	0.25	0.188	0.084148148
#140	0.105	0	0.125	0.115	0
#170	0.088	0	0.125	0.107	0
#200	0.074	0	0.125	0.100	0
#250	0.063	4.2	0.125	0.094	0.09929078
#270	0.06	3.80	0.063	0.062	0.13730804
	0.046	0.00	0.06	0.053	0
	0.033	0.00	0.06	0.047	0
	0.024	0.00	0.06	0.042	0
	0.017	0.00	0.06	0.039	0
	0.013	0.00	0.06	0.037	0
	0.009	0.00	0.06	0.035	0
	0.006	0.00	0.06	0.033	0
	0.004	0.00	0.06	0.032	0
	0.003	0.00	0.06	0.032	0
	0.001	0.00	0.06	0.031	0
Passing Finest Mesh (set Diameter = 0)	0	0.00	0.06	0.030	0
	Total for Sample:	100			0.411710883
	Surface Area per kg:				**4.12**

Grain size data for four waste rock piles, from Munroe et al., 1999).

Site A		
Grain size		wt.%
>2	mm	57.700
<2	mm	42.3
2–1	mm	7
1–0.5	mm	9.7
0.5–0.25	mm	10.5
0.25–0.125	mm	7.1
0.125–0.063	mm	4.2
<0.063	mm	3.8
		100

WRP-B (Munroe 1999)

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A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100,000	75.4	0	200000	8.37778E-07
	50	0	100000	50025	0
	25	0	100000	50012.5	0
	19	0	100000	50009.5	0
	13	0	100000	50006.5	0
	9.5	0	100000	50004.75	0
	6.7	0	100000	50003.35	0
#4	4.75	0	100000	50002.375	0
#5	4		100000	50002	0
#6	3.36	0	100000	50001.68	0
#7	2.83	0	100000	50001.415	0
#8	2.38	0	100000	50001.19	0
#10	2	0	100000	50001	0
#12	1.68	0	100000	50000.84	0
#14	1.41	0	100000	50000.705	0
#16	1.19	0	100000	50000.595	0
#18	1	6.5	100000	50000.5	2.88886E-07
#20	0.84	0	1	0.92	0
#25	0.71	0	1	0.855	0
#30	0.59	0	1	0.795	0
#35	0.5	6.2	1	0.75	0.01837037
#40	0.42	0	0.5	0.46	0
#45	0.35	0	0.5	0.425	0
#50	0.297	0	0.5	0.3985	0
#60	0.25	4.3	0.5	0.375	0.025481481
#70	0.21	0	0.25	0.23	0
#80	0.177	0	0.25	0.2135	0
#100	0.149	0	0.25	0.1995	0
#120	0.125	2.7	0.25	0.1875	0.032
#140	0.105	0	0.125	0.115	0
#170	0.088	0	0.125	0.1065	0
#200	0.074	0	0.125	0.0995	0
#250	0.063	1.9	0.125	0.094	0.044917258
#270	0.06	3.00	0.063	0.0615	0.108401084
	0.046	0.00	0.06	0.053	0
	0.033	0.00	0.06	0.0465	0
	0.024	0.00	0.06	0.042	0
	0.017	0.00	0.06	0.0385	0
	0.013	0.00	0.06	0.0365	0
	0.009	0.00	0.06	0.0345	0
	0.006	0.00	0.06	0.033	0
	0.004	0.00	0.06	0.032	0
	0.003	0.00	0.06	0.0315	0
	0.001	0.00	0.06	0.0305	0
Passing Finest Mesh (set Diameter = 0)	0	0.00	0.06	0.03	0
	Total for Sample:	100			0.22917132
	Surface Area per kg:				**2.29**

Grain size data for four waste rock piles, from Munroe et al., 1999).

Site B		
Grain size		wt.%
		Site B
>2	mm	75.4
<2	mm	24.6
2–1	mm	6.5
1–0.5	mm	6.2
0.5–0.25	mm	4.3
0.25–0.125	mm	2.7
0.125–0.063	mm	1.9
<0.063	mm	3
		100

WRP-C (Munroe 1999)

