Final Report
RE: Murray Brook VMS Zn-Cu-Pb-Ag-Au Deposit
Scoping Metallurgical Test Program
Reference No.: MIS-J1859

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SUMMARY

The Murray Brook deposit is a polymetallic, volcanic hosted massive-sulfide deposit in the Bathurst Mining Camp in New Brunswick. Sulfides in the deposit are mainly fine grained, massive, weakly laminated pyrite with disseminated and banded sphalerite, chalcopyrite and galena. The property is located approximately 60 km west of the town of Bathurst. Rodney Thomas, GM - North American Mineral Exploration, Votorantim Metals Canada Inc. has contracted RPC to carry out metallurgical studies on representative Murray Brook drill core. The three drill hole samples provided by Votorantim for the study were separated into sections based on visible alteration (Table 1). MB-2012-121 was separated into Top (~21kg), Bottom (~1,047kg); MB-2012-124 Top (~135kg), Middle (~106kg), Bottom (~878kg); MB-2012-132 Bulk (~1,039kg).

Table 1
Average Drill Hole Assay

Hole ID	Wt (kg)	Fe (%)	Cu (%)	Pb (%)	Zn (%)	Au (g/t)	Ag (g/t)
Votorantim Average DH Assay							
MB-2012-121 - Average Top	21		1.03	0.76	0.95	0.88	36
MB-2012-121 - Average Bottom	1047		0.54	0.83	1.80	0.88	42
MB-2012-124 - Average Top	135		1.07	1.62	5.11	0.33	80
MB-2012-124 - Average Middle	106		0.14	1.72	4.17	0.17	62
MB-2012-124 - Average Bottom	878		0.19	0.74	2.62	0.25	34
MB-2012-132 - Average	1039		1.15	1.64	5.27	0.58	61
Metallurgical Sample Assay							
MB-2012-121		37.55	0.53	0.96	2.02	0.72	32
MB-2012-124		39.38	0.18	0.78	2.77	0.23	27
MB-2012-132		37.41	0.16	1.39	4.34	0.59	53
Composite (121, 124, 132)		39.44	0.33	1.14	3.42	0.51*	47

*Calculated value

Grindability tests determined that the Murray Brook ore was classified as medium in terms of its RWI value (14.6 kWh/t, hardness percentile = 55%) and soft in terms of its BWI value (10.7 kWh/t, hardness percentile = 10%). SEM-EDS mineralogical examination showed that pyrite was the prominent mineral in all samples. In general, sphalerite and galena occur as an interstitial phase as well as inclusions, fine vienlets and attachments to pyrite. Chalcopyrite was rare (not found in Hole 132 sample) and occurs as interstitial to pyrite. Covellite (CuS) secondary Cu mineralization was present in Hole 124. Most of the target mineral occurrences are <20 µm though 50-100 µm sphalerite interstitial with pyrite are present, particularly in Hole 132. The main Ag bearing mineral is tetrahedrite.

Preliminary bulk sulphide rougher floats (reagent regime = 400g/t $CuSO_4$, pH 10-10.5, 33.3g/t 3418A, 10g/t PAX, 15g/t MIBC, 11min total, 1250rpm) to estimate flotation performance were carried out. Rougher target liberation grind size was determined to be D_{80} of ~30µm.

Initial float testing was carried out to evaluate sequential Cu+Pb+Zn flotation versus CuPb bulk+Zn flotation flowsheets for the Murray Brook ore. Secondary mineralization

in Hole 124 affected the flotation performance in the initial work so tests were carried out separately on the individual drill holes and selected zones as well as a ⅓ blend of each hole excluding the oxidized zones (Top & Middle Hole 124). The flotation performance was found to be satisfactory providing the top and middle zones were excluded and the latter blend sample (1/3 of each Hole 121, 122 & 132) was selected to move forward to the locked cycle testing. The locked cycle test sample was prepared in a series of 1.75kg batches in a small rod mill using the same rod charge and time required to meet the target rougher float grind size (D_{80} = 28.7µm) for the Cu/Pb/Zn rougher floats. Sequential rougher floats (27) were carried out to provide sufficient Cu (2.74kg), Pb (4.27kg) and Zn (8.60kg) rougher concentrate samples for the locked cycle cleaning tests (8 cycles). The flotation performance was confirmed in a locked cycle test. Overall recoveries of 88.8% Zn, 51.4% Cu and 36.6% Pb were achieved in the initial locked cycle test. Lower than expected rougher recovery in the blended 27 rougher floats resulted in overall low Cu and Pb recoveries. Individual locked cycle rougher test recovery/grade results were quite variable (up to ~80% vs 63.6% for Cu, up to ~75% vs 58.3% for Pb); however, indicating that higher recoveries were achievable that would increase overall recoveries of Cu and Pb to ~60% and ~50%, respectively. Locked cycle summary results, Cu/Pb/Zn recoveries and detailed results are presented in Tables 2, 3 and 4. The Pb cleaning recovery was low at 62.7%, potentially due to oxidation. In addition, it was not successful to recover lead from the Cu cleaner scavenger tails which further affected the Pb rougher recovery.

The locked cycle test was carried out over several weeks due to the amount of time required to produce sufficient rougher concentrate. It is recommended that a grind curve be established for the larger ball mill which can grind ~20kg batches that would be immediately be followed by rougher flotation in 32L cells capable of handling much larger feed capacity and subsequently less chance of oxidation. The performance of the Pb circuit was disappointing so oxidation may have contributed to this result. During the locked cycle the used of MIBC was restricted in the cleanings resulting in higher recoveries and grades. Additional optimization tests will be carried out in both the roughers and cleaners to further optimize reagent dosage and flotation times prior to the large batch locked cycle test.

Table 2
Locked Cycle Summary Results

Test	Assay (%)						Distribution (%)					
	Fe	Cu	Pb	Zn	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
Cu Rougher Con	34.15	3.43	2.43	5.10	282	0.839	5.4	63.6	12.0	9.0	37.6	9.8
Final Cu Con	28.77	17.45	6.16	6.04	591	1.051	12.7	80.8	37.8	19.1	33.3	20.2
Pb Rougher Con	35.39	0.37	7.58	5.28	135	0.714	8.7	10.6	58.3	14.6	28.1	13.0
Final Pb Con	13.25	2.40	50.30	5.27	833	0.923	3.5	67.9	62.7	9.5	62.0	14.2
Zn Rougher Con	34.05	0.36	1.11	12.43	80	0.659	22.5	27.6	23.0	91.9	44.6	32.3
Final Zn Con	10.53	0.48	1.08	53.78	95	0.362	7.7	57.2	35.9	96.6	56.7	16.9
Final Rougher Tails	37.11	0.062	0.32	0.20	11	0.386	68.7	13.4	18.4	4.2	17.4	53.0

Table 3
Locked Cycle Cu/Pb/Zn Recoveries

Recovery	Circuit	Cu	Pb	Zn	Total
Copper	Cu Rougher	63.6%			
	Cu Cleaner	80.8%			
	Total Cu	51.4%			**51.4%**
	Total Ag				**12.5%**
	Total Au				**2.0%**
Lead	Pb Rougher		58.3%		
	From Cu Cleaner		0.0%		
	Total Pb Rougher		58.3%		
	Pb Cleaner		62.7%		
	Total Pb		36.6%		**36.6%**
	Total Ag				**17.5%**
	Total Au				**1.8%**
Zinc	Zn Rougher			72.2%	
	From Cu Cleaner			6.6%	
	From Pb Cleaner			13.1%	
	Total Zn Rougher			91.9%	
	Zn Cleaner			96.6%	
	Total Zn			88.8%	**88.8%**
	Total Ag				**25.3%**
	Total Au				**5.5%**

Table 4
Murray Brook Locked Cycle Tests (Rougher Test #1 - #27) Detailed Results

Description	Sample/Circuit	Mass	Mass	Assays						Distribution Ratio (%)					
		(g)	Dist. (%)	Fe (%)	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
Hole 121	Bottom	15908	33.3	36.16	0.48	0.95	1.88	42	0.906	32.7	59.7	27.4	18.4	31.0	51.5
Hole 124	Bottom	15908	33.3	39.55	0.19	0.82	2.91	35	0.263	35.8	23.3	23.8	28.4	25.6	14.9
Hole 132	Whole	15908	33.3	34.92	0.14	1.68	5.46	59	0.591	31.6	17.0	48.8	53.2	43.5	33.6
Average		47724	100.0	36.87	0.27	1.15	3.42	45	0.590	100.0	100.0	100.0	100.0	100.0	100.0
Cu Rghr Recovery	Rougher Con	2740	5.7	34.15	3.43	2.43	5.10	282	0.839	5.4	63.6	12.0	9.0	37.6	9.8
Cu Clnr Recovery	Final Cu Clnr 3 Con	416	0.9	28.77	17.45	6.16	6.04	591	1.051	12.7	80.8	37.8	19.1	33.3	20.2
	Cu Cleaner Tails	2324	4.9	34.79	0.82	1.92	4.61	203	0.800	4.7	12.9	8.0	6.9	23.0	7.9
	Rougher Tail	47308	99.1												
Overall Cu Recovery										0.7	51.4	4.5	1.7	12.5	2.0
	Cu Cleaner Tails	2324	4.9	34.79	0.82	1.92	4.61	203	0.800	4.7	12.9	8.0	6.9	23.0	7.9
Pb Rghr Recovery	Rougher Con	4270	8.9	35.39	0.37	7.58	5.28	135	0.714	8.7	10.6	58.3	14.6	28.1	13.0
Pb Clnr Recovery	Final Pb Clnr 4 Con	405	0.8	13.25	2.40	50.30	5.27	833	0.923	3.5	67.9	62.7	9.5	62.0	14.2
	Pb Cleaner Tails	3864	8.1	38.65	0.12	3.14	5.26	54	0.502	96.5	32.1	37.3	90.5	38.0	85.8
	Rougher Tail	46902	98.3												
Overall Pb Recovery										0.3	7.2	36.6	1.4	17.5	1.8
Zn Rghr - Cu Clnr Tails	Zn Rghr Con (Cu CT)	1168	2.4	30.03	1.54	1.66	8.78	369	0.805	2.0	12.2	3.5	6.6	21.0	4.0
Zn Rghr - Pb Clnr Tails	Zn Rghr Con (Pb CT)	1687	3.5	32.94	0.26	2.72	11.99	82	0.564	3.2	3.0	8.3	13.1	6.7	4.1
Zinc	Zn Rghr Con (Pb RT)	8599	18.0	34.82	0.21	0.73	13.01	40	0.659	17.2	12.4	11.2	72.2	16.9	24.2
Total Zn Rghr Recovery	Total Rougher	11454	24.0	34.05	0.36	1.11	12.43	80	0.660	22.5	27.6	23.0	91.9	44.6	32.3
Zn Clnr Recovery	Final Zn Clnr 4 Con	2913	6.1	10.53	0.48	1.08	53.78	95	0.360	7.7	57.2	35.9	96.6	56.7	16.9
	Zn Cleaner Tails	8541	17.9	43.02	0.12	0.66	0.64	25	0.610	92.3	42.8	64.1	3.4	43.3	83.1
	Zn Rghr Tail (Cu CT)	1156	2.4	35.05	0.17	1.97	0.73	21	0.385	2.3	1.3	4.1	0.5	1.2	1.9
	Zn Rghr Tail (Pb CT)	2178	4.6	39.83	0.11	2.28	0.73	21	0.473	5.0	1.6	8.9	1.0	2.2	4.4
Zinc	Rougher Tail	32115	67.3	37.11	0.062	0.32	0.20	11	0.386	68.7	13.4	18.4	4.2	17.4	53.0
Calc. Head		47724	100.0	36.37	0.31	1.16	3.25	43	0.491	100.0	100.0	100.0	100.0	100.0	100.0
Head Assays				36.02	0.29	1.17	3.12	43	0.595						
Overall Zinc Recovery										1.7	15.8	8.3	88.8	25.3	5.5

INTRODUCTION

The Murray Brook deposit is a polymetallic, volcanic hosted massive-sulfide deposit in the Bathurst Mining Camp in New Brunswick. The property is located approximately 60 km west of the town of Bathurst. Rodney Thomas, GM - North American Mineral Exploration, Votorantim Metals Canada Inc. has contracted RPC to carry out metallurgical studies on representative Murray Brook drill core.

Sulfides in the deposit are mainly fine grained, massive, weakly laminated pyrite with disseminated and banded sphalerite, chalcopyrite and galena. El Niño Ventures Inc., in partnership with Votorantim Metals Canada Inc., carried out extensive drilling in 2011 to evaluate the resource, which is approximately 22M tonnes (Table 5). In February 2012, El Niño Ventures Inc. announced an initial NI 43-101 Mineral Resource Estimate for the Murray Brook Zn-Cu-Pb-Ag-Au deposit.

A detailed mineralogical report carried out by Dr. Peter Fischer was provided to assist in the study. Typically the lower grade of Cu (<0.5%) would require floating Cu & Pb together in the roughers followed by Zn flotation of the Cu/Pb rougher tails. Both Cu/Pb + Zn and sequential Cu + Pb + Zn recovery were to be examined in the study. The Cu/Pb bulk flotation is common to the Bathurst Camp mineralization and used by both the former Heath Steele and Xstrata Zinc Brunswick operation. The production of individual Cu/Pb/Zn concentrates in sequential flotation is always the simpler preferred option.

RPC received bulk test core samples from drill three holes (MB-2012-121, 124, 132) as provided by Votorantim. Prior to shipment to RPC the drill core was inspected and separated into zones based on evident alteration. The drill hole samples were then prepared for the initial scoping metallurgical test program, which consisted of sample preparation, characterization and flowsheet development through scoping/optimization based on a series of rougher and cleaning flotation tests. The flotation performance was confirmed in a locked cycle test.

Table 5
Murray Brook Resource Estimate

Category	Tonnes	Cu (%)	Pb (%)	Zn (%)	Au (g/t)	Ag (g/t)
Measured	1,621,000	0.27	1.19	3.53	0.50	44.1
Indicated	17,063,000	0.43	0.93	2.52	0.51	38.8
Inferred	3,021,000	0.62	0.75	1.83	0.75	35.0

PROGRAM RESULTS

Sample Preparation and Characterization

Bathurst Office and Core Storage Visit

Garth Graves, Senior Geologist, Votorantim Metals Canada Inc. contacted RPC regarding secondary mineralization apparent in the upper sections of two (Hole 121, Hole 124) of the three metallurgical test holes. A visit to the Bathurst office was made to examine the core prior to shipping to RPC. Each of the holes was laid out and the zones where potential secondary mineralization or fracturing was showing in the two holes were marked off and sampled separately. Approximately 21.1 kg in Hole 121 labeled "Top" and 135 kg labeled "Top" and 105.7 kg labeled "Middle" in Hole 124 were placed in separate sample bags. The samples were processed at RPC and evaluated to see if they could be combined with the rest of the sample. General hole description is presented in Table 6. Pictures taken during the visit are presented in Figures 1-7.

Table 6
Sample General Description

Hole	Label	Depth	~Wt. (kg)	Description
MB-2012-121	top	13.5 - 16.0 & 21.6 - 23.8	21	oxidized (excluded barren sediment).
MB-2012-121	bottom	23.8 - 150.6	1047	not oxidized, several minor fractures near top
MB-2012-124	top	25.7 - 45.3	135	oxidized
MB-2012-124	middle	45.3 - 56.7	106	less oxidized
MB-2012-124	bottom	56.7 - 160	878	not oxidized
MB-2012-132		88.25 - 217.65	1039	not oxidized

Figure 1: Core Boxes Hole 121, 124, 132

Figure 2: Hole 121 Top Oxidized Section

Figure 3: Marking Core Sections (Hole 121)

Figure 4: Hole 124 Top (left) Middle (right)

Figure 5: Cutting Core

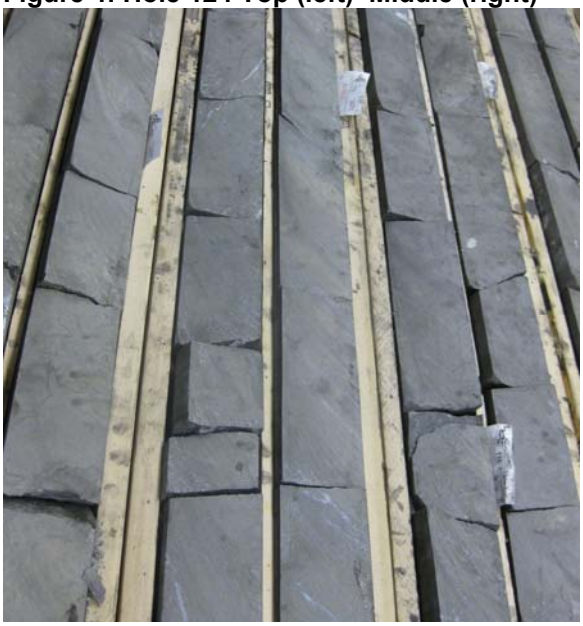


Figure 6: Hole 124 Bottom

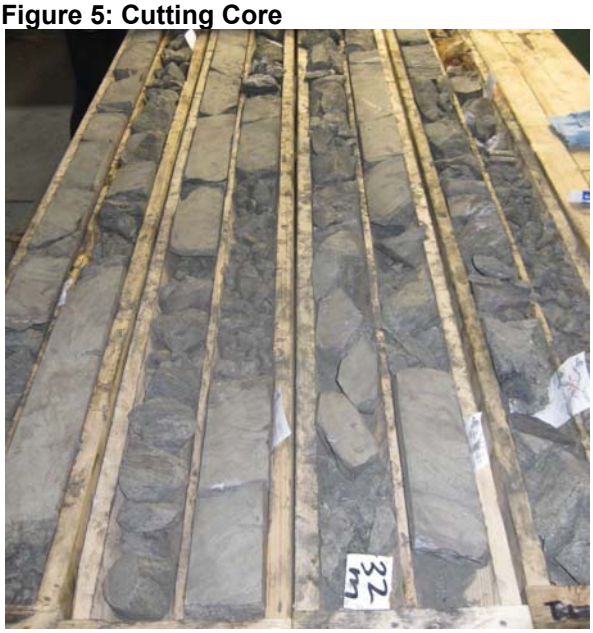


Figure 7: Hole 124 Top

Hole 121 and 124 were received on May 7, 2012 and Hole 132 May 8, 2012. The Hole 121 (Top & Bottom), Hole 124 (Top, Middle & Bottom) and Hole 132 bulk drill core samples were crushed through to approximately minus ¾", blended and split for head assays (Table 2 drill hole assay data from Votorantim) and the initial scoping metallurgical test program. Coarser sample sections (~6") required for additional testing to be carried out subsequent to the Phase 1 program were selected and set aside from each drill core section. The bulk minus ¾" samples were stored in sealed drums for a subsequent pilot scale test program. The split samples (~250kg) were crushed further to minus ¼" and processed as required for subsequent milling and scoping flotation tests. A blend sample was produced (⅓ each by weight Hole 132, 124 & 121) representing the 3 drill core sections for the initial tests.

Hole 121, Hole 124 and Hole 132 bulk drill core assay data reported from Votorantim is presented in Table 7. Head assay data from crushed, blended and split samples as well as the composite sample (⅓ each by weight Hole 132, 124 & 121) are also presented in Table 7.

Table 7
Average Drill Hole Assay

HoleID	From	To	Length	Fe (%)	Cu (%)	Pb (%)	Zn (%)	Au (ppm)	Ag (ppm)
Votorantim Average DH Assay									
MB-2012-121 - Average Top	13.5	24	4.63		1.03	0.76	0.95	0.88	36
MB-2012-121 - Average Bottom	24	150.6	126.6		0.54	0.83	1.80	0.88	42
MB-2012-124 - Average Top	25.7	45	19.3		1.07	1.62	5.11	0.33	80
MB-2012-124 - Average Middle	45	56	11		0.14	1.72	4.17	0.17	62
MB-2012-124 - Average Bottom	56	160	104		0.19	0.74	2.62	0.25	34
MB-2012-132 - Average	86	218	132		1.15	1.64	5.27	0.58	61
Metallurgical Sample Assay									
MB-2012-121				37.55	0.53	0.96	2.02	0.72	32
MB-2012-124				39.38	0.18	0.78	2.77	0.23	27
MB-2012-132				37.41	0.16	1.39	4.34	0.59	53
Composite (121, 124, 132)				39.44	0.33	1.14	3.42	0.51*	47

*Calculated value

Grind curve data D_{80} micron particle size for the composite sample has been updated in summary Table 8 and Figure 8. Grind curve for the composite sample was almost identical to drill Hole 121.

Table 8
Grind Curve Data

Grind Time (min)	Hole 132 (D80µm)	Hole 124 (D80µm)	Hole 121 (D80µm)	Composite (D80µm)
30	102.4			
45	63.3	48.4		48.9
60	37.6	34.1	31.6	32.0
75	31.5	28.8	26.8	28.7
90	25.8	24.5	24.6	24.6
120	20.9			

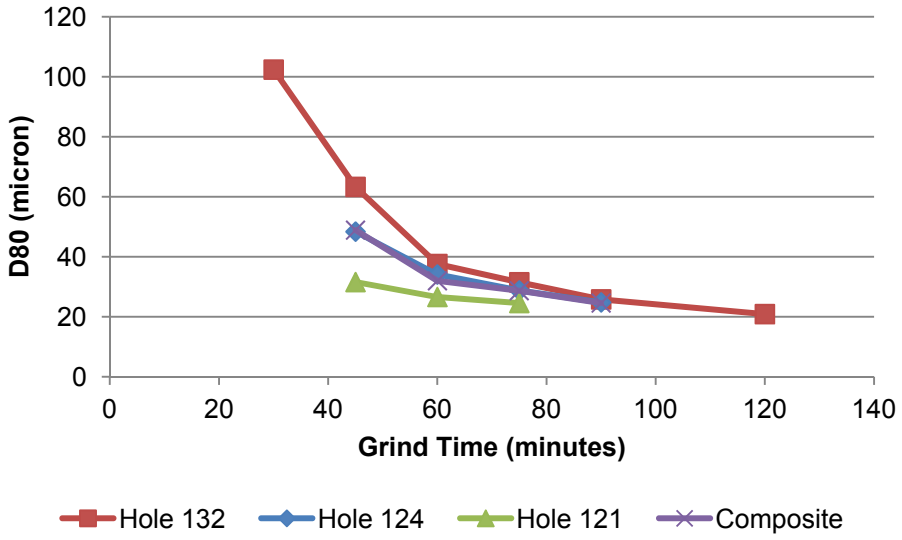


Figure 8: Hole 132, 124, 121 Grind Curves

SEM-EDS Mineralogy

Split samples from the composite as well as each individual drill core section were crushed to ~200µm and submitted for SEM-EDS examination. In addition, a composite bulk rougher float tailings sample (75min grind, D_{80} = 28.7µm) was submitted to determine Cu/Pb/Zn mineral liberation.

Pyrite was the prominent mineral in all samples. In general, sphalerite and galena occur as an interstitial phase as well as inclusions, fine vienlets and attachments to pyrite. Chalcopyrite was rare (not found in Hole 132 sample) and occurs as interstitial to pyrite. Covellite (CuS) secondary Cu mineralization was present in Hole 124. Most of the of the target mineral occurrences are <20µm though 50-100µm sphalerite interstitial with pyrite are present, particularly in Hole 132. The main Ag bearing mineral is tetrahedrite.

During the course of the scoping flotation test program additional samples were submitted for mineralogical examination. Cleaner 2 float and final scavenger tails samples from the Zn circuit cleaning trials were submitted for SEM-EDS examination to investigate potential reasons for cleaning result losses. In both cases and in particular the final scavenger tails, the samples consist of well liberated discrete grains suggesting that other factors are responsible for metal losses. Factors such as secondary mineralization and residual flotation chemicals were investigated in subsequent tests. Residual flotation chemicals can be removed through steam cleaning of Cu/Pb rougher concentrates prior to cleaning. Hole 132 showed no visual evidence of secondary mineralization and will be floated separately to confirm if this is a factor influencing cleaning performance.

Detailed SEM-EDS mineralogical examination results as well as microphotographs can be found in the Appendix.

Hole 121 – Bottom

The sample consists of elongate to equant, irregular fragments <800µm. The fragments are predominantly composite, and range from sulphide-rich to sulphide-poor. Sulphide-rich fragments largely consist of granular, equant subhedral-euhedral pyrite with varied amounts of anhedral interstitial sphalerite and galena. Less common are chalcopyrite, tetrahedrite, and arsenopyrite, which also commonly occur as interstitial phases in pyrite-rich fragments. Pyrite is typically coarser-grained than the other sulphides. There are, however, uncommon fragments consisting predominantly of either chalcopyrite or sphalerite, with subordinant pyrite. Bismuth metal, tetrahedrite, and an unidentified Pb-Bi-Sb-Cu sulphosalt are rare. Some fragments contain abundant quartz or carbonate. Carbonate minerals are more abundant than quartz, and consist predominantly of siderite.

Siderite together with ferruginous dolomite is also a common association, in which siderite may be the dominant or subordinant phase. Calcite is rare. Other silicate minerals identified are chlorite and muscovite. Monomineralic fragments typically consist of either pyrite or a carbonate mineral. Most monomineralic fragments are <20µm and those >50µm are rare. Overall, the sample consists of approximately 30% non-sulphides, 65% pyrite, and 5% other sulphides.

Hole 132 – Whole Sample

This sample consists of fragments of <1mm, but mostly <400µm. The largest fragments tend to be very elongate. The sample consists predominantly of pyrite and sphalerite, with lesser galena. Arsenopyrite is a minor phase. Most fragments are pyrite-rich, with other sulphide minerals present as inclusions in pyrite or as interstitial phases. Rare fragments are sphalerite-rich (50-100µm), with interstitial pyrite and galena. Copper-bearing phases have not been identified. Non-silicates consist of calcite, ferruginous dolomite, and quartz, with minor siderite, muscovite, and chlorite. Some fragments are sulphide-poor, and consist of subhedral-euhedral pyrite dispersed in a silicate or carbonate matrix. Many fragments <50µm are monomineralic, but monomineralic fragments >50µm are rare. Overall, the sample consists of approximately 25% non-sulphides, 65% pyrite, and 10% other sulphides.

Hole 124 – Top, Middle, Bottom (MB-Blend2)

This sample consists of irregular fragments <1 mm. Fragments >600µm are typically very elongate. Pyrite is the dominant mineral. Most fragments consist predominantly of pyrite with interstitial sphalerite, galena, and non-sulphides. Chalcopyrite, bournonite, and boulangerite, and covellite are present in trace amounts. Although most fragments consist of >80% pyrite, rare fragments are either sphalerite-rich, or arsenopyrite-rich, together with interstitial pyrite. Gangue minerals consist predominantly of quartz and ferruginous dolomite, but muscovite and chlorite are also present in minor amounts. Cerussite and siderite are present in trace amounts. Overall, the sample consists of approximately 20% non-sulphides, 75% pyrite, and 5% other sulphides.

Composite: Hole 121 Bottom, Hole 124 – Top, Middle, Bottom, Hole 132 (MB-Blend1)

The sample consists of fragments <1 mm, but most are <500µm. Pyrite is the dominant sulphide mineral. Other sulphides (predominantly sphalerite and galena, with lesser arsenopyrite) are typically included or interstitial to pyrite. Rare fragments are sphalerite-rich, with lesser pyrite, and consist of euhedral or subhedral pyrite in a sphalerite matrix. Galena is a minor phase in virtually all fragments, and is fine-grained (<20um). Non-silicates consist of quartz and calcite, with lesser amounts of ferruginous dolomite and chlorite, and minor amounts of siderite, cassiterite, and muscovite. Bournonite, boulangerite, tetrahedrite, covellite, and famatinite are present in trace amounts only. Overall, the sample consists of 25% non-sulphides, 70% pyrite, and 5% other sulphides.

Composite Rougher Tailings (MB-Comp-75-RT, 75min grind, D_{80} = 28.7µm)

The sample consists predominantly of fragments <30µm. Virtually all fragments are <50µm. They range from equant to elongate, and are typically angular. The fragments are predominantly monomineralic. Pyrite and non-sulphide minerals are about equally abundant. Other sulphide minerals (arsenopyrite, sphalerite, and galena) are of minor to trace abundance. Composite fragments typically consist of pyrite with interstitial or included sphalerite, galena, and/or arsenopyrite. Some consist of pyrite and arsenopyrite with included sphalerite. Non-sulphide minerals consist of magnetite, quartz, chlorite, and calcite. Sphalerite and galena losses to tailings occur largely as a fine-grained (<10µm) interstitial phase as well as inclusions (<10µm) and attachments (<20µm) to pyrite.

Cu Scavenger Tails

This sample consists of irregular, angular fragments, ranging from equant to elongate. Fragment sizes are predominantly <10um, although some elongate fragments have long dimensions that range up to approximately 15µm. Gangue minerals consist predominantly of quartz and chlorite, although dolomite, calcite, apatite, muscovite, and Fe-oxide are also present. The principal sulphide mineral is pyrite. Other sulphide minerals identified are sphalerite, arsenopyrite, tetrahedrite (Ag), and galena. The sample predominantly consists of discrete grains; therefore the ore minerals in question were well liberated.

Cu Clnr2Con

This sample consists mostly of irregular, angular fragments, ranging from equant to elongate. Fragment sizes are predominantly <10µm, although some elongate fragments have long dimensions that range up to approximately 20µm. Gangue minerals predominantly consist of calcite and quartz, although dolomite, chlorite, and Fe-oxide are also present. The principal sulphide mineral is pyrite. Other sulphide minerals identified are chalcopyrite, sphalerite, arsenopyrite, bornite, tetrahedrite (Ag), galena, and bournonite. The sample predominantly consists of discrete grains; therefore the ore minerals in question were well liberated.

Zn cleaner 2 concentrate and final scavenger tails samples were examined by micro-probe assay to determine Fe levels in the sphalerite grains. The Fe levels were relatively close in the tailings grains analyzed. The results are presented in Table 9.

Table 9
Electron Micro-Probe Assay Results

Filename	Fe	Filename	Fe
Scvgtsph01.spc	9.58	Clnr2Consph01.spc	9.61
Scvgtsph02.spc	10.24	Clnr2Consph02.spc	9.43
Scvgtsph03.spc	8.49	Clnr2Consph03.spc	8.77
Scvgtsph04.spc	6.41	Clnr2Consph04.spc	7.47
Scvgtsph05.spc	8.25	Clnr2Consph05.spc	7.77
Scvgtsph07.spc	9.64	Clnr2Consph06.spc	7.87
Scvgtsph08.spc	7.27	Clnr2Consph07.spc	8.36
Scvgtsph09.spc	10.34	Clnr2Consph08.spc	9.55
Scvgtsph10.spc	10.1	Clnr2Consph09.spc	5.64
Avg.	**8.92**	Clnr2Consph10.spc	8.25
		Avg.	**8.23**

Grindability

Grindability composite samples (Murray Brook Hole 121, 124 and 132) were submitted for Bond Ball and Rod Mill Grindability Index. The sample was classified as medium in terms of its RWI value (14.6 kWh/t, harness percentile = 55%) and soft in terms of its BWI value (10.7 kWh/t, harness percentile = 10%). Test result details can be found in the Appendix.

Preliminary Rougher Floatability Tests

Each of the timed interval milled samples was evaluated for liberation in preliminary bulk sulphide rougher floats. Reagent regime (400g/t $CuSO_4$, pH 10-10.5, 33.3g/t 3418A, 10g/t PAX, 15g/t MIBC, 11min total, 1250rpm) for the bulk sulphide floats is presented in Table 10. The bulk sulphide float results are useful to estimate flotation performance. Bulk sulphide float chemical assay results are presented in Tables 11 (Hole 132), 12 (Hole 121), 13 (Hole 124) 14 (Composite) and 15 (Summary @ 75min grind). Bulk Sulphide flowsheet is presented in Figure 9. Based on the preliminary bulk sulphide floats 75 minutes of grinding ~30µm achieved the best target mineral liberation (31.5µm – Hole 132, 28.8µm – Hole 124, 26.8µm – Hole 121) with 94.4-96.2% Zn, 79.5-91.8% Cu, 80.5-86.8% Pb and 65.9-84.8% Ag recovered, respectively. The composite sample (⅓ Holes 132, 121, 124) achieved 95.4% Zn, 87.5% Cu, 84.7% Pb and 75.5% Ag. Au recovery was low at 40.6-43.9% for Holes 132, 121 and the Composite sample; 25.2% for Hole 124. Low gold recovery is possible due to being tied up with pyrite, which is rejected in the rougher flotation.

Hole 124 Top and Middle sample fractions were both ground for 75 minutes and bulk sulphide floats were carried out to determine if the floatability was affected by the extent of oxidation. The middle and top sections achieved very good results with 94.4-97.8% Zn, 78.7-89.8% Cu, 85.6-87.1% Pb and 69.4-72.0% Ag recovered, respectively. Au recovery ranged from 31.8-37.2%. Based on the initial floatability tests the respective

zones may be blended in with the rest of the sample. The recovered Hole 121 Top sample weight was very low and thus not evaluated.

Table 10
Bulk Sulphide Flotation Conditions and Reagent Regime

Bulk Sulphide Flotation Conditions
1750g sample, 30-120min grinding in rod mill, p_{80} close to 20-100 µm
400g/t $CuSO_4$, Repulp 10min with aeration; Maintain pH 10.0 to 10.5 with lime; 33.3g/t 3418A, 10g/t PAX and 15g/t MIBC, float 4 mins at 1250rpm
Maintain pH 10.0 to 10.5 with lime; 33.3g/t 3418A, 10g/t PAX and 10g/t MIBC, float 4 mins at 1250rpm
Maintain pH 10.0 to 10.5 with lime; 33.3g/t 3418A, 10g/t PAX and 10g/t MIBC, float 3 mins at 1250rpm

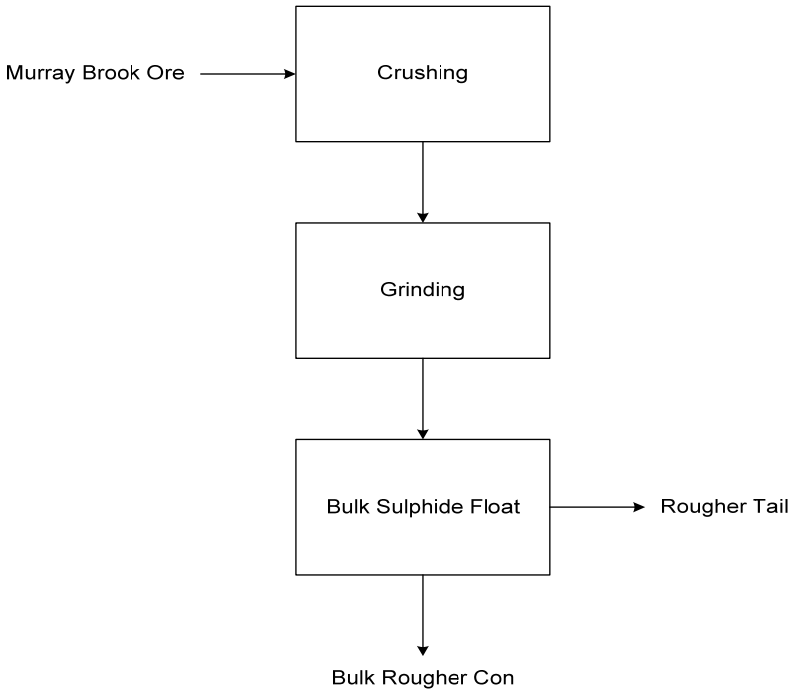


Figure 9: Bulk Sulphide Flotation Flowsheet

Table 11
Bulk Sulphide Flotation Results – Hole 132

Test	Conc. / Tail	Mass	Mass	Chemical Assay Results (%)						Distribution Ratio (%)					
		(g)	Dist. (%)	Fe	Cu	**Pb**	Zn	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
30minG 102.4µm	Rough Con	404.1	23.1	32.34	0.49	4.03	15.74	153	--	21.1	65.0	69.9	87.1	73.0	--
	Rough Tails	1347.0	76.9	36.36	0.079	0.52	0.70	17	--	78.9	35.0	30.1	12.9	27.0	--
	Calc. Head	1751.1		35.43	0.17	1.33	4.17	48	--						
45minG 63.3µm	Rough Con	450.6	27.3	33.04	0.47	3.97	14.39	136	--	25.0	74.9	82.3	94.6	78.5	--
	Rough Tails	1200.7	72.7	37.24	0.059	0.32	0.31	14	--	75.0	25.1	17.7	5.4	21.5	--
	Calc. Head	1651.3		36.09	0.17	1.32	4.2	47	--						
60minG 37.6µ	Rough Con	485.5	27.5	31.39	0.51	4.17	14.62	148	--	23.7	79.4	85.4	95.7	80.0	--
	Rough Tails	1282.7	72.5	38.22	0.050	0.27	0.25	14	--	76.3	20.6	14.6	4.3	20.0	--
	Calc. Head	1768.2		36.34	0.18	1.34	4.20	51	--						
75minG 31.5µm	Rough Con	492.8	27.9	31.77	0.48	4.24	14.46	146	0.842	24.9	80.2	86.8	96.2	82.5	40.6
	Rough Tails	1272.9	72.1	37.09	0.046	0.25	0.22	12	0.477	75.1	19.8	13.2	3.8	17.5	59.4
	Calc. Head	1765.7		35.61	0.17	1.36	4.19	49	0.579						
90minG 25.8µm	Rough Con	418.0	25.0	31.88	0.56	4.84	16.61	158	--	22.3	80.6	86.6	96.3	79.0	--
	Rough Tails	1253.6	75.0	37.05	0.045	0.25	0.21	14	--	77.7	19.4	13.4	3.7	21.0	--
	Calc. Head	1671.6		35.76	0.17	1.40	4.31	50	--						
120minG 20.9µm	Rough Con	413.6	23.3	30.75	0.58	4.80	16.70	158	--	20.4	79.6	85.3	94.2	76.2	--
	Rough Tails	1364.1	76.7	36.38	0.045	0.25	0.31	15	--	79.6	20.4	14.7	5.8	23.8	--
	Calc. Head	1777.7		35.07	0.17	1.31	4.12	48	--						
Head				37.41	0.16	1.39	4.34	53	0.586						

Table 12
Bulk Sulphide Flotation Results – Hole 121

Test	Conc. / Tail	Mass	Mass	Chemical Assay Results (%)						Distribution Ratio (%)					
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
45minG (Btm)	Rough Con	542.8	30.9	28.98	1.53	1.87	5.58			32.8	89.5	81.2	93.2	78.9	
	Rough Tails	1213.3	69.1	29.76	0.04	0.23	0.19			67.2	10.5	18.8	6.8	21.1	
	Calc. Head	1756.1		29.52	0.50	0.74	1.86								
60minG (Btm) 31.6µm	Rough Con	515.1	29.5	39.02	1.66	2.65	6.17	81		30.2	91.2	81.9	95.0	80.9	
	Rough Tails	1232.6	70.5	37.61	0.06	0.25	0.14	8		69.8	8.8	18.1	5.0	19.1	
	Calc. Head	1747.7		38.03	0.54	0.96	1.91	29							
75minG (Btm) 26.8µm	Rough Con	488.7	27.6	39.86	1.83	2.84	6.64	112	1.306	28.5	91.8	81.2	94.7	84.8	43.9
	Rough Tails	1282.2	72.4	38.15	0.06	0.25	0.14	8	0.636	71.5	8.2	18.8	5.3	15.2	56.1
	Calc. Head	1770.9		38.62	0.55	0.96	1.94	36	0.821						
90minG (Btm) 24.6µm	Rough Con	505.9	28.6	28.03	1.67	2.05	5.78			29.0	92.2	82.5	95.3	81.9	
	Rough Tails	1262.5	71.4	30.83	0.02	0.20	0.05			71.0	7.8	17.5	4.7	18.1	
	Calc. Head	1768.4		30.03	0.49	0.73	1.69								
Head				37.55	0.53	0.96	2.02	32	0.720						

Table 13
Bulk Sulphide Flotation Results – Hole 124

Test	Conc. / Tail	Mass	Mass	Chemical Assay Results (%)						Distribution Ratio (%)					
		(g)	Dist (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
75minG (Top)	Rough Con	665.6	37.7	23.07	2.05	3.13	12.70		0.321	32.1	89.8	87.1	97.8	69.4	37.2
	Rough Tails	1099.5	62.3	32.38	0.07	0.34	0.20		0.328	67.9	10.2	12.9	2.2	30.6	62.8
	Calc. Head	1765.1		28.87	0.82	1.39	4.92		0.325						
75minG (Mid)	Rough Con	550.8	30.9	32.98	0.40	5.61	13.85	140	0.227	25.8	78.7	85.6	94.4	72.0	31.8
	Rough Tails	1233.6	69.1	42.42	0.048	0.42	0.37	24	0.217	74.2	21.3	14.4	5.6	28.0	68.2
	Calc. Head	1784.4		39.51	0.16	2.03	4.53	60	0.220						
45minG (Btm) 48.4µm	Rough Con	387.0	22.1	38.92	0.78	2.98	11.99	97		20.7	76.9	78.5	93.5	66.8	
	Rough Tails	1367.5	77.9	42.15	0.07	0.23	0.24	14		79.3	23.1	21.5	6.5	33.2	
	Calc. Head	1754.5		41.44	0.22	0.84	2.83	32							
60minG (Btm) 34.1µm	Rough Con	404.3	22.9	39.13	0.65	2.85	11.14	79		22.1	79.2	81.6	94.3	69.3	
	Rough Tails	1339.5	75.8	41.54	0.05	0.19	0.20	11		77.9	20.8	18.4	5.7	30.7	
	Calc. Head	1743.8		40.98	0.19	0.81	2.74	26							
75minG (Btm) 28.8µm	Rough Con	389.5	22.1	35.44	0.76	2.92	11.18	86	0.261	19.0	79.5	80.5	94.4	65.9	25.2
	Rough Tails	1374.9	77.9	42.80	0.06	0.20	0.19	13	0.220	81.0	20.5	19.5	5.6	34.1	74.8
	Calc. Head	1764.4		41.17	0.21	0.80	2.61	29	0.229						
90minG (Btm) 24.5µm	Rough Con	389.1	23.3	36.48	0.67	2.79	10.92	72		20.1	79.8	80.3	94.3	69.0	
	Rough Tails	1385.4	82.9	40.81	0.05	0.19	0.19	9		79.9	20.2	19.7	5.7	31.0	
	Calc. Head	1774.5		39.86	0.18	0.76	2.54	23							
Head				39.38	0.18	0.78	2.77	27							

Table 14
Composite Bulk Sulphide Float – Hole 132, 121, 124

Test	Conc. / Tail	Mass	Mass	Chemical Assay Results (%)						Distribution Ratio (%)					
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
45minG (Bulk) 48.9µm	Rough Con	415.6	23.7	37.90	1.24	4.22	14.27	149		24.7	81.4	79.4	94.2	72.4	
	Rough Tails	1339.6	76.3	35.83	0.088	0.34	0.27	18		75.3	18.6	20.6	5.8	27.6	
	Calc. Head	1755.2		36.32	0.36	1.26	3.59	49							
60minG (Bulk) 32.0µm	Rough Con	435.0	24.7	34.17	1.24	4.13	13.67	149		22.9	85.0	82.1	95.5	75.9	
	Rough Tails	1326.9	75.3	37.64	0.072	0.30	0.21	16		77.1	15.0	17.9	4.5	24.1	
	Calc. Head	1761.9		36.79	0.36	1.24	3.53	49							
75minG (Bulk) 28.7µm	Rough Con	451.4	25.7	36.74	1.22	3.84	12.17	140	0.643	24.8	87.5	84.7	95.4	75.5	40.8
	Rough Tails	1304.8	74.3	38.59	0.061	0.24	0.20	16	0.323	75.2	12.5	15.3	4.6	24.5	59.2
	Calc. Head	1756.2		38.11	0.36	1.17	3.28	48	0.405						
75minG (Bulk) 28.7µm	Rough Con	429.5	24.3	32.82	1.24	4.44	13.72	153		22.1	85.9	84.1	96.3	77.4	
	Rough Tails	1336.9	75.7	37.09	0.065	0.27	0.17	14		77.9	14.1	15.9	3.7	22.6	
	Calc. Head	1766.4		36.05	0.35	1.28	3.46	48							
90minG (Bulk) 24.5µm	Rough Con	397.9	22.5	34.05	1.28	4.59	14.35	161		20.5	84.7	82.3	95.6	74.4	
	Rough Tails	1370.7	77.5	38.23	0.068	0.29	0.19	16		79.5	15.3	17.7	4.4	25.6	
	Calc. Head	1768.6		37.29	0.34	1.26	3.38	49							
Head				39.44	0.33	1.14	3.42	47							

Table 15
Bulk Sulphide Float Metal Recovery @ 75min Grind

Hole #	Size (µm)	Recovery (%)				
		Cu	Pb	Zn	Ag	Au
121	26.8	91.8	81.2	94.7	84.8	43.9
124	28.8	79.5	80.5	94.4	65.9	25.2
132	31.5	80.2	86.8	96.2	82.5	40.6
Composite	28.7	87.5	84.7	95.4	75.5	40.8

Preliminary Flotation Scoping Tests – Composite Sample (Hole 121, 124, 132)

Open circuit batch flotation tests were conducted on the Murray Brook -¼" composite sample to determine the optimal conditions and design parameters for flowsheet development and production of Cu, Pb, and Zn concentrates. The test program was based on Cu/Pb combined float due to the lower Cu grade; however, several sequential floats (separated Cu and Pb concentrates) were carried out for confirmation. Six (6) preliminary sequential Cu and Pb rougher scoping flotation and 20 scoping bulk Cu/Pb rougher float tests followed by scavenging the rougher tails were carried out.

Sequential Rougher Flotation

Test variables included various pH modifiers (Na_2CO_3, $Ca(OH)_2$), promoters (PEX - Sodium Potassium Ethyl Xanthate, Aero 3418A, Aero 5100) and depressants ($ZnSO_4$, NaCN, MBS). The flowsheet for a typical sequential flotation circuit (Cu + Pb + Zn) is presented in Figure 10. Composite sequential (Cu, Pb, Zn) rougher float reagent regime for each respective float test is presented in Table 16.

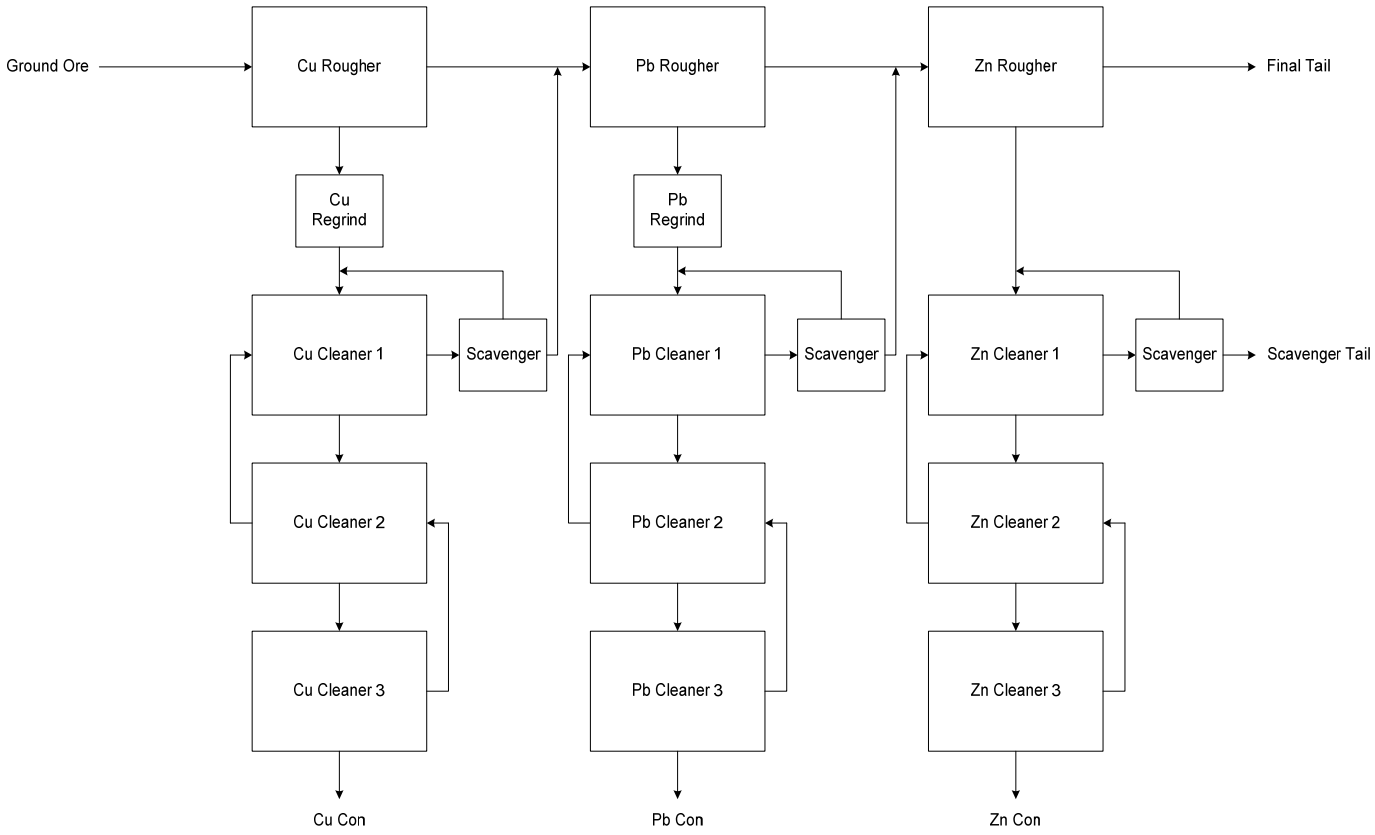


Figure 10: Cu/Pb/Zn Sequential Flowsheet

Table 16
Sequential (Cu, Pb, Zn) Rougher Flotation Conditions – Hole 132, 121, 124 Composite

Test	Stage	Aeration Time (min)	Cond. Time (min)	pH		Reagent Dosage (g/t)								Float Time (min)
				Modifier	Range	PEX	3418A	5100	MIBC	$ZnSO_4$	NaCN	MBS	$CuSO_4$	
S-1	Cu	10	2+1	Na_2CO_3	8.0-8.5			5	15	300				2
	Pb		5+2+1	Na_2CO_3	9.0.0-9.5	8	50		10	300	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50		5				400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25		5					3
S-2	Cu	10	2+1	Na_2CO_3	8.0-8.5			8	15	400				3
	Pb		5+2+1	Na_2CO_3	9.0.0-9.5	8	50		10	400	40			3
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50		5				400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25		5					2
S-3	Cu	10	2+1	$Ca(OH)_2$	10.0-10.5		20		15	400				3
	Pb		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50		10	400	40			3
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50		5				400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25		5					2
S-4	Cu	10	2+1	Na_2CO_3	8.0-8.5			8	15	400		300		3
	Pb		5+2+1	Na_2CO_3	9.0.0-9.5	8	50		10	400				3
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50		5				400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25		5					2
S-5	Cu	10	2+1	Na_2CO_3	8.0-8.5			10	15	400		800		4
	Pb		5+2+1	Na_2CO_3	9.0.0-9.5	8	50		10	400	40			3
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50		5				400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25		5					2
S-6	Cu1	10	5+2+1	Na2CO3	8.0-8.5			8	15	400		800		3
	Cu2		2+1	Na2CO3	8.0-8.5			7	5					2
	Pb		5+2+1	Na2CO3	9.0.0-9.5	8	50		10	400	40			3
	Zn1		5+2+1	Ca(OH)2	10.0-10.5	8	50		5				400	3
	Zn2		2+1	Ca(OH)2	10.0-10.5	4	25		5					2

At 0.33% Cu in the head composite sample separation of Cu and Pb will be difficult in the first stage Cu float. The best sequential float Cu circuit result achieved was in test S-5 where the Cu con achieved 5.48% Cu which is ~16x concentration from the 0.33% Cu head, though only 61.9% was recovered. Pb contamination was the lowest at 3.15% or 9.9% overall. Most other tests actually had Pb values greater than the Cu values. Cu loss to the Pb circuit was high at 11% indicating liberation at the selected grind size (~30µm) may be an issue. The Pb and Zn in this fraction would be recoverable in their respective circuits. In the Pb circuit 10.06% Pb or 59% overall recovery and in the Zn circuit 14.12% Zn or 78.2% overall recovery was achieved. Recovered Pb was ~68.9% (Cu + Pb circuit) and Zn was ~96.6% (Cu + Pb + Zn circuit). Sequential flotation rougher test results are presented in Table 17.

Based on the preliminary test results attained largely due to the low Cu level, sequential flotation did not achieve maximum recovery of the Cu and Pb mineralization, though Zn recovery will be high. Sequential flotation is less complicated than bulk Cu/Pb flotation followed by Cu/Pb separation and Zn flotation. The sequential flotation was eventually revisited to maximize recovery as the Cu/Pb bulk rougher concentrate proved difficult to clean.

Table 17
Sequential (Cu, Pb, Zn) Rougher Flotation Results – Hole 132, 121, 124 Composite

Test	Conc. / Tail	Mass	Mass	Chemical Assay Results (%)					Distribution Ratio (%)				
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
S-1	RC1 (Cu)	78.7	4.4	33.91	4.33	7.35	5.65	452	4.6	55.0	25.5	7.1	43.0
	RC2 (Pb)	174.4	9.9	35.81	0.75	6.65	5.67	129	10.7	21.2	51.1	15.9	27.1
	RC3 (Zn)	463.5	26.2	36.51	0.174	0.43	9.90	29	29.0	13.0	8.8	73.8	16.2
	RTails	1053.3	59.5	30.97	0.064	0.32	0.19	11	55.8	10.8	14.6	3.2	13.7
	Calc. Head	1769.9		33.03	0.35	1.28	3.51	47					
S-2	RC1 (Cu)	94.4	5.3	30.87	4.03	9.12	5.87	451	4.3	63.1	38.8	8.7	49.9
	RC2 (Pb)	124.4	7.0	39.55	0.58	6.21	5.82	115	7.3	12.0	34.8	11.3	16.7
	RC3 (Zn)	643.3	36.3	42.41	0.15	0.44	7.69	28	40.7	15.9	12.7	77.3	21.0
	RTails	908.1	51.3	35.21	0.060	0.33	0.19	12	47.7	9.1	13.7	2.7	12.5
	Calc. Head	1770.2		37.90	0.34	1.25	3.62	48					
S-3	RC1 (Cu)	122.4	6.9	34.79	3.59	11.50	6.12	376	6.5	71.8	63.2	11.7	55.2
	RC2 (Pb)	92.2	5.2	40.72	0.26	3.04	5.05	90	5.7	3.9	12.6	7.3	9.9
	RC3 (Zn)	205.3	11.6	30.28	0.24	0.65	23.33	53	9.4	8.2	5.9	75.1	13.0
	RTails	1351.5	76.3	38.27	0.073	0.30	0.28	14	78.4	16.1	18.3	5.9	21.9
	Calc. Head	1771.4		37.23	0.35	1.26	3.60	47					
S-4	RC1 (Cu)	66	3.7	31.89	6.35	9.38	7.04	624	3.1	64.9	27.1	7.4	46.8
	RC2 (Pb)	137.3	7.8	38.50	0.53	7.64	5.71	124	7.9	11.4	45.9	12.5	19.3
	RC3 (Zn)	401.6	22.7	39.08	0.19	0.55	11.95	35	23.5	12.1	9.7	76.7	16.0
	RTails	1166.3	65.8	37.54	0.064	0.34	0.18	14	65.5	11.6	17.3	3.3	17.9
	Calc. Head	1771.2		37.75	0.36	1.29	3.53	50					
S-5	RC1 (Cu)	71.8	4.1	32.60	5.48	3.15	6.19	501	3.6	61.9	9.9	7.1	39.4
	RC2 (Pb)	134.1	7.6	35.62	0.52	10.06	5.24	142	7.3	11.0	59.0	11.2	20.9
	RC3 (Zn)	346.7	19.6	35.71	0.26	0.76	14.12	45	18.8	14.3	11.6	78.2	17.1
	RTails	1215.3	68.7	38.15	0.067	0.37	0.18	17	70.4	12.8	19.5	3.4	22.6
	Calc. Head	1767.9		37.25	0.36	1.29	3.54	52					
S-6	RC1 (Cu)	93.9	5.3	30.34	4.41	8.73	6.85	445	4.7	65.2	36.0	10.4	48.2
	RC2 (Pb)	116.6	6.6	35.50	0.58	6.39	5.24	122	6.9	10.6	32.7	9.9	16.3
	RC3 (Zn)	334.9	18.9	31.69	0.23	0.79	14.02	41	17.6	12.0	11.6	76.1	15.7
	RTails	1222.9	69.2	34.91	0.06	0.37	0.18	14	70.8	12.3	19.7	3.6	19.8
	Calc. Head	1768.3	100.0	34.09	0.36	1.29	3.49	49					

Cu/Pb Bulk + Zn Flotation

Composite Cu/Pb + Zn rougher float reagent regime for each respective float test is presented in Table 18. Test variables included various pH modifiers (Na_2CO_3, $Ca(OH)_2$), promoters (PEX - Sodium Potassium Ethyl Xanthate, Aero 3418A, Aero 5100, AF 241, AF 404) and depressants ($ZnSO_4$, NaCN, Na_2S). The flowsheet for Cu/Pb + Zn flotation is presented in Figure 11. Cu/Pb + Zn flotation rougher test results are presented in Table 19. Tests B13 – 20 were tests designed to produce rougher concentrate for cleaning tests.

The Cu/Pb rougher followed by Zn rougher achieved favourable results with regards to Cu/Pb recovery. The best result with regards to recovery was achieved in test B-10 where 93% Cu + 80% Pb was recovered in the Cu/Pb circuit and 99.3% Zn was potentially recoverable in the Zn circuit (Cu/Pb + Zn). The mass pull was high in this rougher test at 30.7% resulting in relatively low Cu grade of 0.85% and Pb at 2.43%.

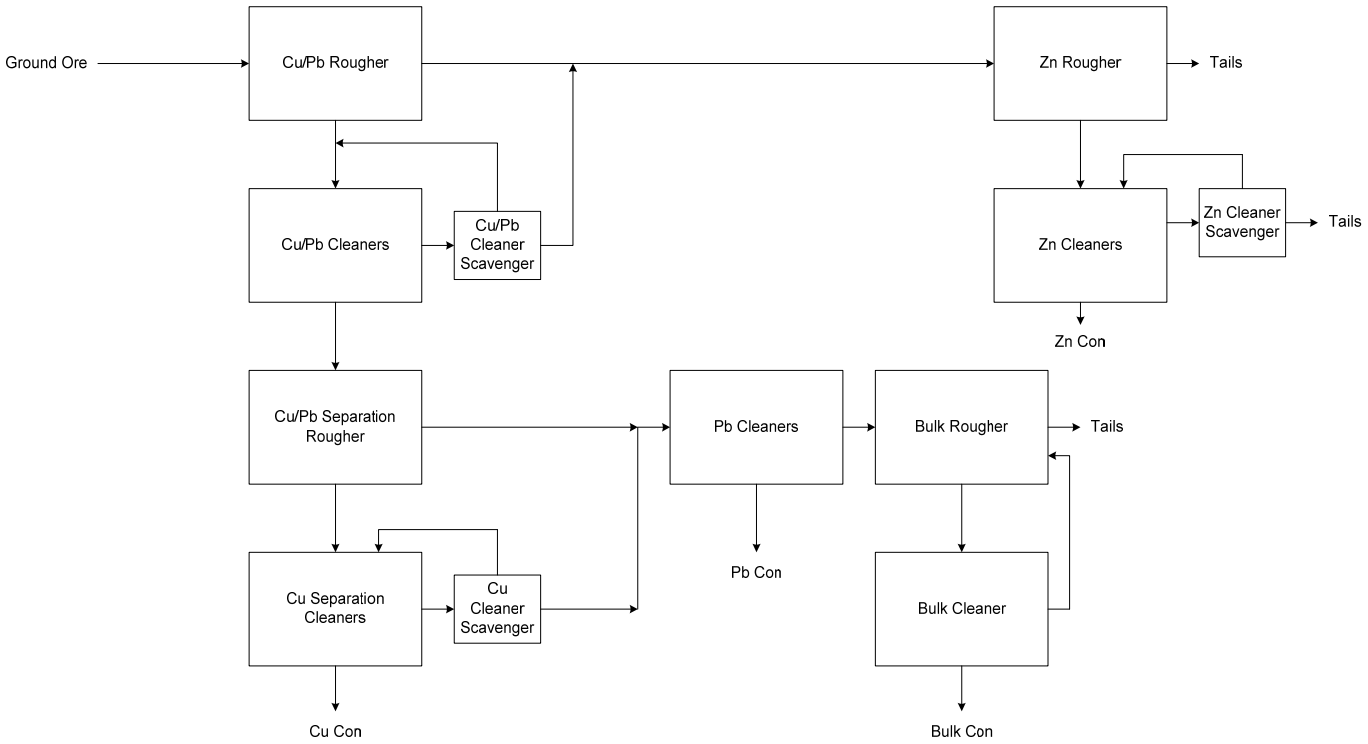


Figure 11: Cu/Pb + Zn Flowsheet

Table 18
Cu/Pb – Zn Rougher Flotation Conditions

Test No.	Stage	Aert'n T(min)	Cond T(min)	pH		Reagent Dosage (g/t)										Time (min)
				Modifier	Range	PEX	3418A	5100	AF-241	AF-404	Na_2S	MIBC	$ZnSO_4$	NaCN	$CuSO_4$	
B-1	Cu/Pb	10	5+2+1	Na_2CO_3	9-9.5	8	50					15	600	40		4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50					10			400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25					5				3
B-2	Cu/Pb1	10	5+2+1	Na_2CO_3	9.0-9.5	8	50					15	500	40		3
	Cu/Pb2		5+2+1	Na_2CO_3	9.0-9.5	4	25					10	500			2
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25					5				3
B-3	Cu/Pb	10	5+2+1	Na_2CO_3	9-9.5			8				15	600	40		4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50					10			400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25					5				3
B-4	Cu/Pb	10	5+2+1	Na_2CO_3	9-9.5	8		10				15	600	40		4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50					10			400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25					5				3
B-5	Cu/Pb1	10	5+2+1	Na_2CO_3	9-9.5	8		8				15	500	40		3
	Cu/Pb2		5+2+1	Na_2CO_3	9-9.5	4		8				10	500			2
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25					5				3
B-6	Cu/Pb1	10	5+2+1	Na_2CO_3	9-9.5	8			10			15	600			3
	Cu/Pb2		2+1	Na_2CO_3	9-9.5	4			10			10				2
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25					5				3

Table 18 (Cont'd)
Cu/Pb – Zn Rougher Flotation Conditions

Test No.	Stage	Aert'n T(min)	Cond T(min)	pH		Reagent Dosage (g/t)										Time (min)
				Modifier	Range	PEX	3418A	5100	AF-241	AF-404	Na_2S	MIBC	$ZnSO_4$	NaCN	$CuSO_4$	
B-7	Cu/Pb1	10	5+2+1	Na_2CO_3	9-9.5	8			30			15	600			3
	Cu/Pb2		2+1	Na_2CO_3	9-9.5	4			10			10				2
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25					5				3
B-8	Cu/Pb1	10	5+2+1	Na_2CO_3	9-9.5	8			50			15	600			3
	Cu/Pb2		2+1	Na_2CO_3	9-9.5	4			25			10				2
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25					5				3
B-9	Cu/Pb1	10	5+2+1	Na_2CO_3	9-9.5	8			50			15	600	40		3
	Cu/Pb2		5+2+1	Na_2CO_3	9-9.5	4			25			10	400			2
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25					5				3
B-10	Cu/Pb1	10	5+2+1	Na_2CO_3	9-9.5	8	20		50			15	800			3
	Cu/Pb2		2+1	Na_2CO_3	9-9.5	4	10		25			10				2
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25					5				3
B-11	Cu/Pb	10	5+2+1	Na_2CO_3	9.0-9.5				75	10		15	800			4
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25					5				3
B-12	Cu/Pb	10	5+2+1	Na_2CO_3	9.0-9.5				75	10	1000	15	800			4
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25					5				3
B-13	Cu/Pb	10	5+2+1	Na_2CO_3	9.0-9.5				75	10		15	800			4
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25					5				3
B-14	Cu/Pb	10	5+2+1	Na_2CO_3	9.0-9.5				75	10		15	800			4
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25					5				3
B-15	Cu/Pb	10	5+2+1	Na_2CO_3	9.0-9.5				75	10		15	800			4
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25					5				3
B-16	Cu/Pb	10	5+2+1	Na_2CO_3	9.0-9.5				75	10		15	800			4
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25					5				3
B-17	Cu/Pb	10	5+2+1	Na_2CO_3	9.0-9.5	8			75	10	1000*	15	800*			4
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25					5				3
B-18	Cu/Pb1	10	5+2+1	Na_2CO_3	9.0-9.5	8			75	10	1000*	15	800*			4
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25					5				3
B-19	Cu/Pb	10	5+2+1	Na_2CO_3	9.0-9.5				75	10	1000*	15	800*			10
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50					5			400	3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25					5				3
B-20**	Cu/Pb	10	5+2+1	Na_2CO_3	9.0-9.5				75	10	1000*	15	800*		400	10
	Zn1		5+2+1	$Ca(OH)_2$	10.0-10.5	8	50					5				3
	Zn2		2+1	$Ca(OH)_2$	10.0-10.5	4	25					5				3

* Reagents added in rod mill during primary grind; **120 min grind

Table 19
Cu/Pb- Zn Rougher Flotation Results – Hole 132, 121, 124 Composite

Test	Conc. / Tail	Mass	Mass	Chemical Assay Results (%)					Distribution Ratio (%)				
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
B-1	RC1 (Cu/Pb)	274.5	15.5	34.80	1.81	6.25	5.47	210	15.3	78.2	77.4	23.3	66.6
	RC2 (Zn)	335.0	18.9	35.54	0.19	0.50	14.06	34	19.0	10.0	7.6	73.0	13.1
	RTails	1160.1	65.6	35.48	0.07	0.29	0.21	15	65.7	11.9	14.9	3.7	20.3
	Calc. Head	1769.6		35.39	0.36	1.25	3.65	49.0					
	Head			39.44	0.33	1.14	3.42	47					
B-2	RC1 (Cu/Pb)	296.0	16.7	33.04	1.53	5.32	5.16	192	16.1	79.4	71.3	24.9	70.4
	RC2 (Zn)	306.9	17.3	33.87	0.16	0.49	13.99	29	17.1	8.6	6.9	70.0	10.9
	RTails	1167.2	65.9	34.66	0.06	0.41	0.27	13	66.7	12.0	21.8	5.1	18.6
	Calc. Head	1770.1		34.25	0.32	1.25	3.47	46					
B-3	RC1 (Cu/Pb)	193.2	10.9	25.46	1.71	5.85	4.53	270	8.0	63.9	58.9	15.0	62.6
	RC2 (Zn)	315.3	17.8	30.30	0.30	0.89	14.95	42	15.6	18.5	14.7	81.0	15.9
	RTails	1260.3	71.3	37.22	0.07	0.40	0.18	14	76.4	17.6	26.4	3.9	21.5
	Calc. Head	1768.8		34.70	0.29	1.08	3.29	47					
B-4	RC1 (Cu/Pb)	185.4	10.5	32.88	2.48	7.94	6.73	282	9.1	70.7	63.7	20.3	63.0
	RC2 (Zn)	346.8	19.6	33.52	0.28	1.07	13.52	38	17.3	14.9	16.1	76.1	16.1
	RTails	1233.7	69.9	40.00	0.08	0.38	0.18	14	73.6	14.4	20.3	3.7	21.0
	Calc. Head	1765.9		37.98	0.37	1.31	3.49	47					
B-5	RC1 (Cu/Pb)	227.4	12.8	32.70	2.08	7.12	6.45	248	12.2	75.6	70.3	23.3	66.4
	RC2 (Zn)	323.5	18.2	31.99	0.21	0.70	14.16	37	16.9	11.0	9.8	72.8	14.3
	RTails	1223.7	69.0	35.36	0.07	0.37	0.20	13	70.9	13.4	19.9	3.9	19.3
	Calc. Head	1774.6		34.41	0.35	1.30	3.54	48					
B-6	RC1 (Cu/Pb)	248.0	14.0	34.95	1.87	6.59	6.81	220	12.8	75.1	72.0	26.7	64.3
	RC2 (Zn)	422.2	23.9	33.69	0.18	0.49	10.47	33	21.0	12.4	9.2	69.9	16.5
	RTails	1097.4	62.1	40.80	0.07	0.39	0.20	15	66.2	12.6	18.8	3.4	19.2
	Calc. Head	1767.6		38.28	0.35	1.28	3.58	48					
B-7	RC1 (Cu/Pb)	317.1	17.9	37.29	1.57	5.76	6.53	183	18.4	79.5	76.3	32.3	70.3
	RC2 (Zn)	501.2	28.4	33.39	0.13	0.40	8.17	25	26.0	10.3	8.4	63.9	15.3
	RTails	949.2	53.7	37.78	0.07	0.38	0.26	12	55.7	10.2	15.3	3.8	14.4
	Calc. Head	1767.5		36.45	0.35	1.35	3.63	47					
B-8	RC1 (Cu/Pb)	354.4	20.1	36.55	1.37	4.85	5.50	177	19.9	80.2	75.3	31.2	72.2
	RC2 (Zn)	552.3	31.3	37.44	0.12	0.45	7.41	24	31.8	10.8	10.8	65.6	15.1
	RTails	857.3	48.6	36.58	0.06	0.37	0.23	13	48.3	9.0	13.9	3.2	12.7
	Calc. Head	1764.0		36.84	0.34	1.30	3.54	49					
B-9	RC1 (Cu/Pb)	365.8	20.7	37.21	1.30	4.81	5.26	172	21.0	79.2	77.0	30.5	55.3
	RC2 (Zn)	452.3	25.6	34.64	0.14	0.49	9.33	25	24.1	10.6	9.7	66.9	10.0
	RTails	951.3	53.8	37.46	0.06	0.32	0.17	42	54.9	10.2	13.3	2.6	34.7
	Calc. Head	1769.4		36.68	0.34	1.29	3.56	64					
B-10	RC1 (Cu/Pb)	544.4	30.7	38.90	0.94	3.47	4.98	115	31.3	84.3	81.4	40.6	73.6
	RC2 (Zn)	561.9	31.7	38.72	0.10	0.39	6.86	21	32.2	9.1	9.4	57.8	13.9
	RTails	664.8	37.5	37.16	0.06	0.32	0.16	16	36.5	6.6	9.2	1.6	12.5
	Calc. Head	1771.1	100.0	38.19	0.34	1.31	3.77	48					
B-11*	RC1 (Cu/Pb)	385.9	21.8	36.65	1.27	4.48	5.26	159	21.4	80.1	77.1	31.9	73.4
	RC2 (Zn)	626.1	35.3	38.7	0.12	0.42	6.69	21	36.7	12.3	11.7	65.8	15.7
	RTails	760.3	42.9	36.49	0.06	0.33	0.20	12	41.9	7.6	11.2	2.4	10.9
	Calc. Head	1772.3	100.0	37.32	0.35	1.27	3.59	47					
B-12-19*	RC1 (Cu/Pb)	396.3	22.4	39.98	1.25	4.81	5.81	153	24.0	80.7	79.5	35.0	75.1
	RC2 (Zn)	582.2	32.9	36.90	0.12	0.41	7.10	21	32.5	11.4	10.0	62.8	15.1
	RTails	790.9	44.7	36.38	0.06	0.32	0.18	10	43.5	7.9	10.6	2.2	9.8
	Calc. Head	1769.4	100.0	37.36	0.35	1.36	3.72	46					

*Float B-11-19: blend CuPb RC's for CuPb Cleaning Tests

Cu/Pb Cleaning Tests

A total of 10 initial Cu/Pb rougher concentrate cleaning tests were carried out with and without regrind at 0, 20, 40, 60, 90 and 120 minutes. The Cu/Pb rougher concentrate cleaning test reagent regime and test results are presented in Table 20 and Table 21, respectively. Particle size analyses results for each test are also presented. The Cu/Pb cleaner tests to achieve reasonable Zn separation resulted in poor Cu and Pb metal recoveries, likely due to the presence of secondary Cu mineralization activating the sphalerite.

Table 20
Cu/Pb Rougher Cleaner Flotation Conditions – Hole 132, 121, 124 Composite

Test No.	Reg. Time (min)	Stage	Cond. Time (min)	pH		Reagent Dosage (g/t)						Float Time (min)
				Modifier	Range	AF-241	AF-404	MIBC	$ZnSO_4$	NaCN	Na_2S	
Cu/Pb Clnr1	0 21.8µm	Clnr1	5+2+1	Na_2CO_3	9-9.5	15		10	300	50		5
		Clnr1Scvg	1	Na_2CO_3	9-9.5			5				2
		Clnr2	1	Na_2CO_3	9-9.5			5				5
Cu/Pb Clnr2	20 16.7µm	Clnr1	5+2+1	Na_2CO_3	9-9.5	15		10	300	50		5
		Clnr1Scvg	1	Na_2CO_3	9-9.5			5				2
		Clnr2	1	Na_2CO_3	9-9.5			5				5
Cu/Pb Clnr3	40 13.9µm	Clnr1	5+2+1	Na_2CO_3	9-9.5	15		10	300	50		5
		Clnr1Scvg	1	Na_2CO_3	9-9.5			5				2
		Clnr2	1	Na_2CO_3	9-9.5			5				5
Cu/Pb Clnr4	60 12.3µm	Clnr1	5+2+1	Na_2CO_3	9-9.5	15		10	300	50		5
		Clnr1Scvg	1	Na_2CO_3	9-9.5			5				2
		Clnr2	1	Na_2CO_3	9-9.5			5				5
Cu/Pb Clnr5	20 16.7µm	Clnr1 stg 1	2+1	Na_2CO_3	9-9.5	20	10		1000*	75*		15
		Clnr1 stg 2	2+1	Na_2CO_3	9-9.5	10	5					10
		Clnr1Scvg	2+1	Na_2CO_3	9-9.5	10	5					5
		Clnr2	1	Na_2CO_3	9-9.5		5					10
Cu/Pb Clnr6	40 13.9µm	Clnr1 stg 1	2+1	Na_2CO_3	9-9.5	20	10		1000*	75*		15
		Clnr1 stg 2	2+1	Na_2CO_3	9-9.5	10	5					10
		Clnr1Scvg	2+1	Na_2CO_3	9-9.5	10	5					5
		Clnr2	1	Na_2CO_3	9-9.5		5					10
Cu/Pb Clnr7	90 10.9µm	Clnr1 stg 1	2+1	Na_2CO_3	9-9.5	20	10		1000*	75*		15
		Clnr1 stg 2	2+1	Na_2CO_3	9-9.5	10	5					10
		Clnr1Scvg	2+1	Na_2CO_3	9-9.5	10	5					5
		Clnr2	1	Na_2CO_3	9-9.5		5					10
Cu/Pb Clnr8	120 9.8µm	Clnr1 stg 1	2+1	Na_2CO_3	9-9.5	20	10		1000*	75*		15
		Clnr1 stg 2	2+1	Na_2CO_3	9-9.5	10	5					10
		Clnr1Scvg	2+1	Na_2CO_3	9-9.5	10	5					5
		Clnr2	1	Na_2CO_3	9-9.5		5					10
Cu/Pb Clnr9	120 9.8µm	Clnr1 stg 1	1	Na_2CO_3	9-9.5			10	1000*	75*	500*	15
		Clnr1 stg 2	1	Na_2CO_3	9-9.5			5				15
		Clnr1Scvg	2+1	Na_2CO_3	9-9.5	10		5				10
		Clnr2	1	Na_2CO_3	9-9.5			5				25
Cu/Pb Clnr10	120 9.8µm	Clnr1 stg 1	1	Na_2CO_3	9-9.5			10	1000*	75*		25
		Clnr1Scvg	2+1	Na_2CO_3	9-9.5	10		5				10
		Clnr2	1	Na_2CO_3	9-9.5			5				20

Table 21
Cu/Pb Rougher Cleaner Flotation Results – Hole 132, 121, 124 Composite

Test	Conc./Tail	Mass	Mass	Analytical Assays (%)					Distribution Ratio (%)				
		(g)	Dist (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
CuPb C1	Cl2	113.6	38.9	34.17	2.83	7.46	11.66	300	36.1	89.4	69.4	88.8	84.0
	Cl2T	24.0	8.2	41.72	0.35	2.45	1.21	55	9.3	2.3	4.8	1.9	3.3
	Scvg	23.9	8.2	40.84	0.47	2.76	2.13	68	9.1	3.1	5.4	3.4	4.0
	ScvgT	130.9	44.8	37.33	0.14	1.90	0.67	27	45.5	5.1	20.4	5.9	8.7
	CalcHead	292.4	100.0	36.75	1.23	4.18	5.10	139					
CuPb C2	Cl2	40.4	13.5	36.51	3.65	8.23	6.03	296	14.0	41.2	28.1	15.7	31.4
	Cl2T	33.7	11.3	34.62	0.91	3.63	5.08	119	11.1	8.6	10.4	11.0	10.5
	Scvg	39.9	13.4	34.36	2.02	5.47	7.81	200	13.1	22.5	18.5	20.1	20.9
	ScvgT	184.3	61.8	35.20	0.54	2.76	4.48	77	61.8	27.8	43.0	53.2	37.2
	CalcHead	298.3	100.0	35.20	1.20	3.96	5.20	128					
CuPb C3	Cl2	38.0	12.2	34.14	4.71	5.37	3.95	283	11.8	52.0	17.4	9.8	27.4
	Cl2T	27.3	8.7	38.11	0.58	3.30	4.56	116	9.5	4.6	7.7	8.2	8.1
	Scvg	42.4	13.6	34.51	1.54	6.50	7.14	245	13.4	19.0	23.4	19.8	26.5
	ScvgT	204.6	65.5	34.99	0.41	2.96	4.64	73	65.3	24.4	51.5	62.2	38.1
	CalcHead	312.3	100.0	35.09	1.10	3.76	4.89	126					
CuPb C4	Cl2	34.7	11.2	35.89	4.06	3.77	3.95	281	11.9	40.3	11.2	9.3	25.5
	Cl2T	39.1	12.6	36.12	0.72	3.90	4.83	116	13.5	8.1	13.1	12.9	11.9
	Scvg	36.4	11.7	35.51	2.26	5.32	6.44	202	12.4	23.5	16.6	16.0	19.2
	ScvgT	34.9	11.2	32.54	1.21	5.94	7.47	183	10.9	12.1	17.8	17.8	16.7
	CalcHead	165.2	53.2	32.33	0.34	2.92	3.91	62	51.2	16.1	41.3	44.0	26.8
		310.3	100.0	33.60	1.13	3.76	4.73	123					
CuPb C5	Cl2	107.1	35.0	34.52	2.95	4.82	4.28	280	34.0	73.9	41.7	34.1	68.6
	Cl2T	47.8	15.6	36.62	0.82	3.99	5.47	98	16.1	9.2	15.4	19.4	10.7
	Scvg	47	15.4	38.47	0.81	4.42	6.94	91	16.6	8.9	16.8	24.2	9.8
	ScvgT	104	34.0	34.66	0.33	3.11	2.88	46	33.2	8.0	26.1	22.3	10.9
	CalcHead	305.9	100.0	35.50	1.40	4.05	4.40	143					
CuPb C6	C6-Cl2C	86.1	28.3	36.05	2.45	5.02	6.10	265	27.6	69.7	35.1	31.0	60.9
	C6-Cl2T	55.6	18.3	39.67	0.60	3.91	6.09	86	19.6	11.0	17.7	20.0	12.8
	C6-ScvgC	39.2	12.9	32.58	0.67	4.68	8.92	110	11.4	8.7	14.9	20.6	11.5
	C6-ScvgT	123	40.5	37.75	0.26	3.23	3.91	45	41.3	10.6	32.3	28.4	14.8
	CalcHead	303.9	100.0	36.95	1.00	4.05	5.58	123					
CuPb C7	Cl2	74.1	23.9	38.53	3.72	5.43	5.28	350	24.2	76.7	32.8	25.6	59.6
	Cl2T	81.6	26.3	39.05	0.48	3.52	5.29	92	27.1	10.9	23.4	28.2	17.2
	Scvg	40.7	13.1	36.02	0.47	4.38	7.03	102	12.5	5.3	14.5	18.7	9.6
	ScvgT	113.5	36.6	37.59	0.22	3.15	3.71	52	36.2	7.1	29.2	27.5	13.6
	CalcHead	309.9	100.0	37.99	1.16	3.96	4.94	141					
CuPb C8	Cl2	52.6	17.3	34.24	5.05	5.36	5.69	449	16.1	74.3	25.7	19.4	54.4
	Cl2T	102.0	33.5	37.50	0.49	3.42	5.24	96	34.1	13.9	31.8	34.7	22.7
	Scvg	43.6	14.3	36.00	0.47	4.29	6.26	106	14.0	5.8	17.0	17.7	10.7
	ScvgT	106.3	34.9	37.88	0.20	2.64	4.10	50	35.9	6.0	25.5	28.2	12.3
	CalcHead	304.5	100.0	36.85	1.18	3.61	5.06	142					
CuPb C9	Cl2	61.3	18.8	36.85	3.98	5.25	5.44	308	17.8	69.1	29.2	23.8	45.8
	Cl2T	80.2	24.6	39.86	0.56	3.77	4.29	108	25.1	12.8	27.4	24.5	21.0
	Scvg	52.3	16.0	37.79	0.82	5.01	6.45	164	15.5	12.1	23.8	24.1	20.8
	ScvgT	132.8	40.7	39.83	0.16	1.62	2.92	39	41.6	6.0	19.5	27.6	12.4
	CalcHead	326.6	100.0	38.95	1.08	3.37	4.30	126					
CuPb C10	Cl2	33.1	17.3	34.04	6.82	4.82	5.30	400	9.2	62.5	16.1	12.5	34.1
	Cl2T	53.4	27.9	38.14	1.03	5.09	4.71	171	16.6	15.2	27.5	17.9	23.5
	Scvg	41.4	21.6	37.69	1.14	5.20	7.49	204	12.7	13.0	21.7	22.0	21.7
	ScvgT	191.5	100.0	39.45	0.17	1.79	3.50	42	61.5	9.2	34.6	47.6	20.7
	CalcHead	319.4	166.8	38.44	1.13	3.10	4.41	121					

Zn Rougher Con Cleaning Tests

Initial Zn rougher concentrate cleaning tests (5) were carried out with and without regrind at 0, 20 and 60 minutes. Typically Zn cleaner circuit has no regrind; however, due to poor performance in the initial cleaning tests, additional grinding at 20 & 60 minutes was investigated to see if further liberation was necessary. Particle size analyses results for each test are pending. The Zn rougher concentrate cleaning test matrix and test results are presented in Table 22 and Table 23, respectively. Zn concentrate grade of 51.5 to 53.6% was attained with respective recoveries of 80.5% and 76.2%.

Table 22
Zn Rougher Cleaner Flotation Conditions – Hole 132, 121, 124 Composite

Test No.	Regrind Time (min)	Stage	Cond. Time (min)	pH		Reagent Dosage (g/t)			Float Time (min)	RPM	Cell (L)
				Modifier	Range	$CuSO_4$	MIBC	3418			
Clnr 1 (ZnC1)	0 26.2µm	Clnr1	1	$Ca(OH)_2$	10.5-10.8		10		7	1000	2
		Scvg	1	$Ca(OH)_2$	11-11.1		5		4	1300	2
		Clnr2	1	$Ca(OH)_2$	10.8-11		5		5	1000	0.5
Clnr 2 (ZnC2)	0	Clnr1	1	$Ca(OH)_2$	10.5-10.8		10		5	1000	2
		Scvg	1	$Ca(OH)_2$	11-11.1		5		4	1300	2
		Clnr2	1	$Ca(OH)_2$	10.8-11				4	1000	0.5
		Clnr3	1	$Ca(OH)_2$	11-11.1		5		3	900	0.5
		Clnr4	1	$Ca(OH)_2$	10.2-11.3				3	900	0.5
Clnr 3 (ZnC3)	0	Clnr1	5+1	$Ca(OH)_2$	10.5-10.8	400	10		7	1000	2
		Scvg	1	$Ca(OH)_2$	11-11.1		5		4	1300	2
		Clnr2	1	$Ca(OH)_2$	10.8-10.9		5		5	1000	2
		Clnr3	1	$Ca(OH)_2$	11-11.1		5		5	900	0.5
		Clnr4	1	$Ca(OH)_2$	10.2-11.3				5	900	0.5
Clnr 4 (ZnC4)	20 20.9µm	Clnr1	5+1	$Ca(OH)_2$	10.5-10.8	400	10		7	1000	2
		Scvg	2+1	$Ca(OH)_2$	11-11.1		5	5	4	1300	2
		Clnr2	1	$Ca(OH)_2$	10.8-10.9		5		5	1000	2
		Clnr3	1	$Ca(OH)_2$	11-11.1		5		5	900	0.5
		Clnr4	1	$Ca(OH)_2$	10.2-11.3		5		4	900	0.5
Clnr 5 (ZnC5)	60 16µm	Clnr1	5+1	$Ca(OH)_2$	10.5-10.8	400	10		7	1000	2
		Scvg	2+1	$Ca(OH)_2$	11-11.1		5	5	4	1300	2
		Clnr2	1	$Ca(OH)_2$	10.8-10.9		5		5	1000	2
		Clnr3	1	$Ca(OH)_2$	11-11.1		5		5	900	0.5
		Clnr4	1	$Ca(OH)_2$	10.2-11.3		5		5	900	0.5

Table 23
Zn Rougher Cleaner Flotation Results – Hole 132, 121, 124 Composite

Test	Conc. / Tail	Mass	Mass	Assays					Distribution Ratio (%)				
		(g)	Dist (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
Zn-C1	C1-Cl2C	55.8	18.8	21.52	0.30	0.34	41.24	300	11.7	42.6	15.1	91.2	42.0
	C1-Cl2T	21.7	7.3	38.69	0.11	0.42	1.68	55	8.2	6.1	7.3	1.4	5.3
	C1-ScvgC	30.3	10.2	38.72	0.22	0.54	4.08	68	11.4	16.4	13.2	4.9	11.7
	C1-ScvgT	189.6	63.8	37.19	0.073	0.42	0.33	27	68.7	34.9	64.3	2.5	41.0
	Calc. Clnr1C	77.5	26.1	26.33	0.25	0.36	30.17	139	19.9	48.7	22.5	92.6	47.3
	Calc. Clnr1T	219.9	73.9	37.40	0.09	0.44	0.84	296	80.1	51.3	77.5	7.4	52.7
	CalcHead	297.4	100.0	34.52	0.13	0.42	8.49	119					
Zn-C2	C2-Cl4C	64.5	10.9	14.65	0.32	0.36	47.81	200	4.1	26.4	7.9	77.3	29.8
	C2-Cl4T	12.7	2.1	30.81	0.30	0.50	21.05	77	1.7	4.9	2.2	6.7	4.3
	C2-Cl3T	9.9	1.7	38.53	0.20	0.64	5.96	128	1.7	2.5	2.2	1.5	2.2
	C2-Cl2T	32.9	5.5	40.20	0.17	0.67	4.50	283	5.8	7.3	7.5	3.7	5.7
	C2-ScvgC	67.3	11.3	40.68	0.20	0.74	2.70	116	12.0	16.9	17.0	4.6	12.0
	C2-ScvgT	406.5	68.5	41.97	0.081	0.46	0.61	245	74.7	41.9	63.2	6.2	45.9
	Calc. Clnr3C	77.2	13.0	17.31	0.32	0.38	43.40	73	5.8	31.3	10.0	84.0	34.1
	Calc. Clnr2C	87.1	14.7	19.72	0.30	0.41	39.15	126	7.5	33.8	12.2	85.5	36.4
	Calc. Clnr1C	120.0	20.2	25.33	0.27	0.48	29.65	281	13.3	41.1	19.7	89.2	42.1
	Calc. Clnr1T	473.8	79.8	41.79	0.10	0.50	0.91	116	86.7	58.9	80.3	10.8	57.9
	CalcHead	593.8	100.0	38.46	0.13	0.49	6.72	202					
Zn-C3	C2-Cl4C	69.1	11.6	14.83	0.32	0.32	47.51	183	4.6	24.9	7.5	81.3	31.7
	C2-Cl4T	11.1	1.9	32.11	0.29	0.47	19.53	62	1.6	3.7	1.8	5.4	4.2
	C2-Cl3T	8.2	1.4	39.13	0.22	0.57	7.17	123	1.4	2.0	1.6	1.5	2.2
	C2-Cl2T	62.1	10.5	40.16	0.18	0.57	4.10	280	11.1	12.5	12.1	6.3	11.5
	C2-ScvgC	92	15.5	40.34	0.18	0.68	1.35	98	16.6	19.2	21.3	3.1	14.1
	C2-ScvgT	351.5	59.2	41.26	0.094	0.46	0.29	91	64.7	37.7	55.6	2.5	36.3
	Calc. Clnr3C	80.2	13.5	17.22	0.31	0.34	43.64	46	6.2	28.5	9.3	86.6	35.9
	Calc. Clnr2C	88.4	14.9	19.25	0.30	0.36	40.26	143	7.6	30.6	10.9	88.1	38.2
	Calc. Clnr1C	150.5	25.3	27.88	0.25	0.45	25.34	265	18.7	43.0	23.1	94.4	49.6
	Calc. Clnr1T	443.5	74.7	41.07	0.11	0.51	0.51	86	81.3	57.0	76.9	5.6	50.4
	CalcHead	594.0	100.0	37.73	0.15	0.49	6.80	110					
Zn-C4	C2-Cl4C	67.5	11.3	13.56	0.38	0.35	48.94	45	3.9	28.8	8.2	84.1	34.5
	C2-Cl4T	3.1	0.5	30.13	0.40	0.60	19.11	123	0.4	1.4	0.7	1.5	1.3
	C2-Cl3T	3.2	0.5	33.07	0.39	0.78	13.40	350	0.5	1.4	0.9	1.1	1.3
	C2-Cl2T	25.3	4.2	36.99	0.32	0.77	8.91	92	4.0	9.2	6.8	5.7	7.7
	C2-ScvgC	87.9	14.7	42.83	0.19	0.66	1.88	102	16.1	18.7	20.0	4.2	15.7
	C2-ScvgT	409.4	68.6	42.96	0.087	0.45	0.32	52	75.2	40.4	63.5	3.4	39.5
	Calc. Clnr3C	70.6	11.8	14.28	0.38	0.36	47.63	141	4.3	30.2	8.8	85.6	35.9
	Calc. Clnr2C	73.8	12.4	15.10	0.38	0.38	46.15	449	4.8	31.7	9.7	86.7	37.2
	Calc. Clnr1C	99.1	16.6	20.69	0.36	0.48	36.64	96	8.8	40.8	16.5	92.4	44.8
	Calc. Clnr1T	497.3	83.4	42.94	0.10	0.48	0.60	106	91.2	59.2	83.5	7.6	55.2
	CalcHead	596.4	100.0	39.24	0.15	0.48	6.59	50					
Zn-C5	C2-Cl4C	56.0	9.3	9.94	0.35	0.33	53.60	142	2.4	22.1	6.3	76.2	22.4
	C2-Cl4T	5.5	0.9	24.00	0.44	0.72	30.54	308	0.6	2.8	1.3	4.3	2.4
	C2-Cl3T	5.9	1.0	29.06	0.48	1.02	23.42	108	0.7	3.3	2.0	3.5	2.7
	C2-Cl2T	24.9	4.1	35.10	0.46	1.12	12.98	164	3.8	13.0	9.4	8.2	9.9
	C2-ScvgC	70.4	11.7	42.46	0.23	0.78	2.23	39	12.9	18.8	18.3	4.0	13.6
	C2-ScvgT	439.8	73.0	42.05	0.080	0.42	0.34	126	79.7	40.0	62.7	3.8	49.1
	Calc. Clnr3C	61.5	10.2	11.20	0.36	0.37	51.54	400	3.0	24.9	7.6	80.5	24.7
	Calc. Clnr2C	67.4	11.2	12.76	0.37	0.42	49.08	171	3.7	28.2	9.6	84.0	27.4
	Calc. Clnr1C	92.3	15.3	18.79	0.39	0.61	39.34	204	7.5	41.2	19.0	92.2	37.3
	Calc. Clnr1T	510.2	84.7	42.10	0.10	0.47	0.60	42	92.5	58.8	81.0	7.8	62.7
	CalcHead	602.5	100.0	38.53	0.15	0.49	6.54	121					

Individual Hole 132, 121 and 124 Sequential Flotation Tests

Sequential rougher and cleaner flotation tests were conducted on the Hole 121, 124 and 132 samples to determine the optimal conditions and design parameters for flowsheet development and production of Cu, Pb, and Zn concentrates. The sequential float circuit was selected based on the performance of scoping tests carried out on the composite blend. During the course of the testing it was also found that the secondary zones, namely the 124-hole middle and top zones, that contained a sufficient amount of secondary Cu mineralization, interfered with the ability to produce clean Cu and Pb concentrates. The Hole 124 middle and top zones were proportionally mixed in to produce the initial composite sample used in both flowsheets (Cu/Pb and Sequential) for the flotation scoping tests. In spite of the low Cu level at ~0.3% sequential Cu + Pb + Zn flotation is less complicated than bulk Cu/Pb flotation followed by Cu/Pb cleaning/separation and Zn flotation. The sequential flotation was revisited in individual drill hole samples as well as the top, middle and bottom sections of Hole 124 to maximize recovery.

Sequential Floats – Hole 132 (Whole)

Several sequential floats were carried out to investigate additional recovery of Cu/Pb/Zn on Hole 132, which contained no visible secondary mineralization. Test conditions and results are presented in Tables 24 and 25. Hole 132 had very low Cu in the head sample (~0.16%) and the highest grade attained in the Cu rougher and cleaners was only 1.7% and 4.4%, respectively, however, a grade of 49.2% Pb was attained (Tables 26, 27, 28 and 29).

Table 24
Sequential Rougher Flotation Conditions – Hole 132 (Whole)

Test No.	Stage	Aeration (min)	Cond. (min)	pH		Reagent Dosage (g/t)								Float (min)
				Modifier	Range	PEX	3418A	5100	MIBC	$ZnSO_4$	NaCN	MBS	$CuSO_4$	
132 SQ1	Cu	10	2+1	Na_2CO_3	8-8.5			10	15	400*		800*		2.5
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	400	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					2
132 SQ2	Cu	10	5+2+1	Na_2CO_3	8-8.5			10	15	400		800		2.5
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	400	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					3
132 SQ3	Cu	10	5+2+1	Na_2CO_3	8-8.5			10	15	400		800		4
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	400	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					3
132 SQ4	Cu	10	5+2+1	Na_2CO_3	8-8.5			10	15	400		800		4
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	400	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					3
132 SQ5	Cu	10	5+2+1	Na_2CO_3	8-8.5			10	15	400		800		4
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	400	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					3

* Reagents added in rod mill during primary grind

Table 25
Sequential Rougher Flotation Results – Hole 132 (Whole)

Test No.	Conc. / Tail	Mass	Mass	Analytical Assays (%)					Distribution Ratio (%)				
		(g)	Dist (%)	Fe	Cu	Pb	Zn	Ag (g/t))	Fe	Cu	Pb	Zn	Ag
132 SQ1	CuRC	82.1	4.6	22.82	1.43	6.63	5.06		4.0	69.6	25.6	5.1	
	PbRC	177.7	10.0	25.26	0.05	5.90	6.42		9.5	5.1	49.4	14.1	
	ZnRC1	428.6	24.2	23.35	0.05	0.37	13.9		21.1	12.0	7.4	74.0	
	ZnRC2	528.6	29.9	34.05	0.02	0.28	0.73		38.0	6.4	6.9	4.8	
	RT	552.5	31.2	23.45	0.02	0.41	0.31		27.4	6.9	10.7	2.1	
	CalcHead	1769.	100.0	26.74	0.10	1.20	4.58						
132 SQ2	CuRC	53.8	3.0	24.49	1.70	2.07	5.93		2.8	49.6	5.3	3.9	
	PbRC	237.5	13.5	24.43	0.20	6.18	5.95		12.3	25.6	70.1	17.2	
	ZnRC1	351.5	19.9	21.26	0.05	0.37	14.7		15.8	10.0	6.3	63.1	
	ZnRC2	232.3	13.2	28.15	0.03	0.40	4.05		13.8	4.4	4.4	11.4	
	RT	890.4	50.4	29.30	0.02	0.33	0.41		55.2	10.5	14.0	4.4	
	CalcHead	1765.	100.0	26.75	0.10	1.19	4.66						
132 SQ3	CuRC	118.2	6.7	24.56	1.06	2.29	6.24		6.2	68.3	12.2	8.4	
	PbRC	257.2	14.5	25.77	0.05	5.70	6.22		14.1	7.1	66.2	18.2	
	ZnRC1	563.8	31.8	23.54	0.05	0.36	10.5		28.2	13.8	9.3	67.7	
	RT	835.0	47.1	29.04	0.02	0.33	0.60		51.5	10.7	12.3	5.7	
	CalcHead	1774.	100.0	26.52	0.10	1.25	4.96						
132 SQ4	CuRC	127.2	7.2	31.33	1.27	2.70	7.18	397	7.7	55.9	10.3	9.8	55.9
	PbRC	168.3	9.5	30.93	0.13	13.22	7.48	133	10.1	7.6	66.7	13.5	24.8
	ZnRC1	248.1	14.0	24.94	0.21	0.80	27.6	6	12.0	18.0	6.0	73.3	1.6
	ZnRC2	155.6	8.8	40.37	0.09	0.69	2.47	31	12.2	4.8	3.2	4.1	5.3
	RT	1070.	60.5	33.68	0.05	0.53	0.30	15	70.1	18.5	17.0	3.4	17.7
	CalcHead	1769.	100.0	29.06	0.16	1.88	5.29	51					
132 SQ5	CuRC	152.1	8.6	31.40	1.07	2.46	7.20	347	8.2	55.9	11.3	31.4	49.3
	PbRC	219.5	12.4	32.31	0.09	10.31	6.83	104	12.2	6.8	68.4	43.0	21.4
	ZnRC1	431.9	24.4	30.30	0.14	0.68	1.50	39	22.5	20.8	8.9	69.6	15.9
	RT	965.3	54.6	34.49	0.05	0.39	0.25	15	57.2	16.6	11.4	2.6	13.3
	CalcHead	1768.	100.0	32.93	0.16	1.87	1.97	60					

Table 26
Cu Cleaner Flotation Conditions – Hole 132 (Cu Con SQ3-5)

Test No.	Regrind Time (min.)	Stage	Cond. Time (min)	pH		Reagent Dosage (g/t)				Float Time (min.)	RPM	Cell Size (L)
				Modifier	Range	ZnSO4	5100	MIBC	MBS			
CuCL1	120 (8.9 microns)	Clnr1	5+1	Na_2CO_3	8.00-8.50	400*		10	400	30	1000	2
		Scvg	2+1	Na_2CO_3	8.00-8.50		5	5		5	1300	2
		Clnr2	1	Na_2CO_3	8.00-8.50			5		25	1000	2

Table 27
Cu Cleaner Flotation Chemical Assay Results – Hole 132 (Cu Con SQ3-5)

Hole 132	Conc. / Tail	Mass	Mass	Analytical Assays (%)					Distribution ratio (%)				
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
CuCL1	Cl2C (0-15)	15.2	4.8	37.88	4.40	4.64	6.42	727	5.7	18.1	8.6	4.6	9.6
	Cl2C (15-25)	6.9	2.2	33.49	2.76	4.31	7.00	593	2.3	5.1	3.6	2.3	3.5
	Cl2T	41.1	13.0	32.45	1.36	3.05	6.86	456	13.1	15.1	15.3	13.2	16.2
	ScvgC	31.8	10.1	30.25	2.40	4.94	8.04	575	9.5	20.6	19.2	12.0	15.8
	ScvgT	219.9	69.8	32.09	0.69	1.98	6.57	288	69.5	41.0	53.2	67.9	54.8
	Calc Head	314.9	100.0	32.26	1.17	2.60	6.76	367					
Head				34.69	1.23	2.73	7.41						

Table 28
Pb Cleaner Flotation Conditions – Hole 132 (Pb Con SQ3-5)

Test No.	Regrind Time (min.)	Stage	Cond. Time (Mins)	pH		Reagent Dosage (g/tonne)				Float Time (min.)	RPM's	Cell Size (L)
				Modifier	Range	ZnSO4	3418	MIBC	NaCN			
PbCL1	120 (9.4 microns)	CLnr1	5+1	Na_2CO_3	9.5-10	400*		15	40	19	1000	2
		Scvg	2+1	Na_2CO_3	9.5-10		5	5		5	1300	2
		CLnr2	1	Na_2CO_3	9.5-10			10		15	1000	2
		CLnr3	1	Na_2CO_3	9.5-10			5		10	1000	2
PbCL2	90 (11.3 microns)	CLnr1	5+1	Na_2CO_3	9.5	400*		15	40*	30	1000	2
		Scvg	2+1	Na_2CO_3	9.5		5	5		5	1300	2
		CLnr2	1	Na_2CO_3	9.5			10		30	900	1
		CLnr3	1	Na_2CO_3	9.8			10		15	900	1
		CLnr4	1	Na_2CO_3	10			5		10	900	1

Table 29
Pb Cleaner Flotation Results – Hole 132 (Pb Con SQ3-5)

Test No.	Conc/Tail	Mass	Mass	Assays (%)					Distribution ratio (%)				
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t))	Fe	Cu	Pb	Zn	Ag
PbCL1	Calc. CLnr1 Tail	208.6	67.0	33.10	0.08	7.05	6.87	79	69.4	45.2	49.2	67.3	49.2
	Scvg Con	46.6	15.0	27.27	0.14	16.97	7.56	164	12.8	18.1	26.4	16.5	22.7
	Scvg Tail	162.0	52.1	34.78	0.06	4.20	6.67	55	56.6	27.0	22.8	50.7	26.5
	Calc. CLnr1 Con	102.6	33.0	29.74	0.19	14.81	6.80	166	30.6	54.8	50.8	32.7	50.8
	CL2 Tail	72.8	23.4	31.24	0.12	11.85	6.96	126	22.8	24.3	28.8	23.8	27.3
	Calc. CLnr2 Con	29.8	9.6	26.06	0.37	22.03	6.41	265	7.8	30.5	22.0	9.0	23.5
	CL3 Tail	18.1	5.8	28.18	0.18	16.93	6.89	185	5.1	9.1	10.2	5.9	10.0
	Final CL3 Con	11.7	3.8	22.78	0.66	29.92	5.67	389	2.7	21.5	11.7	3.1	13.5
	Calc. head	311.2	100.0	31.99	0.12	9.61	6.85	108					
PbCL2	Calc. CLnr1 Tail	213.7	69.2	31.41	0.06	4.45	6.48	57	72.1	37.4	32.5	67.2	37.2
	Scvg Con	36.2	11.7	29.85	0.12	13.37	9.01	139	11.6	12.3	16.5	15.8	15.4
	Scvg Tail	177.5	57.4	31.73	0.05	2.63	5.96	40	60.5	25.1	15.9	51.4	21.8
	Calc. CLnr1 Con	95.3	30.8	27.23	0.23	20.77	7.08	215	27.9	62.6	67.5	32.8	62.8
	CL2 Tail	41.5	13.4	34.52	0.08	5.00	7.63	71	15.4	9.4	7.1	15.4	9.0
	Calc. CLnr2 Con	53.8	17.4	21.62	0.35	32.93	6.66	325	12.5	53.2	60.5	17.4	53.7
	CL3 Tail	17.0	5.5	31.08	0.13	10.96	8.06	131	5.7	6.3	6.4	6.7	6.8
	Calc. CLnr3 Con	36.8	11.9	17.24	0.45	43.08	6.01	415	6.8	46.9	54.1	10.7	46.9
	CL4 Tail	7.1	2.3	28.80	0.20	17.46	7.70	210	2.2	4.0	4.2	2.7	4.6
	Final CL4 Con	29.7	9.6	14.48	0.51	49.20	5.61	464	4.6	42.9	49.9	8.1	42.3
	Calc. Head	309.0	100.0	30.12	0.11	9.48	6.66	105					
Head Assay				31.90	0.12	10.38	7.23						

Sequential Floats – Hole 121 (Bottom)

Open circuit sequential floats were carried out on Hole 121 bottom, which had no evident secondary mineralization. The top zone was very oxidized and not included in any of the testing. Test conditions and chemical assay results for Hole 121 rougher tests as well as Cu, Pb and Zn rougher concentrate cleaning tests are presented rougher in Tables 30-37. In Hole 121 estimated Cu/Pb/Zn grade at 0.6/0.9/1.86% attained 6.34/3.55/6.32% with 80.1/68.2/95.6% recoveries, respectively. Highest grade attained in cleaners was 21.6% Cu, 31% Pb and 25.1% Zn.