GRAIN 3.0©,TM

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100,000	74.6	0	200000	8.28889E-07
	50	0	100000	50025	0
	25	0	100000	50012.5	0
	19	0	100000	50009.5	0
	13	0	100000	50006.5	0
	9.5	0	100000	50004.75	0
	6.7	0	100000	50003.35	0
#4	4.75	0	100000	50002.375	0
#5	4		100000	50002	0
#6	3.36	0	100000	50001.68	0
#7	2.83	0	100000	50001.415	0
#8	2.38	0	100000	50001.19	0
#10	2	0	100000	50001	0
#12	1.68	0	100000	50000.84	0
#14	1.41	0	100000	50000.705	0
#16	1.19	0	100000	50000.595	0
#18	1	5.8	100000	50000.5	2.57775E-07
#20	0.84	0	1	0.92	0
#25	0.71	0	1	0.855	0
#30	0.59	0	1	0.795	0
#35	0.5	5.4	1	0.75	0.016
#40	0.42	0	0.5	0.46	0
#45	0.35	0	0.5	0.425	0
#50	0.297	0	0.5	0.3985	0
#60	0.25	3.6	0.5	0.375	0.021333333
#70	0.21	0	0.25	0.23	0
#80	0.177	0	0.25	0.2135	0
#100	0.149	0	0.25	0.1995	0
#120	0.125	2.9	0.25	0.1875	0.03437037
#140	0.105	0	0.125	0.115	0
#170	0.088	0	0.125	0.1065	0
#200	0.074	0	0.125	0.0995	0
#250	0.063	3.1	0.125	0.094	0.073286052
#270	0.06	4.60	0.063	0.0615	0.166214995
	0.046	0.00	0.06	0.053	0
	0.033	0.00	0.06	0.0465	0
	0.024	0.00	0.06	0.042	0
	0.017	0.00	0.06	0.0385	0
	0.013	0.00	0.06	0.0365	0
	0.009	0.00	0.06	0.0345	0
	0.006	0.00	0.06	0.033	0
	0.004	0.00	0.06	0.032	0
	0.003	0.00	0.06	0.0315	0
	0.001	0.00	0.06	0.0305	0
Passing Finest Mesh (set Diameter = 0)	0	0.00	0.06	0.03	0
	Total for Sample:	100			0.311205838
	Surface Area per kg:				**3.11**

Grain size data for four waste rock piles, from Munroe et al., 1999).

Site C		
Grain size		wt.%
>2	mm	74.600
<2	mm	25.4
2–1	mm	5.8
1–0.5	mm	5.4
0.5–0.25	mm	3.6
0.25–0.125	mm	2.9
0.125–0.063	mm	3.1
<0.063	mm	4.6
		100

WRP-D (Munroe 1999)

GRAIN 3.0©,TM

A SPREADSHEET TO CALCULATE GRAIN-SURFACE AREA FROM SIEVE ANALYSES (from MDAG Publishing, www.mdag.com)

Specific Gravity of Sample Solids: 2.7

Mesh Size	Sieve Diameter (mm)	Wt. Retained On Sieve (g)	Last Mesh with Wt. > 0	Average Particle Diameter (mm)	Calculated Grain-Surface Area (m^2)
	100,000	54.4	0	200000	6.04444E-07
	50	0	100000	50025	0
	25	0	100000	50012.5	0
	19	0	100000	50009.5	0
	13	0	100000	50006.5	0
	9.5	0	100000	50004.75	0
	6.7	0	100000	50003.35	0
#4	4.75	0	100000	50002.375	0
#5	4		100000	50002	0
#6	3.36	0	100000	50001.68	0
#7	2.83	0	100000	50001.415	0
#8	2.38	0	100000	50001.19	0
#10	2	0	100000	50001	0
#12	1.68	0	100000	50000.84	0
#14	1.41	0	100000	50000.705	0
#16	1.19	0	100000	50000.595	0
#18	1	9.1	100000	50000.5	4.0444E-07
#20	0.84	0	1	0.92	0
#25	0.71	0	1	0.855	0
#30	0.59	0	1	0.795	0
#35	0.5	11.3	1	0.75	0.033481481
#40	0.42	0	0.5	0.46	0
#45	0.35	0	0.5	0.425	0
#50	0.297	0	0.5	0.3985	0
#60	0.25	9.7	0.5	0.375	0.057481481
#70	0.21	0	0.25	0.23	0
#80	0.177	0	0.25	0.2135	0
#100	0.149	0	0.25	0.1995	0
#120	0.125	4.6	0.25	0.1875	0.054518519
#140	0.105	0	0.125	0.115	0
#170	0.088	0	0.125	0.1065	0
#200	0.074	0	0.125	0.0995	0
#250	0.063	5.6	0.125	0.094	0.132387707
#270	0.06	5.30	0.063	0.0615	0.191508582
	0.046	0.00	0.06	0.053	0
	0.033	0.00	0.06	0.0465	0
	0.024	0.00	0.06	0.042	0
	0.017	0.00	0.06	0.0385	0
	0.013	0.00	0.06	0.0365	0
	0.009	0.00	0.06	0.0345	0
	0.006	0.00	0.06	0.033	0
	0.004	0.00	0.06	0.032	0
	0.003	0.00	0.06	0.0315	0
	0.001	0.00	0.06	0.0305	0
Passing Finest Mesh (set Diameter = 0)	0	0.00	0.06	0.03	0
	Total for Sample:	100			0.469378779
	Surface Area per kg:				**4.69**

Grain size data for four waste rock piles, from Munroe et al., 1999).

Site D		
Grain size		wt.%
>2	mm	54.400
<2	mm	48.6
2–1	mm	9.1
1–0.5	mm	11.3
0.5–0.25	mm	9.7
0.25–0.125	mm	4.6
0.125–0.063	mm	5.6
<0.063	mm	5.3
		100