Table 30
Sequential Rougher Flotation Conditions – Hole 121 (Bottom)

Test No.	Stage	Aeration time (min)	Cond. Time (min)	pH		Reagent Dosage (g/t)								Float Time (min)
				Modifier	Range	PEX	3418A	5100	MIBC	$ZnSO_4$	NaCN	MBS	$CuSO_4$	
121 SQ1	Cu	10	5+2+1	Na_2CO_3	8-8.5			10	15	400		800		4
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	800	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					3
121 SQ2	Cu	10	5+2+1	Na_2CO_3	8-8.5			10	15	400		800		4
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	800	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					3
121 SQ3	Cu	10	5+2+1	Na_2CO_3	8-8.5			10	15	400		800		4
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	800	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					3

Table 31
Sequential Rougher Flotation Results – Hole 121 (Bottom)

Test No.	Conc. / Tail	Mass	Mass	Analytical Assays (%)					Distribution Ratio (%)				
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
121 SQ1	CuRC	136.4	7.7	31.94	6.34	2.58	4.55	289	7.0	80.1	21.5	17.7	48.7
	PbRC	213.7	12.1	37.05	0.37	3.55	2.65	93	12.8	7.3	46.4	16.1	24.6
	ZnRC	397.1	22.4	38.32	0.16	0.47	5.47	26	24.5	5.9	11.4	61.8	12.8
	RT	1024.6	57.8	33.69	0.07	0.33	0.15	11	55.7	6.6	20.7	4.4	13.9
		1771.8	100.0	35.00	0.61	0.92	1.98	46					
121 SQ2	CuRC	124.1	7.0	30.56	6.33	1.59	3.95	271	6.2	75.8	12.4	14.7	43.6
	PbRC	261.9	14.8	35.98	0.40	3.40	2.41	88	15.5	10.1	55.8	18.9	29.9
	ZnRC	331.9	18.8	37.10	0.22	0.55	6.23	30	20.3	7.0	11.4	61.8	12.9
	RT	1048.6	59.4	33.58	0.07	0.31	0.15	10	58.0	7.1	20.4	4.7	13.6
		1766.5	100.0	34.38	0.59	0.90	1.89	44					
121 SQ3	CuRC	177.4	10.0	33.12	4.68	1.62	3.65	216	9.8	79.2	18.1	19.7	48.9
	PbRC	241.1	13.6	35.67	0.35	3.31	2.33	83	14.3	8.1	50.2	17.1	25.5
	ZnRC	386.9	21.9	37.57	0.17	0.48	5.00	27	24.2	6.3	11.7	58.8	13.3
	RT	962.5	54.4	32.38	0.07	0.33	0.15	10	51.8	6.4	20.0	4.4	12.3
		1767.9	100.0	34.04	0.59	0.90	1.86	44					

Table 32
Cu Cleaner Flotation Conditions (Hole 121 Cu Conc. SQ1-3)

Test No.	Regrind Time (min)	Stage	Cond. Time (min)	pH		Reagent Dosage (g/t)				Float Time (min)	RPM's	Cell Size (L)
				Modifier	Range	ZnSO4	5100	MIBC	MBS			
CuCL1	90	Clnr 1	5+1	Na_2CO_3	8-8.50	600*		15	400	30	1000	2
		Scvg	2+1	Na_2CO_3	8-8.50		5	5		5	1300	2
		Clnr 2	1	Na_2CO_3	8-8.50			10		20	900	1
		Clnr 3	1	Na_2CO_3	8-8.50			5		15	900	1

Table 33
Cu Cleaner Flotation Results (Hole 121 Cu Conc. SQ1-3)

Hole 121	Conc. / Tail	Mass	Mass	Chemical Assay (%)					Distribution Ratio (%)				
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
CuCL1	Calc. CLnr1 Tail	323.2	73.3	36.66	2.99	1.27	3.08	231	77.6	40.6	51.5	58.4	69.7
	Scvg Con	50.7	11.5	41.16	5.78	2.86	5.44	252	13.7	12.3	18.1	16.2	11.9
	Scvg Tail	272.5	61.8	35.82	2.47	0.98	2.64	227	63.9	28.3	33.4	42.2	57.8
	Calc. CLnr1 Con	117.7	26.7	29.07	12.00	3.29	6.03	275	22.4	59.4	48.5	41.6	30.3
	CL2 Tail	58.0	13.2	31.93	6.17	2.12	5.64	311	12.1	15.0	15.4	19.2	16.9
	Calc. CLnr2 Con	59.7	13.5	26.30	17.66	4.43	6.41	240	10.3	44.3	33.1	22.4	13.4
	CL3 Tail	17.1	3.9	25.98	7.98	2.37	6.90	299	2.9	5.7	5.1	6.9	4.8
	Final CL3 Con	42.6	9.7	26.43	21.55	5.26	6.21	217	7.4	38.6	28.0	15.5	8.6
	Calc. Head	440.9	100.0	34.63	5.39	1.81	3.87	243					

Table 34
Pb Cleaner Flotation Conditions (Hole 121 Pb Conc. SQ1-3)

Test No.	Regrind Time (min)	Stage	Cond. Time (min)	pH		Reagent Dosage (g/t)				Float Time (min)	RPM	Cell Size (L)
				Modifier	Range	ZnSO4	3418	MIBC	NaCN			
PbCL1	90	CLnr1	5+1	Na_2CO_3	9.50	400		15	40*	30	1000	2
		Scvg	2+1	Na_2CO_3	9.50		5	5		5	1300	2
		CLnr2	1	Na_2CO_3	9.50			10		20	900	1
		CLnr3	1	Na_2CO_3	9.80			10		10	900	1
		CLnr4	1	Na_2CO_3	10.00			5		10	900	1

Table 35
Pb Cleaner Flotation Results (Hole 121 Pb Conc. SQ1-3)

Hole 121	Conc. / Tail	Mass	Mass	Chemical Assay (%)					Distribution Ratio (%)				
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (ppm)	Fe	Cu	Pb	Zn	Ag
PbCL1	Calc. CLnr1 Tail	277.2	81.7	41.11	0.11	1.59	1.51	35	84.7	26.3	40.7	51.6	35.3
	Scvg Con	39.4	11.6	38.00	0.23	2.30	2.93	70	11.1	7.7	8.4	14.2	10.1
	Scvg Tail	237.8	70.1	41.63	0.09	1.47	1.28	29	73.6	18.6	32.3	37.4	25.2
	Calc. CLnr1 Con	62.0	18.3	33.17	1.40	10.36	6.35	285	15.3	73.7	59.3	48.4	64.7
	CL2 Tail	34.9	10.3	38.57	0.34	3.07	3.66	93	10.0	10.1	9.9	15.7	11.9
	Calc. CLnr2 Con	27.1	8.0	26.21	2.76	19.75	9.81	532	5.3	63.6	49.4	32.7	52.8
	CL3 Tail	9.4	2.8	33.28	1.03	6.83	8.45	220	2.3	8.2	5.9	9.8	7.6
	Calc. CLnr3 Con	17.7	5.2	22.45	3.69	26.61	10.54	698	3.0	55.4	43.5	22.9	45.2
	CL4 Tail	3.6	1.1	31.20	1.71	9.51	9.91	343	0.8	5.2	3.2	4.4	4.5
	Final CL4 Con	14.1	4.2	20.22	4.19	30.97	10.70	789	2.1	50.2	40.3	18.5	40.7
	Calc. Head	339.2	100.0	39.66	0.35	3.19	2.40	81					

Table 36
Zn Cleaner Flotation Conditions – Hole 121 (Zn Rougher Con SQ1-3)

Test No.	Regrind Time (min)	Stage	Cond. Time (min)	pH		Reagent Dosage (g/tonne)				Float Time (min.)	RPM	Cell Size (L)
				Modifier	Range	$CuSO_4$	3418	MIBC	NaCN			
ZnCL1	40 17.2µm	CLnr1	5+1	$Ca(OH)_2$	10.5-10.8	400		10		10	900	2
		Scvg	2+1	$Ca(OH)_2$	11-11.1		5	5		5	1300	2
		CLnr2	1	$Ca(OH)_2$	10.8-10.9			5		10	900	2
		CLnr3	1	$Ca(OH)_2$	11-11.1			5		10	900	2
		CLnr4	1	$Ca(OH)_2$	10.2-11.3			5		10	900	2
ZnCL2	50 16.7µm	CLnr1	5+1	$Ca(OH)_2$	10.5-10.8	400		10		10	900	2
		Scvg	2+1	$Ca(OH)_2$	11-11.1		5	5		5	1300	2
		CLnr2	1	$Ca(OH)_2$	10.8-10.9			5		10	900	2
		CLnr3	1	$Ca(OH)_2$	11-11.1			5		10	900	2
		CLnr4	1	$Ca(OH)_2$	10.2-11.3			5		7	900	1

Table 37
Zn Cleaner Flotation Results – Hole 121 (Zn Rougher Con SQ1-3)

Circuit	Conc/Tail	Mass	Mass	Chemical Assays (%)					Distribution Ratio (%)				
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
ZnCL1	Calc. CLnr1 Tail	144.0	23.3	34.01	0.16	0.84	0.65	21	20.1	20.1	40.3	2.9	17.9
	Scvg Con	62.4	10.1	39.38	0.18	0.71	0.84	24	10.1	9.6	14.8	1.6	9.0
	Scvg Tail	81.6	13.2	29.91	0.15	0.94	0.50	18	10.0	10.5	25.6	1.3	8.9
	Calc. CLnr1 Con	472.9	76.7	41.19	0.20	0.38	6.57	29	79.9	79.9	59.7	97.1	82.1
	CL2 Tail	187.3	30.4	44.70	0.14	0.40	0.81	25	34.3	22.5	25.0	4.7	28.3
	Calc. CLnr2 Con	285.6	46.3	38.89	0.23	0.37	10.36	31	45.6	57.4	34.7	92.4	53.8
	CL3 Tail	97.8	15.9	45.37	0.12	0.32	0.63	18	18.2	10.1	10.4	1.9	10.6
	Calc. CLnr3 Con	187.8	30.4	35.52	0.29	0.39	15.42	38	27.4	47.3	24.3	90.4	43.2
	CL4 Tail	64.5	10.5	45.58	0.13	0.29	1.35	21	12.1	7.2	6.2	2.7	8.2
	Final CL4 Con	123.3	20.0	30.25	0.38	0.44	22.78	47	15.3	40.2	18.1	87.7	35.0
	Calc. Head	616.9	100.0	39.52	0.19	0.49	5.19	27					
ZnCL2	Calc. CLnr1 Tail	231.4	46.2	40.36	0.14	0.56	0.72	16	45.8	34.3	58.0	6.6	33.3
	Scvg Con	70.7	14.1	42.36	0.19	0.53	1.49	21	14.7	14.1	16.8	4.2	13.2
	Scvg Tail	160.7	32.1	39.48	0.12	0.57	0.38	14	31.1	20.2	41.2	2.4	20.0
	Calc. CLnr1 Con	270.0	53.8	40.91	0.23	0.35	8.77	28	54.2	65.7	42.0	93.4	66.7
	CL2 Tail	103.1	20.6	44.76	0.12	0.33	0.55	16	22.6	13.0	15.3	2.2	14.7
	Calc. CLnr2 Con	166.9	33.3	38.53	0.30	0.36	13.85	35	31.5	52.7	26.7	91.2	52.0
	CL3 Tail	64.6	12.9	44.99	0.14	0.30	1.42	20	14.3	9.5	8.7	3.6	11.5
	Calc. CLnr3 Con	102.3	20.4	34.46	0.40	0.39	21.71	44	17.3	43.3	18.0	87.6	40.5
	CL4 Tail	14.4	2.9	43.72	0.12	0.27	0.93	17	3.1	1.8	1.7	0.5	2.2
	Final CL4 Con	87.9	17.5	32.94	0.45	0.41	25.11	49	14.2	41.5	16.2	87.1	38.4
	Calc. Head	501.4	100.0	40.66	0.19	0.44	5.06	22					

Sequential Floats – Hole 124 (Top Zone)

Several sequential floats were carried out to investigate additional recovery of Cu/Pb/Zn and to verify the effect of secondary mineralization evident in Holes 121 and 124. Hole 124 top zone had significant evident secondary mineralization. Test conditions and chemical assay results for Hole 124 (Top) rougher tests are presented in Tables 38 and 39. Cu, Pb and Zn rougher con cleaning tests were not carried out. In Hole 124 Top Zone based on chemical assay results with estimated Cu/Pb/Zn grade at 0.8/1.36/5.18% attained 4.2/2.1/13.8% grade with 67.4/79.7/98.7% recoveries, respectively.

Table 38
Sequential Rougher Flotation Conditions – Hole 124 (Top Zone)

Test No.	Stage	Aeration time (min)	Cond. Time (min)	pH		Reagent Dosage (g/tonne) [1]										Float Time (min)
				Modifier	Range	PEX	3418A	AF-241	AF-404	5100	MIBC	$ZnSO_4$	NaCN	MBS	$CuSO_4$	
124 Top SQ4	Cu	10	5+2+1	Na_2CO_3	8-8.5				5	10	15	800		800		5
	Pb		5+2+1	Na_2CO_3	9-9.5			50			10	800	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50				10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25				5					3
124 Top SQ5	Cu	10	5+2+1	Na_2CO_3	8-8.5				5	10	15	800		800		5
	Pb		5+2+1	Na_2CO_3	9-9.5			50			10	800	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50				10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25				5					3

Table 39
Sequential Rougher Flotation Results – Hole 124 (Top Zone)

Hole 124	Conc. / Tail	Mass	Mass	Chemical Assay (%)					Distribution Ratio (%)				
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
124 Top SQ4	CuRC	198.5	11.3	29.90	3.81	5.27	11.21	380	9.3	42.7	45.1	20.9	44.1
	PbRC	271.9	15.5	34.54	2.71	2.13	9.64	153	14.7	41.6	25.0	24.6	24.3
	ZnRC	408.2	23.2	36.32	0.48	0.75	13.82	55	23.2	11.1	13.2	52.9	13.1
	RT	878.9	50.0	38.43	0.10	0.44	0.20	36	52.8	4.7	16.7	1.6	18.5
	Calc. Head	1757.5	100.0	36.37	1.01	1.32	6.07	97					
124 Top SQ5	CuRC	291.2	16.6	34.33	4.16	6.71	11.01	314	14.5	67.4	65.0	30.1	53.6
	PbRC	210.7	12.0	39.84	1.71	2.10	8.95	134	12.2	20.1	14.7	17.7	16.6
	ZnRC	401.4	22.8	37.16	0.38	0.71	13.55	52	21.6	8.5	9.5	51.0	12.2
	RT	855.5	48.6	41.75	0.09	0.38	0.16	35	51.7	4.0	10.8	1.3	17.6
	Calc. Head	1758.8	100.0	39.25	1.02	1.71	6.07	97					

Sequential Floats – Hole 124 (Bottom Zone)

Sequential floats were carried out to investigate additional recovery of Cu/Pb/Zn and to verify the effect of secondary mineralization evident in Holes 121 and 124. Hole 124 bottom zone had no significant evident secondary mineralization. Test conditions and chemical assay results for Hole 124 (Top) rougher tests are presented in Tables 40 and 41. Cu rougher con cleaning tests were carried out (Tables 42 and 43). Pb and Zn cleaning tests were not carried out. In Hole 124 Bottom Zone based on chemical assay results with an estimated Cu/Pb/Zn grade at 0.16/0.59/2.55% attained 1.9/4.7/11.8%

rougher grade with 77.6/70.9/95.3% recoveries, respectively. Cu cleaner circuit attained 17.6% grade and estimated recovery of 75% (cleaner 1).

Table 40
Sequential Rougher Flotation Conditions – Hole 124 (Bottom Zone)

Test No.	Stage	Aeration time (min)	Cond. Time (min)	pH		Reagent Dosage (g/t)								Float Time (min)
				Modifier	Range	PEX	3418A	5100	MIBC	$ZnSO_4$	NaCN	MBS	$CuSO_4$	
124 Btm SQ6	Cu	10	5+2+1	Na_2CO_3	8-8.5			10	15	400		800		3
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	800	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					3
124 Btm SQ7	Cu	10	5+2+1	Na_2CO_3	8-8.5			10	15	400		800		3
	Pb		5+2+1	Na_2CO_3	9.0.0-9.5	8	50		10	800	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					3
124 Btm SQ8	Cu	10	5+2+1	Na_2CO_3	8-8.5			10	15	400		800		3
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	800	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					3

Table 41
Sequential Rougher Flotation Results – Hole 124 (Bottom Zone Only)

Hole 124	Conc. / Tail	Mass	Mass	Chemical Assays (%)					Distribution Ratio (%)				
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
124 Btm SQ6	CuRC	96.2	5.5	37.93	1.94	1.26	4.50	157	5.1	46.1	8.7	8.9	23.9
	PbRC	179.6	10.2	39.98	0.50	4.68	4.45	119	10.0	22.2	60.3	16.4	33.9
	ZnRC	290.2	16.5	36.62	0.20	0.46	11.79	38	14.8	14.3	9.6	70.1	17.5
	RT	1197.9	67.9	41.90	0.06	0.25	0.19	13	70.1	17.4	21.5	4.7	24.7
	Calc. Head	1763.9	100.0	40.62	0.23	0.79	2.77	36					
124 Btm SQ7	CuRC	120.4	6.8	43.38	1.89	1.38	4.63	168	7.7	58.0	12.2	12.4	32.8
	PbRC	193.7	11.0	37.86	0.19	4.12	3.25	76	10.9	9.4	58.5	14.0	23.9
	ZnRC	301.2	17.0	34.69	0.20	0.41	10.14	39	15.5	15.3	9.1	68.1	19.0
	RT	1152.8	65.2	38.67	0.06	0.24	0.21	13	66.0	17.3	20.3	5.4	24.3
	Calc. Head	1768.1	100.0	38.22	0.22	0.77	2.54	35					
124 Btm SQ8	CuRC	106.9	6.0	32.57	1.89	1.21	4.37	168	5.0	55.7	9.2	9.4	30.9
	PbRC	212.3	12.0	38.87	0.16	4.09	3.38	70	11.9	9.4	61.7	14.5	25.6
	ZnRC	406.4	23.0	40.85	0.16	0.39	8.83	29	23.9	17.9	11.3	72.3	20.3
	RT	1041.9	58.9	39.57	0.06	0.24	0.18	13	59.3	17.0	17.8	3.8	23.3
	Calc. Head	1767.5	100.0	39.36	0.21	0.80	2.81	33					

Table 42
Cu Cleaner Flotation Conditions – Hole 124 (Bottom, Cu RCon SQ6-8)

Test No.	Regrind Time (min)	Stage	Cond. Time (min)	pH		Reagent Dosage (g/tonne)				Float Time (min)	RPM	Cell Size (L)
				Modifier	Range	ZnSO4	5100	MIBC	MBS			
CuCL1	78	Clnr 1	5+1	Na_2CO_3	8-8.5	600*		15	400	30	900	2
		Scvg	2+1	Na_2CO_3	8-8.5		5	5		5	1300	2
		Clnr 2	1	Na_2CO_3	8-8.5			10		10	900	1
		Clnr 3	1	Na_2CO_3	8-8.5			5		8	900	1

* Reagents added in regrind mill

Table 43
Cu Cleaner Flotation Results – Hole 124 (Bottom, Cu RCon SQ6-8)

Test	Conc. / Tail	Mass	Mass	Chemical Assay (%)						Distribution Ratio (%)					
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
CuCL1	Calc. CLnr1 Tail	191.0	68.7	38.34	0.68	1.00	3.99	95	0.45	67.4	25.0	53.3	65.0	44.4	74.7
	Scvg Con	30.3	10.9	39.59	2.00	1.29	7.06	213	0.28	11.0	11.7	10.9	18.3	15.7	7.5
	Scvg Tail	160.7	57.8	38.11	0.43	0.95	3.41	73	0.48	56.3	13.3	42.4	46.8	28.6	67.3
	Calc. CLnr1 Con	87.2	31.3	40.66	4.46	1.93	4.70	261	0.33	32.6	75.0	46.7	35.0	55.6	25.3
	CL2 Tail	67.6	24.3	41.77	2.60	1.64	4.47	203	0.34	26.0	33.9	30.8	25.8	33.5	19.6
	Calc. CLnr2 Con	19.6	7.0	36.83	10.88	2.93	5.50	463	0.33	6.6	41.1	15.9	9.2	22.2	5.6
	CL3 Tail	11.1	4.0	39.89	5.71	2.25	5.60	406	0.36	4.1	12.2	6.9	5.3	11.0	3.4
	Final CL3 Con	8.5	3.1	32.84	17.64	3.81	5.36	538	0.30	2.6	28.9	9.0	3.9	11.2	2.2
	Calc.Head	278.2	100.0	39.07	1.86	1.29	4.21	147	0.41						

Sequential Floats – Hole 124 (50:50 Blend – Middle + Bottom Zone)

Sequential floats were carried out to investigate additional recovery of Cu/Pb/Zn and to verify the effect of secondary mineralization evident in Holes 121 and 124. Hole 124 middle had some evident secondary mineralization. Test conditions and chemical assay results for Hole 124 (50:50 Blend – Middle + Bottom Zone) rougher tests are presented in Tables 44 and 45. Cu, Pb and Zn rougher con cleaning tests were carried out (Tables 44 - 51). In Hole 124 Middle + Bottom Zone (50:50) based on chemical assay results with estimated Cu/Pb/Zn grade at 0.19/1.61/3.75% attained 1.1/8.0/14.46% grade with 65.9/78.4/96.6% recoveries, respectively. Highest grade attained in cleaners was 6.5% Cu, 34.6% Pb and 48.2% Zn.

Table 44
Sequential Rougher Flotation Conditions – Hole 124 (50:50 Blend Middle/Bottom Zone)

Test No.	Stage	Aeration time (min)	Cond. Time (min)	pH		Reagent Dosage (g/tonne)*								Float Time (min)
				Modifier	Range	PEX	3418A	5100	MIBC	$ZnSO_4$	NaCN	MBS	$CuSO_4$	
124 (50:50) SQ1	Cu	10	5+2+1	Na_2CO_3	8-8.5			10	15	400		800		4
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	800	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					3
124 (50:50) SQ2	Cu	10	5+2+1	Na_2CO_3	8.0-8.5			10	15	400		800		4
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	800	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					3
124 (50:50) SQ3	Cu	10	5+2+1	Na_2CO_3	8-8.5			10	15	400		800		4
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	800	40			4
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					3

* Reagents added in regrind mill

Table 45
Sequential Rougher Flotation Results – Hole 124 (50:50 Blend Middle/Bottom Zone)

Hole 124 (50:50)	Conc. / Tail	Mass (g)	Mass Dist. (%)	Chemical Assays (%)					Distribution ratio (%)				
				Fe	Cu	Pb	Zn	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
124 (50:50) SQ1	CuRC	171.8	9.7	35.17	0.94	2.49	5.23	154	8.9	47.1	15.0	13.6	30.7
	PbRC	225.6	12.8	38.38	0.33	8.01	4.93	118	12.8	21.7	63.4	16.8	30.9
	ZnRC	303.8	17.2	34.18	0.17	0.65	14.46	46	15.3	15.1	6.9	66.3	16.2
	RT	1067.4	60.4	39.97	0.05	0.39	0.21	18	63.0	16.2	14.6	3.4	22.3
	Calc. Head	1768.6	100.0	38.31	0.19	1.61	3.75	49					
124 (50:50) SQ2	CuRC	160.7	9.1	35.27	1.11	3.46	5.56	223	8.4	54.4	22.6	13.9	40.7
	PbRC	196.0	11.1	37.12	0.22	6.94	4.89	100	10.8	13.1	55.2	15.0	22.3
	ZnRC	327.0	18.5	35.40	0.16	0.64	13.17	43	17.1	15.9	8.5	67.2	16.0
	RT	1086.1	61.4	39.58	0.05	0.31	0.23	17	63.7	16.6	13.7	3.9	21.0
	Calc. Head	1769.8	100.0	38.14	0.19	1.39	3.62	50					
124 (50:50) SQ3	CuRC	164.8	9.3	35.72	1.06	3.75	5.24	210	8.6	50.8	24.6	13.3	38.2
	PbRC	198.0	11.2	37.98	0.30	6.79	5.12	123	11.0	17.3	53.5	15.6	26.9
	ZnRC	332.3	18.8	36.07	0.16	0.63	13.13	40	17.5	15.5	8.3	67.0	14.7
	RT	1072.6	60.7	40.22	0.05	0.32	0.25	17	62.9	16.5	13.6	4.1	20.2
	Calc. Head	1767.7	100.0	38.77	0.19	1.42	3.68	51					

Table 46
Cu Cleaner Flotation Conditions – Hole 124 (50:50, Cu RCon SQ1-3)

Test No.	Regrind Time (min)	Stage	Cond. Time (min)	pH		Reagent Dosage (g/tonne)*				Float Time (min)	RPM's	Cell Size (L)
				Modifier	Range	ZnSO4	5100	MIBC	MBS			
CuCL1	90 10.5µm	Clnr 1	5+1	Na_2CO_3	8-8.5	600*		15	400	30	900	2
		Scvg	2+1	Na_2CO_3	8-8.5		5	5		5	1300	2
		Clnr 2	1	Na_2CO_3	8-8.5			10		10	900	1
		Clnr 3	1	Na_2CO_3	8-8.5			5		8	900	1

* Reagents added in regrind mill

Table 47
Cu Cleaner Flotation Results – Hole 124 (50:50, Cu RCon SQ1-3)

Hole 124	Conc. / Tail	Mass (g)	Mass Dist. (%)	Chemical Assay (%)					Distribution Ratio (%)				
				Fe	Cu	Pb	Zn	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
CuCL1	Calc. CLnr1 Tail	375.0	86.1	32.87	0.78	2.65	5.05	157	85.1	70.2	78.1	86.3	83.0
	Scvg Con	65.7	15.1	35.25	1.98	5.24	5.54	237	16.0	31.4	27.0	16.6	21.9
	Scvg Tail	309.3	71.1	32.36	0.52	2.10	4.94	140	69.1	38.8	51.0	69.7	61.0
	Calc. CLnr1 Con	60.3	13.9	35.75	2.05	4.63	4.98	200	14.9	29.8	21.9	13.7	17.0
	CL2 Tail	41.5	9.5	35.88	1.13	3.99	5.26	189	10.3	11.3	13.0	10.0	11.1
	Calc. CLnr2 Con	18.8	4.3	35.46	4.09	6.04	4.37	225	4.6	18.5	8.9	3.7	6.0
	CL3 Tail	9.9	2.3	36.71	1.94	4.92	4.94	214	2.5	4.6	3.8	2.2	3.0
	Final CL3 Con	8.9	2.0	34.08	6.48	7.29	3.73	238	2.1	13.9	5.1	1.5	3.0
	Calc. Head	435.3	100.0	33.27	0.95	2.92	5.04	163					
Head Assay				27.67	0.88	2.34	4.72						

Table 48
Pb Cleaner Flotation Conditions – Hole 124 (50:50, Pb RCon SQ1-3)

Test No.	Regrind Time (min)	Stage	Cond. Time (min)	pH		Reagent Dosage (g/tonne)*				Float Time (min)	RPM's	Cell Size (L)
				Modifier	Range	ZnSO4	3418	MIBC	NaCN			
PbCL1	90 11.3µm	CLnr1	1	Na_2CO_3	9.50	400*		15	40*	30	1000	2
		Scvg	2+1	Na_2CO_3	9.50		5	5		5	1300	2
		CLnr2	1	Na_2CO_3	9.50			10		20	900	1
		CLnr3	1	Na_2CO_3	9.80			10		10	900	1
		CLnr4	1	Na_2CO_3	10.00			5		10	900	1

* Reagents added in regrind mill

Table 49
Pb Cleaner Flotation Results – Hole 124 (50:50, Pb RCon SQ1-3)

Hole 124	Conc. / Tail	Mass	Mass	Chemical Assays (%)					Distribution Ratio (%)				
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
PbCL1	Calc. CLnr1 Tail	244.4	78.2	40.98	0.12	3.92	4.45	63	82.2	34.2	48.3	71.3	43.0
	Scvg Con	39.2	12.5	35.16	0.29	9.85	7.44	147	11.3	13.4	19.5	19.1	16.1
	Scvg Tail	205.2	65.7	42.09	0.09	2.79	3.88	47	70.9	20.8	28.9	52.2	26.9
	Calc. CLnr1 Con	68.1	21.8	31.86	0.82	15.04	6.43	299	17.8	65.8	51.7	28.7	57.0
	CL2 Tail	32.0	10.2	37.66	0.25	7.25	5.78	124	9.9	9.4	11.7	12.1	11.1
	Calc. CLnr2 Con	36.1	11.6	26.72	1.33	21.95	7.01	455	7.9	56.4	40.0	16.6	45.9
	CL3 Tail	16.4	5.2	32.71	0.53	13.35	6.89	240	4.4	10.2	11.0	7.4	11.0
	Calc. CLnr3 Con	19.7	6.3	21.73	1.99	29.12	7.10	634	3.5	46.1	28.9	9.2	34.9
	CL4 Tail	7.3	2.3	28.80	0.88	19.85	6.92	370	1.7	7.6	7.3	3.3	7.5
	Final CL4 Con	12.4	4.0	17.57	2.64	34.57	7.21	789	1.8	38.6	21.6	5.9	27.3
	Cal. Head	312.5	100.0	38.99	0.27	6.35	4.88	115					

Table 50
Zn Cleaner Flotation Conditions – Hole 124 (50:50, Zn RCon SQ1-3)

Hole 124 (50:50)	Regrind Time (min)	Stage	Cond. Time (min)	pH		Reagent Dosage (g/tonne)			Float Time (min)	RPM	Cell Size (L)
				Modifier	Range	$CuSO_4$	3418	MIBC			
ZnCL1	60 15.4µm	CLnr1	5+1	$Ca(OH)_2$	10.5-10.8	400		10	15	900	2
		Scvg	1	$Ca(OH)_2$	11-11.1		0	5	5	1300	2
		CLnr2	1	$Ca(OH)_2$	10.8-10.9			5	10	900	2
		CLnr3	1	$Ca(OH)_2$	11-11.1			5	10	900	2
		CLnr4	1	$Ca(OH)_2$	10.2-11.3			5	10	900	2

Table 51
Zn Cleaner Flotation Results – Hole 124 (50:50, Zn RCon SQ1-3)

Hole 124 (50:50)	Conc. / Tail	Mass	Mass	Chemical Assays (%)					Distribution Ratio (%)				
		(g)	Dist. (%)	Fe (%)	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Fe	Cu	Pb	Zn	Ag
ZnCL1	Calc. CLnr1 Tail	280.9	46.3	36.93	0.13	0.68	3.13	31	49.9	33.2	52.3	11.0	36.7
	Scvg Con	69.9	11.5	22.85	0.26	0.96	12.23	49	7.7	16.6	18.3	10.7	14.4
	Scvg Tail	211.0	34.8	41.60	0.09	0.59	0.11	25	42.2	16.6	34.0	0.3	22.2
	Calc. CLnr1 Con	326.2	53.7	31.92	0.22	0.54	21.84	46	50.1	66.8	47.7	89.0	63.3
	CL2 Tail	126.8	20.9	44.89	0.12	0.55	2.49	29	27.4	13.9	19.0	3.9	15.5
	Calc. CLnr2 Con	199.4	32.8	23.67	0.29	0.53	34.14	57	22.7	52.9	28.6	85.1	47.9
	CL3 Tail	45.4	7.5	44.32	0.18	0.58	5.72	42	9.7	7.5	7.2	3.2	8.0
	Calc. CLnr3 Con	154.0	25.4	17.58	0.32	0.51	42.52	61	13.0	45.5	21.5	81.8	39.8
	CL4 Tail	51.7	8.5	29.16	0.35	0.61	31.37	70	7.3	16.5	8.6	20.3	15.2
	Final CL4 Con	102.3	16.9	11.73	0.31	0.46	48.15	57	5.8	29.0	12.8	61.6	24.6
	Calc. Head	607.1	100.0	34.24	0.18	0.60	13.18	39					

Sequential Floats – Hole 121, 124 & 132 (1/3 Blend Bottom Zones)

Sequential floats were carried out to investigate additional recovery of Cu/Pb/Zn with a 1/3 blend of the bottom zones from Hole 121, 124 & 132 excluding the top and middle oxidized zones from Hole 124. Test conditions and chemical assay results for Hole 121, 124 & 132 blend rougher tests are presented in Tables 52 and 53. Cu, Pb and Zn rougher con cleaning tests were carried out (Tables 54-59). In Hole 121, 124 & 132 (1/3 Blend Bottom Zones) based on chemical assay results with estimated Cu/Pb/Zn grade at 0.23/0.82/2.91% attained 6.61/9.69/15.0% grade with 71.9/77.7/96.8% recoveries, respectively. Highest grade attained in cleaners was 12.2% Cu, 22.9% Pb and 32.2% Zn. Based on the rougher test results this blend should provide satisfactory performance going forward. The poor grades attained in this test from the cleaners can be attributed to the addition of 5100 and 3418A, which would not be utilized in the locked cycle tests.

Table 52
Sequential Rougher Flotation Conditions – Holes 121, 124, 132

Test No.	Stage	Aeration time (min)	Cond. Time (min)	pH		Reagent Dosage (g/tonne) [1]									Float Time (min)
				Modifier	Range	PEX	3418A	AF-241	5100	MIBC	$ZnSO_4$	NaCN	MBS	$CuSO_4$	
SQ1	Cu	10	5+2+1	Na_2CO_3	8-8.5				10	15	400		800		4
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50			10	400	40			3
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50			10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25			5					2
SQ2	Cu	10	5+2+1	Na_2CO_3	8-8.5				10	15	400		800		5
	Pb		5+2+1	Na_2CO_3	9-9.5	4		50		10	400	40			3
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50			10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25			5					
SQ3	Cu	10	5+2+1	Na_2CO_3	8-8.5				10	15	400		800		5
	Pb		5+2+1	Na_2CO_3	9-9.5	8		50		10	400	40			3
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50			10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25			5					2
SQ4-SQ8	Cu	10	5+2+1	Na_2CO_3	8-8.5				10	15	400		800		5
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50			10	400	40			3
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50			10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25			5					2

Table 53
Sequential Flotation Results – Holes 121, 124, 132

	Conc. / Tail	Mass	Mass	Analytical Assays (%)						Distribution ratio (%)					
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
SQ1	CuRC	48.9	2.8	34.15	6.61	2.71	5.22	545	1.01	2.7	55.3	6.4	4.5	30.3	5.4
	PbRC	177.6	10.1	36.28	0.66	7.94	5.16	188	0.78	10.3	20.1	68.1	16.0	38.0	15.1
	ZnRC	288.0	16.3	32.58	0.23	0.57	15.00	40	0.68	15.0	11.3	7.9	75.6	13.1	21.4
	RT	1251.6	70.9	36.04	0.06	0.29	0.18	13	0.43	72.1	13.3	17.5	3.9	18.5	58.1
	Calc. Head	1766.1	100.0	35.45	0.33	1.17	3.24								
SQ2	CuRC	52.5	3.0	30.80	5.88	2.05	4.88	462	0.96	2.4	57.9	5.5	4.4	30.2	5.6
	PbRC	130.1	7.4	38.56	0.49	9.69	5.49	188	0.78	7.3	12.0	64.7	12.2	30.5	11.4
	ZnRC	365.4	20.7	35.07	0.23	0.55	12.82	43	0.62	18.7	15.8	10.3	79.7	19.6	25.4
	RT	1220.6	69.0	40.26	0.06	0.31	0.18	13	0.42	71.6	14.4	19.4	3.7	19.8	57.7
	Calc. Head	1768.6	100.0	38.78	0.30	1.10	3.32								
SQ3	CuRC	76.2	4.3	34.80	5.14	2.58	5.53	408	0.96	3.9	65.3	9.8	6.7	39.7	8.2
	PbRC	185.3	10.5	39.25	0.32	7.02	4.87	122	0.69	10.8	9.9	65.1	14.4	28.8	14.4
	ZnRC1(0-3)	220.6	12.5	31.61	0.26	0.52	20.93	45	0.56	10.3	9.6	5.7	73.6	12.7	13.8
	ZnRC2(3-5)	105.5	6.0	41.13	0.15	0.52	1.01	28	0.71	6.4	2.6	2.7	1.7	3.8	8.4
	RT	1179.1	66.7	39.29	0.06	0.28	0.19	10	0.42	68.6	12.6	16.5	3.6	15.0	55.1
	Calc. Head	1766.7	100.0	38.24	0.34	1.13	3.55								
SQ4-8	CuRC	80.3	4.5	48.78	5.98	3.03	6.70	354	0.93	7.7	71.9	11.9	10.5	34.4	8.7
	PbRC	169.1	9.6	36.47	0.43	7.94	5.03	155	0.63	12.2	10.9	65.8	16.6	31.7	12.5
	ZnRC	344.7	19.5	24.28	0.16	0.50	10.40	44	0.67	16.5	8.3	8.4	69.8	18.3	26.9
	RT	1173.2	66.4	27.53	0.05	0.24	0.14	11	0.38	63.6	9.0	13.8	3.2	15.6	52.0
	Calc. Head	1767.3	100.0	28.72	0.38	1.15	2.91								

*Cu, Pb & Zn rghr concs from SQ4-SQ8 were blended to produce concs for cleaning.

Table 54
Cu Cleaner Flotation Conditions – Hole 121, 124, 132 (Cu Con SQ4-8)

Test No.	Regrind Time (min.)	Stage	Cond. Time (Mins)	pH		Reagent Dosage (g/tonne)				Float Time (min.)	RPM's	Cell Size (L)
				Modifier	Range	ZnSO4	5100	MIBC	MBS			
CuCL1	60 11µm	Clnr 1	5+1	Na_2CO_3	8.-8.5	600*	2	15	400	30	1000	2
		Scvg	2+1	Na_2CO_3	8.-8.5		5	5		10	1300	2
		Clnr 2	1	Na_2CO_3	8.-8.5	300		10	200	20	900	2
		Clnr 3	1	Na_2CO_3	8.-8.5			5		7	900	1

Table 55
Cu Cleaner Flotation Results– Hole 121, 124, 132 (Cu Con SQ4-8)

	Conc/Tail	Mass	Mass	Analytical Assays (%)						Distribution ratio (%)					
		(g)	Dist.	Fe	Cu	Pb	Zn	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
CuCL1	Calc. CLnr1	169.7	55.6	29.72	2.77	1.87	4.67	288	0.83	57.8	39.4	52.1	58.3	50.3	50.7
	Scvg Con	65.7	21.5	27.56	5.46	3.68	6.50	465	1.18	20.8	30.1	39.7	31.4	31.4	27.9
	Scvg Tail	104.0	34.1	31.08	1.07	0.73	3.52	176	0.61	37.0	9.3	12.5	26.9	18.8	22.8
	Calc. CLnr1	135.5	44.4	27.18	5.33	2.16	4.18	357	1.01	42.2	60.6	47.9	41.7	49.7	49.3
	CL2 Tail	79.4	26.0	22.54	2.63	1.78	3.96	312	0.82	20.5	17.5	23.2	23.1	25.5	23.5
	Calc. CLnr2	56.1	18.4	33.74	9.15	2.69	4.50	420	1.28	21.7	43.1	24.7	18.6	24.2	25.9
	CL3 Tail	21.6	7.1	34.32	4.34	2.60	5.23	445	1.04	8.5	7.9	9.2	8.3	9.9	8.1
	Final CL3 Con	34.5	11.3	33.37	12.16	2.74	4.04	404	1.42	13.2	35.2	15.5	10.2	14.3	17.7
	Calc. Head	305.2	100.0	28.59	3.91	2.00	4.46	318	0.91						

Table 56
Pb Cleaner Flotation Conditions – Hole 121, 124, 132 (Pb Con SQ4-8)

Test No.	Regrind Time (min.)	Stage	Cond. Time (Mins)	pH		Reagent Dosage (g/tonne)				Float Time (min.)	RPM's	Cell Size (L)
				Modifier	Range	ZnSO4	5100	MIBC	NaCN			
PbCL1	90 10µm	CLnr1	1	Na_2CO_3	9.50	400*	5	15	40*	30	1000	2
		Scvg	2+1	Na_2CO_3	9.50		5	5		10	1300	2
		CLnr2	1	Na_2CO_3	9.50			10		20	900	1
		CLnr3	1	Na_2CO_3	9.80			10		15	900	1
		CLnr4	1	Na_2CO_3	10.00			5		10	900	1

Table 57
Pb Cleaner Flotation Results – Hole 121, 124, 132 (Pb Con SQ4-8)

	Conc/Tail	Mas	Mas	Analytical Assays (%)						Distribution ratio (%)					
		(g)	Dist (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
PbCL 1	Calc. CLnr1	192.	62.0	35.7	0.1	2.86	4.3	51	0.53	68.	16.	27.	56.	22.	54.
	Scvg Con	39.7	12.8	34.1	0.2	6.62	6.5	115	0.63	13.	7.3	13.	17.	10.	13.
	Scvg Tail	153.	49.2	36.1	0.0	1.89	3.7	35	0.51	55.	9.2	14.	38.	11.	41.
	Calc. CLnr1	118.	38.0	26.7	0.9	12.0	5.3	297	0.74	31.	83.	72.	43.	77.	45.
	CL2 Tail	38.6	12.4	31.4	0.1	4.28	4.9	81	0.62	12.	4.4	8.4	13.	6.9	12.
	Calc. CLnr2	79.7	25.6	24.5	1.3	15.8	5.5	401	0.80	19.	79.	63.	30.	71.	33.
	CL3 Tail	23.6	7.6	30.9	0.2	6.54	5.9	121	0.65	7.3	4.3	7.8	9.5	6.3	8.0
	Calc. CLnr3	56.1	18.0	21.7	1.7	19.7	5.4	519	0.86	12.	74.	55.	20.	64.	25.
	CL4 Tail	11.9	3.8	28.8	0.3	7.97	5.9	150	0.68	3.4	3.2	4.8	4.8	4.0	4.2
	Final CL4 Con	44.2	14.2	19.8	2.1	22.8	5.2	618	0.91	8.7	71.	51.	15.	60.	21.
	Calc. Head	311.	100.	32.3	0.4	6.36	4.7	145	0.61						

Table 58
Zn Cleaner Flotation Conditions – Hole 121, 124, 132 (Zn Con SQ4-8)

Test No.	Regrind Time (min.)	Stage	Cond. Time (Mins)	pH		Reagent Dosage (g/t)			Float Time (min.)	RPM's	Cell Size (L)
				Modifier	Range	CuSO4	5100	MIBC			
ZnCL1	60 16µm	CLnr1	5+1	$Ca(OH)_2$	10.5-10.8	400		10	15	900	2
		Scvg	1	$Ca(OH)_2$	11-11.1		0	5	5	1300	2
		CLnr2	1	$Ca(OH)_2$	10.8-10.9			5	10	900	2
		CLnr3	1	$Ca(OH)_2$	11-11.1			5	10	900	2
		CLnr4	1	$Ca(OH)_2$	10.2-11.3			5	10	900	2

Table 59
Zn Cleaner Flotation Results – Hole 121, 124, 132 (Zn Con SQ4-8)

	Con/Tail	Mass	Mass	Analytical Assays						Distribution ratio (%)					
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
ZnCL 1	Calc. CLnr1 Tail	166.2	27.2	31.1	0.1	0.6	1.80	23	0.78	28.	14.	32.	4.0	17.	36.
	Scvg Con	46.4	7.6	32.7	0.1	0.7	4.43	32	1.04	8.4	5.7	10.	2.8	6.8	13.
	Scvg Tail	119.8	19.6	30.5	0.0	0.6	0.78	20	0.68	20.	8.2	22.	1.3	11.	22.
	Calc. CLnr1	444.3	72.8	29.1	0.2	0.4	16.0	40	0.51	71.	86.	67.	96.	82.	63.
	CL2 Tail	96.7	15.8	33.6	0.1	0.5	1.40	27	0.65	17.	8.5	16.	1.8	12.	17.
	Calc. CLnr2	347.6	56.9	27.9	0.2	0.4	20.0	44	0.46	53.	77.	50.	94.	70.	45.
	CL3 Tail	74.5	12.2	34.9	0.1	0.4	1.50	27	0.59	14.	6.6	10.	1.5	9.3	12.
	Calc. CLnr3	273.1	44.7	26.0	0.2	0.4	25.1	48	0.43	39.	70.	40.	92.	60.	33.
	CL4 Tail	63.3	10.4	37.3	0.1	0.4	2.16	23	0.55	13.	6.1	7.8	1.8	6.7	9.8
	Final CL4 Con	209.8	34.4	22.6	0.3	0.5	32.0	56	0.40	26.	64.	32.	90.	54.	23.
	Calc. Head	610.5	100.0	29.7	0.1	0.5	12.1	36	0.58						

Locked Cycle Test

The sequential flotation performance was found to be satisfactory providing the top and middle zones were excluded and the latter blend sample (1/3 of each of Hole 121, 122 & 132) was selected to move forward to the locked cycle testing. The locked cycle test flow diagram is illustrated in Figure 12.

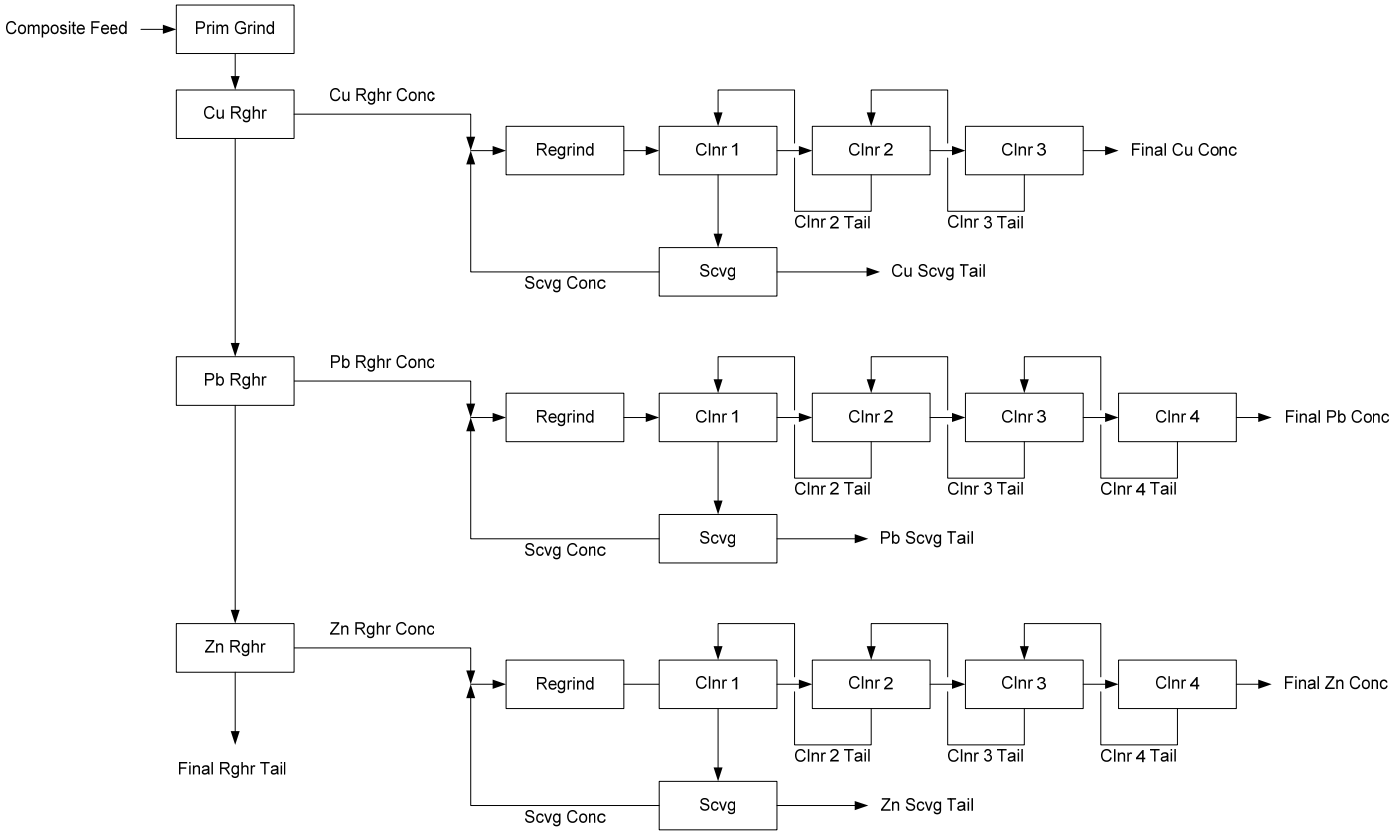


Figure 12: Locked Cycle Test Flow Diagram

Locked Cycle Rougher Flotation

A total of 27 sequential rougher floats were carried out to provide sufficient Cu (2740.4g), Pb (4269.8g) and Zn (8599.1g) rougher concentrate samples for the locked cycle cleaning tests. Locked cycle rougher flotation conditions and test results are presented in Tables 60 and 61.

Table 60
Locked Cycle Rougher Flotation Conditions – Holes 121, 124, 132

Test No.	Stage	Aeration time (min)	Cond. Time (min)	pH		Reagent Dosage (g/tonne) [1]								Float Time (min)
				Modifier	Range	PEX	3418A	5100	MIBC	$ZnSO_4$	NaCN	MBS	$CuSO_4$	
LC1 28-29µm	Cu	10	5+2+1	Na_2CO_3	8-8.5			10	15	400		800		5
	Pb		5+2+1	Na_2CO_3	9-9.5	8	50		10	400	40			3
	Zn1		5+2+1	$Ca(OH)_2$	10-10.5	8	50		10				400	3
	Zn2		2+1	$Ca(OH)_2$	10-10.5	4	25		5					2

Table 61
Locked Cycle Cu/Pb/Zn Rougher Flotation Results (Rougher 1-27) – Holes 121, 124, 132

Description	Conc. / Tail	Mass	Mass	Chemical Assays (%)						Distribution Ratio (%)					
		(g)	Dist. (%)	Fe	Cu	Pb	Zn	Ag(g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
Hole 121	Bottom	15908	33.3	36.16	0.48	0.95	1.88	42	0.906	32.7	59.7	27.4	18.4	31.0	51.5
Hole 124	Bottom	15908	33.3	39.55	0.19	0.82	2.91	35	0.263	35.8	23.3	23.8	28.4	25.6	14.9
Hole 132	Whole	15908	33.3	34.92	0.14	1.68	5.46	59	0.591	31.6	17.0	48.8	53.2	43.5	33.6
Average		47724	100.0	36.87	0.27	1.15	3.42	45	0.590	100.0	100.0	100.0	100.0	100.0	100.0
Cu Rougher	Rougher Con	2740	5.7	34.15	3.43	2.43	5.10	282	0.839	5.4	63.6	12.0	9.0	37.6	9.8
Pb Rougher	Rougher Con	4270	8.9	35.39	0.37	7.58	5.28	135	0.714	8.7	10.6	58.3	14.6	28.1	13.0
Zn Rougher	Rougher Con	8599	18.0	34.82	0.21	0.73	13.01	40	0.659	17.2	12.4	11.2	72.2	16.9	24.2
Tail	Rougher Tail	32115	67.4	37.11	0.062	0.32	0.20	11	0.386	68.7	13.4	18.4	4.2	17.4	53.0
Total		47724	100.0							100.0	100.0	100.0	100.0	100.0	100.0

Locked Cycle Cu Rougher Cleaning

Locked cycle Cu rougher concentrate cleaning conditions and test results are presented in Tables 62 and 63, respectively. Eight (8) locked cycle Cu rougher concentrate cleaning (3 cleanings) were carried out. Cu concentrate grade attained was 17.5% with cleaner recovery of 80.8%. Total Cu recovery including roughers (63.6%) was approximately 51.4%. Locked cycle Cu rougher and cleaner overall recoveries are presented in Table 64.

Table 62
Locked Cycle – Cu Cleaner Conditions

Test No.	Conc. Mass (g)	Regrind Time (min)	Stage	Cond. Time (min)	pH		Reagent Dosage (g/t)				Float Time (min)	RPM	Cell Size (L)
					Modifier	Range	$ZnSO_4$	5100	MIBC	MBS			
Cu LC 1-8	330 + Scav Con	70 10-11µm	Clnr 1	5+1	Na_2CO_3	8-8.5	800		15	400	30	900	2
			Scvg	2+1	Na_2CO_3	8-8.5		5	5		10	1300	2
			Clnr 2	1	Na_2CO_3	8-8.5			10		7	900	2
			Clnr 3	1	Na_2CO_3	8-8.5			5		5	900	2

Table 63
Locked Cycle – Preliminary Cu Cleaner Results

	Conc. / Tail	Mass	Mass	Assays						Normalized Distribution ratio (%)					
		(g)	Dist. (%)	Fe (%)	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
Cu LC 1	Scvg Tail	198.2	7.7	34.37	0.86	1.67	4.40	144	0.717						
	Final CL3 Con	28.1	1.1	32.93	16.57	3.79	3.18	678	1.023						
Cu LC 2	Scvg Tail	230.0	8.9	33.80	1.04	1.89	4.59	174	0.713						
	Final CL3 Con	22.0	0.9	30.19	16.52	3.44	5.90	708	0.962						
Cu LC 3	Scvg Tail	286.8	11.1	34.71	0.90	1.85	4.45	202	0.748						
	Final CL3 Con	39.2	1.5	29.61	19.51	6.69	4.15	578	1.077						
Cu LC 4	Scvg Tail	268.7	10.4	35.40	0.69	2.10	4.59	215	0.768						
	Final CL3 Con	48.7	1.9	30.39	16.71	5.66	5.80	555	1.077						
Cu LC 5	Scvg Tail	226.7	8.8	35.19	0.76	1.73	5.10	216	0.713						
	Final CL3 Con	46.5	1.8	31.31	16.36	4.96	5.37	548	1.003						
Cu LC 6	Scvg Tail	272.8	10.6	35.62	0.73	1.70	4.88	212	0.721	88.3	19.0	59.4	81.5	65.6	76.1
	Final CL3 Con	46.1	1.8	28.25	18.44	7.50	4.49	518	1.084	11.8	81.4	44.3	12.7	27.1	19.3
Cu LC 7	Scvg Tail	274.1	10.6	34.65	0.81	1.94	4.40	219	0.735	86.3	21.3	68.2	73.9	67.9	77.9
	Final CL3 Con	45.7	1.8	28.53	16.40	5.41	7.63	674	1.027	11.9	71.7	31.7	21.4	34.9	18.1
Cu LC 8	Scvg Tail	267.4	10.4	35.69	0.69	1.81	4.46	205	0.779	86.8	17.7	62.2	73.0	62.1	80.5
	Final CL3 Con	50.1	1.9	29.45	17.49	5.62	6.00	582	1.044	13.4	83.9	36.1	18.4	33.0	20.2
Cu LC 8	Calc. CLnr1 Tail	349.3	13.6	35.09	1.13	1.99	5.53	249	0.830						
	Scvg Con	81.9	3.2	33.15	2.54	2.57	9.02	393	0.977						
	Scvg Tail	267.4	10.4	35.69	0.69	1.81	4.46	205	0.779						
	Calc. CLnr1 Con	194.7	7.6	31.91	8.98	3.85	7.87	532	1.060						
	CL2 Tail	92.3	3.6	33.47	4.16	2.86	8.29	469	1.068						
	Calc. CLnr2 Con	102.4	4.0	30.51	13.32	4.74	7.50	590	1.050						
	CL3 Tail	52.3	2.0	31.51	9.33	3.90	8.94	597	1.054						
	Final CL3 Con	50.1	1.9	29.45	17.49	5.62	6.00	582	1.044						
	Calc Head	2577.6	100	34.14	3.24	2.42	5.07	274	0.382						
Cu LC6-8 (Normalized)	Scvg Tail	271.4	84.8	35.31	0.74	1.82	4.58	212	0.50	87.3	19.2	62.2	80.9	66.7	79.8
	Final CL3 Con	48.6	15.2	28.77	17.45	6.16	6.04	591	1.05	12.7	80.8	37.8	19.1	33.3	20.2
	Total	320.1	100.0							100.0	100.0	100.0	100.0	100.0	100.0
Cu Cleaning Con Grade and Recovery				**28.77**	**17.45**	**6.16**	**6.04**	**591**	**1.05**	**12.7**	**80.8**	**37.8**	**19.1**	**33.3**	**20.2**

Table 64
Locked Cycle – Cu Rougher and Cleaner Overall Recovery

	Head	Mass	Mass	Assays						Distribution Ratio (%)					
		(g)	Dist. (%)	Fe (%)	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
Cu Rghr Recovery	Rougher Con	2740	5.7	34.15	3.43	2.43	5.10	282	0.839	5.4	63.6	12.0	9.0	37.6	9.8
Cu Clnr Recovery	Final Cu Clnr 3 Con	416	0.9	28.77	17.45	6.16	6.04	591	1.051	12.7	80.8	37.8	19.1	33.3	20.2
	Cu Cleaner Tails	2324	4.9	34.79	0.82	1.92	4.61	203	0.800	4.7	12.9	8.0	6.9	23.0	7.9
	Rougher Tail	47308	99.1												
Overall Cu Recovery										0.7	51.4	4.5	1.7	12.5	2.0
	Cu Cleaner Tails	2324	4.9	34.79	0.82	1.92	4.61	203	0.80	4.7	12.9	8.0	6.9	23.0	7.9

Locked Cycle Pb Rougher Cleaning

Locked cycle Pb rougher concentrate cleaning conditions and test results are presented in Tables 65 and 66, respectively. Nine (9) locked cycle Pb rougher concentrate cleaning (4 cleanings) were carried out. Pb concentrate grade attained was 50.3% with cleaner recovery of 62.7%. Total Pb recovery including roughers (58.3%) was approximately 37%. Locked cycle Pb rougher and cleaner overall recoveries are presented in Table 67.

Table 65
Locked Cycle – Pb Cleaner Conditions

Test No.	Conc. Mass (g)	Regrind Time (min)	Stage	Cond Time (min)	pH		Reagent Dosage (g/t)				Float Time (min)	RPM's	Cell Size (L)
					Modifier	Range	ZnSO4	3418	MIBC	NaCN			
Pb LC 1-9	300 + Scav Con	105 9µm	Clnr 1	5+1	Na_2CO_3	9.70	800*		10	80*	30	900	2
			Scvg	2+1	Na_2CO_3	9.70		5	5		10	1300	2
			Clnr 2	5	Na_2CO_3	9.80	110		0		10	900	1
			Clnr 3	5	Na_2CO_3	9.90	67		0		7	900	1
			Clnr 4	5	Na_2CO_3	10.00	33		0		5	900	1

Table 66
Locked Cycle – Preliminary Pb Cleaner Results

	Conc. / Tail	Mass	Mass	Assays						Normalized Distribution ratio (%)					
		(g)	Dist. (%)	Fe (%)	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
Pb LC 1	Scvg Tail	176.8	6.5	39.07	0.29	1.86	3.92	31	0.564						
	Final CL4 Con	24.2	0.9	13.46	1.84	51.10	6.72	810	0.877						
Pb LC 2	Scvg Tail	220.0	8.1	39.77	0.09	1.91	4.38	32	0.603						
	Final CL4 Con	43.0	1.6	16.86	1.62	41.42	7.90	694	0.900						
Pb LC 3	Scvg Tail	230.8	8.5	41.62	0.10	2.22	4.62	39	0.607						
	Final CL4 Con	27.7	1.0	15.63	1.71	45.27	6.74	785	0.878						
Pb LC 4	Scvg Tail	252.4	9.3	39.61	0.11	2.58	5.41	48	0.609						
	Final CL4 Con	27.6	1.0	13.98	1.63	51.69	5.68	751	0.943						
Pb LC 5	Scvg Tail	254.5	9.4	39.04	0.12	2.34	5.22	41	0.605						
	Final CL4 Con	22.4	0.8	13.50	1.74	53.21	5.00	796	1.019						
Pb LC 6	Scvg Tail	240.6	8.9	40.48	0.12	2.29	5.12	53	0.582						
	Final CL4 Con	22.7	0.8	15.93	2.73	41.26	6.52	798	1.206						
Pb LC 7	Scvg Tail	256.0	9.4	39.54	0.12	2.85	5.59	49	0.588	92.0	27.6	32.8	87.6	29.8	76.8
	Final CL4 Con	27.6	1.0	12.80	1.96	51.45	5.45	813	0.924	3.2	49.4	63.9	9.2	53.6	13.0
Pb LC 8	Scvg Tail	287.3	10.6	38.49	0.13	3.30	4.87	58	0.523	100.5	33.1	42.7	85.6	40.1	76.6
	Final CL4 Con	28.9	1.1	14.87	3.12	43.46	5.61	826	0.987	3.9	82.3	56.5	9.9	57.0	14.6
Pb LC 9	Scvg Tail	274.3	10.1	37.99	0.11	3.25	5.36	53	0.649	94.7	27.9	40.2	89.9	34.6	90.8
	Final CL4 Con	29.4	1.1	12.08	2.09	55.95	4.77	860	0.860	3.2	56.0	74.0	8.6	60.3	12.9
Pb LC 9	Calc. CLnr1 Tail	354.1	13.1	37.85	0.15	3.67	5.93	67	0.671						
	Scvg Con	79.8	2.9	37.40	0.27	5.09	7.89	114	0.745						
	Scvg Tail	274.3	10.1	37.99	0.11	3.25	5.36	53	0.649						
	Calc. CLnr1 Con	214.4	7.9	31.94	4.62	7.49	7.98	382	0.893						
	CL2 Tail	124.7	4.6	33.73	0.62	7.13	8.28	246	0.861						
	Calc. CLnr2 Con	89.7	3.3	21.93	1.75	28.65	7.66	703	0.936						
	CL3 Tail	40.7	1.5	29.43	1.39	10.86	9.42	557	0.998						
	Calc. CLnr3 Con	49.0	1.8	15.70	2.05	43.43	6.19	824	0.885						
	CL4 Tail	19.6	0.7	21.13	1.99	24.64	8.33	769	0.923						
	Final CL4 Con	29.4	1.1	12.08	2.09	55.95	4.77	860	0.860						
	Calc Head	2711.0	100.0	36.52	0.36	7.38	5.43	139	0.632						
Pb LC (Normalized)	Scvg Tail	272.5	90.5	38.65	0.12	3.14	5.26	54	0.586	96.5	32.1	37.3	90.5	38.0	85.8
	Final CL4 Con	28.6	9.5	13.25	2.40	50.30	5.27	833	0.923	3.5	67.9	62.7	9.5	62.0	14.2
		301.2	100.0							100.0	100.0	100.0	100.0	100.0	100.0
Pb Cleaning Con Grade and Recovery				**13.25**	**2.40**	**50.30**	**5.27**	**833**	**0.923**	**3.5**	**67.9**	**62.7**	**9.5**	**62.0**	**14.2**

Table 67
Locked Cycle – Pb Rougher and Cleaner Overall Recovery

Description	Head	Mass	Mass	Assays						Distribution Ratio (%)					
		(g)	Dist. (%)	Fe (%)	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
	Cu Cleaner Tails	2324	4.9	34.79	0.82	1.92	4.61	203	0.800	4.7	12.9	8.0	6.9	23.0	7.9
Pb Rghr Recovery	Rougher Con	4270	8.9	35.39	0.37	7.58	5.28	135	0.714	8.7	10.6	58.3	14.6	28.1	13.0
Pb Clnr Recovery	Final Pb Clnr 4 Con	405	0.8	13.25	2.40	50.30	5.27	833	0.923	3.5	67.9	62.7	9.5	62.0	14.2
	Pb Cleaner Tails	3864	8.1	38.65	0.12	3.14	5.26	54	0.502	96.5	32.1	37.3	90.5	38.0	85.8
	Rougher Tail	46902	98.3												
Overall Pb Recovery										0.3	7.2	36.6	1.4	17.5	1.8

Locked Cycle Zn Rougher Cleaning

Locked cycle Zn rougher concentrate cleaning conditions and test results are presented in Tables 68 and 69, respectively. Eight (8) locked cycle Zn rougher concentrate cleaning (4 cleanings) were carried out. Zn concentrate grade attained was 53.8% with cleaner recovery of 96.6%. Total Zn recovery including roughers (91.9%) was approximately 88.8%. Locked cycle Zn rougher and cleaner overall recoveries are presented in Table 70.

Table 68
Locked Cycle – Zn Cleaner Conditions

Test No.	Conc. Mass (g)	Regrind Time (min.)	Stage	Cond. Time (Mins)	pH		Reagent Dosage (g/t)			Float Time (min.)	RPM's	Cell Size (L)
					Modifier	Range	$CuSO_4$	3418	MIBC			
Zn LC 1-8	600 + Clnr Tails	60	Clnr 1	5 + 1	$Ca(OH)_2$	10.50	400		0	8	900	2
			Scvg	2+1	$Ca(OH)_2$	11.00		5	5	5	1300	2
			Clnr 2	1	$Ca(OH)_2$	10.80			0	5	900	2
			Clnr 3	1	$Ca(OH)_2$	11.00			0	5	900	1
			Clnr 4	1	$Ca(OH)_2$	10.20			0	5	900	1

Table 69
Locked Cycle – Zn Cleaner Results

	Conc. / Tail	Mass	Mass	Assays						Normalized Distribution ratio (%)					
		(g)	Dist. (%)	Fe (%)	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
Zn LC 1	Scvg Tail	337.2	7.1	43.46	0.11	0.58	0.60	21	0.545						
	Final CL4 Con	84.7	1.8	8.66	0.30	1.11	57.75	78	0.222						
Zn LC 2	Scvg Tail	290.8	6.1	40.63	0.087	0.56	1.09	19	0.618						
	Final CL4 Con	59.2	1.2	11.64	0.36	0.97	53.17	69	0.221						
Zn LC 3	Scvg Tail	442.4	9.3	42.61	0.084	0.61	0.69	18	0.602						
	Final CL4 Con	108.7	2.3	10.57	0.48	2.18	52.71	76	0.319						
Zn LC 4	Scvg Tail	469.9	9.9	43.88	0.12	0.71	0.68	26	0.600						
	Final CL4 Con	120.5	2.5	9.98	0.41	1.13	54.47	85	0.310						
Zn LC 5	Scvg Tail	446.7	9.4	42.29	0.12	0.66	0.65	26	0.616						
	Final CL4 Con	127.1	2.7	10.00	0.40	1.03	54.50	87	0.302						
Zn LC 6	Scvg Tail	417.7	8.8	42.13	0.11	0.66	0.60	21	0.572	84.1	33.3	58.9	3.2	36.0	69.5
	Final CL4 Con	156.3	3.3	10.69	0.51	1.09	51.68	94	0.358	8.0	59.4	36.2	102.9	60.0	16.3
Zn LC 7	Scvg Tail	415.3	8.8	43.85	0.13	0.67	0.62	27	0.614	87.0	38.9	59.6	3.3	45.3	74.1
	Final CL4 Con	137.5	2.9	10.39	0.47	1.05	55.50	95	0.343	6.8	47.8	30.8	97.2	53.4	13.7
Zn LC 8	Scvg Tail	445.0	9.4	43.09	0.13	0.64	0.71	26	0.629	91.6	44.4	60.3	4.0	47.6	81.4
	Final CL4 Con	142.0	3.0	10.49	0.46	1.10	54.43	95	0.384	7.1	48.4	33.2	98.5	55.2	15.9
Zn LC 8	Calc. CLnr1 Tail	642.9	13.6	42.07	0.22	0.69	2.55	34	0.755						
	Scvg Con	197.9	4.2	39.77	0.41	0.82	6.68	52	1.039						
	Scvg Tail	445.0	9.4	43.09	0.13	0.64	0.71	26	0.629						
	Calc. CLnr1 Con	484.7	10.2	23.88	0.59	1.09	33.54	86	0.701						
	CL2 Tail	227.9	4.8	33.11	0.60	1.04	19.81	72	0.857						
	Calc. CLnr2 Con	256.8	5.4	15.69	0.58	1.14	45.72	98	0.563						
	CL3 Tail	76.5	1.6	23.63	0.71	1.15	32.39	95	0.827						
	Calc. CLnr3 Con	180.3	3.8	12.32	0.52	1.14	51.38	99	0.451						
	CL4 Tail	38.3	0.8	19.09	0.75	1.28	40.05	111	0.700						
Zn LC (Normalized)	Scvg Tail	426.0	74.6	43.02	0.12	0.66	0.64	25	0.610	92.3	42.8	64.1	3.4	43.3	83.1
	Final CL4 Con	145.3	25.4	10.53	0.48	1.08	53.78	95	0.360	7.7	57.2	35.9	96.6	56.7	16.9
		571.3	100.0							100.0	100.0	100.0	100.0	100.0	100.0
Zn Cleaning Con Grade and Recovery				**10.53**	**0.48**	**1.08**	**53.78**	**95**	**0.360**	**7.7**	**57.2**	**35.9**	**96.6**	**56.7**	**16.9**

Table 70
Locked Cycle – Zn Rougher and Cleaner Overall Recovery

Description	Head	Mass	Mass	Assays						Distribution Ratio (%)					
		(g)	Dist. (%)	Fe (%)	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Au (g/t)	Fe	Cu	Pb	Zn	Ag	Au
Zn Rghr - Cu ClnrTail	Zn Rghr Con (CuCT)	1168	2.4	30.03	1.54	1.66	8.78	369	0.805	2.0	12.2	3.5	6.6	21.0	4.0
Zn Rghr - Pb ClnrTail	Zn Rghr Con (PbCT)	1687	3.5	32.94	0.26	2.72	11.99	82	0.564	3.2	3.0	8.3	13.1	6.7	4.1
Zinc	Zn Rghr Con (Pb RT)	8599	18.0	34.82	0.21	0.73	13.01	40	0.659	17.2	12.4	11.2	72.2	16.9	24.2
Total Zn Rghr Recovery	Total Rougher	11454	24.0	34.05	0.36	1.11	12.43	80	0.660	22.5	27.6	23.0	91.9	44.6	32.3
Zn Clnr Recovery	Final Zn Clnr 4 Con	2913	6.1	10.53	0.48	1.08	53.78	95	0.360	7.7	57.2	35.9	96.6	56.7	16.9
	Zn Cleaner Tails	8541	17.9	43.02	0.12	0.66	0.64	25	0.610	92.3	42.8	64.1	3.4	43.3	83.1
	Zn Rghr Tail (Cu CT)	1156	2.4	35.05	0.17	1.97	0.73	21	0.385	2.3	1.3	4.1	0.5	1.2	1.9
	Zn Rghr Tail (Pb CT)	2178	4.6	39.83	0.11	2.28	0.73	21	0.473	5.0	1.6	8.9	1.0	2.2	4.4
Zinc	Rougher Tail	32115	67.3	37.11	0.062	0.32	0.20	11	0.386	68.7	13.4	18.4	4.2	17.4	53.0
Calc. Rougher Head		47724	100.0	36.37	0.31	1.16	3.25	43	0.491	100.0	100.0	100.0	100.0	100.0	100.0
Rougher Head Assays				36.02	0.29	1.17	3.12	43	0.595						
Overall Zinc Recovery										1.7	15.8	8.3	88.8	25.3	5.5

Multi-Elemental Scan Analysis

Head, flotation feed, rougher concentrate, cleaner scavenger tails and final cleaner concentrates were analyzed by ICP for multi-element scan. The ICP scan assay results of the bottom section of Hole 121 and 124, the whole section of Hole 132 as well as the blended ground flotation feed (1/3 Hole 121 Bottom: 1/3 Hole 124 Bottom: 1/3 Hole 132 Whole) are presented in Table 71. The ICP scan results of the rougher concentrates and tail, final cleaner concentrates, and cleaner scavenger tails are presented in Tables 72, 73 and 74, respectively. Detail assay reports are attached in the Appendix.

Table 71
Hole 121, 124, 132 and Flotation Feed Blend ICP Scan Assay Results

Sample ID	Hole 121 (Btm)	Hole 124 (Btm)	Hole 132 (Whole)	Ground Feed	Sample ID	Hole 121 (Btm)	Hole 124 (Btm)	Hole 132 (Whole)	Blended Feed
Total S, %	36.0	44.3	40.4	39.6	Sr, ppm	43.2	5.9	8.1	14.9
Na, %	0.07	0.01	0.02	0.02	Zr, ppm	42	21	20	26
Mg, %	0.61	0.17	0.27	0.27	Nb, ppm	5	1.2	0.9	2.5
Al, %	0.88	0.23	0.33	0.36	Mo, ppm	9.4	14.3	13.2	67.1
K, %	0.14	0.07	0.12	0.09	In, ppm	4.1	11.7	20.1	11.8
Ca, %	2.36	0.59	1.18	0.91	Sn, ppm	31	30	58	18
Li, ppm	4.2	2.7	1.7	1.7	Sb, ppm	> 500	> 500	> 500	> 500
Cd, ppm	53.8	42.1	109	53.2	Te, ppm	< 0.1	< 0.1	< 0.1	< 0.1
V, ppm	51	17	16	17	Ba, ppm	46	21	19	25
Cr, ppm	12.6	22.5	18.6	333	La, ppm	4.5	1.1	2.2	2.5
Mn, ppm	1530	772	1160	1040	Ce, ppm	10.1	3.2	5.2	5.9
Hf, ppm	0.7	< 0.1	< 0.1	0.5	Pr, ppm	1.2	0.4	0.6	0.7
Hg, ppm	11.1	18.0	22.1	17.0	Nd, ppm	5.0	1.4	2.1	2.6
Ni, ppm	9.3	10.5	11	237	Sm, ppm	1.1	0.3	0.4	0.6
Er, ppm	0.6	0.2	0.2	0.3	Gd, ppm	1.3	0.3	0.4	0.5
Be, ppm	0.5	0.2	0.2	0.2	Tb, ppm	0.2	< 0.1	< 0.1	< 0.1
Cs, ppm	0.44	0.27	0.42	0.33	Dy, ppm	1.2	0.4	0.4	0.5
Co, ppm	130	143	57.7	89.3	Ge, ppm	0.7	2.0	3.1	1.1
Eu, ppm	0.65	0.25	0.38	0.36	Yb, ppm	0.5	0.2	0.2	0.3
Bi, ppm	106	36.6	25.5	45.5	Ta, ppm	0.7	0.4	0.5	< 0.1
Se, ppm	48.2	25.2	22.5	27.9	W, ppm	1.6	1.6	1.7	2.8
Ga, ppm	7.4	4.0	4.8	4.9	Re, ppm	0.004	0.011	0.004	0.016
As, ppm	2850	6500	5920	4420	Tl, ppm	30.2	51.2	63.3	45
Rb, ppm	11.6	5.6	9.8	7.8	Th, ppm	1.0	0.5	1.0	0.6
Y, ppm	6.2	2.3	2.2	3.0	U, ppm	2.4	1.5	2.8	2.0

Table 72
Rougher Concentrate and Tail ICP Scan Assay Results

Sample ID	Rougher Cu Con	Rougher Pb Con	Rougher Zn Con	Rougher Zn Tail	Sample ID	Rougher Cu Con	Rougher Pb Con	Rougher Zn Con	Rougher Zn Tail
Total S, %	37.9	42.7	42.8	37.6	Sr, ppm	13.3	5.6	7.5	20.7
Na, %	0.03	0.01	0.01	0.05	Zr, ppm	32	17	17	28
Mg, %	0.27	0.11	0.13	0.43	Nb, ppm	1.4	1.3	1.2	3.6
Al, %	0.44	0.15	0.15	0.59	Mo, ppm	92.4	40.4	54.2	78.4
K, %	0.11	0.03	0.03	0.13	In, ppm	26.8	14.7	39.2	1.7
Ca, %	1.21	0.46	0.64	1.56	Sn, ppm	43	19	21	13
Li, ppm	2.1	0.9	1.1	3.2	Sb, ppm	> 500	> 500	> 500	265
Cd, ppm	105	103	254	2.6	Te, ppm	< 0.1	< 0.1	< 0.1	< 0.1
V, ppm	14	8	4	25	Ba, ppm	11	8	11	34
Cr, ppm	515	197	270	396	La, ppm	1.0	< 0.1	1.2	3.3
Mn, ppm	1070	534	645	1460	Ce, ppm	6.3	2.4	2.8	7.5
Hf, ppm	0.4	0.3	< 0.1	0.3	Pr, ppm	0.7	0.3	0.3	0.8
Hg, ppm	29.4	24.0	47.7	3.4	Nd, ppm	2.8	1.1	1.1	3.1
Ni, ppm	344	135	198	320	Sm, ppm	0.6	0.2	0.2	0.7
Er, ppm	0.4	0.1	0.1	0.4	Gd, ppm	0.7	0.2	0.3	0.8
Be, ppm	0.4	0.2	0.2	0.4	Tb, ppm	0.1	< 0.1	< 0.1	0.1
Cs, ppm	0.39	0.19	0.19	0.43	Dy, ppm	0.7	0.2	0.2	0.8
Co, ppm	130	69.6	84.6	120	Ge, ppm	1.6	1.5	1.5	0.9
Eu, ppm	0.43	0.2	0.19	0.51	Yb, ppm	0.3	< 0.1	0.1	0.3
Bi, ppm	127	151	44.2	39.6	Ta, ppm	0.2	0.7	0.3	0.5
Se, ppm	44	61.2	29	22.2	W, ppm	1.4	2.0	2.2	3.3
Ga, ppm	5.8	2.9	4.8	5.6	Re, ppm	0.021	0.011	0.013	0.009
As, ppm	6170	4480	5990	4530	Tl, ppm	56.8	82.2	36.9	41.5
Rb, ppm	8.6	2.6	2.8	10.4	Th, ppm	1.2	1.1	0.5	0.9
Y, ppm	3.2	1.1	1.2	3.9	U, ppm	2.8	2.0	2.4	2.0

Table 73
Average Final Cleaner Concentrate ICP Scan Assay Results

Sample ID	Final Cu Con	Final Pb Con	Final Zn Con	Sample ID	Final Cu Con	Final Pb Con	Final Zn Con
Total S, %	36.0	24.7	33.6	Sr, ppm	3.0	5.8	1.0
Na, %	< 0.01	< 0.01	< 0.01	Zr, ppm	19	6	2
Mg, %	0.03	0.02	0.01	Nb, ppm	0.1	< 0.1	0.3
Al, %	0.05	0.05	0.01	Mo, ppm	42.1	17.4	10.4
K, %	< 0.01	0.01	< 0.01	In, ppm	77.2	19.7	> 100
Ca, %	0.135	0.21	0.08	Sn, ppm	153	46	28
Li, ppm	< 0.5	< 0.5	< 0.5	Sb, ppm	> 500	> 500	304
Cd, ppm	153	112	1037	Te, ppm	< 0.1	0.1	0.2
V, ppm	4	2	< 1	Ba, ppm	9	1.5	3
Cr, ppm	73.2	36.4	15.3	La, ppm	< 0.1	< 0.1	< 0.1
Mn, ppm	191	164	211	Ce, ppm	1.8	0.7	0.3
Hf, ppm	0.15	0.15	< 0.1	Pr, ppm	0.2	< 0.1	< 0.1
Hg, ppm	49.5	36.2	> 100	Nd, ppm	0.75	0.3	0.1
Ni, ppm	52.2	25.8	15.7	Sm, ppm	0.2	< 0.1	< 0.1
Er, ppm	0.1	< 0.1	< 0.1	Gd, ppm	0.2	< 0.1	< 0.1
Be, ppm	< 0.1	0.1	0.2	Tb, ppm	< 0.1	< 0.1	< 0.1
Cs, ppm	0.1	0.07	< 0.05	Dy, ppm	0.2	< 0.1	< 0.1
Co, ppm	68.5	19.3	4.6	Ge, ppm	0.95	1.3	0.3
Eu, ppm	0.11	0.07	< 0.05	Yb, ppm	0.15	< 0.1	< 0.1
Bi, ppm	262	751	27.4	Ta, ppm	< 0.1	< 0.1	0.2
Se, ppm	83.2	301	28.6	W, ppm	0.2	0.15	0.2
Ga, ppm	2.3	1.55	9.1	Re, ppm	0.03	0.018	0.011
As, ppm	3335	2080	1460	Tl, ppm	89.1	356	30.6
Rb, ppm	0.8	0.6	< 0.2	Th, ppm	1.4	0.6	0.1
Y, ppm	1.1	0.4	0.1	U, ppm	2.1	1.4	1.3

Note: Final Cu Con (Cu LC7&8), Final Pb Con (Pb LC8&9), Final Zn Con (Zn LC6,7,8)

Table 74
Average Cleaner Scavenger Tail ICP Scan Assay Results

Sample ID	Cu Clnr Scav Tail	Pb Clnr Scav Tail	Zn Clnr Scav Tail	Sample ID	Cu Clnr Scav Tail	Pb Clnr Scav Tail	Zn Clnr Scav Tail
Total S, %	36.3	45.9	45.8	Sr, ppm	17.9	8.8	9.1
Na, %	0.04	0.01	0.01	Zr, ppm	40	20	18
Mg, %	0.27	0.21	0.17	Nb, ppm	2.7	1.4	1.5
Al, %	0.48	0.33	0.24	Mo, ppm	91.7	55.9	60
K, %	0.13	0.06	0.05	In, ppm	17.2	3.5	4.1
Ca, %	1.04	1.14	0.86	Sn, ppm	41	9	10
Li, ppm	2.3	1.8	1.2	Sb, ppm	> 500	305	192
Cd, ppm	77.1	9.1	10.3	Te, ppm	< 0.1	< 0.1	< 0.1
V, ppm	31	6	6.33	Ba, ppm	27	8	8
Cr, ppm	576	318	277	La, ppm	2.4	1.4	1.5
Mn, ppm	1110	691	719	Ce, ppm	7.2	3.2	3.3
Hf, ppm	1.1	0.2	0.1	Pr, ppm	0.8	0.4	0.4
Hg, ppm	24.6	4340	4.34	Nd, ppm	3.0	1.4	1.6
Ni, ppm	374	281	238	Sm, ppm	0.6	0.3	0.3
Er, ppm	0.4	0.1	0.2	Gd, ppm	0.6	0.3	0.3
Be, ppm	0.2	0.1	0.2	Tb, ppm	0.1	< 0.1	< 0.1
Cs, ppm	0.42	0.21	0.22	Dy, ppm	0.6	0.3	0.3
Co, ppm	114	111	93.5	Ge, ppm	1.7	0.8	0.6
Eu, ppm	0.39	0.22	0.2	Yb, ppm	0.3	< 0.1	0.2
Bi, ppm	75.7	40.5	43.0	Ta, ppm	< 0.1	0.7	0.7
Se, ppm	30.7	18.9	18.9	W, ppm	0.5	5.1	2.9
Ga, ppm	5.9	2.8	2.7	Re, ppm	0.016	0.01	0.02
As, ppm	5960	6950	7087	Tl, ppm	47.7	26.9	29.9
Rb, ppm	10.6	3.1	3.1	Th, ppm	3.8	0.7	0.5
Y, ppm	3.5	1.5	1.6	U, ppm	2.7	2.2	2.4

CONCLUSIONS AND RECOMMENDATIONS

RPC carried out the scoping studies on drill core from drill three holes (MB-2012-121, 124, 132) as provided by Votorantim. Prior to shipment to RPC the drill core was inspected and separated into zones based on evident alteration. The drill hole samples were then prepared for the initial scoping metallurgical test program, which consisted of sample preparation, characterization and flowsheet development through scoping/optimization based on a series of rougher and cleaning flotation tests. Both Cu/Pb + Zn and sequential Cu + Pb + Zn recovery flowsheets were examined in the study. The Cu/Pb bulk flotation is common to the Bathurst Camp mineralization and used by both the former Heath Steele and Xstrata Zinc Brunswick operation. The production of individual Cu/Pb/Zn concentrates in sequential flotation was the simpler preferred option and selected for most of the scoping and optimization tests. The drill hole samples were tested both separately and as blended samples. The secondary altered zones in Hole 124 (Top and Middle) interfered with flotation performance and were left out of the final test sample.

The flotation performance was confirmed in a locked cycle test. Recoveries of 88.8% Zn, 51.4% Cu and 36.6% Pb were achieved in the initial locked cycle test. Individual locked cycle rougher test recovery/grade results were quite variable (up to ~80% vs 63.6% for Cu, up to ~75% vs 58.3% for Pb); however, indicating that higher recoveries were achievable that would increase overall recoveries of Cu and Pb to ~60% and ~50%, respectively. The locked cycle test sample was prepared in a series of 2kg batches in a small rod mill using the same rod charge and time required to meet the target rougher float grind size (D_{80} = 28.7µm) for the Cu/Pb/Zn rougher floats. The Pb locked cycle cleaning recovery was low at 62.7%, potentially due to oxidation from the 27 small batch rougher floats in order to produce rougher concentrates for the cleaning tests. Four Pb cleaning stages were conducted and the cleanings achieved an average of 50.3% Pb Con. It is likely that only 3 cleaning stages are required in order to produce an acceptable 45% Pb Con product. Reducing the cleaning stages should also improve the cleaning recovery efficiency.

A total of 27 rougher floats were required to obtain sufficient Cu rougher concentrate (2.74kg) for the locked cycle cleaning tests (4.27kg Pb rougher con, 8.60 kg Zn rougher con). The locked cycle test was carried out over several weeks due to the amount of time required to produce sufficient rougher concentrate. It is recommended that a grind curve be established for the larger ball mill which can grind ~20kg batches that would be immediately be followed by rougher flotation in 32L cells capable of handling much larger feed capacity and subsequently less chance of oxidation. The performance of the Pb circuit was disappointing so oxidation may have contributed to this result. During the locked cycle the used of MIBC was restricted in the cleanings resulting in higher recoveries and grades. Additional optimization tests will be carried out in both the roughers and cleaners to further optimize reagent dosage and flotation times prior to the large batch locked cycle test.

The following recommendations apply:

1. Several small 1.75kg rougher and cleaning tests should be carried out to establish more precise reagent dosages and flotation times to investigate if improved metal recoveries and grade can be obtained.
2. Larger scale (32L) rougher flotation tests followed by a locked cycle test should be carried out to investigate improved flotation performance with less chance of oxidation.
3. Continuous pilot plant verification of bench scale testing (Figure 13).

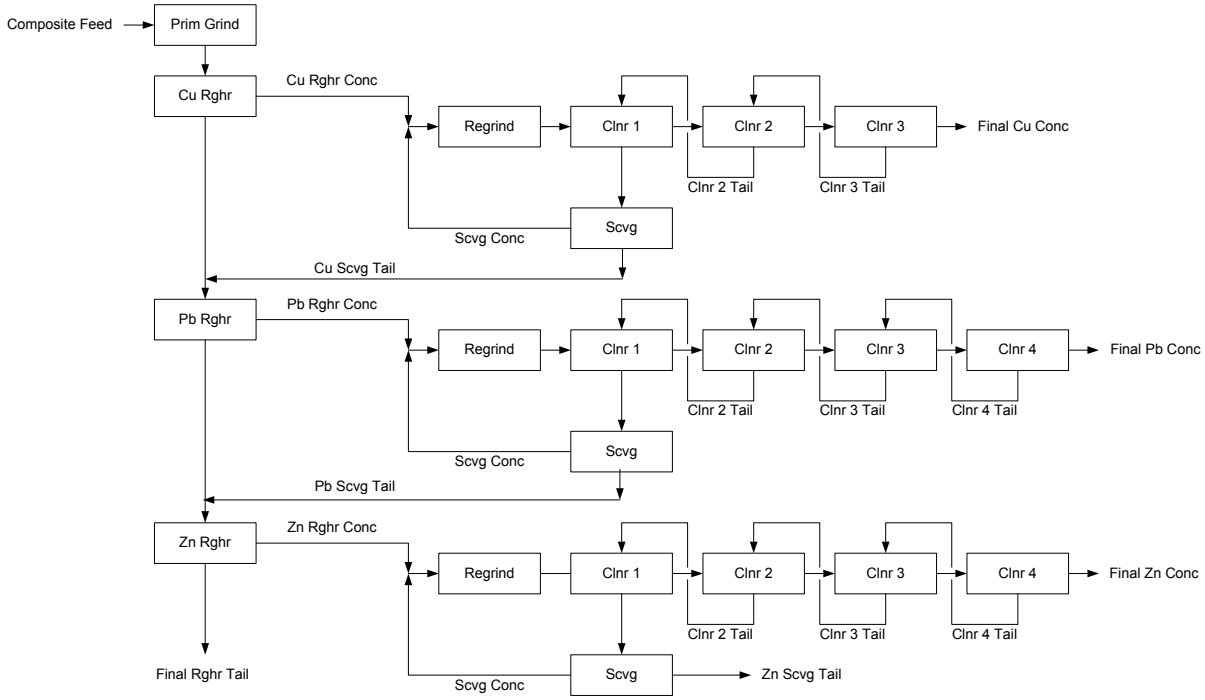


Figure 13: Pilot Conceptual Block Diagram

APPENDIX

October 31, 2012

Rodney N. Thomas
GM - North American Mineral Exploration
Votorantim Metals Canada Inc.
4 King St W, Toronto, ON
M5H 1B6

Dear Mr. Thomas,

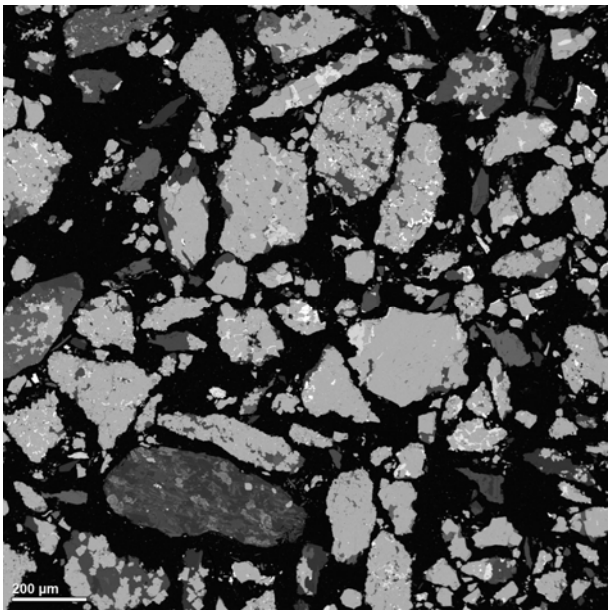
RE: Murray Brook VMS Zn-Cu-Pb-Ag-Au Deposit Scoping Metallurgical Test Program – Mineralogy Report; Reference No.: MIS-J1859 Rev 1

We present our mineralogy report detailing SEM-EDS results on your Murray Brook VMS deposit from Holes 121, 124, 132 and composite metallurgical head samples as well as composite rougher flotation tailings. Pyrite is the prominent mineral in all samples. In general, sphalerite and galena occur as an interstitial phase as well as inclusions, fine vienlets and attachments to pyrite. Chalcopyrite was rare (not found in Hole 132 sample) and occurs as interstitial to pyrite. Covellite (CuS) secondary Cu mineralization was present in Hole 124. Most of the target mineral occurrences are <20µm though 50-100µm sphalerite interstitial with pyrite are present, particularly in Hole 132. The main Ag bearing mineral is tetrahedrite.

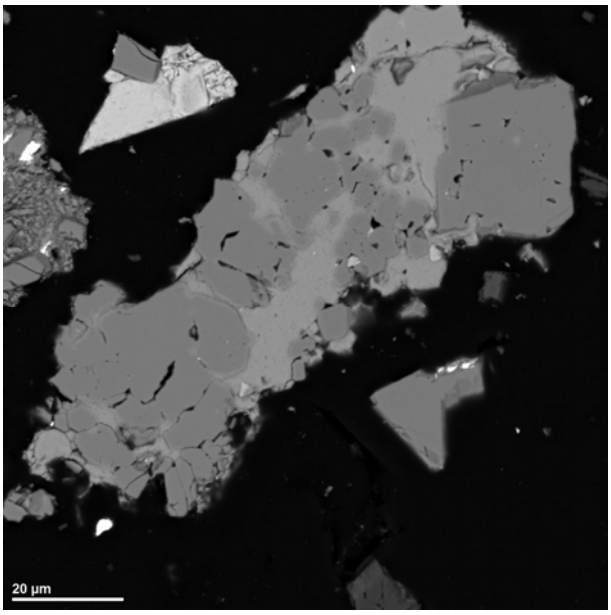
MB-12-121-Btm:

The sample consists of elongate to equant, irregular fragments <800 µm. The fragments are predominantly composite, and range from sulphide-rich to sulphide-poor. Sulphide-rich fragments largely consist of granular, equant subhedral-euhedral pyrite with varied amounts of anhedral interstitial sphalerite and galena. Less common are chalcopyrite, tetrahedrite, and arsenopyrite, which also commonly occur as interstitial phases in pyrite-rich fragments. Pyrite is typically coarser-grained than the other sulphides. There are, however, uncommon fragments consisting predominantly of either chalcopyrite or sphalerite, with subordinant pyrite. Bismuth metal, tetrahedrite, and an unidentified Pb-Bi-Sb-Cu sulphosalt are rare. Some fragments contain abundant quartz or carbonate. Carbonate minerals are more abundant than quartz, and consist predominantly of siderite.

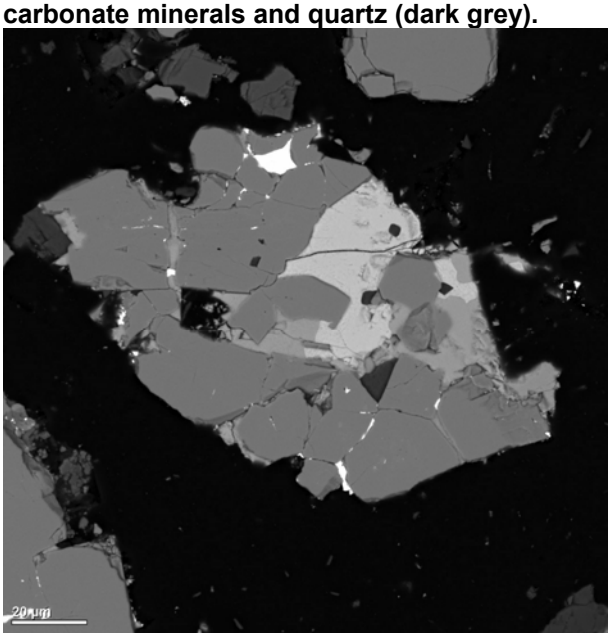
Siderite together with ferruginous dolomite is also a common association, in which siderite may be the dominant or subordinant phase. Calcite is rare. Other silicate minerals identified are chlorite and muscovite. Monomineralic fragments typically consist of either pyrite or a carbonate mineral. Most monomineralic fragments are <20µm, and those >50µm are rare. Overall, the sample consists of approximately 30% non-sulphides, 65% pyrite, and 5% other sulphides.



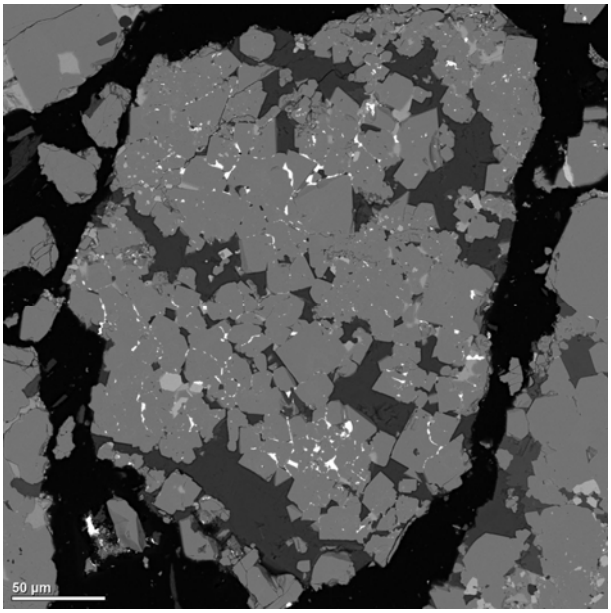
MB-121-0001: Low magnification overview. Dark grey are silicates (predominantly quartz) and carbonates (predominantly calcite). Polygranular pyrite fragments (medium grey) host finer grained galena (white) and other sulphides (light grey) as well as interstitial carbonate minerals and quartz (dark grey).



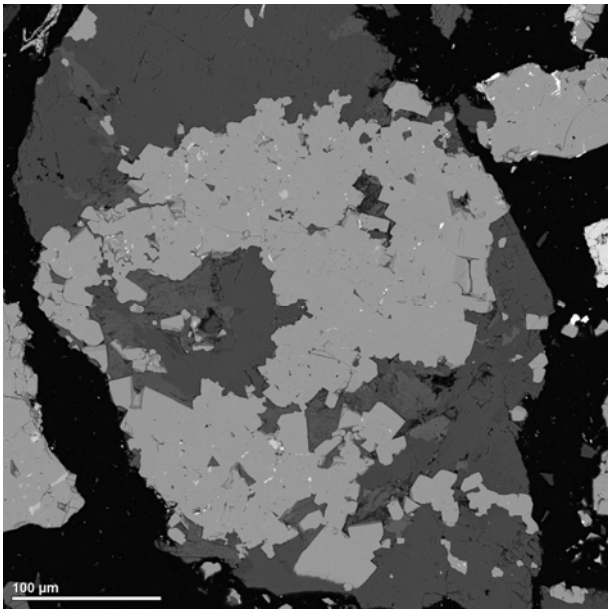
MB-121-0003: Pyrite (medium grey) with chalcopyrite (light grey). The very fine-grained (<5µm) equant grains (lighter grey) are arsenopyrite. The angular fragment at upper left consists of tetrahedrite (light grey) and pyrite.



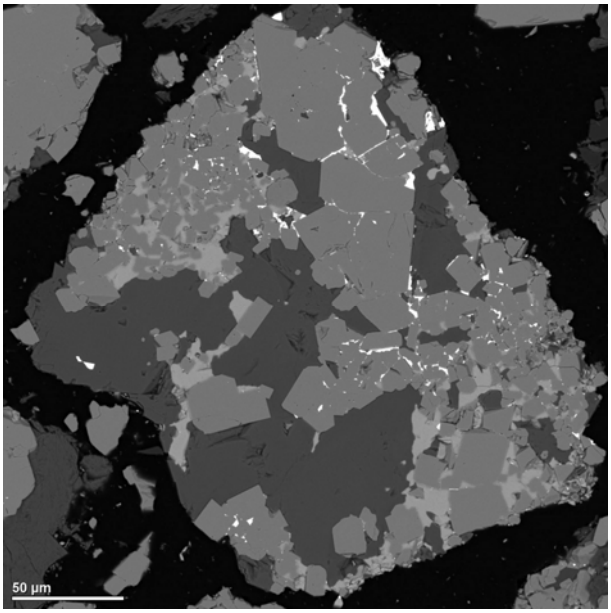
MB-121-0002: Pyrite (medium-dark grey) with sphalerite (medium grey), tetrahedrite (light grey) and galena (white). The fragment also contains minor fine-grained calcite (dark grey).



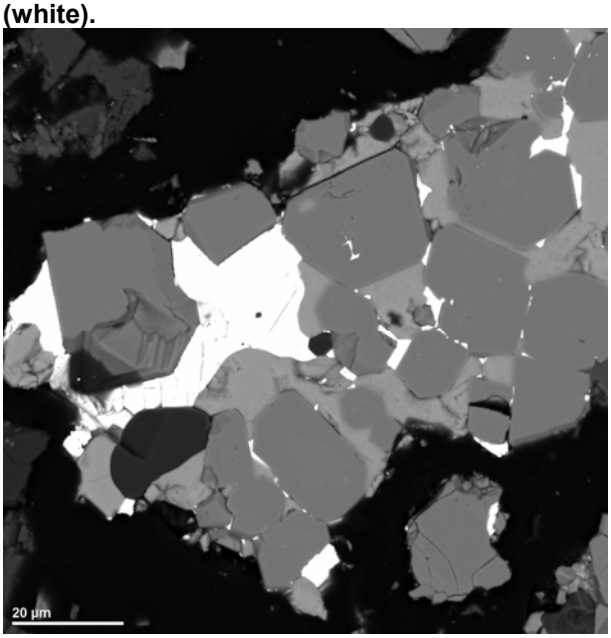
MB-121-0004: Equant pyrite (medium grey) with interstitial calcite (dark grey), and fine-grained galena (white), anhedral sphalerite and subhedral to euhedral arsenopyrite (light grey).



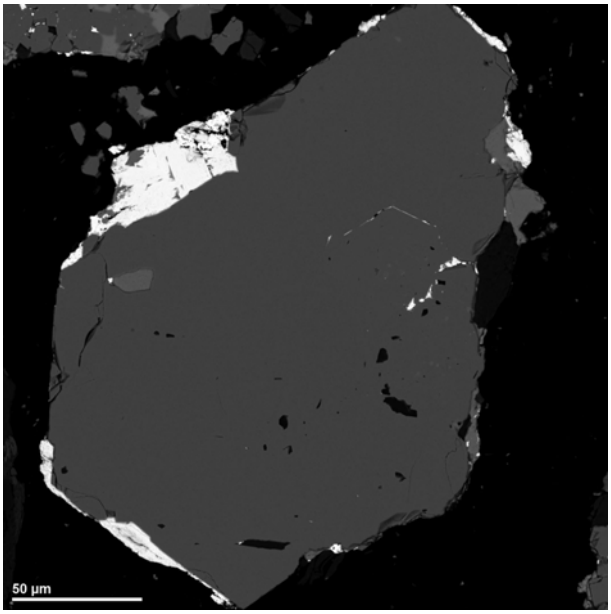
MB-121-0005: Fragment consisting of anhedral to subhedral pyrite (medium grey) ferruginous dolomite (dark grey), and siderite (dark medium grey). Pyrite contains fine-grained inclusions of sphalerite (light grey) and galena (white).



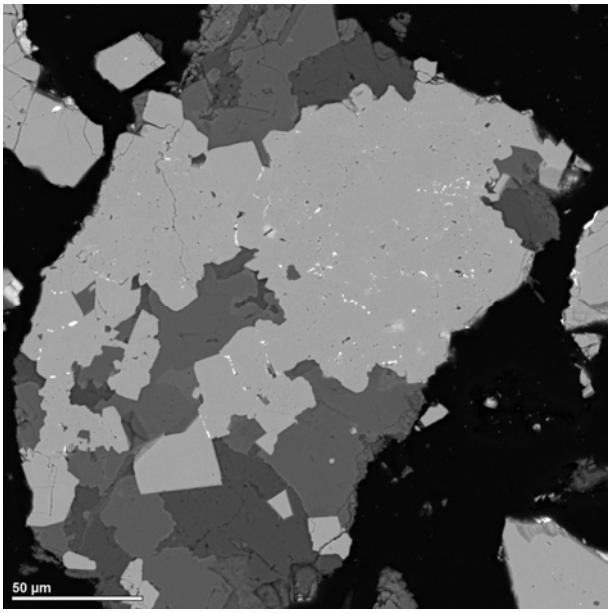
MB-121-0007: Fragment consisting predominantly of siderite (dark grey) and pyrite (medium grey). Sphalerite (light grey) and galena (white) are interstitial to pyrite.



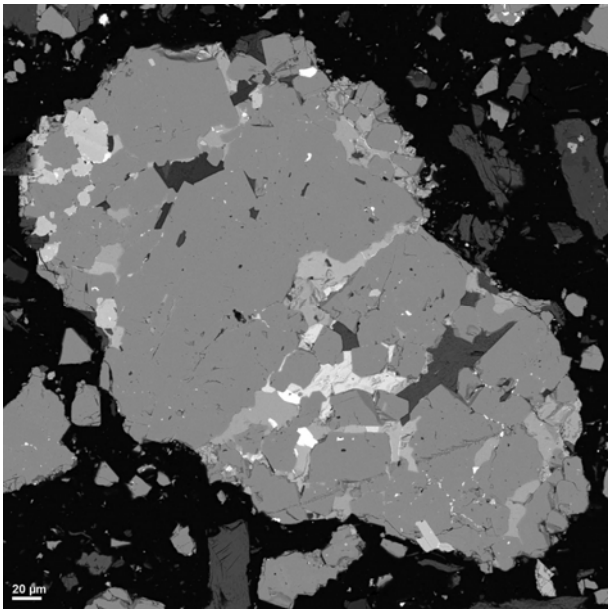
MB-121-0006: Equant subhedral-anhedral pyrite (medium grey) with interstitial sphalerite (light grey) galena (white), and quartz (dark grey).



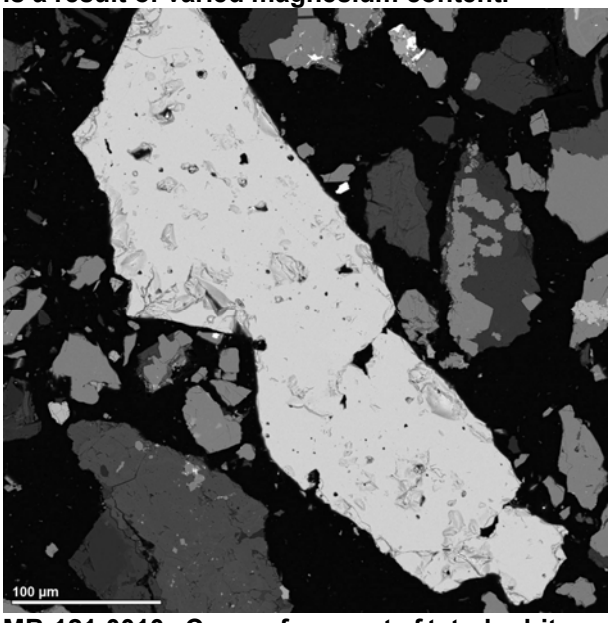
MB-121-0008: Coarse pyrite partially mantled by an unidentified Pb-Bi-Sb-Cu sulphosalt (white) and chalcopyrite (light grey). The sulphosalt grain at upper-left contains an inclusion of Bi-metal.



MB-121-0009: Fragment consisting of approximately equal amounts of pyrite (light grey), siderite (medium grey) and ferruginous dolomite (dark grey). Pyrite contains many fine-grained inclusions of galena (white) and trace chalcopyrite. Varied intensity of siderite is a result of varied magnesium content.



MB-121-0011: Fragment consisting of pyrite (medium grey) with interstitial chlorite (dark grey), sphalerite (light grey), tetrahedrite (bright grey), and boulangerite (white).

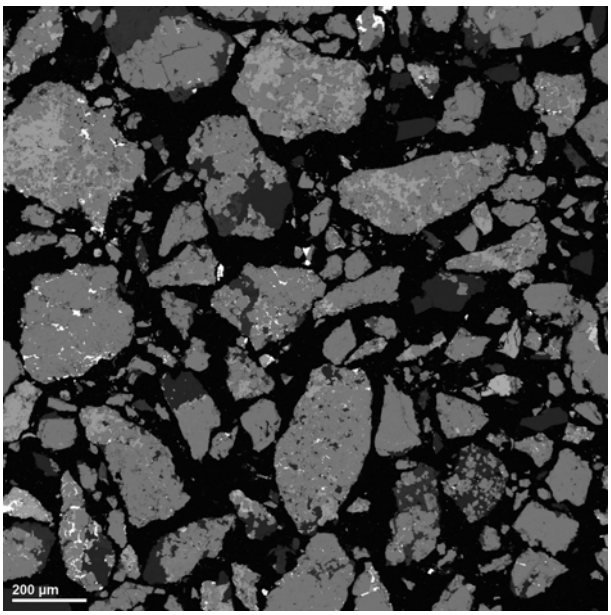


MB-121-0010: Coarse fragment of tetrahedrite. This grain contains 0.9 wt.% Ag.

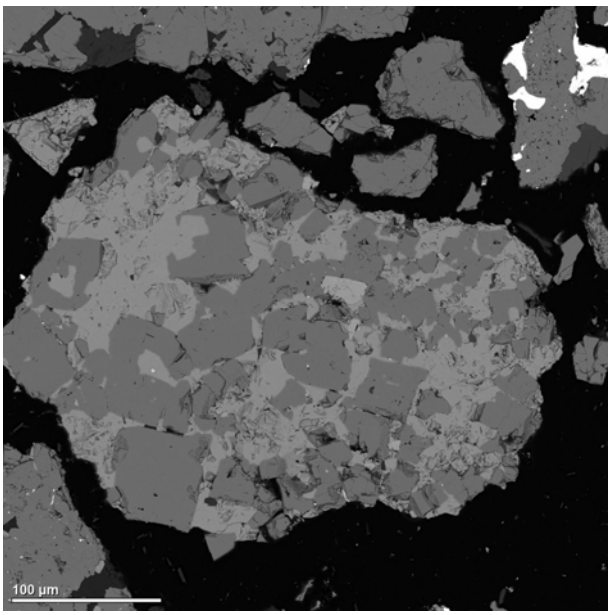
MB-12-132:

This sample consists of fragments of <1 mm, but mostly <400 µm . The largest fragments tend to be very elongate. The sample consists predominantly of pyrite and sphalerite, with lesser galena. Arsenopyrite is a minor phase. Most fragments are pyrite-rich, with other sulphide minerals present as inclusions in pyrite or as interstitial phases. Rare fragments are sphalerite-rich (50-100µm), with interstitial pyrite and galena. Copper-bearing phases have not been identified. Non-silicates consist of calcite, ferruginous dolomite, and quartz, with minor siderite, muscovite, and chlorite. Some fragments are sulphide-poor, and consist of subhedral-euhedral pyrite dispersed in a silicate or carbonate matrix.

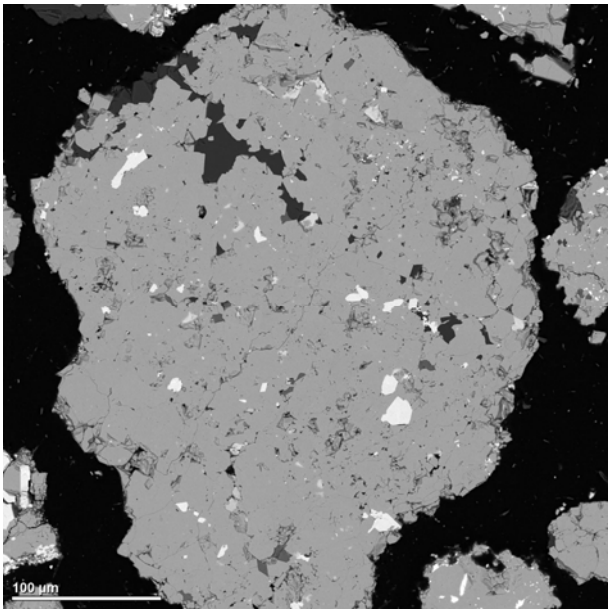
Many fragments <50 µm are monomineralic, but monomineralic fragments >50 µm are rare. Overall, the sample consists of approximately 25% non-sulphides, 65% pyrite, and 10% other sulphides.



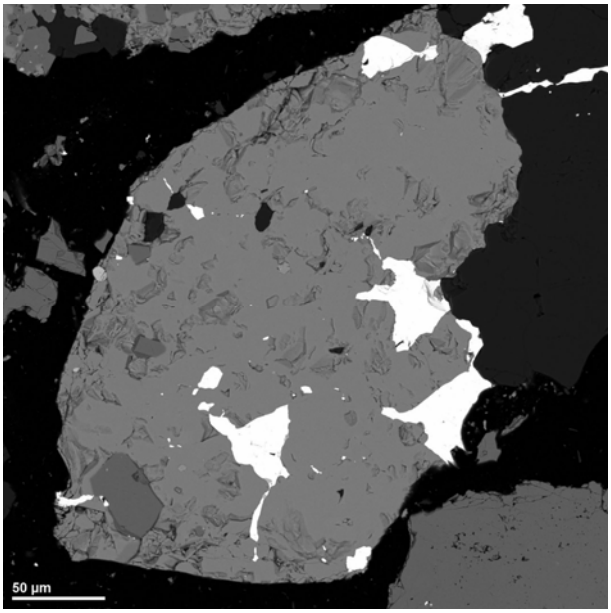
MB-132-0001: Low magnification overview. Dark grey are carbonate (predominantly ferruginous dolomite) and silicates (predominantly muscovite and lesser quartz).



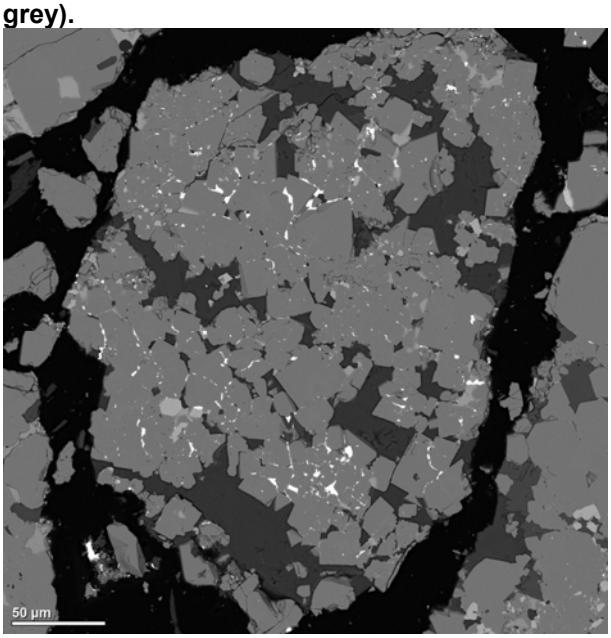
MB-132-0002: Fragment consisting of subhedral-anhedral pyrite (medium grey) and anhedral sphalerite (light grey). Minor arsenopyrite (lighter phase) is also present.



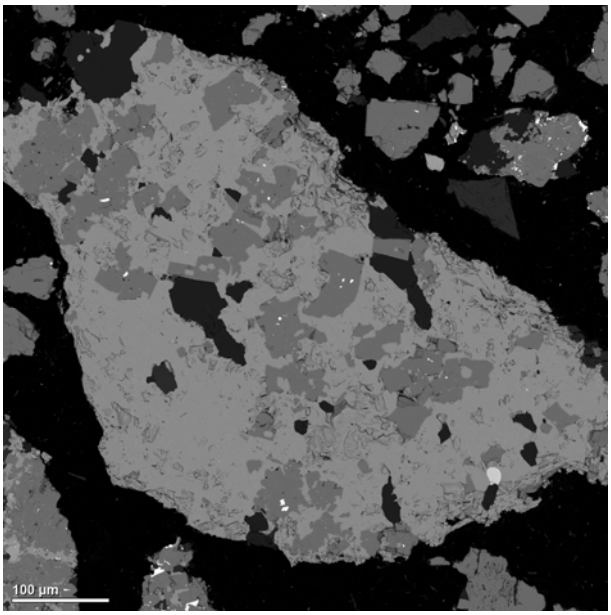
MB-132-0003: Fragment consisting predominantly of pyrite (medium grey), with interstitial arsenopyrite (white), sphalerite and chalcopyrite (light grey), and quartz (dark grey).



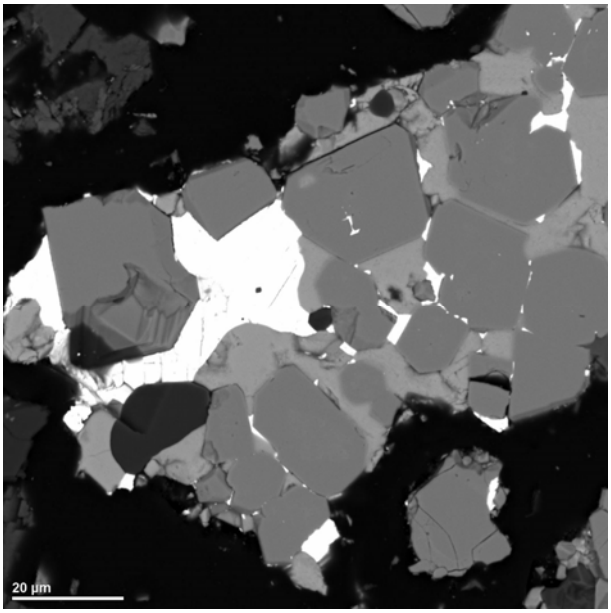
MB-132-0005: Sphalerite-rich fragment with interstitial anhedral galena (white) and subhedral pyrite (medium grey). Quartz (dark grey) is at upper right.



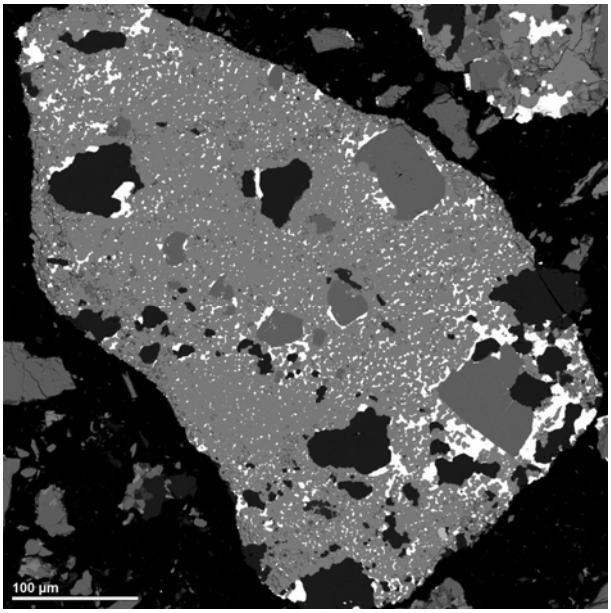
MB-132-0004: Subhedral pyrite (medium grey) and anhedral galena (white) together with sphalerite (light grey). Arsenopyrite occurs as minor equant grains. Ferrugenous dolomite (dark grey) is at the bottom of the fragment.



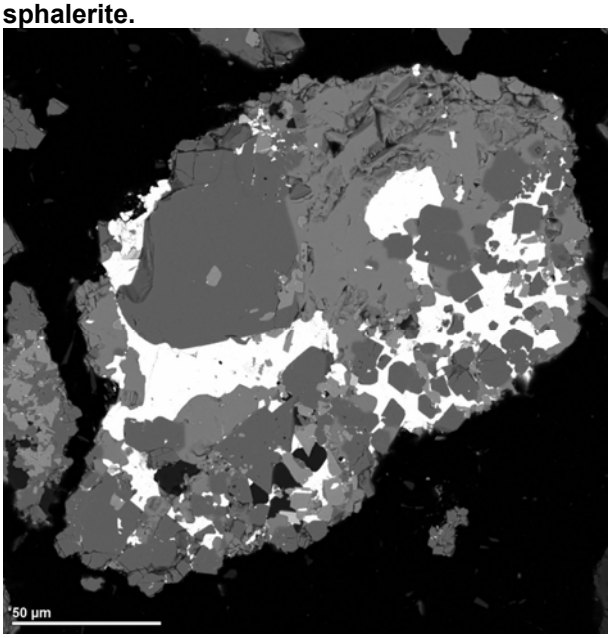
MB-132-0006: Sphalerite-rich fragment with equant pyrite (medium grey), quartz (dark grey) and equant, anhedral cassiterite (light grey; lower right). Galena (white) occurs as very fine-grained inclusions in pyrite.



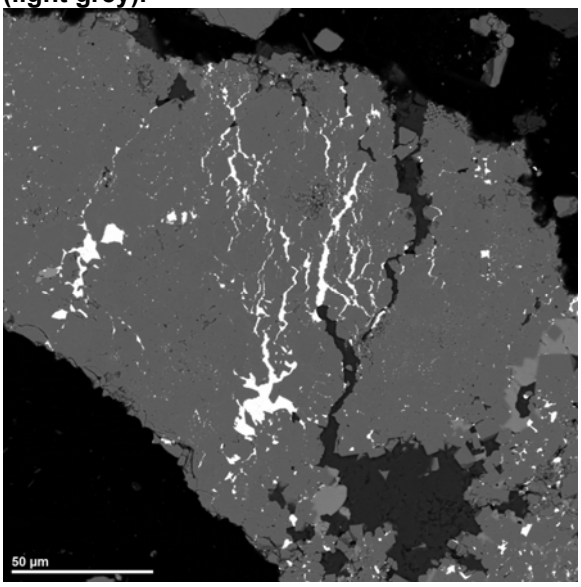
MB-132-0007: Pyrite-rich fragment with siderite (dark grey), anhedral interstitial arsenopyrite (light grey), galena (white) and sphalerite.



MB-132-0009: Equant coarse pyrite (medium grey), anhedral quartz (dark grey) and fine-grained anhedral galena (white) in sphalerite (light grey).



MB-132-0008: Equant pyrite (dark grey) with sphalerite (medium grey), minor fine-grained arsenopyrite (light grey) and galena (white).

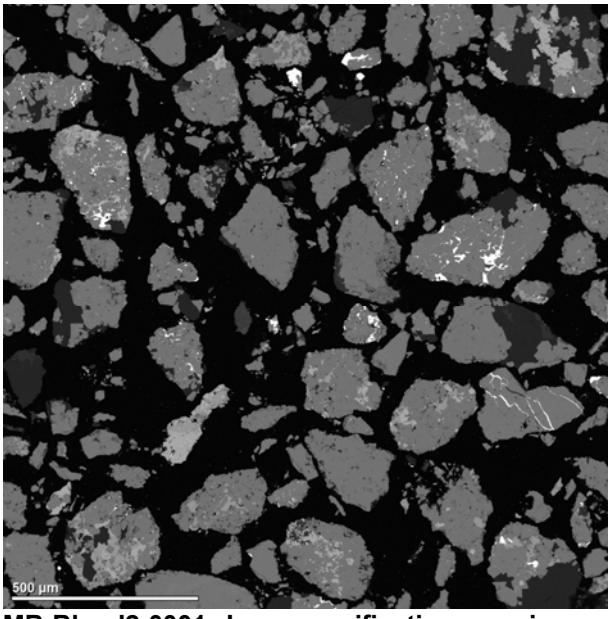


MB-132-0010: Veins of galena (white) and calcite (dark grey) in pyrite. Galena also occurs as very fine-grained inclusions in pyrite (<1µm). The light grey phase is sphalerite.

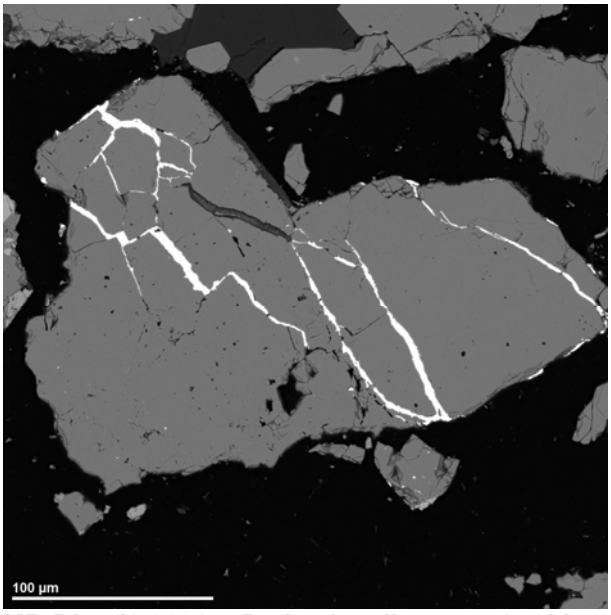
MB-Blend2 – Hole 124

Blend #2: 124 Top, Middle, Bottom

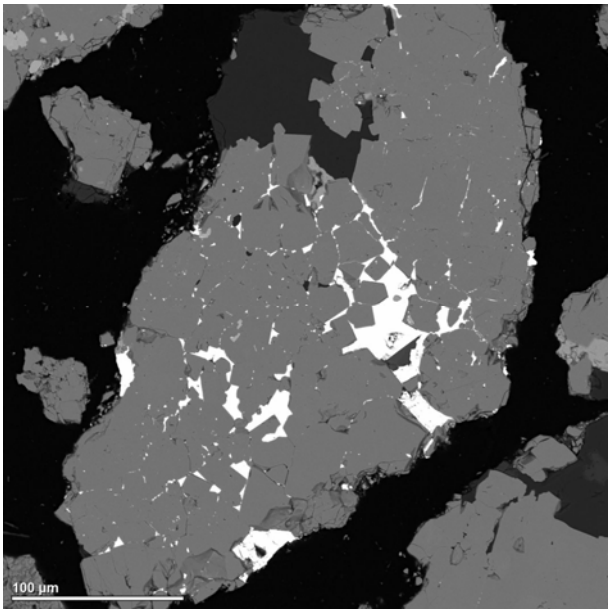
This sample consists of irregular fragments <1 mm. Fragments >600µm are typically very elongate. Pyrite is the dominant mineral. Most fragments consist predominantly of pyrite with interstitial sphalerite, galena, and non-sulphides. Chalcopyrite, bournonite, and boulangerite, and covellite are present in trace amounts. Although most fragments consist of >80% pyrite, rare fragments are either sphalerite-rich, or arsenopyrite-rich, together with interstitial pyrite. Gangue minerals consist predominantly of quartz and ferruginous dolomite, but muscovite and chlorite are also present in minor amounts. Cerussite and siderite are present in trace amounts. Overall, the sample consists of approximately 20% non-sulphides, 75% pyrite, and 5% other sulphides.



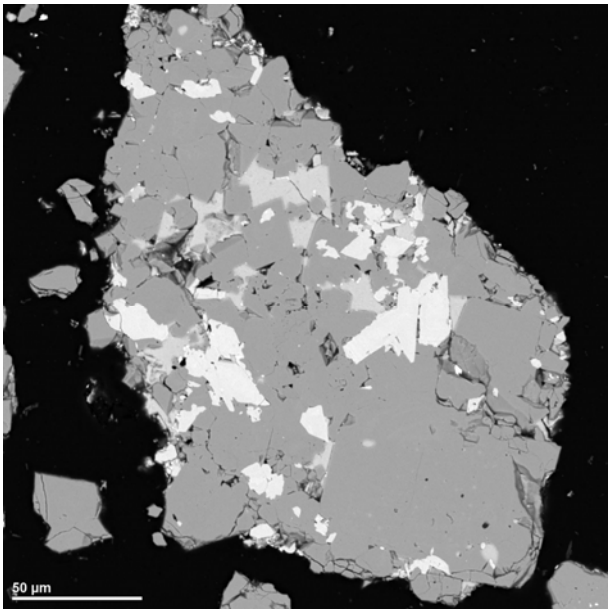
MB-Blend2-0001: Low magnification overview. The sample consists predominantly of pyrite (medium grey) with sphalerite and arsenopyrite (light grey), and minor galena (white). Gangue minerals consist predominantly of quartz and ferruginous dolomite (dark grey), but muscovite and chlorite are also present in minor amounts.



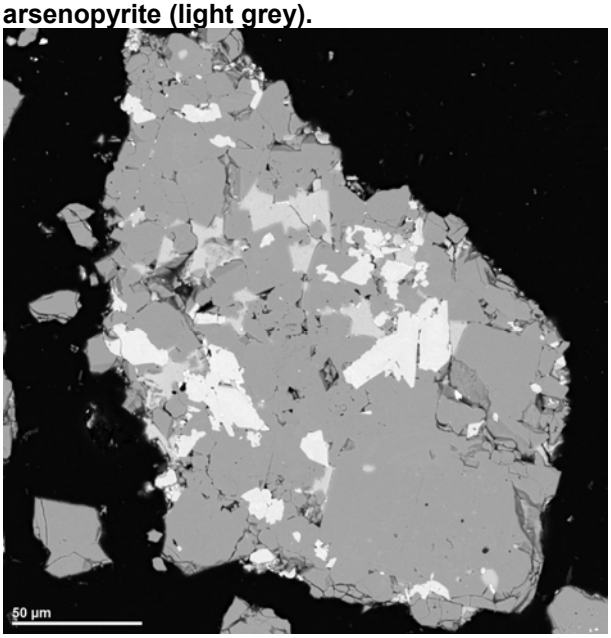
MB-Blend2-0002: Pyrite (medium grey) with galena veins (white).



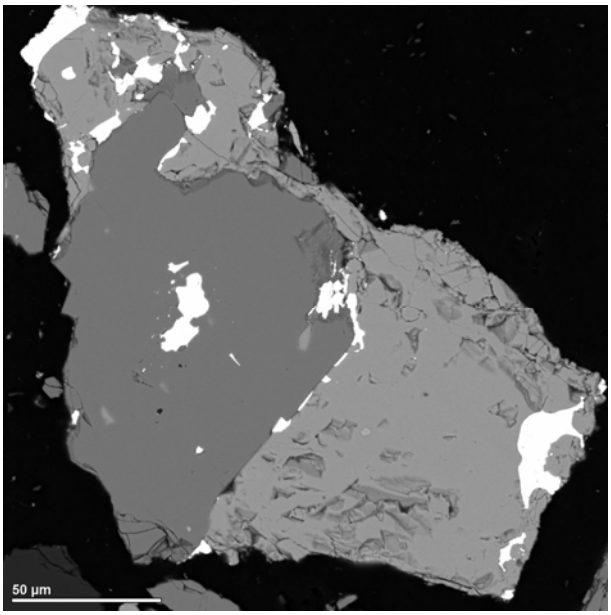
MB-Blend2-0003: Pyrite (medium grey) with interstitial galena (white). This fragment also contains quartz (top; dark grey) and minor amounts of fine-grained, interstitial arsenopyrite (light grey).



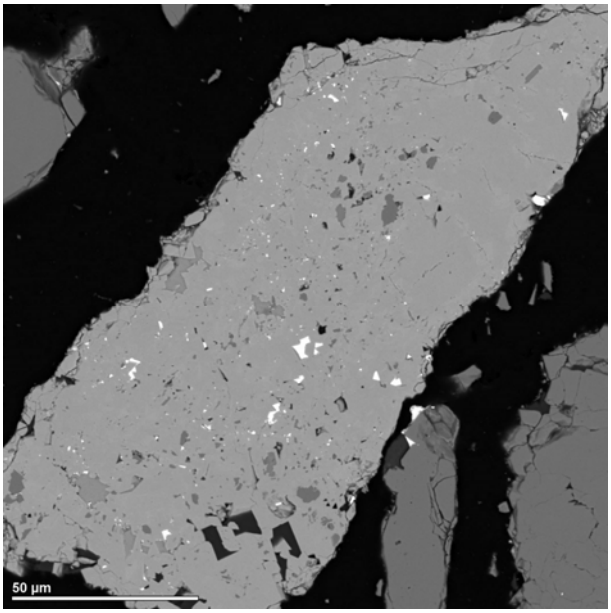
MB-Blend2-0005: Coarse-grained pyrite (medium grey) and sphalerite (light grey) with interstitial galena (white).



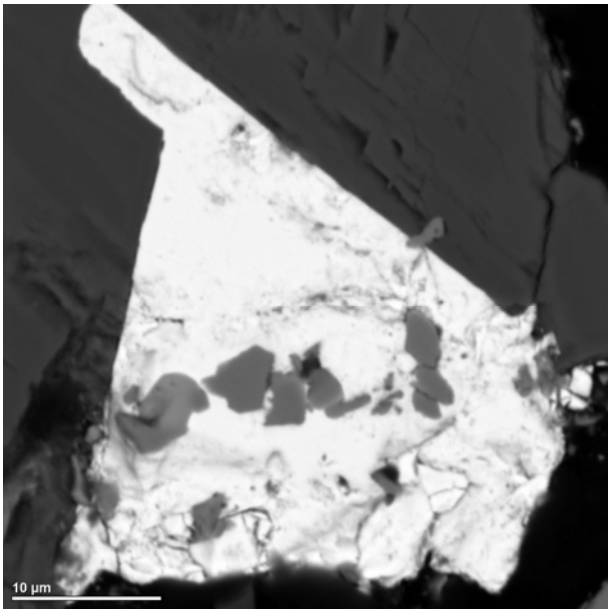
MB-Blend2-0004: Pyrite (medium grey) with abundant euhedral arsenopyrite (bright grey) and interstitial sphalerite (light grey).



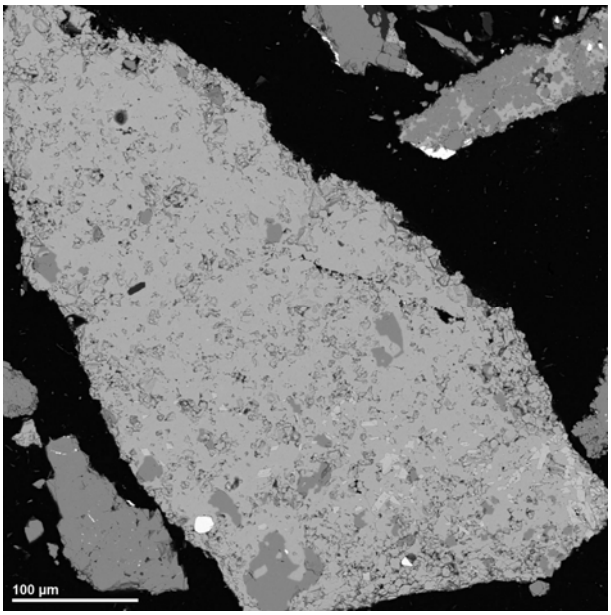
MB-Blend2-0006: Intergrowth of pyrite (medium grey), sphalerite (light grey), galena (white), and quartz (dark grey).



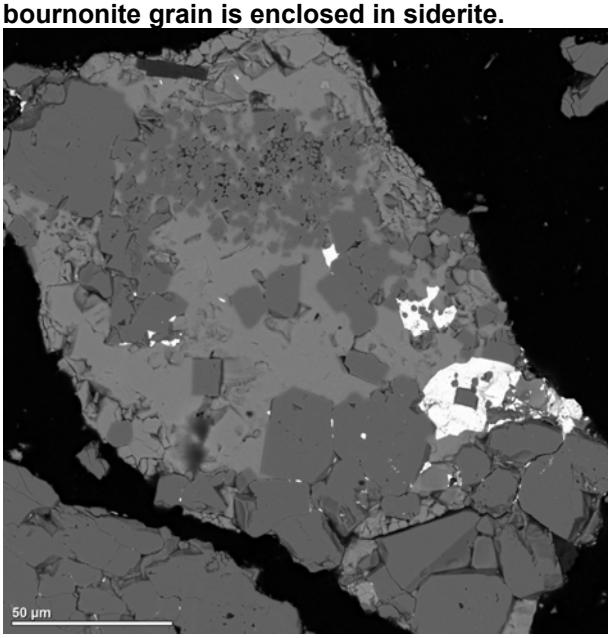
MB-Blend2-0007: Arsenopyrite with fine-grained interstitial sphalerite, pyrite, and galena.



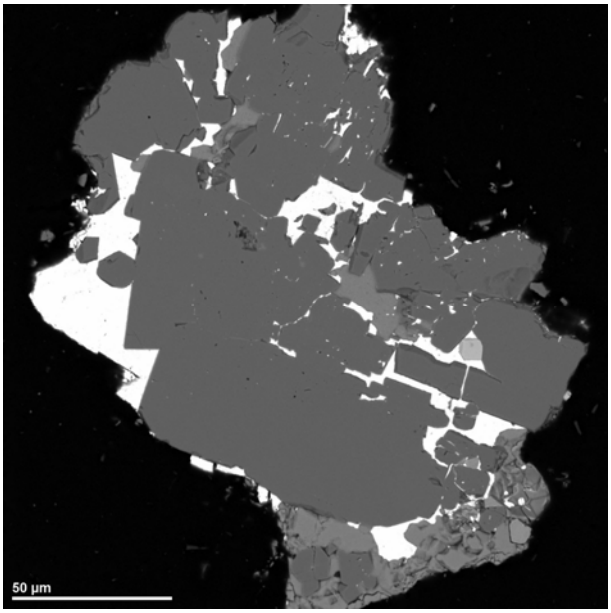
MB-Blend2-0009: Pb-Sb-Cu sulphosalt (white; bournonite) with inclusions of pyrite (medium grey) and sphalerite (light grey). The bournonite grain is enclosed in siderite.



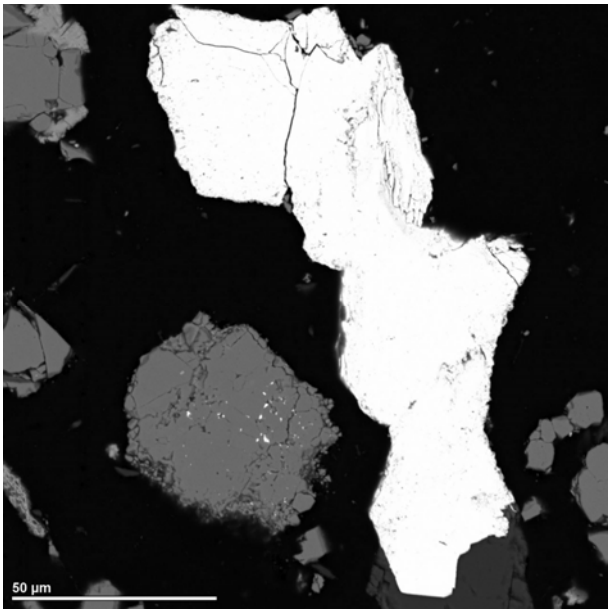
MB-Blend2-0008: Sphalerite with fine-grained interstitial arsenopyrite, pyrite, and cassiterite.



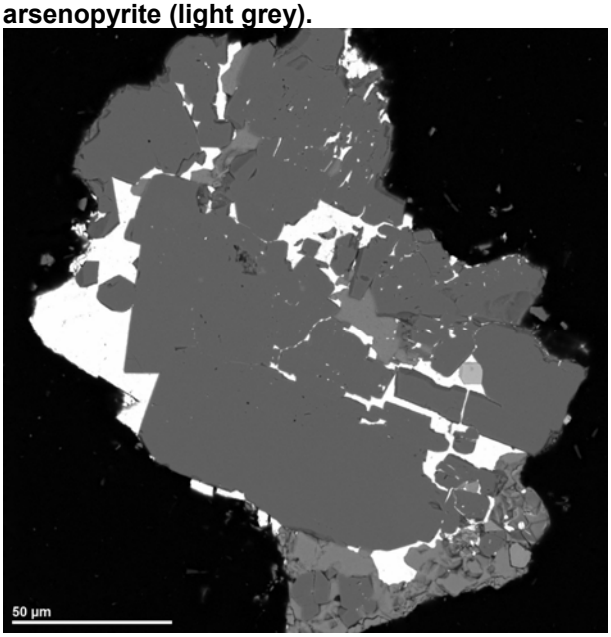
MB-Blend2-0010: Sphalerite (light grey) with subhedral-euhedral pyrite (medium grey) and Pb-Sb sulphosalt (boulangerite; white).



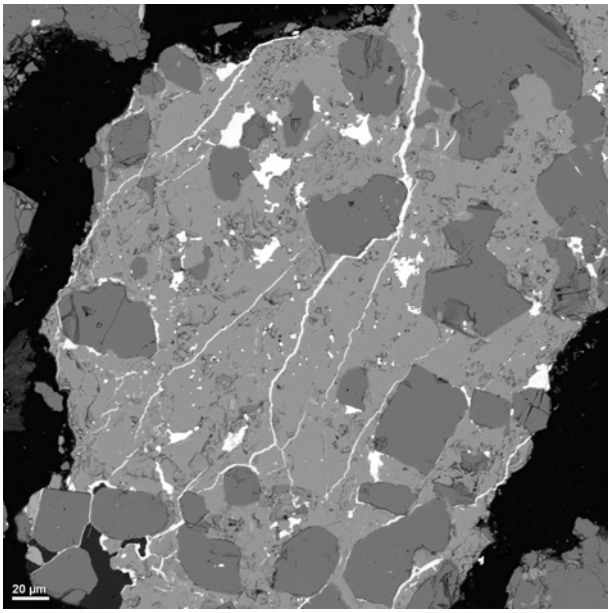
MB-Blend2-0011: Euhedral pyrite (medium grey) with galena (white) and sphalerite and arsenopyrite (light grey).



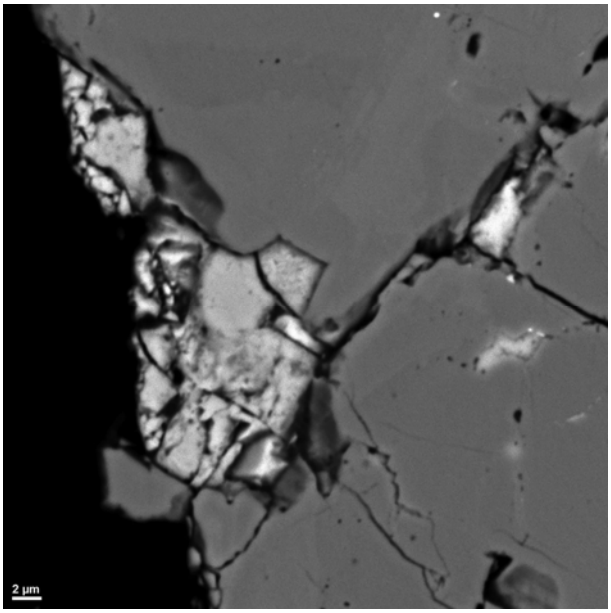
MB-Blend2-0013: Coarse fragment of boulangerite.



MB-Blend2-0012: Pyrite (medium grey) with fine-grained interstitial sphalerite (light grey), arsenopyrite (bright grey) in a carbonate matrix of ferruginous dolomite and siderite.



MB-Blend2-0014: Thin veinlets of cerrusite cross-cutting a fragment consisting of covellite (light grey), equant pyrite (medium grey), and galena (white).

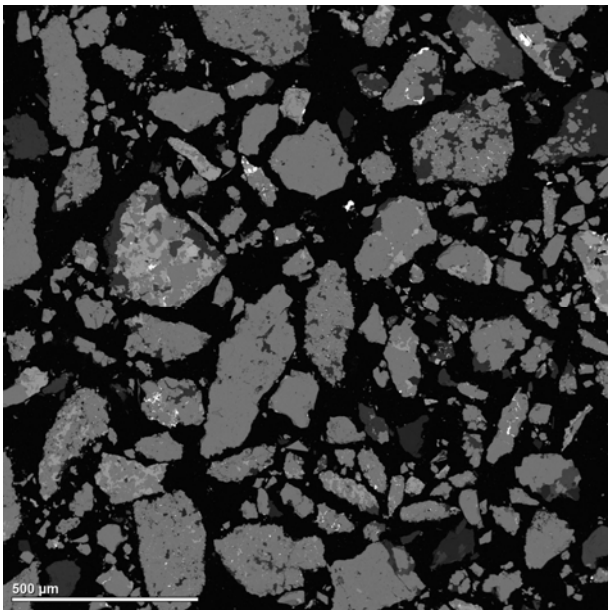


MB-Blend2-0015: Chalcopyrite (light grey) adjacent to coarse-grained pyrite (medium grey).

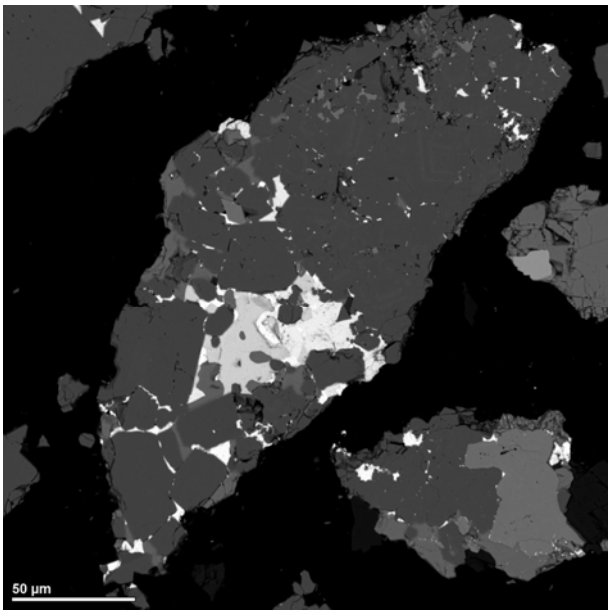
MB-Blend1: 121 + 124 + 132

Blend#1: 121 Bottom + 124 Top, Middle, Bottom + 132

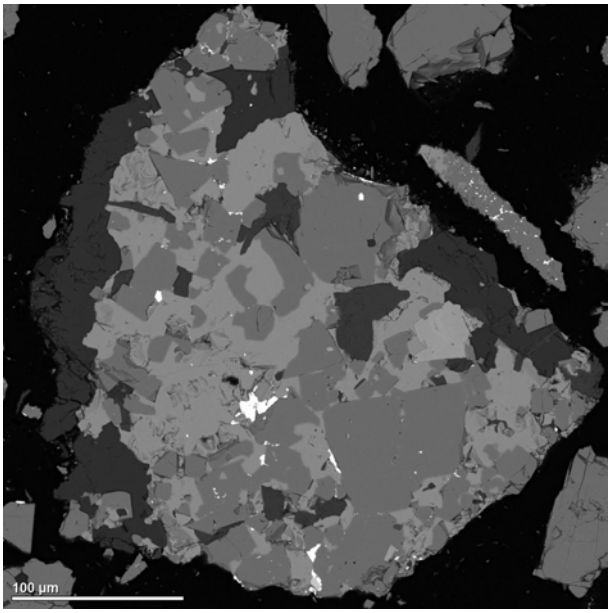
The sample consists of fragments <1 mm, but most are <500 µm. Pyrite is the dominant sulphide mineral. Other sulphides (predominantly sphalerite and galena, with lesser arsenopyrite) are typically included or interstitial to pyrite. Rare fragments are sphalerite-rich, with lesser pyrite, and consist of euhedral or subhedral pyrite in a sphalerite matrix. Galena is a minor phase in virtually all fragments, and is fine-grained (<20 µm). Non-silicates consist of quartz and calcite, with lesser amounts of ferruginous dolomite and chlorite, and minor amounts of siderite, cassiterite, and muscovite. Bournonite, boulangerite, tetrahedrite, covellite, and famatinite are present in trace amounts only. Overall, the sample consists of 25% non-sulphides, 70% pyrite, and 5% other sulphides.



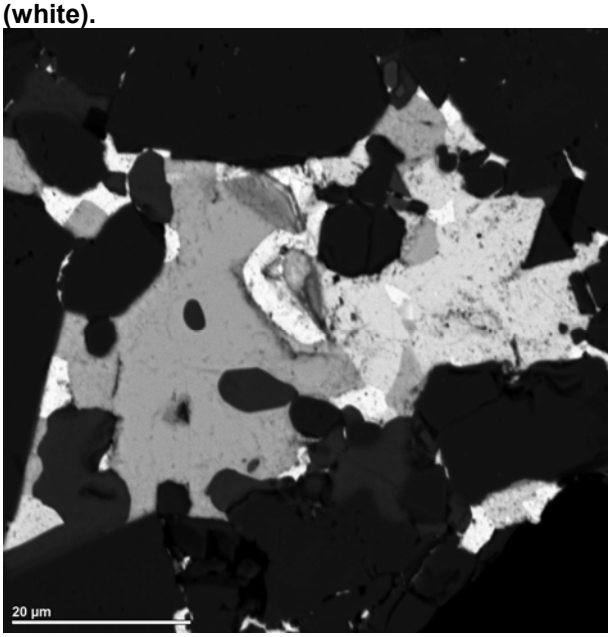
MB-Blend1-0001: Low magnification overview.



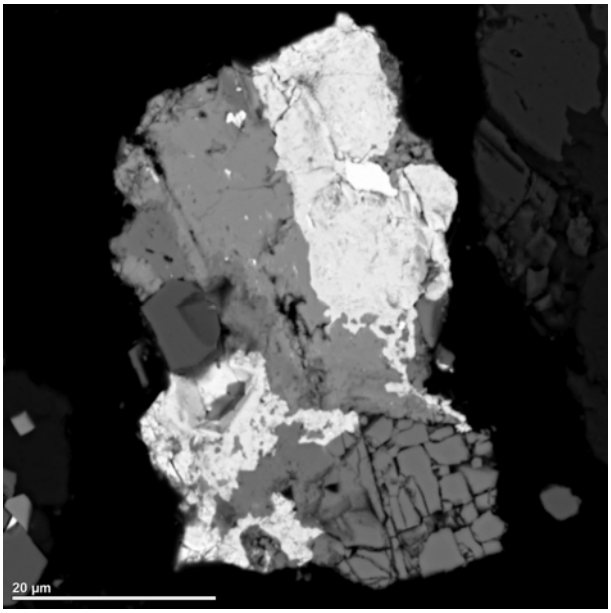
MB-Blend1-0003: Pyrite (dark grey) with fine-grained interstitial sphalerite (medium grey), bournonite (light grey) and boulangerite (white).



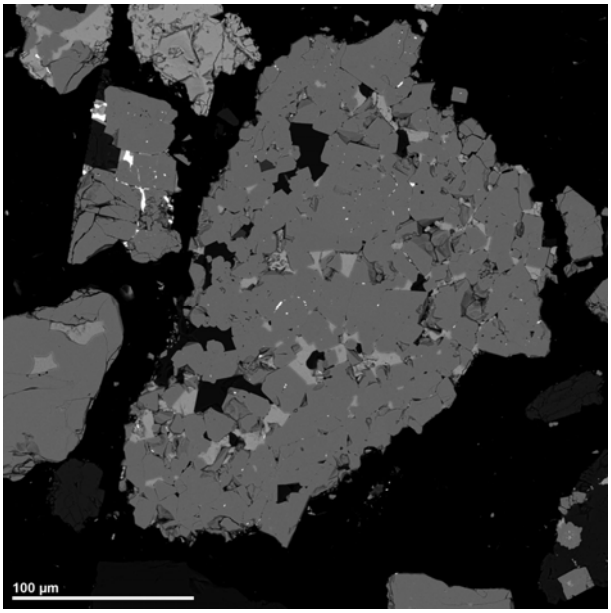
MB-Blend1-0002: Intergrowth of chlorite and calcite (dark grey), pyrite (medium grey) and sphalerite (light grey), with minor arsenopyrite (bright grey) and galena (white).



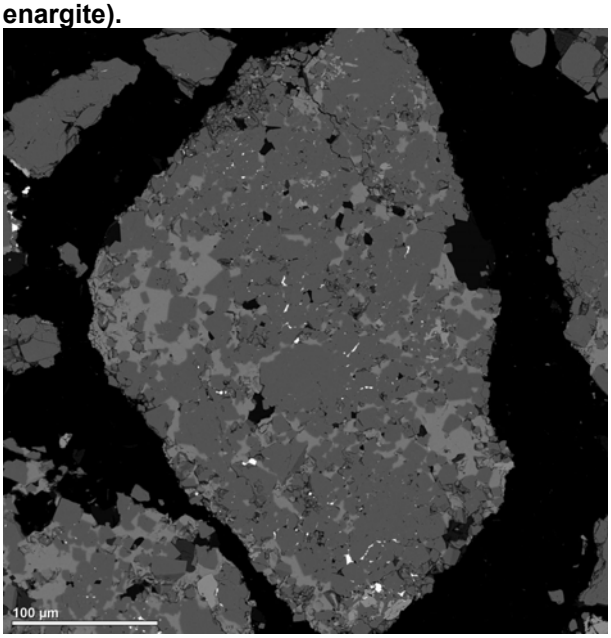
MB-Blend1-0004: Interstitial pocket from fragment in MB-Blend1-0003, consisting of bournonite (light grey), boulangerite (bright grey), and galena (white).



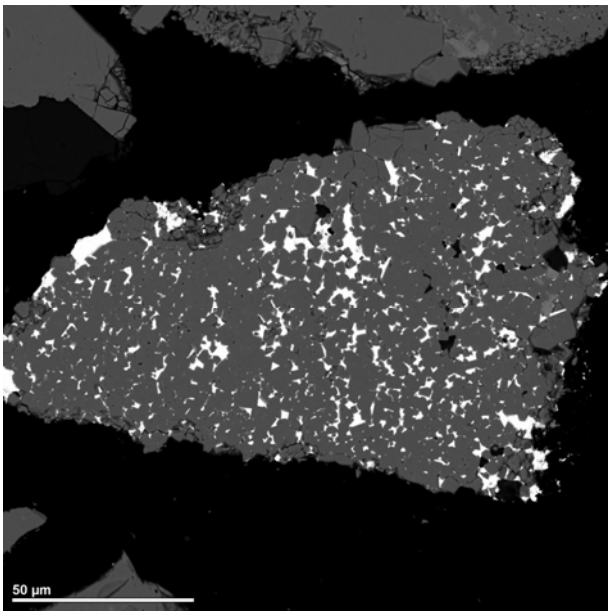
MB-Blend1-0005: Intergrowth of boulangerite, cerrusite, famatinite, covellite, sphalerite, and pyrite. The famatinite adjacent to sphalerite contains minor As (solid solution toward enargite).



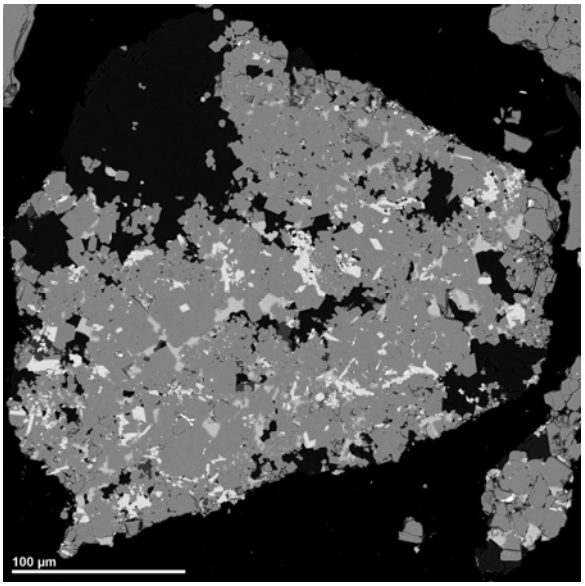
MB-Blend1-0007: Pyrite (medium grey) with fine-grained interstitial sphalerite (light grey) and trace amounts of galena (white).



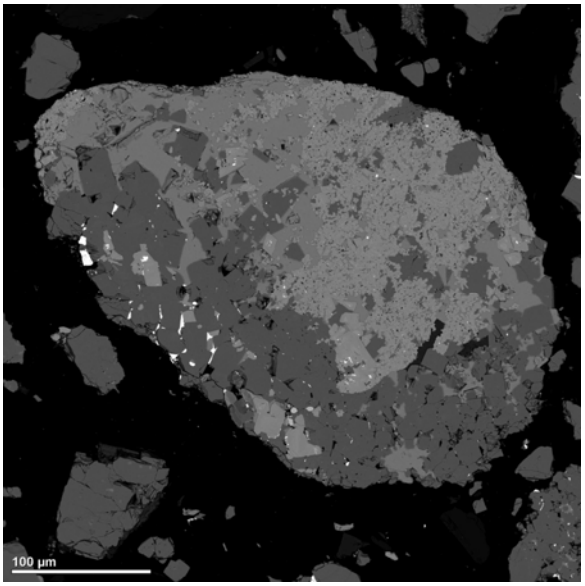
MB-Blend1-0006: Pyrite (medium grey) with fine-grained interstitial sphalerite (light grey) and galena (white). A few grains of arsenopyrite (slightly lighter than sphalerite) are present near the bottom of the fragment.



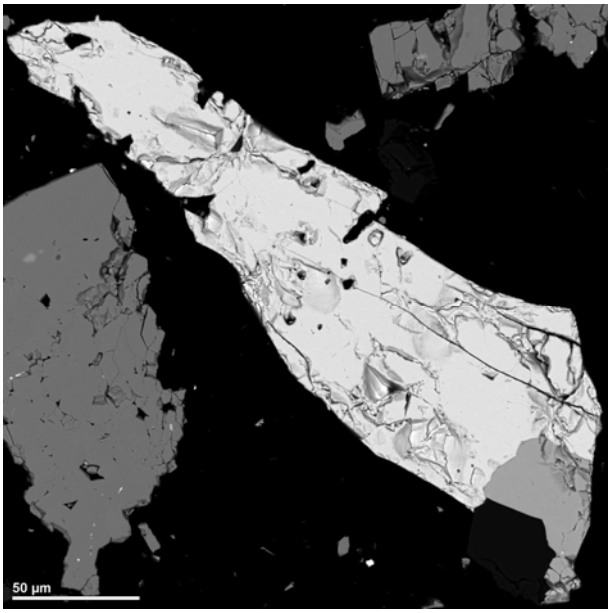
MB-Blend1-0008: Fine-grained pyrite (medium grey) with interstitial galena (white).



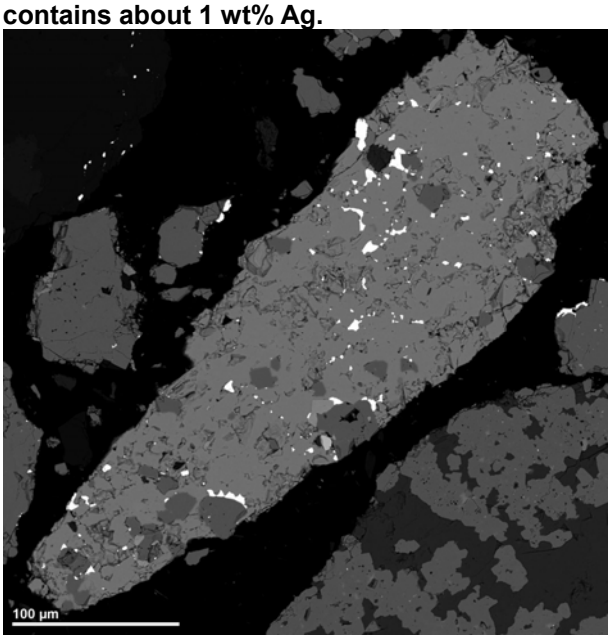
MB-Blend1-0009: Pyrite (medium grey) with interstitial sphalerite (light grey) and arsenopyrite (bright grey). This fragment also contains trace quantities of very fine-grained cassiterite (bright grey) and galena (white).



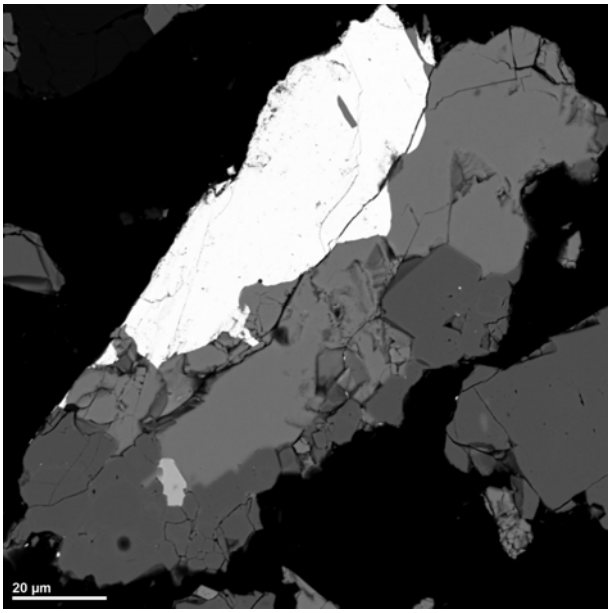
MB-Blend1-0010: Intergrowth of pyrite (medium grey), sphalerite (light grey), arsenopyrite (bright grey), and galena (white).



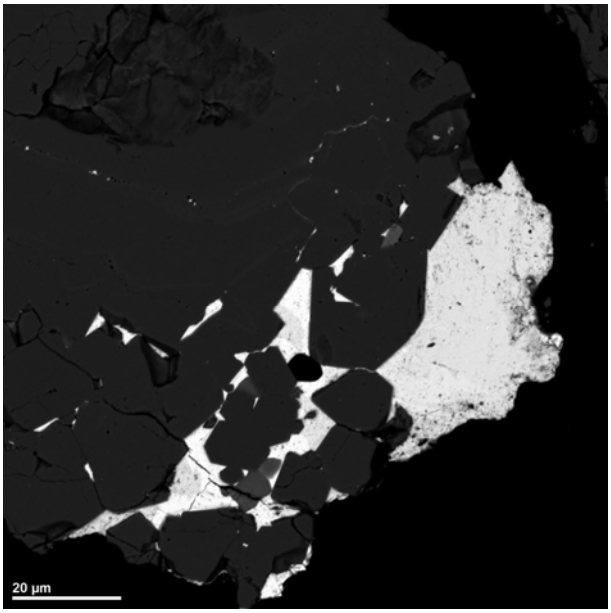
MB-Blend1-0011: elongate grain of tetrahedrite (bright grey) with sphalerite grain in contact (light grey). Surrounding fragments consist of pyrite (medium grey). The tetrahedrite contains about 1 wt% Ag.



MB-Blend1-0012: Sphalerite-rich fragment (light grey) with interstitial pyrite (medium grey) and galena (white), as well as minor fine-grained arsenopyrite and cassiterite (bright grey).



MB-Blend1-0013: Fragment consisting of boulangerite (white), cassiterite (bright grey), sphalerite (light grey), and pyrite (medium grey).

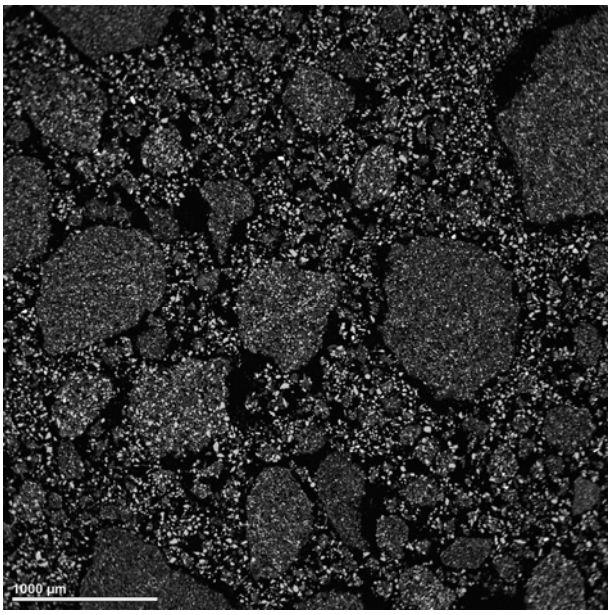


MB-Blend1-0014: Part of a pyrite-rich fragment (medium grey) depicting an area rich in euhedral sphalerite (light grey), galena (white) and boulangerite (near white). The pale bands within pyrite in the upper portion of the image are slightly enriched in Sb (<1 wt%).

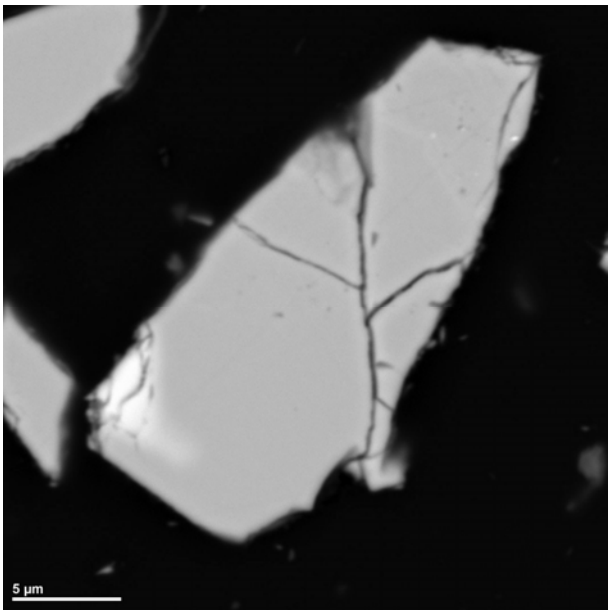
MB-Comp-75-RT:

The sample consists predominantly of fragments <30 µm. Virtually all fragments are <50 µm. They range from equant to elongate, and are typically angular. The fragments are predominantly monomineralic. Pyrite and non-sulphide minerals are about equally abundant. Other sulphide minerals (arsenopyrite, sphalerite, and galena) are of minor to trace abundance. Composite fragments typically consist of pyrite with interstitial or included sphalerite, galena, and/or arsenopyrite. Some consist of pyrite and arsenopyrite with included sphalerite. Non-sulphide minerals consist of magnetite, quartz, chlorite, and calcite.

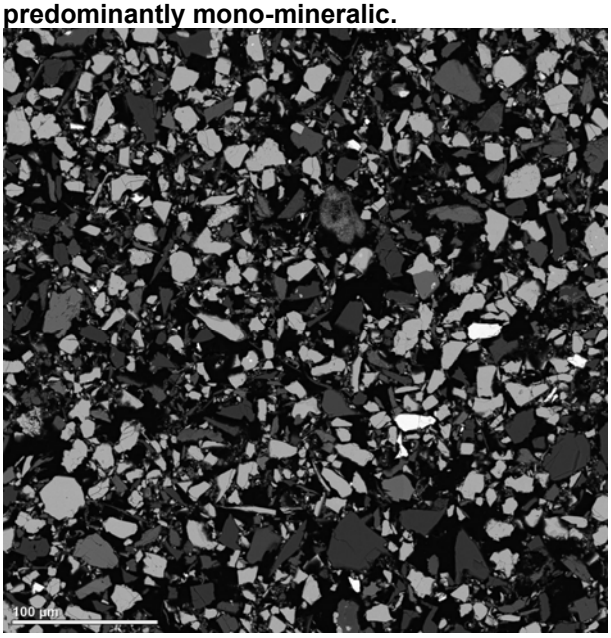
Sphalerite and galena losses to tailings occur largely as a fine-grained (<10 µm) interstitial phase as well as inclusions (<10 µm) and attachments (<20 µm) to pyrite.



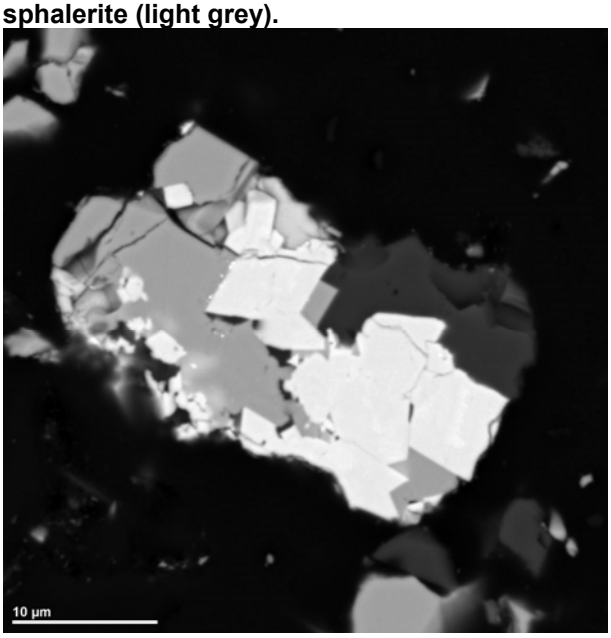
MB-Comp-75-RT-0001: Low magnification overview. Fragments are typically <30 µm, and predominantly mono-mineralic.



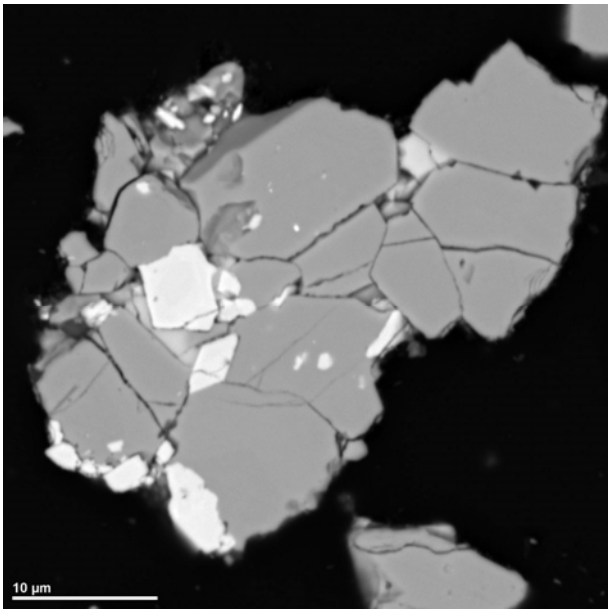
MB-Comp-75-RT-0003: Pyrite fragment (medium grey) with partially included sphalerite (light grey).



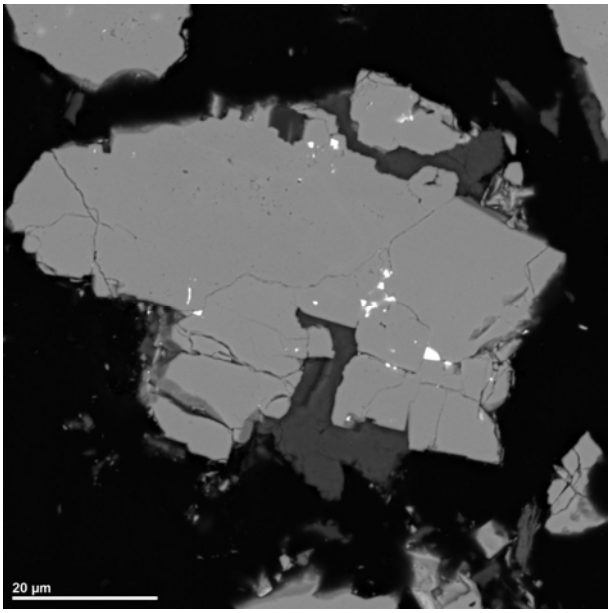
MB-Comp-75-RT-0002: Higher magnification image of part of RT-0001. The sample consists of arsenopyrite (white), pyrite (light grey), magnetite (medium grey), silicates (dark grey), and calcite (dark grey). Silicates consist predominantly of quartz, and lesser chlorite.



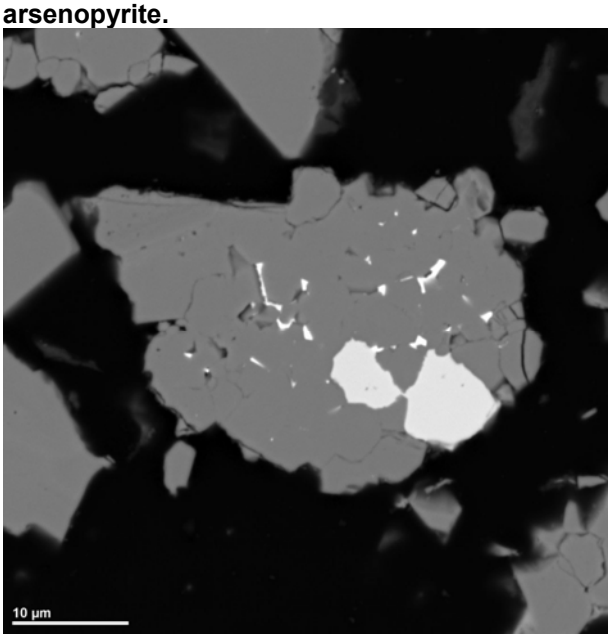
MB-Comp-75-RT-0004: Composite fragment consisting of arsenopyrite (white), pyrite (medium grey), and quartz (dark grey). Sphalerite (light grey) occurs as fine-grained inclusions in pyrite, adjacent to arsenopyrite.



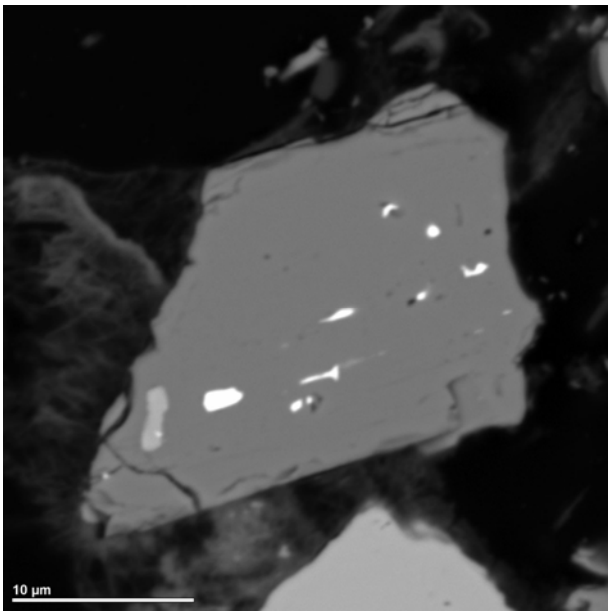
MB-Comp-75-RT-0005: Composite fragment consisting of arsenopyrite (white) and pyrite (medium grey). Sphalerite (light grey) occurs as a fine-grained interstitial phase, adjacent to arsenopyrite.



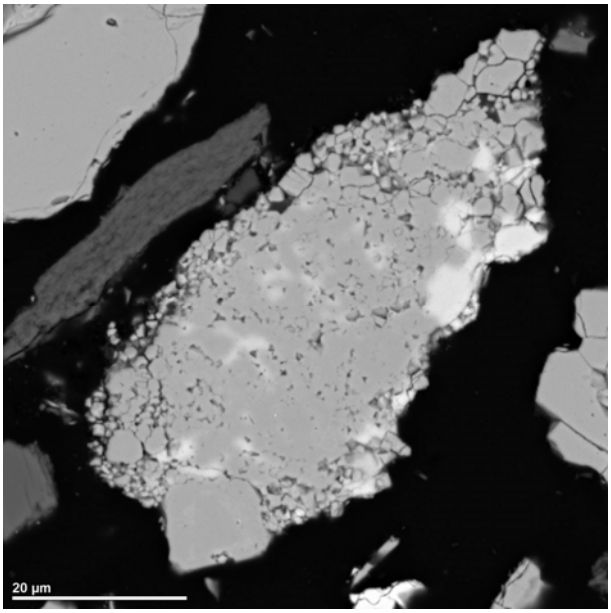
MB-Comp-75-RT-0007: Pyrite (medium grey) with calcite (dark grey) and fine-grained galena (white).



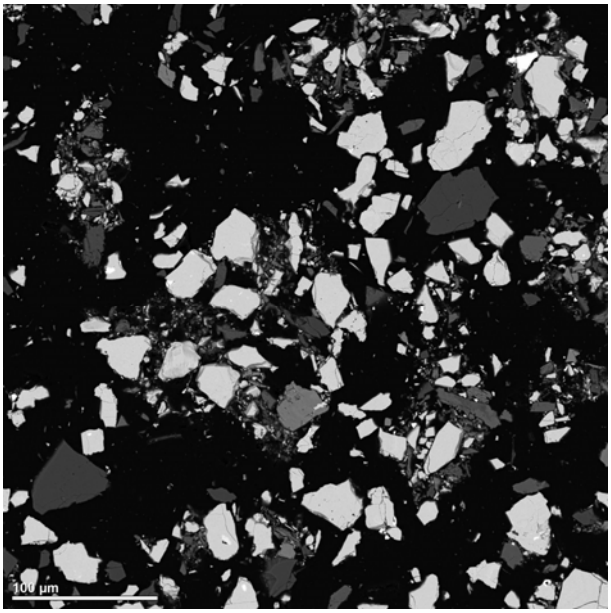
MB-Comp-75-RT-0006: Pyrite (medium grey) and cassiterite (bright grey, with fine-grained interstitial galena (white).



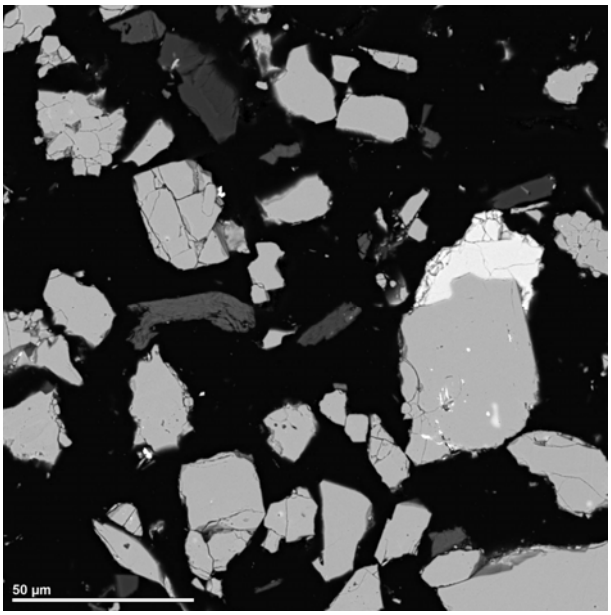
MB-Comp-75-RT-0008: Pyrite grain (medium grey) with fine-grained inclusions of arsenopyrite (light grey) and galena (white).



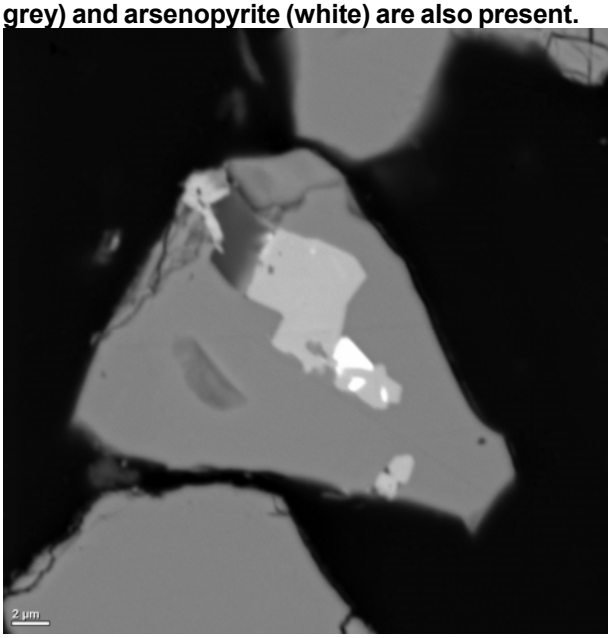
MB-Comp-75-RT-0009: Pyrite (medium grey) with fine grained sphalerite (light grey).



MB-Comp-75-RT-0011: Typical cluster of fragments. Pyrite (light grey) and silicates (dark grey) predominate, but Fe-oxide (medium grey) and arsenopyrite (white) are also present.



MB-Comp-75-RT-0010: Cluster of pyrite fragments (medium grey), as well as some silicate fragments (dark grey). The large pyrite at right is in contact with sphalerite (light grey), and has very fine grained inclusions of sphalerite and galena (white).



MB-Comp-75-RT-0012: Pyrite (medium grey) with included arsenopyrite (light grey) and galena (white)

SEM-EDS Mineralogy (Extracted from July Progress Report)

Cleaner 2 float and final scavenger tails samples from the Zn circuit cleaning trials were submitted for SEM-EDS examination to investigate potential reasons for cleaning result losses. The SEM-EDS mineralogical examination results are presented below. In both cases and in particular the final scavenger tails, the samples consist of well liberated discrete grains suggesting that other factors are responsible for metal losses. Factors such as secondary mineralization and residual flotation chemicals will be investigated in subsequent tests. Residual flotation chemicals can be removed through steam cleaning of Cu/Pb rougher concentrates prior to cleaning. Hole 132 showed no visual evidence of secondary mineralization and will be floated separately to confirm if this is a factor influencing cleaning performance.

Scavenger Tails:

This sample consists of irregular, angular fragments, ranging from equant to elongate. Fragment sizes are predominantly <10 µm, although some elongate fragments have long dimensions that range up to approximately 15 µm. Gangue minerals consist predominantly of quartz and chlorite, although dolomite, calcite, apatite, muscovite, and Fe-oxide are also present. The principal sulphide mineral is pyrite. Other sulphide minerals identified are sphalerite, arsenopyrite, tetrahedrite (Ag), and galena.

The sample predominantly consists of discrete grains; therefore the ore minerals in question are well liberated.

Backscattered electron images to illustrate the liberated nature of the mineral grains (Figures 1, 2 & 3). The corresponding images with suffixes B, C, and D have white, light grey, and medium grey mineral grains highlighted, respectively.

Images Figures 4 through 8 are representative of typical fields of view. Dark grey: Quartz, chlorite, dolomite, calcite, apatite, muscovite in order of decreasing abundance. Medium grey: Pyrite, Fe-oxide in order of decreasing abundance (Fe-oxide is a minor component). Light grey: Sphalerite, arsenopyrite, and tetrahedrite in order of decreasing abundance. White: Galena.

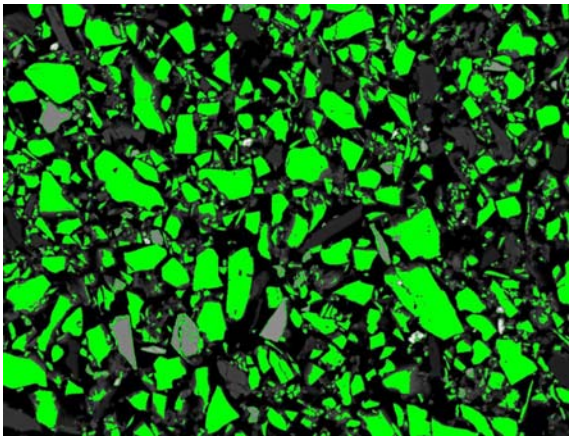


Figure 1: Backscatter Image (D)

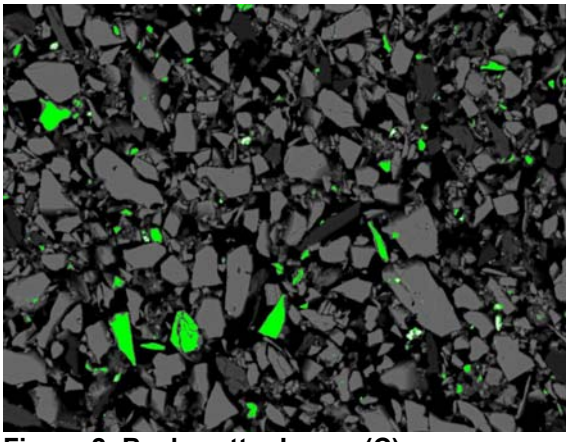


Figure 2: Backscatter Image (C)

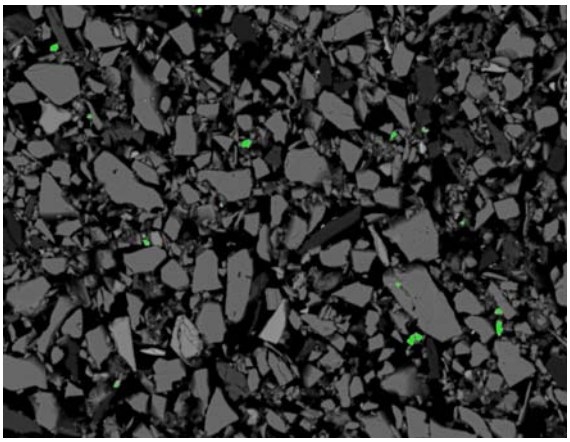


Figure 3: Backscatter Image (B)

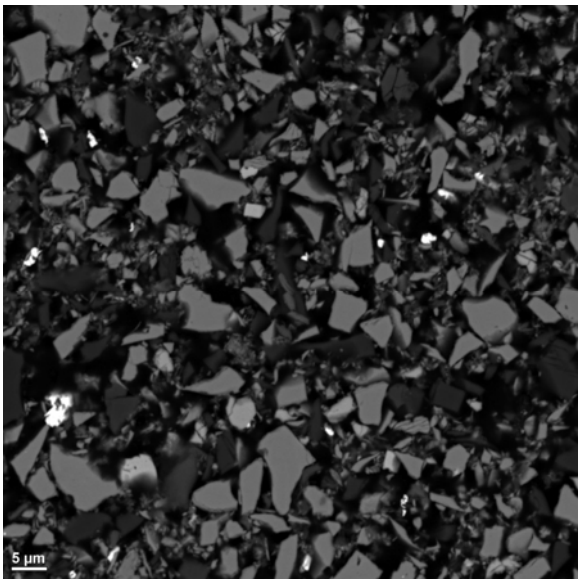


Figure 4: Typical Fields of View

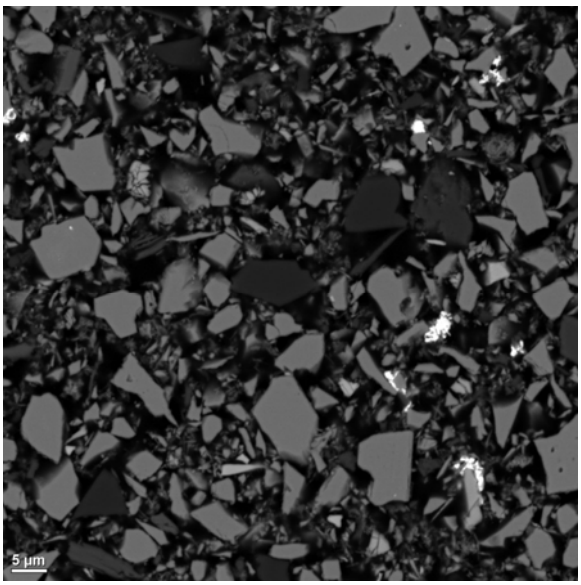


Figure 5: Typical Fields of View

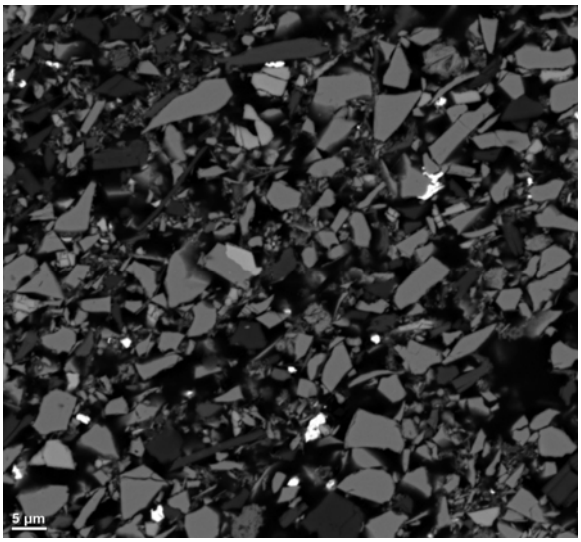


Figure 6: Typical Fields of View

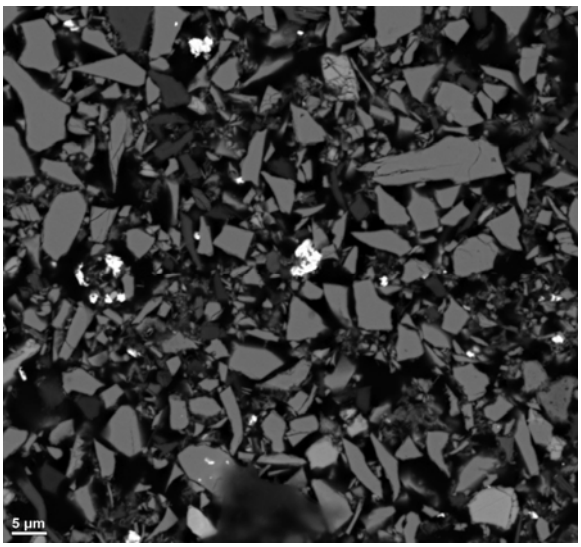


Figure 7: Typical Fields of View

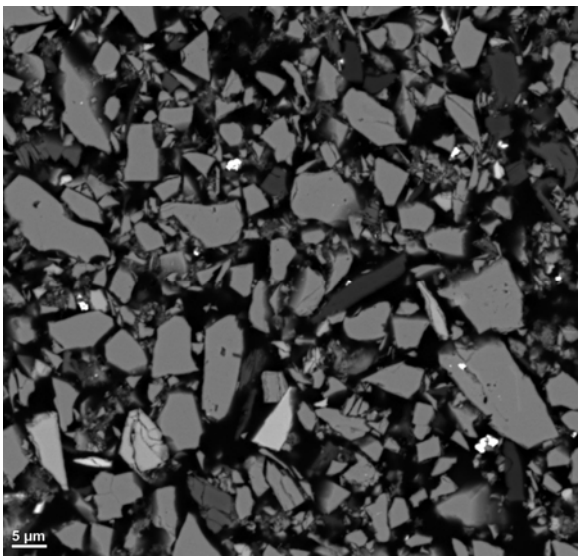


Figure 8: Typical Fields of View

Clnr2Con:

This sample consists mostly of irregular, angular fragments, ranging from equant to elongate. Fragment sizes are predominantly <10 µm, although some elongate fragments have long dimensions that range up to approximately 20 µm. Gangue minerals predominantly consist of calcite and quartz, although dolomite, chlorite, and Fe-oxide are also present. The principal sulphide mineral is pyrite. Other sulphide minerals identified are chalcopyrite, sphalerite, arsenopyrite, bornite, tetrahedrite (Ag), galena, and bournonite.

The sample predominantly consists of discrete grains; therefore the ore minerals in question are well liberated.

Backscattered electron images to illustrate the liberated nature of the mineral grains.

Dark grey: Calcite, quartz, dolomite, chlorite in order of decreasing abundance. Medium grey: Pyrite, Fe-oxide in order of decreasing abundance (Fe-oxide is a minor component). Light grey: Sphalerite, chalcopyrite, arsenopyrite, tetrahedrite, bornite in order of decreasing abundance. White: Galena, bournonite in order of decreasing abundance.

Figures 9 through 17 are representative of typical fields of view. Figure 17 illustrates an example of an uncommon composite grain, in this case galena and pyrite (centre of image). The corresponding images with suffixes B, C, and D have white, light grey, and medium grey mineral grains highlighted, respectively.

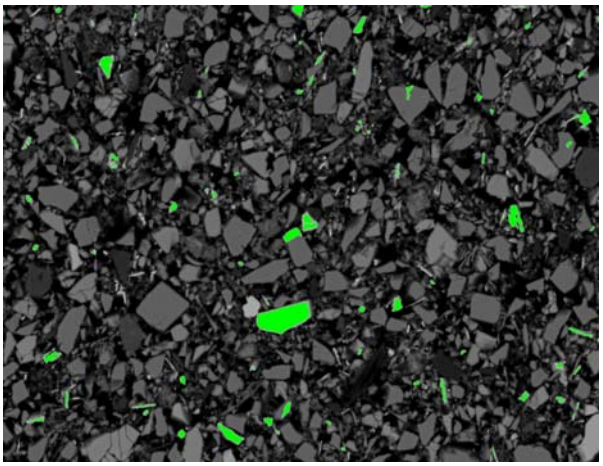


Figure 9: Backscatter Image (B)

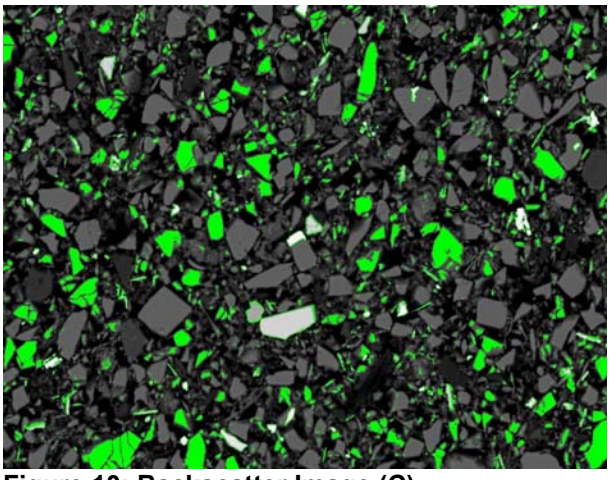


Figure 10: Backscatter Image (C)

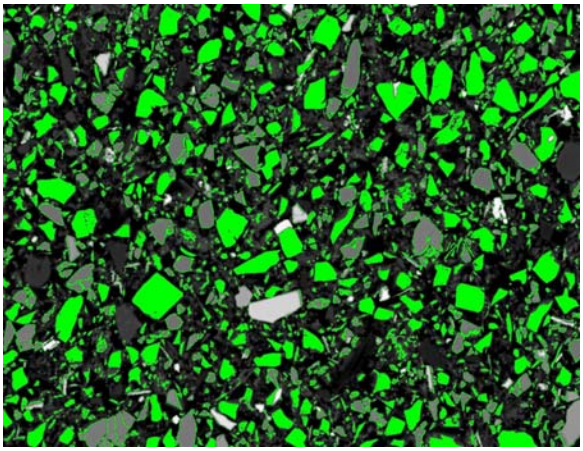


Figure 11: Backscatter Image (D)

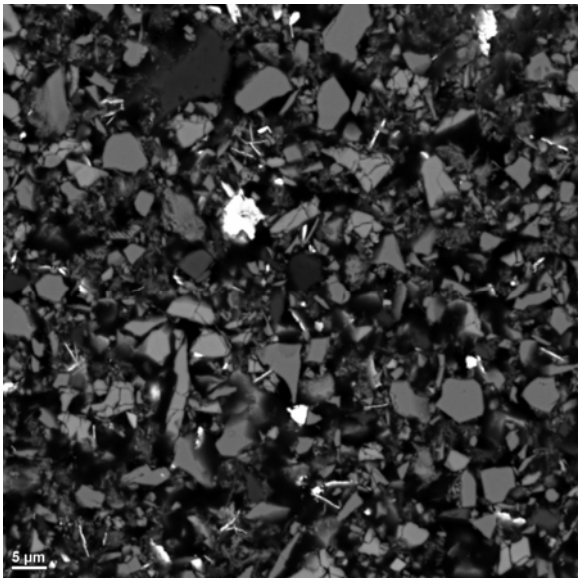


Figure 12: Typical Fields of View

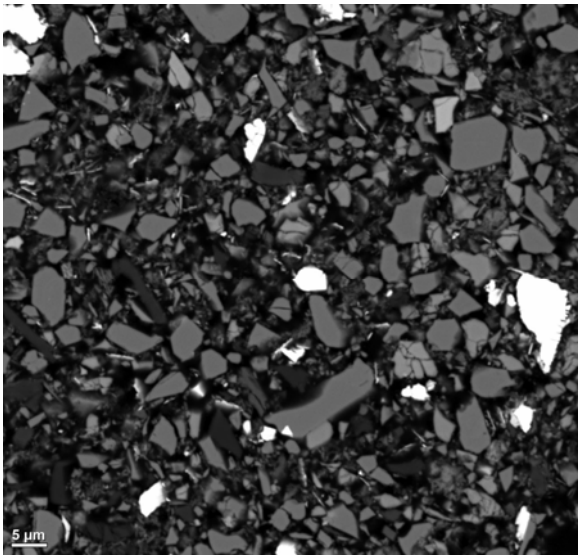


Figure 13: Typical Fields of View

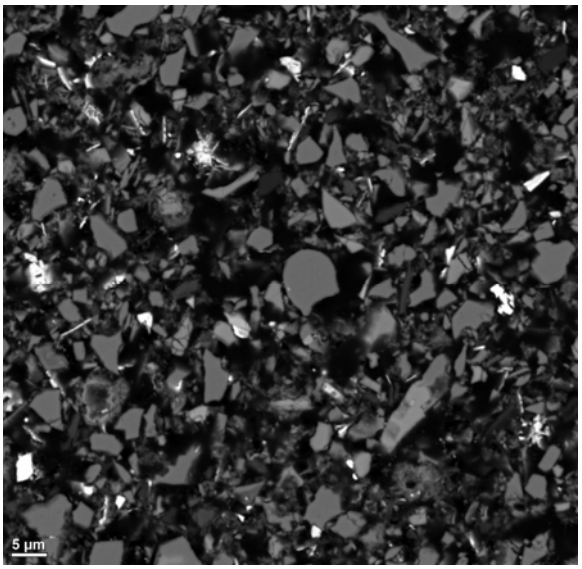


Figure 14: Typical Fields of View

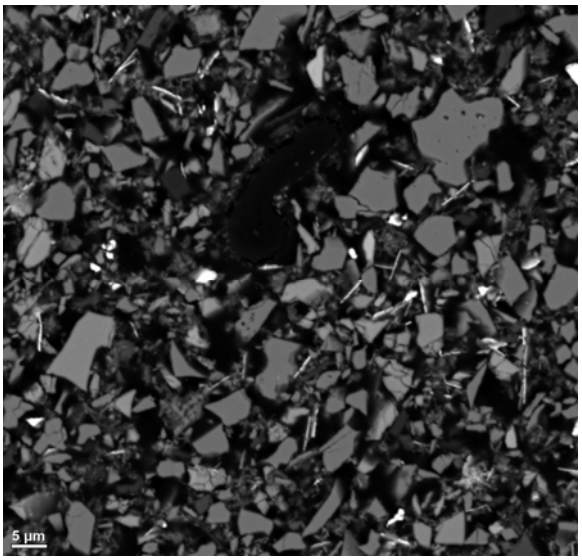


Figure 15: Typical Fields of View

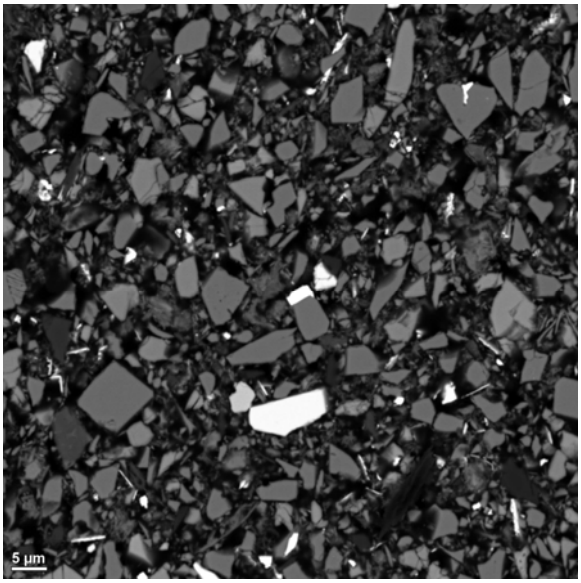


Figure 16: Typical Fields of View

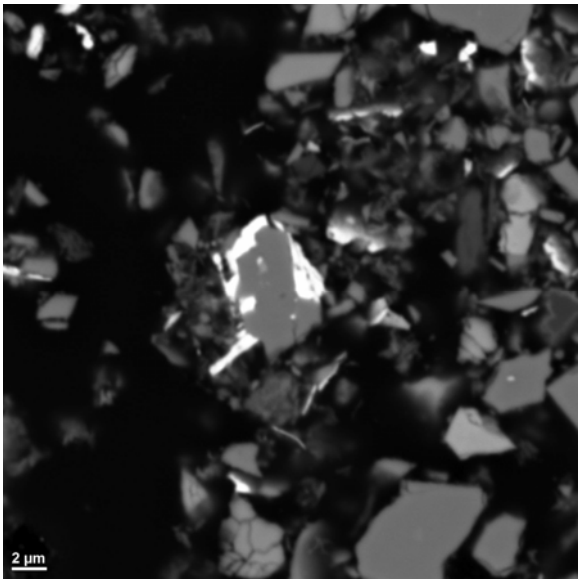


Figure 17: Typical Fields of View

Zn cleaner 2 concentrate and final scavenger tails samples were examined by micro-probe assay to determine Fe levels in the sphalerite grains. The Fe levels were relatively close in the tailings grains analysed. The results are presented in Table 1.

Table 1
Electron Micro-Probe Assay Results

Filename	Fe	Filename	Fe
Scvgtsph01.spc	9.58	Clnr2Consph01.spc	9.61
Scvgtsph02.spc	10.24	Clnr2Consph02.spc	9.43
Scvgtsph03.spc	8.49	Clnr2Consph03.spc	8.77
Scvgtsph04.spc	6.41	Clnr2Consph04.spc	7.47
Scvgtsph05.spc	8.25	Clnr2Consph05.spc	7.77
Scvgtsph07.spc	9.64	Clnr2Consph06.spc	7.87
Scvgtsph08.spc	7.27	Clnr2Consph07.spc	8.36
Scvgtsph09.spc	10.34	Clnr2Consph08.spc	9.55
Scvgtsph10.spc	10.1	Clnr2Consph09.spc	5.64
Avg.	**8.92**	Clnr2Consph10.spc	8.25
		Avg.	**8.23**

Prepared by:

Ross Gilders

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Senior Consultant, Mineral Processing
Minerals & Industrial Services

Reviewed by:

Leo Cheung, P.Eng.
Manager, Mineral Processing
Minerals & Industrial Services

An Investigation into

THE GRINDABILITY CHARACTERISTICS OF A SINGLE SAMPLE FROM THE MURRAY BROOK MINE

submitted by

RESEARCH & PRODUCTIVITY COUNCIL

Project 12629-001 – Final Report
September 25, 2012

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Member of the SGS Group (SGS SA)

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Testwork Summary

One sample from the Murray Brook mine was submitted for the Bond rod mill and Bond ball mill grindability tests. The results are summarized in Table 1 and the test details are discussed in Section 2 of the Discussion.

The sample was classified as medium in terms of its RWI value and soft in terms of its BWI value.

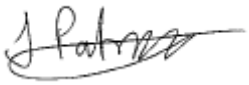
Table 1: Grindability Test Summary

Sample Name	RWI (kWh/t)	BWI (kWh/t)
J1859 - MB Comp	14.6	10.7

Introduction

Mr. Leo Cheung of Research & Productivity Council (RPC) requested that SGS Minerals Services (SGS) perform grindability testing on a single sample from the Murray Brook mine located in northern New Brunswick, Canada.

This report presents the grindability test results.



John Patsias, B.A.Sc.
Project Metallurgist, Metallurgical Operations

Dan Imeson, MSc.
Manager, Mineral Processing

Experimental work by: Arnie Rosborough
Report preparation by: John Patsias
Reviewed by: Guillaume Chiasson and Dan Imeson

Discussion

1. Sample Preparation

A shipment of one pail was received at the SGS Lakefield site on June 25th, 2012 and was given the SGS receipt number 0382-JUN12. The pail contained a single sample labelled J1859 – MB Comp.

The sample preparation diagram is depicted in Figure 1.

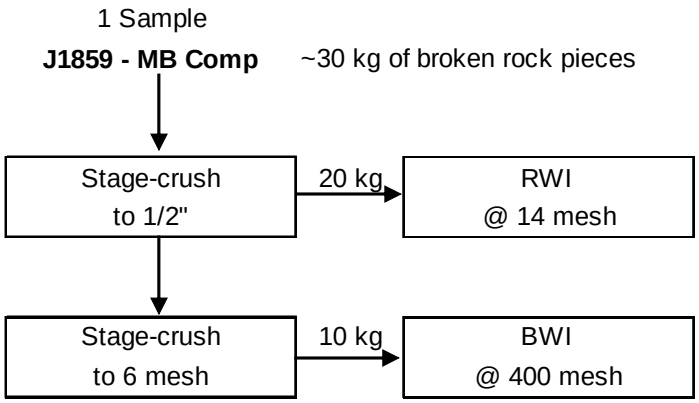


Figure 1: Sample Preparation

2. Grindability Testing

2.1. Bond Rod Mill Grindability Test

The Bond rod mill grindability test was performed at 14 mesh of grind (1,180 microns). The test results are summarized in Table 2 and compared to the SGS database in Figure 2. The test details are appended (Appendix A). The sample was categorized as medium in terms of its Bond Rod mill Work Index (RWI) value.

Table 2: Bond Rod Mill Grindability Test Results

Sample Name	Mesh of Grind	F_{80} (μm)	P_{80} (μm)	Gram per Revolution	Work Index (kWh/t)	Hardness Percentile
J1859 - MB Comp	14	10,859	896	8.65	14.6	55

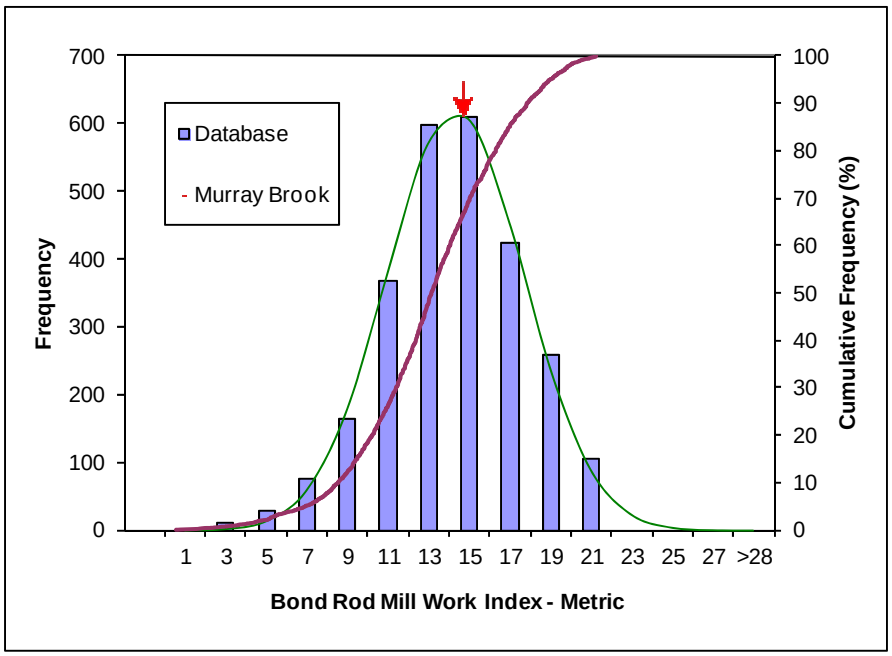


Figure 2: Bond Rod Mill Work Index Database

2.2. Bond Ball Mill Grindability Test

The Bond ball mill grindability test was performed at 400 mesh of grind (38 microns). The test results are summarized in Table 3 and compared to the SGS database in Figure 3. The test details are appended (Appendix B). The sample was categorized as soft in terms of its Bond Ball mill Work Index (BWI) value. The achieved P_{80} was 28 microns.

Table 3: Bond Ball Mill Grindability Test Results

Sample Name	Mesh of Grind	F_{80} (µm)	P_{80} (µm)	Gram per Revolution	Work Index (kWh/t)	Hardness Percentile
J1859 - MB Comp	400	2,368	28	1.23	10.7	14

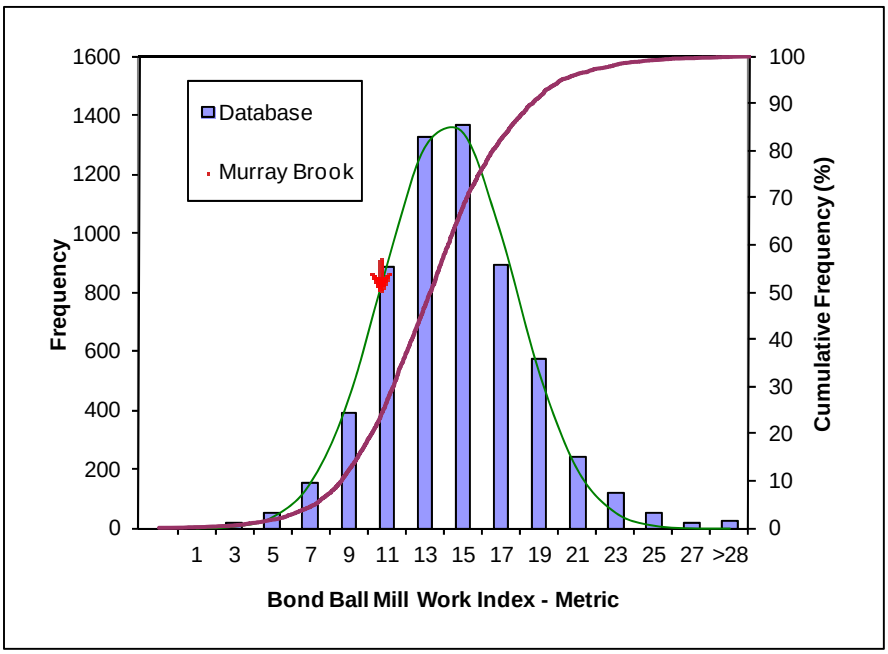


Figure 3: Bond Ball Mill Work Index Database

Appendix A – Bond Rod Mill Grindability Test Details

SGS Minerals Services

Standard Bond Rod Mill Grindability Test

Project No.: 12629-001 Date: 14-Aug-12
Sample.: J1859 - MB Comp

Purpose: To determine the rod mill grindability of the sample in terms of a Bond work index number.

Procedure: The equipment and procedure duplicate the Bond method for determining rod mill work indices.

Test Conditions:

Feed 100% Passing	0.5	inch	
Mesh of grind:	14	mesh	
Test feed weight (1250 mL):	3,088	grams	
Equivalent to :	2,470	kg/m³ at Minus 1/2"	
Weight % of the undersize material in the rod mill feed:			10.0%
Weight of undersize product for 100% circulating load:			1,544 grams

Results: Gram per Rev Average for the Last Three Stages = **8.65 g**
Circulation load = **97%**

CALCULATION OF A BOND WORK INDEX

$$RWI = \frac{62}{P1^{0.23} \times Grp^{0.625} \times \left\{ \frac{10}{\sqrt{P}} - \frac{10}{\sqrt{F}} \right\}}$$

P1 = 100% passing size of the product	1,180	microns
Grp = Grams per revolution	8.65	grams
P_{80} = 80% passing size of product	896	microns
F_{80} = 80% passing size of the feed	10,859	microns

RWI = **13.3** kWh/t (imperial)

RWI = **14.6** kWh/t (metric)

Comments:

Stage No.	# of Revs	New Feed (grams)	Product in Feed (grams)	Material to Be Ground (grams)	Material Passing 14 mesh in Product (grams)	Net Ground Material (grams)	Material Ground Per Mill Rev (grams)
1	50	3,088	309	1,235	533	224	4.48
2	333	533	53	1,491	2,526	2,473	7.43
3	174	2,526	253	1,291	1,622	1,369	7.87
4	176	1,622	162	1,382	1,616	1,454	8.26
5	167	1,616	162	1,382	1,630	1,468	8.79
6	157	1,630	163	1,381	1,509	1,346	8.57
7	163	1,509	151	1,393	1,553	1,402	8.60
		Average for Last Three Stages =			1,564 g		8.65 g

SGS Minerals Services

Standard Bond Rod Mill Grindability Test

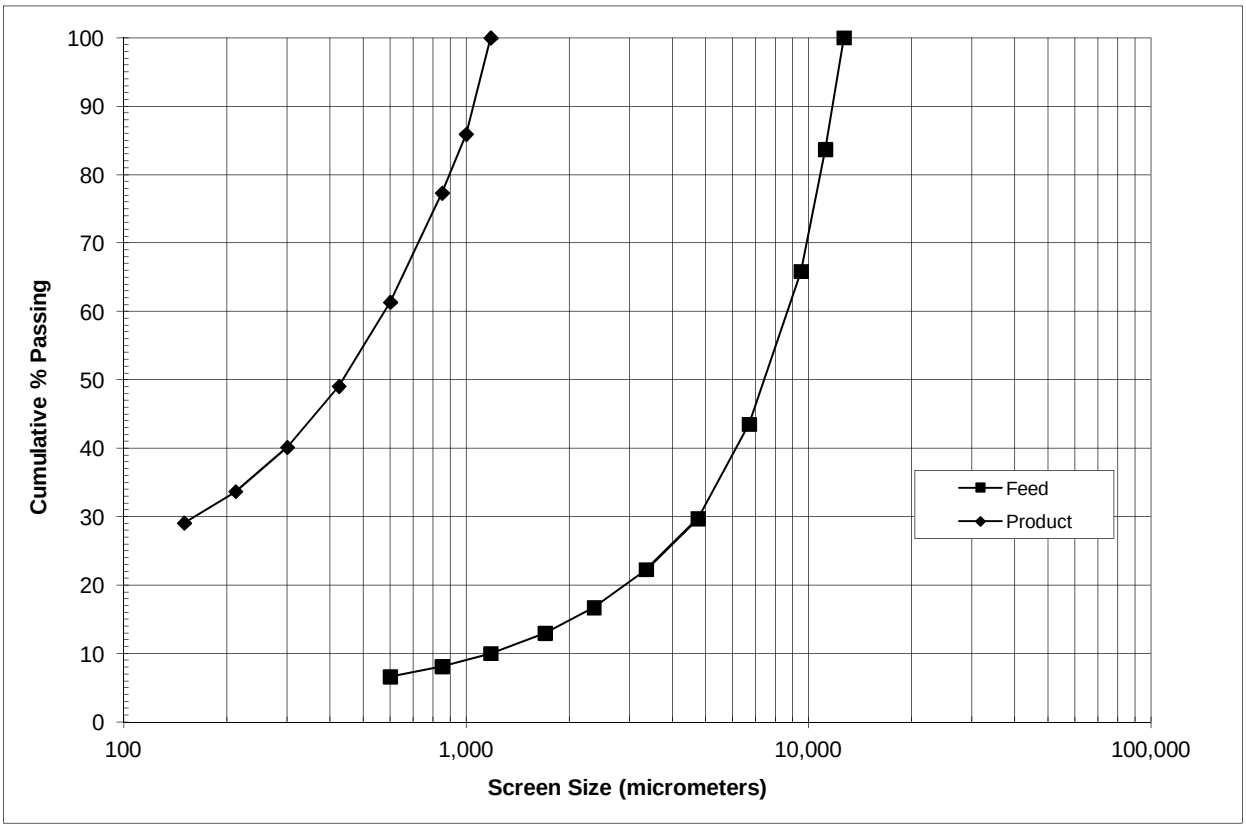
Project No.: 12629-001 Date: 14-Aug-12
Sample.: J1859 - MB Comp

Feed Particle Size Analysis

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
1/2"	12,700	0.00	0.00	0.00	100.0
7/16"	11,200	277.8	16.3	16.3	83.7
3/8"	9,500	303.1	17.8	34.1	65.9
3	6,700	380.5	22.4	56.5	43.5
4	4,750	234.5	13.8	70.3	29.7
6	3,350	127.1	7.47	77.7	22.3
8	2,360	94.5	5.55	83.3	16.7
10	1,700	63.7	3.74	87.0	13.0
14	1,180	50.6	2.97	90.0	10.0
18	1,000	-	-	-	-
20	850	32.3	1.90	91.9	8.11
28	600	25.5	1.50	93.4	6.61
35	425				
48	300				
65	212				
100	150				
Pan		112.6	6.61	100.0	-
Total	**-**	**1702.2**	**100.0**	**F_{80}:**	**10,859**

Product Particle Size Analysis

Weight	% Retained		% Passing
grams	Individual	Cumulative	Cumulative
0.00	0.00	0.00	100.0
50.0	14.1	14.1	85.9
30.6	8.62	22.7	77.3
56.6	15.9	38.6	61.4
43.6	12.3	50.9	49.1
31.7	8.93	59.9	40.1
22.9	6.45	66.3	33.7
16.4	4.62	70.9	29.1
103.2	29.1	100.0	-
355.0	**100.0**	**P_{80}:**	**896**



Appendix B – Bond Ball Mill Grindability Test Details

SGS Minerals Services

Standard Bond Ball Mill Grindability Test

Project No.: 12629-001 Date: 7-Sep-12
Sample: J1859 - MB Comp

Purpose: To determine the ball mill grindability of the sample in terms of a Bond work index number.

Procedure: The equipment and procedure duplicate the Bond method for determining ball mill work indices.

Test Conditions:

Feed 100% Passing	6	mesh	
Mesh of grind:	400	mesh	
Test feed weight (700 mL):	1,937	grams	
Equivalent to :	2,767	kg/m³	at Minus 6 mesh
Weight % of the undersize material in the ball mill feed:			8.3%
Weight of undersize product for 250% circulating load:			553 grams

Results: Gram per Rev Average for the Last Three Stages = **1.23 g**
Circulation load = **252%**

CALCULATION OF A BOND WORK INDEX

$$BWI = \frac{44.5}{P1^{0.23} \times Grp^{0.82} \times \left\{ \frac{10}{\sqrt{P}} - \frac{10}{\sqrt{F}} \right\}}$$

P1 = 100% passing size of the product	38	microns
Grp = Grams per revolution	1.23	grams
P_{80} = 80% passing size of product	28	microns
F_{80} = 80% passing size of the feed	2,368	microns

BWI = **9.7** kWh/t (imperial)

BWI = **10.7** kWh/t (metric)

Comments:

Stage No.	# of Revs	New Feed (grams)	Product in Feed (grams)	Material to Be Ground (grams)	Material Passing 400 mesh in Product (grams)	Net Ground Material (grams)	Material Ground Per Mill Rev (grams)
1	400	1,937	161	393	560	399	1.00
2	508	560	47	507	649	603	1.19
3	421	649	54	500	590	536	1.27
4	396	590	49	504	550	501	1.27
5	401	550	46	508	548	502	1.25
6	405	548	46	508	551	506	1.25
7	407	551	46	508	541	495	1.22
8	418	541	45	509	558	513	1.23
		Average for Last Three Stages =		550 g			1.23 g

SGS Minerals Services

Standard Bond Ball Mill Grindability Test

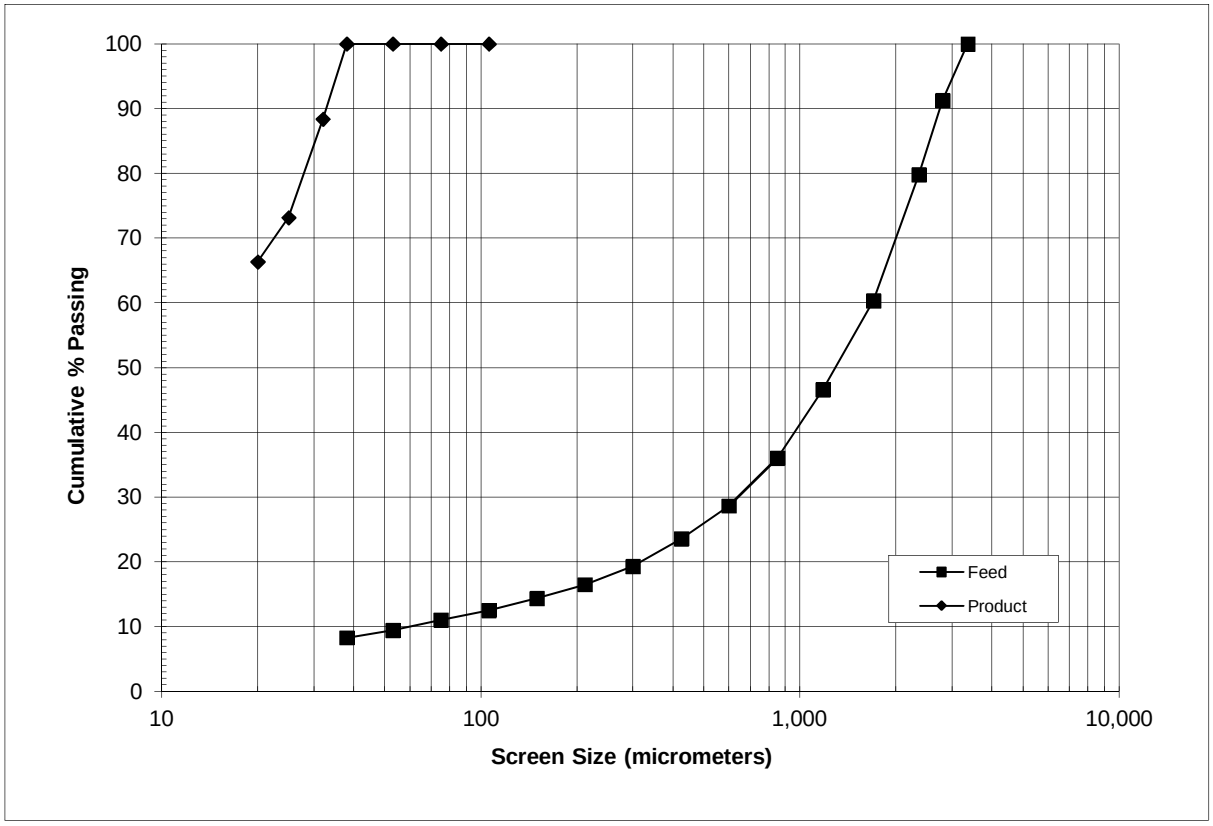
Project No.: 12629-001 Date: 7-Sep-12
Sample: J1859 - MB Comp

Feed Particle Size Analysis

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
6	3,360	0.00	0.00	0.00	100.0
7	2,800	73.8	8.77	8.77	91.2
8	2,360	96.3	11.4	20.2	79.8
10	1,700	163.8	19.5	39.7	60.3
14	1,180	115.5	13.7	53.4	46.6
20	850	88.7	10.5	63.9	36.1
28	600	62.2	7.39	71.3	28.7
35	425	42.6	5.06	76.4	23.6
48	300	36.3	4.31	80.7	19.3
65	212	23.4	2.78	83.5	16.5
100	150	18.2	2.16	85.7	14.3
150	106	15.2	1.81	87.5	12.5
200	75	12.6	1.50	89.0	11.0
270	53	13.5	1.60	90.6	9.44
400	38	9.50	1.13	91.7	8.31
450	32				
500	25				
635	20				
Pan	-	69.9	8.3	100.0	-
Total	**-**	**841.5**	**100.0**	**F_{80}:**	**2,368**

Product Particle Size Analysis

Weight	% Retained		% Passing
grams	Individual	Cumulative	Cumulative
0.00	0.00	0.00	100.0
0.00	0.00	0.00	100.0
0.00	0.00	0.00	100.0
0.00	0.00	0.00	100.0
18.3	11.6	11.6	88.4
24.0	15.2	26.8	73.2
10.8	6.85	33.7	66.3
104.6	66.3	100.0	-
157.7	**100.0**	**P_{80}:**	**28**



Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 15-18

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	70.1	8.5
162.0	100.0	0.0	15.3	61.6	8.1
140.0	100.0	0.0	13.2	53.5	7.9
121.0	100.0	0.0	11.4	45.7	6.4
104.0	100.0	0.0	9.8	39.2	4.2
89.9	100.0	0.0	8.5	35.1	4.9
77.5	100.0	0.0	7.3	30.1	6.1
66.9	100.0	0.0	6.3	24.0	5.1
57.7	100.0	0.2	5.4	18.9	3.2
49.8	99.7	0.6	4.7	15.7	2.0
42.9	99.1	0.7	4.1	13.7	3.2
37.1	98.4	1.4	3.5	10.5	4.2
32.0	97.0	3.5	3.0	6.2	3.1
27.6	93.5	6.2	2.6	3.1	1.2
23.8	87.3	8.3	2.2	2.0	0.8
20.5	79.0	8.9	1.9	1.1	0.7

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1946
Volume Conc. = 0.0287 %
Log. Diff. =3.06
Model indp

D(v,0.5) = 12.4 µm
D(v,0.9) = 25.2 µm
D(v,0.1) = 3.4 µm
D(4,3) = 13.7 µm
D(3,2) = 7.9 µm
Span = 1.8
Spec. surf. area
0.25 sq.m./cc.

Sample details:-RPC - PO 80865 - J1859-120minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 15-18

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	99.9	0.1
45	355.0 µm	100.0	0.0	325	45.0 µm	99.3	0.6
50	300.0 µm	100.0	0.0	400	38.0 µm	98.6	0.8

Sample details:-RPC - PO 80865 - J1859-120minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 15-22

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	56.7	7.3
162.0	100.0	0.0	15.3	49.3	6.4
140.0	100.0	0.0	13.2	43.0	6.3
121.0	100.0	0.0	11.4	36.7	5.6
104.0	100.0	0.0	9.8	31.0	4.1
89.9	100.0	0.2	8.5	26.9	3.9
77.5	99.8	0.3	7.3	23.0	4.2
66.9	99.5	0.3	6.3	18.8	3.9
57.7	99.2	0.5	5.4	14.8	3.1
49.8	98.7	1.9	4.7	11.7	2.3
42.9	96.8	2.8	4.1	9.4	2.3
37.1	93.9	3.8	3.5	7.1	2.3
32.0	90.2	6.0	3.0	4.8	1.6
27.6	84.2	8.8	2.6	3.2	0.9
23.8	75.4	9.8	2.2	2.3	0.8
20.5	65.6	8.9	1.9	1.5	0.7

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1840
Volume Conc. = 0.0313 %
Log. Diff. =2.97
Model indp

D(v,0.5) = 15.5 µm
D(v,0.9) = 31.8 µm
D(v,0.1) = 4.2 µm
D(4,3) = 17.3 µm
D(3,2) = 9.4 µm
Span = 1.8
Spec. surf. area
0.18 sq.m./cc.

Sample details:-RPC - PO 80865 - J1859-90minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 15-22

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.8	0.2
35	500.0 µm	100.0	0.0	230	63.0 µm	99.4	0.4
40	425.0 µm	100.0	0.0	270	53.0 µm	99.0	0.4
45	355.0 µm	100.0	0.0	325	45.0 µm	97.5	1.5
50	300.0 µm	100.0	0.0	400	38.0 µm	94.5	3.0

Sample details:-RPC - PO 80865 - J1859-90minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 15-26

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	50.6	6.4
162.0	100.0	0.0	15.3	44.2	5.6
140.0	100.0	0.0	13.2	38.6	5.6
121.0	100.0	0.0	11.4	33.0	5.0
104.0	100.0	0.0	9.8	28.0	3.7
89.9	100.0	0.4	8.5	24.3	3.6
77.5	99.6	0.7	7.3	20.7	3.7
66.9	99.0	0.7	6.3	17.0	3.4
57.7	98.3	1.0	5.4	13.5	2.7
49.8	97.3	3.3	4.7	10.8	2.1
42.9	94.0	4.6	4.1	8.6	2.2
37.1	89.4	5.4	3.5	6.5	2.1
32.0	84.0	7.1	3.0	4.3	1.5
27.6	76.9	9.1	2.6	2.8	0.8
23.8	67.9	9.3	2.2	2.0	0.7
20.5	58.5	7.9	1.9	1.3	0.6

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2262
Volume Conc. = 0.0426 %
Log. Diff. =2.93
Model indp

D(v,0.5) = 17.5 µm
D(v,0.9) = 37.7 µm
D(v,0.1) = 4.5 µm
D(4,3) = 19.6 µm
D(3,2) = 10.0 µm
Span = 1.9
Spec. surf. area
0.16 sq.m./cc.

Sample details:-RPC - PO 80865 - J1859-75minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 15-26

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.5	0.5
35	500.0 µm	100.0	0.0	230	63.0 µm	98.7	0.8
40	425.0 µm	100.0	0.0	270	53.0 µm	97.9	0.7
45	355.0 µm	100.0	0.0	325	45.0 µm	95.3	2.7
50	300.0 µm	100.0	0.0	400	38.0 µm	90.3	5.0

Sample details:-RPC - PO 80865 - J1859-75minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 15-30

Size microns	under	% in band	Size microns	under	% in band
188.0	100.0	0.0	17.7	42.0	5.4
162.0	100.0	0.0	15.3	36.6	4.8
140.0	99.9	0.0	13.2	31.8	4.6
121.0	99.9	0.0	11.4	27.2	4.0
104.0	99.9	0.0	9.8	23.2	3.1
89.9	99.8	0.3	8.5	20.1	2.9
77.5	99.5	1.3	7.3	17.2	3.1
66.9	98.3	2.5	6.3	14.1	2.9
57.7	95.7	4.1	5.4	11.2	2.4
49.8	91.7	5.6	4.7	8.8	1.8
42.9	86.0	6.6	4.1	7.0	1.9
37.1	79.4	7.4	3.5	5.1	1.6
32.0	72.0	8.0	3.0	3.6	1.1
27.6	64.1	8.2	2.6	2.5	0.9
23.8	55.9	7.6	2.2	1.6	0.5
20.5	48.3	6.4	1.9	1.1	0.4

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2081
Volume Conc. = 0.0448 %
Log. Diff. =2.96
Model indp

D(v,0.5) = 21.2 µm
D(v,0.9) = 47.5 µm
D(v,0.1) = 5.1 µm
D(4,3) = 24.5 µm
D(3,2) = 11.4 µm
Span = 2.0
Spec. surf. area
0.12 sq.m./cc.

Sample details:-RPC - PO 80865 - J1859-60minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 15-30

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	99.9	0.1
20	850.0 µm	100.0	0.0	140	106.0 µm	99.9	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	99.8	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.3	0.5
35	500.0 µm	100.0	0.0	230	63.0 µm	97.4	1.9
40	425.0 µm	100.0	0.0	270	53.0 µm	93.6	3.8
45	355.0 µm	100.0	0.0	325	45.0 µm	88.0	5.6
50	300.0 µm	100.0	0.0	400	38.0 µm	80.6	7.4

Sample details:-RPC - PO 80865 - J1859-60minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 15-35

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	24.3	3.5
162.0	100.0	0.0	15.3	20.8	3.0
140.0	100.0	0.0	13.2	17.8	2.4
121.0	100.0	0.6	11.4	15.4	1.9
104.0	99.4	3.1	9.8	13.5	1.7
89.9	96.4	5.5	8.5	11.8	1.8
77.5	90.9	7.5	7.3	10.1	2.0
66.9	83.4	8.8	6.3	8.1	1.9
57.7	74.6	9.3	5.4	6.2	1.3
49.8	65.3	9.2	4.7	4.9	1.0
42.9	56.1	8.0	4.1	3.9	1.0
37.1	48.1	6.8	3.5	2.8	0.9
32.0	41.3	5.3	3.0	1.9	0.6
27.6	36.0	4.1	2.6	1.3	0.4
23.8	31.9	3.8	2.2	0.9	0.3
20.5	28.1	3.8	1.9	0.6	0.2

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1705
Volume Conc. = 0.0551 %
Log. Diff. =3.40
Model indp

D(v,0.5) = 38.5 µm
D(v,0.9) = 76.0 µm
D(v,0.1) = 7.3 µm
D(4,3) = 38.4 µm
D(3,2) = 16.7 µm
Span = 1.8
Spec. surf. area
0.08 sq.m./cc.

Sample details:-RPC - PO 80865 - J159-45minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 15-35

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	99.7	0.3
25	710.0 µm	100.0	0.0	170	90.0 µm	96.4	3.3
30	600.0 µm	100.0	0.0	200	75.0 µm	89.4	7.1
35	500.0 µm	100.0	0.0	230	63.0 µm	79.9	9.4
40	425.0 µm	100.0	0.0	270	53.0 µm	69.3	10.7
45	355.0 µm	100.0	0.0	325	45.0 µm	59.0	10.2
50	300.0 µm	100.0	0.0	400	38.0 µm	49.3	9.7

Sample details:-RPC - PO 80865 - J159-45minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 15-41

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	1.3	17.7	14.2	1.7
162.0	98.7	3.7	15.3	12.5	1.7
140.0	95.0	5.8	13.2	10.8	1.5
121.0	89.2	8.1	11.4	9.4	1.1
104.0	81.1	9.6	9.8	8.2	1.0
89.9	71.5	11.2	8.5	7.2	1.1
77.5	60.3	11.2	7.3	6.1	1.3
66.9	49.1	9.6	6.3	4.8	1.0
57.7	39.6	6.2	5.4	3.8	0.9
49.8	33.4	3.1	4.7	2.9	0.6
42.9	30.3	2.3	4.1	2.3	0.6
37.1	28.0	3.3	3.5	1.7	0.6
32.0	24.7	3.5	3.0	1.2	0.4
27.6	21.2	2.9	2.6	0.7	0.3
23.8	18.3	2.3	2.2	0.5	0.2
20.5	16.0	1.8	1.9	0.3	0.1

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1877
Volume Conc. = 0.0943 %
Log. Diff. =3.87
Model indp

D(v,0.5) = 67.7 µm
D(v,0.9) = 123.2 µm
D(v,0.1) = 12.2 µm
D(4,3) = 67.9 µm
D(3,2) = 25.4 µm
Span = 1.6
Spec. surf. area
0.05 sq.m./cc.

Sample details:-RPC - PO 80865 - J1859-30minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 15-41

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	99.9	0.1
16	1180.0 µm	100.0	0.0	100	150.0 µm	97.0	2.9
18	1000.0 µm	100.0	0.0	120	125.0 µm	90.7	6.4
20	850.0 µm	100.0	0.0	140	106.0 µm	82.2	8.5
25	710.0 µm	100.0	0.0	170	90.0 µm	71.6	10.6
30	600.0 µm	100.0	0.0	200	75.0 µm	57.8	13.8
35	500.0 µm	100.0	0.0	230	63.0 µm	44.9	12.8
40	425.0 µm	100.0	0.0	270	53.0 µm	35.5	9.4
45	355.0 µm	100.0	0.0	325	45.0 µm	31.1	4.4
50	300.0 µm	100.0	0.0	400	38.0 µm	28.4	2.7

Sample details:-RPC - PO 80865 - J1859-30minG

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28-May-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

PO - 80898

Solids:	mg/kg
Sample	Au
MB-9min-GH	0.586
J1859-75min-RC	0.842
J1859-75min-RT	0.498
J1859-75min-RT Dup.	0.455

Certified Reference Standards	mg/kg Au	Recommended Value
OXC72	0.204	0.205±0.003

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Manager, Minerals Engineering Centre

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28-May-12

Research and Productivity Council,
921 College Hill Rd.,
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Attention: J. Jewett

P0 80898

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
MB-90min-GH	37.41	0.16	1.39	4.34	53
J1859-30min-RC	32.34	0.49	4.03	15.74	153
J1859-45min-RC	33.04	0.47	3.97	14.39	136
J1859-60min-RC	31.39	0.51	4.17	14.62	148
J1859-75min-RC	31.77	0.48	4.24	14.46	146
J1859-90min-RC	31.88	0.56	4.84	16.61	158
J1859-120min-RC	30.75	0.58	4.80	16.70	158
J1859-30min-RT	36.36	0.079	0.52	0.70	17
J1859-45min-RT	37.24	0.059	0.32	0.31	14
J1859-60min-RT	38.22	0.050	0.27	0.25	14
J1859-75min-RT	37.09	0.046	0.25	0.22	12
J1859-90min-RT	37.05	0.045	0.25	0.21	14
J1859-120min-RT	36.38	0.045	0.25	0.31	15

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	6.32	1.43	4.27	18.46	73
CZN-1	11.08	0.14	7.33	44.16	94
CCU-1c	8.89	0.26	65.83	4.46	601
CPB-1	28.28	24.91	0.36	3.99	127

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 13-44

Size microns	under	% in band	Size microns	under	% in band
188.0	100.0	0.0	17.7	51.2	7.1
162.0	100.0	0.0	15.3	44.1	6.3
140.0	100.0	0.0	13.2	37.8	5.6
121.0	100.0	0.0	11.4	32.2	4.8
104.0	100.0	0.0	9.8	27.4	3.7
89.9	100.0	0.3	8.5	23.8	3.6
77.5	99.7	0.5	7.3	20.2	3.8
66.9	99.3	0.5	6.3	16.4	3.6
57.7	98.8	0.7	5.4	12.7	2.8
49.8	98.1	2.3	4.7	9.9	2.1
42.9	95.8	4.1	4.1	7.8	2.1
37.1	91.7	6.0	3.5	5.8	1.8
32.0	85.7	7.8	3.0	4.0	1.3
27.6	77.9	9.2	2.6	2.7	1.0
23.8	68.7	9.3	2.2	1.7	0.6
20.5	59.4	8.3	1.9	1.2	0.4

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1638
Volume Conc. = 0.0303 %
Log. Diff. =3.04
Model indp

D(v,0.5) = 17.3 µm
D(v,0.9) = 35.4 µm
D(v,0.1) = 4.7 µm
D(4,3) = 19.1 µm
D(3,2) = 10.2 µm
Span = 1.8
Spec. surf. area
0.17 sq.m./cc.

Sample details:-RPC - PO80916 - MB124-Btm-75G

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 13-44

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.6	0.4
35	500.0 µm	100.0	0.0	230	63.0 µm	99.1	0.6
40	425.0 µm	100.0	0.0	270	53.0 µm	98.6	0.5
45	355.0 µm	100.0	0.0	325	45.0 µm	96.8	1.8
50	300.0 µm	100.0	0.0	400	38.0 µm	92.5	4.2

Sample details:-RPC - PO80916 - MB124-Btm-75G

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 13-30

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.1	17.7	32.6	4.4
162.0	99.9	0.3	15.3	28.1	4.2
140.0	99.6	0.3	13.2	24.0	3.6
121.0	99.3	0.3	11.4	20.3	3.0
104.0	99.0	0.2	9.8	17.4	2.2
89.9	98.7	1.2	8.5	15.1	2.1
77.5	97.5	3.5	7.3	13.0	2.3
66.9	94.0	5.5	6.3	10.7	2.4
57.7	88.5	6.9	5.4	8.3	2.0
49.8	81.6	8.1	4.7	6.3	1.5
42.9	73.5	8.4	4.1	4.8	1.2
37.1	65.1	8.5	3.5	3.7	1.1
32.0	56.5	7.7	3.0	2.6	0.8
27.6	48.9	6.2	2.6	1.8	0.5
23.8	42.6	5.3	2.2	1.2	0.4
20.5	37.3	4.8	1.9	0.8	0.3

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2140
Volume Conc. = 0.0571 %
Log. Diff. =3.23
Model indp

D(v,0.5) = 28.3 µm
D(v,0.9) = 59.8 µm
D(v,0.1) = 6.0 µm
D(4,3) = 31.5 µm
D(3,2) = 14.1 µm
Span = 1.9
Spec. surf. area
0.10 sq.m./cc.

Sample details:-RPC - PO80916 - MB124-Btm-45G

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 13-30

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	99.8	0.2
18	1000.0 µm	100.0	0.0	120	125.0 µm	99.4	0.4
20	850.0 µm	100.0	0.0	140	106.0 µm	99.0	0.4
25	710.0 µm	100.0	0.0	170	90.0 µm	98.7	0.3
30	600.0 µm	100.0	0.0	200	75.0 µm	96.9	1.9
35	500.0 µm	100.0	0.0	230	63.0 µm	91.9	4.9
40	425.0 µm	100.0	0.0	270	53.0 µm	84.7	7.3
45	355.0 µm	100.0	0.0	325	45.0 µm	76.2	8.5
50	300.0 µm	100.0	0.0	400	38.0 µm	66.5	9.7

Sample details:-RPC - PO80916 - MB124-Btm-45G

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 13-37

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	53.6	6.8
162.0	100.0	0.0	15.3	46.8	6.0
140.0	100.0	0.0	13.2	40.8	5.8
121.0	100.0	0.0	11.4	35.0	5.2
104.0	100.0	0.0	9.8	29.7	4.1
89.9	100.0	0.2	8.5	25.7	3.7
77.5	99.8	0.4	7.3	21.9	3.8
66.9	99.4	0.4	6.3	18.2	3.7
57.7	99.0	0.6	5.4	14.5	3.2
49.8	98.4	2.1	4.7	11.3	2.6
42.9	96.3	3.6	4.1	8.7	2.5
37.1	92.7	5.3	3.5	6.2	2.0
32.0	87.4	7.2	3.0	4.3	1.3
27.6	80.1	9.1	2.6	3.0	1.1
23.8	71.1	9.4	2.2	1.9	0.6
20.5	61.7	8.2	1.9	1.3	0.5

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1479
Volume Conc. = 0.0258 %
Log. Diff. =2.96
Model indp

D(v,0.5) = 16.5 µm
D(v,0.9) = 34.2 µm
D(v,0.1) = 4.4 µm
D(4,3) = 18.3 µm
D(3,2) = 9.7 µm
Span = 1.8
Spec. surf. area
0.17 sq.m./cc.

Sample details:-RPC - PO80916 - MB124-Mid-75G

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 13-37

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.7	0.3
35	500.0 µm	100.0	0.0	230	63.0 µm	99.3	0.5
40	425.0 µm	100.0	0.0	270	53.0 µm	98.8	0.4
45	355.0 µm	100.0	0.0	325	45.0 µm	97.2	1.7
50	300.0 µm	100.0	0.0	400	38.0 µm	93.4	3.8

Sample details:-RPC - PO80916 - MB124-Mid-75G

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31-May-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Label Correction
MB124-Mid-RT

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
P0 80916					
MB124-BTM-45-RC	38.92	0.78	2.98	11.99	97
MB124-BTM-45-RT	42.15	0.07	0.23	0.24	14
MB124-Mid-RC	32.98	0.40	5.61	13.85	140
MB124-Mid-RT	42.42	0.05	0.42	0.37	24
MB124-BTM-75-RC	35.44	0.76	2.92	11.18	86
MB124-BTM-75-RT	42.80	0.06	0.20	0.19	13
P0 80929					
MB124-BTM-60-GH	39.38	0.18	0.78	2.77	27
MB124-BTM-60-RC	39.13	0.65	2.85	11.14	79
MB124-BTM-60-RT	41.54	0.05	0.19	0.20	11
MB124-BTM-90-RC	36.48	0.67	2.79	10.92	72
MB124-BTM-90-RT	40.81	0.05	0.19	0.19	9
MB121-60min-GH	37.55	0.53	0.96	2.02	32
MB121-60-RC	39.02	1.66	2.65	6.17	81
MB121-60-RT	37.61	0.07	0.25	0.14	8
MB121-75-RT	38.15	0.06	0.25	0.14	8
MB121-75-RC	39.86	1.83	2.84	6.64	112

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CANMET Reference Standards	Wt. %				mg/kg
	Fe	Cu	Pb	Zn	Ag
MP-1a	6.21	1.44	4.27	19.29	67
CZN-1	10.97	0.14	7.43	43.10	101
CCU-1c	8.89	0.26	64.79	4.35	663
CPB-1	28.49	25.62	0.34	3.95	126

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

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4-Jun-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids: Sample	mg/kg Au
RPC 80916	
MB124-Mid-RC	0.227
MB124-Mid-RT	0.217
MB124-BTM-75-RC	0.261
MB124-BTM-75-RT	0.240
MB124-BTM-75-RT Dup.	0.200
RPC 80929	
MB124-BTM-60-GH	0.184
MB121-60min-GH	0.720
MB121-75-RT	0.636
MB121-75-RC	1.306
RPC 80952	
MB124-Top-75-RC	0.321
MB124-Top-75-RT	0.328
MB-COMP-75-RC	0.643
MB-COMP-75-RT	0.323
MB-COMP-75-GH	0.022

Certified Reference Standards	mg/kg Au	Recommended Value
WCM PM914	10.2	10.7

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 13-56

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	44.5	5.8
162.0	100.0	0.0	15.3	38.7	4.5
140.0	100.0	0.0	13.2	34.3	4.8
121.0	100.0	0.0	11.4	29.4	4.7
104.0	100.0	0.0	9.8	24.8	3.5
89.9	100.0	0.0	8.5	21.2	3.3
77.5	100.0	0.0	7.3	18.0	3.3
66.9	100.0	1.0	6.3	14.7	3.0
57.7	99.0	3.6	5.4	11.6	2.3
49.8	95.4	5.8	4.7	9.3	1.8
42.9	89.6	6.2	4.1	7.6	2.1
37.1	83.5	5.9	3.5	5.4	1.9
32.0	77.6	6.9	3.0	3.5	1.2
27.6	70.7	8.8	2.6	2.3	0.9
23.8	61.9	9.3	2.2	1.4	0.4
20.5	52.6	8.1	1.9	0.9	0.3

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1937
Volume Conc. = 0.0398 %
Log. Diff. =2.99
Model indp

D(v,0.5) = 19.6 µm
D(v,0.9) = 43.3 µm
D(v,0.1) = 4.9 µm
D(4,3) = 20.6 µm
D(3,2) = 10.7 µm
Span = 2.0
Spec. surf. area
0.15 sq.m./cc.

Sample details:-RPC - PO80929 - MB124-BTM-60-G

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 13-56

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	97.3	2.7
45	355.0 µm	100.0	0.0	325	45.0 µm	91.7	5.7
50	300.0 µm	100.0	0.0	400	38.0 µm	84.5	7.2

Sample details:-RPC - PO80929 - MB124-BTM-60-G

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 14-00

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	59.2	8.1
162.0	100.0	0.0	15.3	51.1	6.6
140.0	100.0	0.0	13.2	44.5	5.9
121.0	100.0	0.0	11.4	38.6	5.2
104.0	100.0	0.0	9.8	33.4	4.4
89.9	100.0	0.0	8.5	29.0	4.7
77.5	100.0	0.1	7.3	24.3	4.8
66.9	99.9	0.0	6.3	19.5	3.6
57.7	99.8	0.3	5.4	16.0	2.3
49.8	99.5	1.9	4.7	13.7	2.0
42.9	97.6	2.7	4.1	11.6	3.2
37.1	94.8	3.3	3.5	8.4	3.7
32.0	91.5	5.1	3.0	4.7	2.2
27.6	86.4	7.9	2.6	2.5	0.9
23.8	78.6	9.7	2.2	1.7	0.7
20.5	68.9	9.7	1.9	1.0	0.6

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2089
Volume Conc. = 0.0352 %
Log. Diff. =2.96
Model indp

D(v,0.5) = 14.9 µm
D(v,0.9) = 30.3 µm
D(v,0.1) = 3.7 µm
D(4,3) = 16.5 µm
D(3,2) = 9.1 µm
Span = 1.8
Spec. surf. area
0.20 sq.m./cc.

Sample details:-RPC - PO 80929 - MB124-Btm-90-G

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 14-01

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.9	0.1
35	500.0 µm	100.0	0.0	230	63.0 µm	99.9	0.1
40	425.0 µm	100.0	0.0	270	53.0 µm	99.8	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	98.3	1.5
50	300.0 µm	100.0	0.0	400	38.0 µm	95.3	3.0

Sample details:-RPC - PO 80929 - MB124-Btm-90-G

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 14-05

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	49.5	6.9
162.0	100.0	0.0	15.3	42.6	5.9
140.0	100.0	0.0	13.2	36.7	5.1
121.0	100.0	0.0	11.4	31.6	4.4
104.0	100.0	0.0	9.8	27.2	3.7
89.9	100.0	0.0	8.5	23.6	3.7
77.5	100.0	0.2	7.3	19.9	3.8
66.9	99.7	1.1	6.3	16.1	3.4
57.7	98.7	2.4	5.4	12.7	2.7
49.8	96.2	4.0	4.7	10.0	2.1
42.9	92.2	5.2	4.1	7.9	2.1
37.1	87.0	6.4	3.5	5.9	1.7
32.0	80.6	7.2	3.0	4.1	1.2
27.6	73.4	7.9	2.6	2.9	1.0
23.8	65.6	8.2	2.2	1.9	0.6
20.5	57.3	7.9	1.9	1.3	0.5

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1575
Volume Conc. = 0.0293 %
Log. Diff. =2.94
Model indp

D(v,0.5) = 17.9 µm
D(v,0.9) = 40.2 µm
D(v,0.1) = 4.7 µm
D(4,3) = 20.4 µm
D(3,2) = 10.2 µm
Span = 2.0
Spec. surf. area
0.15 sq.m./cc.

Sample details:-RPC - PO80929 - MB121-60minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 14-05

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	99.4	0.5
40	425.0 µm	100.0	0.0	270	53.0 µm	97.5	2.0
45	355.0 µm	100.0	0.0	325	45.0 µm	93.7	3.8
50	300.0 µm	100.0	0.0	400	38.0 µm	88.0	5.7

Sample details:-RPC - PO80929 - MB121-60minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 14-10

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	56.7	8.1
162.0	100.0	0.0	15.3	48.6	7.0
140.0	100.0	0.0	13.2	41.6	5.8
121.0	100.0	0.0	11.4	35.8	4.8
104.0	100.0	0.0	9.8	31.0	4.0
89.9	100.0	0.2	8.5	27.0	4.0
77.5	99.7	0.4	7.3	22.9	4.2
66.9	99.3	0.4	6.3	18.7	3.9
57.7	98.9	0.6	5.4	14.8	3.2
49.8	98.3	2.2	4.7	11.6	2.5
42.9	96.1	3.5	4.1	9.1	2.2
37.1	92.6	4.6	3.5	6.9	2.0
32.0	87.9	6.0	3.0	4.9	1.5
27.6	81.9	7.5	2.6	3.4	0.9
23.8	74.4	8.7	2.2	2.4	0.8
20.5	65.7	9.0	1.9	1.6	0.7

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1823
Volume Conc. = 0.0310 %
Log. Diff. =3.10
Model indp

D(v,0.5) = 15.7 µm
D(v,0.9) = 34.0 µm
D(v,0.1) = 4.3 µm
D(4,3) = 17.8 µm
D(3,2) = 9.4 µm
Span = 1.9
Spec. surf. area
0.17 sq.m./cc.

Sample details:-RPC - PO 80929 - MB121-75minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 14-10

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.7	0.3
35	500.0 µm	100.0	0.0	230	63.0 µm	99.2	0.5
40	425.0 µm	100.0	0.0	270	53.0 µm	98.7	0.5
45	355.0 µm	100.0	0.0	325	45.0 µm	97.0	1.8
50	300.0 µm	100.0	0.0	400	38.0 µm	93.2	3.7

Sample details:-RPC - PO 80929 - MB121-75minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 14-14

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	60.9	8.6
162.0	100.0	0.0	15.3	52.2	7.3
140.0	100.0	0.0	13.2	45.0	6.1
121.0	100.0	0.1	11.4	38.9	5.2
104.0	99.9	0.3	9.8	33.7	4.4
89.9	99.7	0.5	8.5	29.4	4.4
77.5	99.2	0.6	7.3	25.0	4.6
66.9	98.6	0.6	6.3	20.4	4.3
57.7	97.9	0.8	5.4	16.1	3.5
49.8	97.1	1.9	4.7	12.6	2.7
42.9	95.2	2.6	4.1	9.9	2.3
37.1	92.6	3.2	3.5	7.6	2.1
32.0	89.4	4.4	3.0	5.5	1.6
27.6	85.0	6.3	2.6	3.9	1.0
23.8	78.7	8.4	2.2	2.8	0.9
20.5	70.3	9.4	1.9	1.9	0.8

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2256
Volume Conc. = 0.0371 %
Log. Diff. =2.82
Model indp

D(v,0.5) = 14.7 µm
D(v,0.9) = 32.8 µm
D(v,0.1) = 4.1 µm
D(4,3) = 15.9 µm
D(3,2) = 8.7 µm
Span = 2.0
Spec. surf. area
0.12 sq.m./cc.

Sample details:-RPC - PO 80929 - MB121-90minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 29-05-12 Time 14-14

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	99.7	0.3
30	600.0 µm	100.0	0.0	200	75.0 µm	99.0	0.6
35	500.0 µm	100.0	0.0	230	63.0 µm	98.3	0.8
40	425.0 µm	100.0	0.0	270	53.0 µm	97.6	0.7
45	355.0 µm	100.0	0.0	325	45.0 µm	95.9	1.6
50	300.0 µm	100.0	0.0	400	38.0 µm	93.1	2.9

Sample details:-RPC - PO 80929 - MB121-90minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 05-06-12 Time 13-52

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.1	17.7	35.5	5.1
162.0	99.9	0.2	15.3	30.4	4.2
140.0	99.7	0.3	13.2	26.2	3.5
121.0	99.4	0.3	11.4	22.7	3.0
104.0	99.1	0.2	9.8	19.7	2.6
89.9	98.9	0.9	8.5	17.1	2.6
77.5	98.0	2.8	7.3	14.5	2.6
66.9	95.2	4.8	6.3	11.8	2.5
57.7	90.4	6.9	5.4	9.3	2.1
49.8	83.5	8.4	4.7	7.2	1.6
42.9	75.1	8.2	4.1	5.5	1.3
37.1	66.9	7.4	3.5	4.2	1.2
32.0	59.5	6.4	3.0	3.0	0.9
27.6	53.1	5.8	2.6	2.1	0.6
23.8	47.2	5.9	2.2	1.5	0.5
20.5	41.4	5.9	1.9	1.0	0.4

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1904
Volume Conc. = 0.0464 %
Log. Diff. =3.07
Model indp

D(v,0.5) = 25.6 µm
D(v,0.9) = 57.1 µm
D(v,0.1) = 5.7 µm
D(4,3) = 29.8 µm
D(3,2) = 13.1 µm
Span = 2.0
Spec. surf. area
0.10 sq.m./cc.

Sample details:-RPC - PO 80941 - MB121-45minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 05-06-12 Time 13-53

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	99.8	0.2
18	1000.0 µm	100.0	0.0	120	125.0 µm	99.5	0.3
20	850.0 µm	100.0	0.0	140	106.0 µm	99.2	0.3
25	710.0 µm	100.0	0.0	170	90.0 µm	98.9	0.2
30	600.0 µm	100.0	0.0	200	75.0 µm	97.5	1.4
35	500.0 µm	100.0	0.0	230	63.0 µm	93.5	4.0
40	425.0 µm	100.0	0.0	270	53.0 µm	86.7	6.8
45	355.0 µm	100.0	0.0	325	45.0 µm	77.9	8.8
50	300.0 µm	100.0	0.0	400	38.0 µm	68.2	9.7

Sample details:-RPC - PO 80941 - MB121-45minG

Malvern Instruments MASTER Particle Sizer M3.1 Date 05-06-12 Time 13-48

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	56.1	8.4
162.0	100.0	0.0	15.3	47.7	6.0
140.0	100.0	0.0	13.2	41.7	5.4
121.0	100.0	0.0	11.4	36.3	5.3
104.0	100.0	0.0	9.8	31.0	4.9
89.9	100.0	0.0	8.5	26.1	4.6
77.5	100.0	0.1	7.3	21.5	4.1
66.9	99.9	0.1	6.3	17.4	3.1
57.7	99.8	0.3	5.4	14.3	2.4
49.8	99.6	1.6	4.7	11.9	2.3
42.9	97.9	2.6	4.1	9.6	3.0
37.1	95.3	3.7	3.5	6.6	3.0
32.0	91.6	5.6	3.0	3.7	1.7
27.6	86.0	8.3	2.6	2.0	0.7
23.8	77.7	10.6	2.2	1.3	0.5
20.5	67.1	10.9	1.9	0.8	0.5

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1401
Volume Conc. = 0.0244 %
Log. Diff. =3.10
Model indp

D(v,0.5) = 16.0 µm
D(v,0.9) = 30.4 µm
D(v,0.1) = 4.1 µm
D(4,3) = 17.0 µm
D(3,2) = 9.6 µm
Span = 1.6
Spec. surf. area
0.21 sq.m./cc.

Sample details:-RPC - PO 80941 - MB121-Top-75G

Malvern Instruments MASTER Particle Sizer M3.1 Date 05-06-12 Time 13-48

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.9	0.1
35	500.0 µm	100.0	0.0	230	63.0 µm	99.9	0.1
40	425.0 µm	100.0	0.0	270	53.0 µm	99.8	0.1
45	355.0 µm	100.0	0.0	325	45.0 µm	98.6	1.2
50	300.0 µm	100.0	0.0	400	38.0 µm	95.8	2.8

Sample details:-RPC - PO 80941 - MB121-Top-75G

Malvern Instruments MASTER Particle Sizer M3.1 Date 05-06-12 Time 13-42

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	51.6	7.3
162.0	100.0	0.0	15.3	44.3	5.1
140.0	100.0	0.0	13.2	39.3	4.7
121.0	100.0	0.0	11.4	34.5	4.7
104.0	100.0	0.0	9.8	29.8	4.2
89.9	100.0	0.2	8.5	25.6	4.2
77.5	99.8	0.3	7.3	21.4	4.0
66.9	99.5	0.3	6.3	17.4	3.2
57.7	99.1	0.8	5.4	14.1	2.4
49.8	98.3	3.7	4.7	11.7	2.2
42.9	94.7	4.9	4.1	9.5	2.7
37.1	89.8	5.1	3.5	6.9	2.7
32.0	84.6	6.0	3.0	4.1	1.7
27.6	78.7	7.7	2.6	2.4	0.8
23.8	71.0	9.5	2.2	1.7	0.6
20.5	61.5	9.8	1.9	1.0	0.6

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1489
Volume Conc. = 0.0265 %
Log. Diff. =2.98
Model indp

D(v,0.5) = 17.2 µm
D(v,0.9) = 37.4 µm
D(v,0.1) = 4.2 µm
D(4,3) = 18.9 µm
D(3,2) = 9.8 µm
Span = 1.9
Spec. surf. area
0.17 sq.m./cc.

Sample details:-RPC - PO 80952 - MB-Compst-75G

Malvern Instruments MASTER Particle Sizer M3.1 Date 05-06-12 Time 13-42

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.7	0.3
35	500.0 µm	100.0	0.0	230	63.0 µm	99.3	0.4
40	425.0 µm	100.0	0.0	270	53.0 µm	99.0	0.3
45	355.0 µm	100.0	0.0	325	45.0 µm	96.1	2.9
50	300.0 µm	100.0	0.0	400	38.0 µm	90.6	5.5

Sample details:-RPC - PO 80952 - MB-Compst-75G

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4-Jun-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
P0 80941					
MB121-45RC	39.77	1.77	2.60	6.42	117
MB121-45RT	36.43	0.093	0.27	0.21	14
MB121-90RC	38.05	1.88	2.70	6.61	124
MB121-90RT	37.27	0.064	0.23	0.13	11
P0 80952					
MB124-Top-75-RC	32.55	2.38	4.78	16.03	172
MB124-Top-75-RT	41.68	0.16	0.43	0.21	46
MB-COMP-75-RC	36.74	1.22	3.84	12.17	140
MB-COMP-75-RT	38.59	0.061	0.24	0.20	16
MB-COMP-75-GH	39.44	0.33	1.14	3.42	47

CANMET Reference Standards	Wt. %				mg/kg
	Fe	Cu	Pb	Zn	Ag
MP-1a	6.15	1.44	4.23	18.80	73
CZN-1	10.92	0.15	7.26	43.60	93
CCU-1c	8.65	0.26	65.51	4.48	620
CPB-1	28.98	25.72	0.34	4.00	127

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11-Jun-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	mg/kg
Sample	Au
RPC 80952	
MB-COMP-75-GH Repeat	0.565

Certified Reference Standards	mg/kg Au	Recommended Value
WCM PM914	10.3	10.7
WCM PM914	10.4	10.7
OXC72	0.2	0.205±0.013

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11-Jun-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	mg/kg
Sample	Au
RPC 80961	
MB-CompSeq1-RC1	0.832
MB-CompSeq1-RC2	0.754
MB-CompSeq1-RC3	0.565
MB-CompSeq1-RT	0.454
MB-CompSeq2-RC1	0.776
MB-CompSeq2-RC2	0.590
MB-CompSeq2-RT	0.494
MB-CompSeq1-RC2 Dup.	0.775

Certified Reference Standards	mg/kg Au	Recommended Value
WCM PM914	10.3	10.7
WCM PM914	10.4	10.7
OXC72	0.206	0.205±0.013

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11-Jun-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
P0 80961					
MB-CompSeq1-RC1	33.91	4.33	7.35	5.65	452
MB-CompSeq1-RC2	35.81	0.75	6.65	5.67	129
MB-CompSeq1-RC3	36.51	0.17	0.43	9.90	29
MB-CompSeq1-RT	30.97	0.064	0.32	0.19	11
MB-CompSeq2-RC1	34.80	1.81	6.25	5.47	210
MB-CompSeq2-RC2	35.54	0.19	0.50	14.06	34
MB-CompSeq2-RT	35.48	0.065	0.29	0.21	15

CANMET Reference Standards	Wt. %				mg/kg
	Fe	Cu	Pb	Zn	Ag
MP-1a	6.15	1.42	4.27	18.77	69
CZN-1	10.46	0.14	7.33	43.79	99
CCU-1c	8.50	0.26	65.05	4.46	605
CPB-1	28.36	25.32	0.35	3.97	122

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Malvern Instruments MASTER Particle Sizer M3.1 Date 11-06-12 Time 13-09

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	78.2	6.7
162.0	100.0	0.0	15.3	71.5	6.6
140.0	100.0	0.0	13.2	64.8	7.1
121.0	100.0	0.0	11.4	57.8	6.2
104.0	100.0	0.0	9.8	51.5	4.4
89.9	100.0	0.0	8.5	47.1	5.2
77.5	100.0	0.0	7.3	41.9	6.4
66.9	100.0	0.0	6.3	35.4	6.0
57.7	100.0	0.1	5.4	29.5	4.4
49.8	99.9	0.2	4.7	25.1	3.1
42.9	99.7	0.2	4.1	22.0	3.8
37.1	99.5	0.7	3.5	18.3	4.3
32.0	98.8	2.4	3.0	14.0	3.2
27.6	96.4	4.8	2.6	10.8	2.6
23.8	91.6	6.5	2.2	8.2	2.3
20.5	85.2	7.0	1.9	5.8	2.1

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1567
Volume Conc. = 0.0157 %
Log. Diff. =2.71
Model indp

D(v,0.5) = 9.3 µm
D(v,0.9) = 22.9 µm
D(v,0.1) = 2.5 µm
D(4,3) = 11.3 µm
D(3,2) = 5.7 µm
Span = 2.2
Spec. surf. area
0.28 sq.m./cc.

Sample details:-RPC - PO 80991 - J1862-5-Slime

Malvern Instruments MASTER Particle Sizer M3.1 Date 11-06-12 Time 13-09

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	99.8	0.2
50	300.0 µm	100.0	0.0	400	38.0 µm	99.6	0.2

Sample details:-RPC - PO 80991 - J1862-5-Slime

Malvern Instruments MASTER Particle Sizer M3.1 Date 11-06-12 Time 13-14

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	90.3	5.9
162.0	100.0	0.0	15.3	84.4	6.6
140.0	100.0	0.0	13.2	77.8	6.7
121.0	100.0	0.0	11.4	71.1	6.4
104.0	100.0	0.0	9.8	64.7	5.7
89.9	100.0	0.0	8.5	59.0	6.4
77.5	100.0	0.0	7.3	52.5	7.2
66.9	100.0	0.0	6.3	45.3	7.0
57.7	100.0	0.0	5.4	38.3	6.0
49.8	100.0	0.0	4.7	32.3	5.1
42.9	100.0	0.1	4.1	27.3	4.9
37.1	99.9	0.3	3.5	22.4	4.5
32.0	99.5	0.4	3.0	17.9	3.6
27.6	99.1	1.2	2.6	14.3	3.3
23.8	98.0	2.9	2.2	11.0	3.0
20.5	95.0	4.7	1.9	8.0	2.8

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1494
Volume Conc. = 0.0124 %
Log. Diff. =2.77
Model indp

D(v,0.5) = 6.9 µm
D(v,0.9) = 17.6 µm
D(v,0.1) = 2.1 µm
D(4,3) = 8.7 µm
D(3,2) = 4.7 µm
Span = 2.2
Spec. surf. area
0.35 sq.m./cc.

Sample details:-RPC - PO 80991 - J1862-6-Slime

Malvern Instruments MASTER Particle Sizer M3.1 Date 11-06-12 Time 13-14

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	99.9	0.1

Sample details:-RPC - PO 80991 - J1862-6-Slime

Malvern Instruments MASTER Particle Sizer M3.1 Date 12-06-12 Time 13-28

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.1	17.7	34.1	5.0
162.0	99.9	0.2	15.3	29.1	4.0
140.0	99.7	0.2	13.2	25.0	3.2
121.0	99.5	0.2	11.4	21.8	2.7
104.0	99.3	0.1	9.8	19.2	2.3
89.9	99.2	1.2	8.5	16.8	2.5
77.5	98.0	3.6	7.3	14.3	2.8
66.9	94.4	5.8	6.3	11.6	2.7
57.7	88.7	7.6	5.4	8.9	2.1
49.8	81.1	8.8	4.7	6.8	1.4
42.9	72.3	8.2	4.1	5.4	1.4
37.1	64.1	7.0	3.5	4.0	1.2
32.0	57.1	5.9	3.0	2.8	0.8
27.6	51.2	5.5	2.6	1.9	0.7
23.8	45.7	5.7	2.2	1.3	0.4
20.5	40.0	5.8	1.9	0.9	0.3

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1113
Volume Conc. = 0.0269 %
Log. Diff. =3.15
Model indp

D(v,0.5) = 26.7 µm
D(v,0.9) = 59.5 µm
D(v,0.1) = 5.8 µm
D(4,3) = 31.0 µm
D(3,2) = 13.4 µm
Span = 2.0
Spec. surf. area
0.10 sq.m./cc.

Sample details:-RPC - PO 81017 - J1859-Comp45G

Malvern Instruments MASTER Particle Sizer M3.1 Date 12-06-12 Time 13-28

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	99.8	0.2
18	1000.0 µm	100.0	0.0	120	125.0 µm	99.6	0.3
20	850.0 µm	100.0	0.0	140	106.0 µm	99.3	0.2
25	710.0 µm	100.0	0.0	170	90.0 µm	99.2	0.1
30	600.0 µm	100.0	0.0	200	75.0 µm	97.4	1.8
35	500.0 µm	100.0	0.0	230	63.0 µm	92.3	5.1
40	425.0 µm	100.0	0.0	270	53.0 µm	84.5	7.8
45	355.0 µm	100.0	0.0	325	45.0 µm	75.1	9.3
50	300.0 µm	100.0	0.0	400	38.0 µm	65.4	9.8

Sample details:-RPC - PO 81017 - J1859-Comp45G

Malvern Instruments MASTER Particle Sizer M3.1 Date 12-06-12 Time 13-33

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	47.0	6.1
162.0	100.0	0.0	15.3	40.9	4.6
140.0	100.0	0.0	13.2	36.3	4.2
121.0	99.9	0.0	11.4	32.1	4.6
104.0	99.9	0.0	9.8	27.6	4.7
89.9	99.9	0.1	8.5	22.8	4.0
77.5	99.8	0.6	7.3	18.8	3.2
66.9	99.2	1.3	6.3	15.6	2.8
57.7	97.9	2.3	5.4	12.8	2.5
49.8	95.6	3.7	4.7	10.3	2.3
42.9	91.9	5.1	4.1	8.0	2.3
37.1	86.8	6.8	3.5	5.7	1.8
32.0	80.0	7.9	3.0	3.9	1.2
27.6	72.1	8.5	2.6	2.7	0.9
23.8	63.6	8.7	2.2	1.8	0.6
20.5	54.9	7.9	1.9	1.2	0.5

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1462
Volume Conc. = 0.0276 %
Log. Diff. =3.23
Model indp

D(v,0.5) = 18.8 µm
D(v,0.9) = 40.4 µm
D(v,0.1) = 4.6 µm
D(4,3) = 21.3 µm
D(3,2) = 10.4 µm
Span = 1.9
Spec. surf. area
0.14 sq.m./cc.

Sample details:-RPC - PO 81017 - J1859-Comp60G

Malvern Instruments MASTER Particle Sizer M3.1 Date 12-06-12 Time 13-33

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	99.9	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	99.9	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.7	0.2
35	500.0 µm	100.0	0.0	230	63.0 µm	98.8	0.9
40	425.0 µm	100.0	0.0	270	53.0 µm	96.7	2.1
45	355.0 µm	100.0	0.0	325	45.0 µm	93.2	3.5
50	300.0 µm	100.0	0.0	400	38.0 µm	87.8	5.5

Sample details:-RPC - PO 81017 - J1859-Comp60G

Malvern Instruments MASTER Particle Sizer M3.1 Date 12-06-12 Time 13-41

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	50.1	6.8
162.0	100.0	0.0	15.3	43.3	4.8
140.0	100.0	0.0	13.2	38.5	4.3
121.0	100.0	0.0	11.4	34.2	4.8
104.0	100.0	0.0	9.8	29.5	5.2
89.9	100.0	0.3	8.5	24.3	4.4
77.5	99.6	0.5	7.3	19.9	3.4
66.9	99.1	0.6	6.3	16.5	2.9
57.7	98.6	0.8	5.4	13.6	2.6
49.8	97.8	2.5	4.7	11.0	2.4
42.9	95.3	4.1	4.1	8.5	2.5
37.1	91.2	5.9	3.5	6.0	2.0
32.0	85.3	7.5	3.0	4.0	1.3
27.6	77.8	8.8	2.6	2.8	1.0
23.8	69.0	9.7	2.2	1.8	0.6
20.5	59.3	9.2	1.9	1.2	0.5

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1480
Volume Conc. = 0.0267 %
Log. Diff. =3.33
Model indp

D(v,0.5) = 17.7 µm
D(v,0.9) = 35.9 µm
D(v,0.1) = 4.4 µm
D(4,3) = 19.2 µm
D(3,2) = 10.0 µm
Span = 1.8
Spec. surf. area
0.16 sq.m./cc.

Sample details:-RPC - PO 81017 - J1859-Comp75G

Malvern Instruments MASTER Particle Sizer M3.1 Date 12-06-12 Time 13-41

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.5	0.5
35	500.0 µm	100.0	0.0	230	63.0 µm	98.9	0.7
40	425.0 µm	100.0	0.0	270	53.0 µm	98.3	0.6
45	355.0 µm	100.0	0.0	325	45.0 µm	96.3	1.9
50	300.0 µm	100.0	0.0	400	38.0 µm	92.0	4.3

Sample details:-RPC - PO 81017 - J1859-Comp75G

Malvern Instruments MASTER Particle Sizer M3.1 Date 12-06-12 Time 13-46

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	58.1	8.1
162.0	100.0	0.0	15.3	49.9	5.8
140.0	100.0	0.0	13.2	44.2	4.7
121.0	100.0	0.0	11.4	39.5	5.2
104.0	100.0	0.0	9.8	34.2	5.9
89.9	100.0	0.1	8.5	28.4	5.2
77.5	99.9	0.2	7.3	23.2	4.0
66.9	99.7	0.2	6.3	19.2	3.5
57.7	99.5	0.3	5.4	15.8	3.1
49.8	99.2	1.1	4.7	12.7	2.8
42.9	98.1	2.3	4.1	9.9	2.7
37.1	95.8	3.9	3.5	7.2	2.4
32.0	91.9	5.8	3.0	4.9	1.6
27.6	86.1	7.8	2.6	3.2	0.9
23.8	78.3	9.8	2.2	2.3	0.8
20.5	68.4	10.3	1.9	1.5	0.7

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1470
Volume Conc. = 0.0237 %
Log. Diff. =3.43
Model indp

D(v,0.5) = 15.3 µm
D(v,0.9) = 30.3 µm
D(v,0.1) = 4.1 µm
D(4,3) = 16.6 µm
D(3,2) = 9.0 µm
Span = 1.7
Spec. surf. area
0.19 sq.m./cc.

Sample details:-RPC - PO 81017 - J1859-Comp90G

Malvern Instruments MASTER Particle Sizer M3.1 Date 12-06-12 Time 13-46

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.8	0.2
35	500.0 µm	100.0	0.0	230	63.0 µm	99.6	0.2
40	425.0 µm	100.0	0.0	270	53.0 µm	99.4	0.2
45	355.0 µm	100.0	0.0	325	45.0 µm	98.6	0.8
50	300.0 µm	100.0	0.0	400	38.0 µm	96.3	2.3

Sample details:-RPC - PO 81017 - J1859-Comp90G

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20-Jun-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

P0 81032

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
1859-K3-RC	37.90	1.24	4.22	14.27	149
1859-K3-RT	35.83	0.088	0.34	0.27	18
1859-K4-RC	34.17	1.24	4.13	13.67	149
1859-K4-RT	37.64	0.072	0.30	0.21	16
1859-K5-CuRC	30.87	4.03	9.12	5.87	451
1859-K5-PbRC	39.55	0.58	6.21	5.82	115
1859-K5-ZnRC	42.41	0.15	0.44	7.69	28
1859-K5-RT	35.21	0.060	0.33	0.19	12
1859-K6-CuRC	34.79	3.59	11.50	6.12	376
1859-K6-PbRC	40.72	0.26	3.04	5.05	90
1859-K6-ZnRC	30.28	0.24	0.65	23.33	53
1859-K6-RT	38.27	0.073	0.30	0.28	14

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	6.15	1.42	4.18	19.11	73
CZN-1	10.68	0.15	7.05	43.00	97
CCU-1c	8.81	0.27	66.35	4.46	617
CPB-1	29.20	25.42	0.36	3.95	125

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Manager, Minerals Engineering Centre

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20-Jun-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

P0 81064

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
1859-K7-RT	37.54	0.064	0.34	0.18	13
1859-K7-ZnRC	39.08	0.19	0.55	11.95	35
1859-K7-PbRC	38.50	0.53	7.64	5.71	123
1859-K7-CuRC	31.89	6.35	9.38	7.04	624
1859-K8-RT	38.15	0.067	0.37	0.18	17
1859-K8-ZnRC	35.71	0.26	0.76	14.12	45
1859-K8-PbRC	35.62	0.52	10.06	5.24	142
1859-K8-CuRC	32.60	5.48	3.15	6.19	501

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	6.15	1.42	4.18	19.11	73
CZN-1	10.68	0.15	7.05	43.00	97
CCU-1c	8.81	0.27	66.35	4.46	617
CPB-1	29.20	25.42	0.36	3.95	125

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22-Jun-12

Research and Productivity Council,
921 College Hill Rd.,
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Attention: J. Jewett

P0 81118

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
1859-K12-RT	40.00	0.076	0.38	0.18	14
1859-K12-ZnRC	33.52	0.28	1.07	13.52	38
1859-K12-PbRC	32.88	2.48	7.94	6.73	282
1859-K13-Cu/PbRC	32.70	2.08	7.12	6.45	248
1859-K13-RT	35.36	0.068	0.37	0.20	13
1859-K13-ZnRC	31.99	0.21	0.70	14.16	37

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	6.21	1.40	4.46	19.10	71
CZN-1	10.44	0.15	7.33	43.90	94
CCU-1c	8.42	0.26	65.83	4.49	615
CPB-1	27.46	25.69	0.35	4.07	126

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22-Jun-12

Research and Productivity Council,
921 College Hill Rd.,
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Attention: J. Jewett

P0 81130

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
1859-K9-RT	34.91	0.064	0.37	0.18	14
1859-K9-ZnRC	31.69	0.23	0.79	14.02	41
1859-K9-PbRC	35.50	0.58	6.39	5.24	122
1859-K9-CuRC	30.34	4.41	8.73	6.85	445
1859-K10-RT	34.66	0.059	0.41	0.27	13
1859-K10-ZnRC	33.87	0.16	0.49	13.99	29
1859-K10-Cu/PbRC	33.04	1.53	5.32	5.16	192
1859-K11-RT	37.22	0.072	0.40	0.18	14
1859-K11-ZnRC	30.30	0.30	0.89	14.95	42
1859-K11-Cu/PbRC	25.46	1.71	5.85	4.53	270

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	6.21	1.40	4.46	19.10	71
CZN-1	10.44	0.15	7.33	43.90	94
CCU-1c	8.42	0.26	65.83	4.49	615
CPB-1	27.46	25.69	0.35	4.07	126

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27-Jun-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
P0 81146					
1859-K14-RT	40.80	0.071	0.39	0.20	15
1859-K14-ZnRC	33.69	0.18	0.49	10.47	33
1859-K14-Cu/PbRC	34.95	1.87	6.59	6.81	220
P0 81165					
1859-K15-RT	37.78	0.067	0.38	0.26	12
1859-K15-ZnRC	33.39	0.13	0.40	8.17	25
1859-K15-Cu/PbRC	37.29	1.57	5.76	6.53	183
P0 81179					
1859-K16-RT	36.58	0.064	0.37	0.23	13
1859-K16-ZnRC	37.44	0.12	0.45	7.41	24
1859-K16-Cu/PbRC	36.55	1.37	4.85	5.50	177
P0 81184					
1859-K17-RT	37.46	0.064	0.32	0.17	42
1859-K17-ZnRC	34.64	0.14	0.49	9.33	25
1859-K17-Cu/PbRC	37.21	1.30	4.81	5.26	172
1859-K1-RT	37.09	0.065	0.27	0.17	14
1859-K1-RC	32.82	1.24	4.44	13.72	153
1859-K2-RT	38.23	0.068	0.29	0.19	16
1859-K2-RC	34.05	1.28	4.59	14.35	161

CANMET Reference Standards	Wt. % Fe	Cu	Pb	Zn	mg/kg Ag
MP-1a	6.15	1.40	4.27	19.13	73
CZN-1	10.68	0.15	7.33	43.60	94
CCU-1c	8.81	0.27	65.57	4.50	612
CPB-1	28.89	25.78	0.35	3.95	124

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23-Jul-12

Research and Productivity Council,
921 College Hill Rd.,
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E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
P0 81199					
1859-K18-RT	37.16	0.060	0.32	0.16	16
1859-K18-ZnRC	38.72	0.098	0.39	6.86	21
1859-K18-Cu/PbRC	38.90	0.94	3.47	4.98	115
P0 81221					
1859-K19-RT	36.49	0.061	0.33	0.20	12
1859-K19-ZnRC	38.74	0.12	0.42	6.69	21
1859-K19-Cu/PbRC	36.65	1.27	4.48	5.26	159
1859-K20-RT	36.38	0.061	0.32	0.18	10
1859-K20-ZnRC	36.90	0.12	0.41	7.10	21
1859-K20-Cu/PbRC	39.98	1.25	4.81	5.81	153
P0 81243					
1859-Clnr01-CL2C	34.17	2.83	7.46	11.66	300
1859-Clnr01-CL2T	41.72	0.35	2.45	1.21	55
1859-Clnr01-ScvgC	40.84	0.47	2.76	2.13	68
1859-Clnr01-ScvgT	37.33	0.14	1.90	0.67	27
P0 81266					
1859-C2-CL2C	36.51	3.65	8.23	6.03	296
1859-C2-CL2T	34.62	0.91	3.63	5.08	119
1859-C2-ScvgC	34.36	2.02	5.47	7.81	200
1859-C2-ScvgT	35.20	0.54	2.76	4.48	77
1859-C3-CL2C	34.14	4.71	5.37	3.95	283
1859-C3-CL2T	38.11	0.58	3.30	4.56	116
1859-C3-ScvgC	34.51	1.54	6.50	7.14	245
1859-C3-ScvgT	34.99	0.41	2.96	4.64	73
P0 81280					
1859-C4-CL2C	35.89	4.06	3.77	3.95	281
1859-C4-CL2T	36.12	0.72	3.90	4.83	116
1859-C4-ScvgC1	35.51	2.26	5.32	6.44	202
1859-C4-ScvgC2	32.54	1.21	5.94	7.47	183
1859-C4-ScvgT	32.33	0.34	2.92	3.91	62

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
P0 81327					
1859-C5-CL2C	34.52	2.95	4.82	4.28	280
1859-C5-CL2T	36.62	0.82	3.99	5.47	98
1859-C5-ScvgC	38.47	0.81	4.42	6.94	91
1859-C5-ScvgT	34.66	0.33	3.11	2.88	46
1859-C6-CL2C	36.05	2.45	5.02	6.10	265
1859-C6-CL2T	39.67	0.60	3.91	6.09	86
1859-C6-ScvgC	32.58	0.67	4.68	8.92	110
1859-C6-ScvgT	37.75	0.26	3.23	3.91	45

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	5.93	1.42	4.18	19.06	73
CZN-1	10.68	0.15	7.33	44.53	94
CCU-1c	8.50	0.26	65.70	4.55	610
CPB-1	28.99	25.06	0.35	3.94	133

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Manager, Minerals Engineering Centre

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10-Jul-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	mg/kg
Sample	Au
RPC 81221	
1859-K19-RT	0.502
1859-K19-ZnRC	0.585
1859-K19-Cu/PbRC	0.835

Certified Reference Standards	mg/kg Au	Recommended Value
OXC72	0.192	0.205±0.013

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

Malvern Instruments MASTER Particle Sizer M3.1 Date 06-07-12 Time 11-33

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	68.6	7.4
162.0	100.0	0.0	15.3	61.2	6.7
140.0	100.0	0.0	13.2	54.5	7.1
121.0	100.0	0.0	11.4	47.4	6.2
104.0	100.0	0.0	9.8	41.2	4.5
89.9	100.0	0.0	8.5	36.7	5.7
77.5	100.0	0.0	7.3	31.0	6.9
66.9	100.0	0.0	6.3	24.1	5.2
57.7	100.0	0.1	5.4	18.9	3.2
49.8	99.9	0.6	4.7	15.7	2.3
42.9	99.3	1.5	4.1	13.4	3.4
37.1	97.8	2.8	3.5	10.0	4.0
32.0	95.0	4.3	3.0	5.9	2.6
27.6	90.6	6.1	2.6	3.4	1.1
23.8	84.6	7.7	2.2	2.3	0.9
20.5	76.9	8.3	1.9	1.4	0.8

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1321
Volume Conc. = 0.0186 %
Log. Diff. =2.98
Model indp

D(v,0.5) = 12.0 µm
D(v,0.9) = 27.1 µm
D(v,0.1) = 3.5 µm
D(4,3) = 14.1 µm
D(3,2) = 8.0 µm
Span = 2.0
Spec. surf. area
0.23 sq.m./cc.

Sample details:-RPC - PO 81266 - 1859Clnr01 Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 06-07-12 Time 11-33

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	99.6	0.4
50	300.0 µm	100.0	0.0	400	38.0 µm	98.1	1.5

Sample details:-RPC - PO 81266 - 1859Clnr01 Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 06-07-12 Time 11-39

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	83.3	8.0
162.0	100.0	0.0	15.3	75.4	8.3
140.0	100.0	0.0	13.2	67.0	8.4
121.0	100.0	0.0	11.4	58.6	7.8
104.0	100.0	0.0	9.8	50.8	6.4
89.9	100.0	0.0	8.5	44.4	6.7
77.5	100.0	0.0	7.3	37.7	7.4
66.9	100.0	0.0	6.3	30.3	7.0
57.7	100.0	0.0	5.4	23.3	5.5
49.8	100.0	0.0	4.7	17.8	3.9
42.9	99.9	0.4	4.1	13.9	3.4
37.1	99.6	0.8	3.5	10.5	3.1
32.0	98.8	0.9	3.0	7.5	2.2
27.6	97.9	2.4	2.6	5.2	1.4
23.8	95.5	5.0	2.2	3.8	1.3
20.5	90.5	7.2	1.9	2.5	1.3

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1647
Volume Conc. = 0.0201 %
Log. Diff. =3.34
Model indp

D(v,0.5) = 9.6 µm
D(v,0.9) = 20.3 µm
D(v,0.1) = 3.4 µm
D(4,3) = 10.4 µm
D(3,2) = 6.7 µm
Span = 1.7
Spec. surf. area
0.31 sq.m./cc.

Sample details:-RPC - PO 81266 - 1859Clnr02 Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 06-07-12 Time 11-40

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	99.7	0.3

Sample details:-RPC - PO 81266 - 1859Clnr02 Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 06-07-12 Time 11-45

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	91.3	6.1
162.0	100.0	0.0	15.3	85.2	8.0
140.0	100.0	0.0	13.2	77.2	8.7
121.0	100.0	0.0	11.4	68.5	8.5
104.0	100.0	0.0	9.8	60.0	7.5
89.9	100.0	0.0	8.5	52.6	7.7
77.5	100.0	0.0	7.3	44.9	8.1
66.9	100.0	0.0	6.3	36.8	7.7
57.7	100.0	0.0	5.4	29.0	6.4
49.8	100.0	0.0	4.7	22.6	4.9
42.9	100.0	0.1	4.1	17.7	4.3
37.1	99.8	0.4	3.5	13.4	3.7
32.0	99.5	0.4	3.0	9.7	2.6
27.6	99.1	1.3	2.6	7.0	2.0
23.8	97.8	2.6	2.2	5.0	1.6
20.5	95.3	4.0	1.9	3.4	1.4

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1904
Volume Conc. = 0.0206 %
Log. Diff. =3.28
Model indp

D(v,0.5) = 8.0 µm
D(v,0.9) = 17.1 µm
D(v,0.1) = 3.1 µm
D(4,3) = 9.4 µm
D(3,2) = 6.0 µm
Span = 1.7
Spec. surf. area
0.36 sq.m./cc.

Sample details:-RPC - PO 81266 - 1859-Clnr03 Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 06-07-12 Time 11-45

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	99.9	0.1

Sample details:-RPC - PO 81266 - 1859-Clnr03 Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 06-07-12 Time 11-49

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	94.6	4.6
162.0	100.0	0.0	15.3	90.0	6.3
140.0	100.0	0.0	13.2	83.7	7.8
121.0	100.0	0.0	11.4	75.9	8.2
104.0	100.0	0.0	9.8	67.7	7.6
89.9	100.0	0.0	8.5	60.0	8.1
77.5	100.0	0.0	7.3	51.9	8.8
66.9	100.0	0.0	6.3	43.0	8.8
57.7	100.0	0.0	5.4	34.3	7.5
49.8	100.0	0.0	4.7	26.8	5.9
42.9	100.0	0.0	4.1	20.8	5.2
37.1	99.9	0.0	3.5	15.6	4.4
32.0	99.9	0.4	3.0	11.2	3.1
27.6	99.5	1.0	2.6	8.1	2.3
23.8	98.5	1.2	2.2	5.7	1.9
20.5	97.4	2.8	1.9	3.9	1.6

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1942
Volume Conc. = 0.0192 %
Log. Diff. =3.23
Model indp

D(v,0.5) = 7.1 µm
D(v,0.9) = 15.3 µm
D(v,0.1) = 2.9 µm
D(4,3) = 8.4 µm
D(3,2) = 5.5 µm
Span = 1.8
Spec. surf. area
0.40 sq.m./cc.

Sample details:-RPC - PO 81266 - 1859Clnr04 Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 06-07-12 Time 11-49

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-RPC - PO 81266 - 1859Clnr04 Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 18-07-12 Time 14-30

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	96.9	3.2
162.0	100.0	0.0	15.3	93.7	4.8
140.0	100.0	0.0	13.2	88.9	6.4
121.0	100.0	0.0	11.4	82.5	7.5
104.0	100.0	0.0	9.8	75.0	7.8
89.9	100.0	0.0	8.5	67.2	8.9
77.5	100.0	0.0	7.3	58.3	9.9
66.9	100.0	0.0	6.3	48.5	10.0
57.7	100.0	0.0	5.4	38.4	8.7
49.8	100.0	0.0	4.7	29.7	6.9
42.9	100.0	0.0	4.1	22.9	5.9
37.1	100.0	0.0	3.5	17.0	4.8
32.0	100.0	0.2	3.0	12.2	3.4
27.6	99.8	0.5	2.6	8.8	2.6
23.8	99.3	0.6	2.2	6.2	2.0
20.5	98.7	1.7	1.9	4.2	1.8

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1375
Volume Conc. = 0.0123 %
Log. Diff. =3.21
Model indp

D(v,0.5) = 6.4 µm
D(v,0.9) = 13.6 µm
D(v,0.1) = 2.8 µm
D(4,3) = 7.5 µm
D(3,2) = 5.1 µm
Span = 1.7
Spec. surf. area
0.45 sq.m./cc.

Sample details:-RPC - PO 81327 - 1859-Clnr-07-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 18-07-12 Time 14-30

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-RPC - PO 81327 - 1859-Clnr-07-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 18-07-12 Time 14-38

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	97.9	2.5
162.0	100.0	0.0	15.3	95.4	3.9
140.0	100.0	0.0	13.2	91.6	5.2
121.0	100.0	0.0	11.4	86.4	6.2
104.0	100.0	0.0	9.8	80.2	7.0
89.9	100.0	0.0	8.5	73.2	8.6
77.5	100.0	0.0	7.3	64.6	10.1
66.9	100.0	0.0	6.3	54.5	10.5
57.7	100.0	0.0	5.4	43.9	9.3
49.8	100.0	0.0	4.7	34.6	7.4
42.9	100.0	0.0	4.1	27.2	6.5
37.1	100.0	0.0	3.5	20.7	5.6
32.0	100.0	0.1	3.0	15.1	4.1
27.6	99.9	0.3	2.6	11.1	3.1
23.8	99.5	0.4	2.2	7.9	2.5
20.5	99.1	1.2	1.9	5.4	2.2

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1471
Volume Conc. = 0.0121 %
Log. Diff. =3.13
Model indp

D(v,0.5) = 5.9 µm
D(v,0.9) = 12.6 µm
D(v,0.1) = 2.5 µm
D(4,3) = 6.9 µm
D(3,2) = 4.7 µm
Span = 1.7
Spec. surf. area
0.49 sq.m./cc.

Sample details:-RPC - PO 81327 - 1859-Clnr-08-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 18-07-12 Time 14-38

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-RPC - PO 81327 - 1859-Clnr-08-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 18-07-12 Time 14-44

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	67.1	9.2
162.0	100.0	0.0	15.3	57.9	9.0
140.0	100.0	0.0	13.2	48.9	7.6
121.0	100.0	0.0	11.4	41.3	6.1
104.0	100.0	0.0	9.8	35.2	4.8
89.9	100.0	0.0	8.5	30.4	4.6
77.5	100.0	0.0	7.3	25.8	4.9
66.9	100.0	0.1	6.3	20.9	4.6
57.7	99.9	0.6	5.4	16.3	3.7
49.8	99.3	0.9	4.7	12.6	2.7
42.9	98.4	0.9	4.1	9.9	2.2
37.1	97.6	2.4	3.5	7.7	2.0
32.0	95.1	4.7	3.0	5.7	1.5
27.6	90.4	6.5	2.6	4.2	1.1
23.8	83.9	8.0	2.2	3.1	1.0
20.5	76.0	8.8	1.9	2.1	1.0

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1531
Volume Conc. = 0.0229 %
Log. Diff. =3.15
Model indp

D(v,0.5) = 13.4 µm
D(v,0.9) = 27.3 µm
D(v,0.1) = 4.1 µm
D(4,3) = 14.0 µm
D(3,2) = 8.2 µm
Span = 1.7
Spec. surf. area
0.22 sq.m./cc.

Sample details:-RPC - PO 81355 - 1859-120min-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 18-07-12 Time 14-44

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	99.6	0.4
45	355.0 µm	100.0	0.0	325	45.0 µm	98.8	0.9
50	300.0 µm	100.0	0.0	400	38.0 µm	97.7	1.0

Sample details:-RPC - PO 81355 - 1859-120min-Head

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2-Aug-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 81336					
1859-C7-CL2C	38.53	3.72	5.43	5.28	350
1859-C7-CL2T	39.05	0.48	3.52	5.29	92
1859-C7-ScvgC	36.02	0.47	4.38	7.03	102
1859-C7-ScvgT	37.59	0.22	3.15	3.71	52
1859-C8-CL2C	34.24	5.05	5.36	5.69	449
1859-C8-CL2T	37.50	0.49	3.42	5.24	96
1859-C8-ScvgC	36.00	0.47	4.29	6.26	106
1859-C8-ScvgT	37.88	0.20	2.64	4.10	50
PO 81410					
1859-ZC1-CL2C	21.52	0.30	0.34	41.24	59
1859-ZC1-CL2T	38.69	0.11	0.42	1.68	19
1859-ZC1-ScvgC	38.72	0.22	0.54	4.08	30
1859-ZC1-ScvgT	37.19	0.073	0.42	0.33	17
1859-C9-CL2C	36.85	3.98	5.25	5.44	308
1859-C9-CL2T	39.86	0.56	3.77	4.29	108
1859-C9-ScvgC	37.79	0.82	5.01	6.45	164
1859-C9-ScvgT	39.83	0.16	1.62	2.92	39
1859-C10-CL2C	34.04	6.82	4.82	5.30	400
1859-C10-CL2T	38.14	1.03	5.09	4.71	171
1859-C10-ScvgC	37.69	1.14	5.20	7.49	204
1859-C10-ScvgT	39.45	0.17	1.79	3.50	42
1859-BlendZnRC	38.86	0.13	0.48	6.65	25

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 81420					
1859-ZC2-CL4C	14.65	0.32	0.36	47.81	74
1859-ZC2-CL2T	40.20	0.17	0.67	4.50	28
1859-ZC2-CL3T	38.53	0.20	0.64	5.96	36
1859-ZC2-CL4T	30.81	0.30	0.50	21.05	55
1859-ZC2-ScvgC	40.68	0.20	0.74	2.70	29
1859-ZC2-ScvgT	41.97	0.081	0.46	0.61	18
1859-ZC3-CL4C	14.83	0.32	0.32	47.51	69
1859-ZC3-CL2T	40.16	0.18	0.57	4.10	28
1859-ZC3-CL3T	39.13	0.22	0.57	7.17	41
1859-ZC3-CL4T	32.11	0.29	0.47	19.53	57
1859-ZC3-ScvgC	40.34	0.18	0.68	1.35	23
1859-ZC3-ScvgT	41.26	0.094	0.46	0.29	15
PO 81446					
1859-ZC4-CL4C	13.56	0.38	0.35	48.94	77
1859-ZC4-CL2T	36.99	0.32	0.77	8.91	46
1859-ZC4-CL3T	33.07	0.39	0.78	13.40	61
1859-ZC4-CL4T	30.13	0.40	0.60	19.11	64
1859-ZC4-ScvgC	42.83	0.19	0.66	1.88	27
1859-ZC4-ScvgT	42.96	0.087	0.45	0.32	15
PO 81469					
1859-ZC5-CL4C	9.94	0.35	0.33	53.60	70
1859-ZC5-CL2T	35.10	0.46	1.12	12.98	70
1859-ZC5-CL3T	29.06	0.48	1.02	23.42	80
1859-ZC5-CL4T	24.00	0.44	0.72	30.54	76
1859-ZC5-ScvgC	42.46	0.23	0.78	2.23	34
1859-ZC5-ScvgT	42.05	0.080	0.42	0.34	20
PO 81478					
1859-Z28-ZnRC	33.81	0.10	0.32	6.98	20
1859-Z28-CuPbRC(1-4)	37.66	1.25	4.13	4.60	140
1859-Z28-CuPbRC(4-10)	38.26	0.14	1.69	4.56	42
1859-Z28-RT	37.49	0.067	0.28	0.39	13

CANMET Reference Standards	Wt. % Fe	Cu	Pb	Zn	mg/kg Ag
MP-1a	6.10	1.39	4.09	18.96	73
CZN-1	10.77	0.15	7.18	44.67	94
CCU-1c	9.04	0.27	65.31	4.60	610
CPB-1	29.25	25.62	0.35	4.07	133

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 12-28

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	57.9	8.1
162.0	100.0	0.0	15.3	49.8	7.3
140.0	100.0	0.0	13.2	42.5	6.3
121.0	100.0	0.0	11.4	36.2	5.4
104.0	100.0	0.0	9.8	30.8	4.6
89.9	100.0	0.2	8.5	26.2	4.5
77.5	99.8	0.4	7.3	21.6	4.6
66.9	99.4	0.4	6.3	17.1	4.0
57.7	99.0	0.6	5.4	13.1	3.1
49.8	98.4	2.2	4.7	10.0	2.4
42.9	96.2	3.3	4.1	7.7	2.3
37.1	92.9	4.3	3.5	5.4	1.8
32.0	88.6	5.8	3.0	3.6	1.2
27.6	82.8	7.6	2.6	2.4	0.9
23.8	75.2	8.7	2.2	1.5	0.5
20.5	66.6	8.7	1.9	1.0	0.4

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1616
Volume Conc. = 0.0288 %
Log. Diff. =3.25
Model indp

D(v,0.5) = 15.4 µm
D(v,0.9) = 33.4 µm
D(v,0.1) = 4.7 µm
D(4,3) = 17.6 µm
D(3,2) = 9.7 µm
Span = 1.9
Spec. surf. area
0.17 sq.m./cc.

Sample details:-rpc 81430 1859-ZnClnrHead

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 12-28

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.7	0.3
35	500.0 µm	100.0	0.0	230	63.0 µm	99.2	0.5
40	425.0 µm	100.0	0.0	270	53.0 µm	98.8	0.4
45	355.0 µm	100.0	0.0	325	45.0 µm	97.1	1.7
50	300.0 µm	100.0	0.0	400	38.0 µm	93.5	3.6

Sample details:-rpc 81430 1859-ZnClnrHead

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 12-48

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	70.2	9.4
162.0	100.0	0.0	15.3	60.8	9.3
140.0	100.0	0.0	13.2	51.5	7.9
121.0	100.0	0.0	11.4	43.6	6.4
104.0	100.0	0.0	9.8	37.2	5.1
89.9	100.0	0.1	8.5	32.2	5.1
77.5	99.9	0.1	7.3	27.1	5.4
66.9	99.8	0.1	6.3	21.7	4.9
57.7	99.7	0.2	5.4	16.8	3.8
49.8	99.6	0.7	4.7	13.0	2.7
42.9	98.8	1.3	4.1	10.3	2.3
37.1	97.5	2.1	3.5	8.0	2.1
32.0	95.5	3.5	3.0	5.9	1.6
27.6	91.9	5.5	2.6	4.3	1.1
23.8	86.4	7.4	2.2	3.2	1.0
20.5	79.0	8.7	1.9	2.2	1.0

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1618
Volume Conc. = 0.0237 %
Log. Diff. =3.28
Model indp

D(v,0.5) = 12.9 µm
D(v,0.9) = 26.0 µm
D(v,0.1) = 4.0 µm
D(4,3) = 14.4 µm
D(3,2) = 8.2 µm
Span = 1.7
Spec. surf. area
0.22 sq.m./cc.

Sample details:-RPC 81430 1859-ZnCnr20min

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 12-48

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.9	0.1
35	500.0 µm	100.0	0.0	230	63.0 µm	99.8	0.1
40	425.0 µm	100.0	0.0	270	53.0 µm	99.7	0.1
45	355.0 µm	100.0	0.0	325	45.0 µm	99.1	0.6
50	300.0 µm	100.0	0.0	400	38.0 µm	97.8	1.4

Sample details:-RPC 81430 1859-ZnCnr20min

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 11-58

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	82.3	9.0
162.0	100.0	0.0	15.3	73.3	10.2
140.0	100.0	0.0	13.2	63.1	9.7
121.0	100.0	0.0	11.4	53.4	8.2
104.0	100.0	0.0	9.8	45.3	6.2
89.9	100.0	0.0	8.5	39.1	5.9
77.5	100.0	0.0	7.3	33.2	6.2
66.9	100.0	0.0	6.3	26.9	5.8
57.7	100.0	0.1	5.4	21.1	4.7
49.8	99.9	0.3	4.7	16.4	3.4
42.9	99.6	0.3	4.1	13.0	2.9
37.1	99.4	0.7	3.5	10.2	2.5
32.0	98.7	1.6	3.0	7.7	1.9
27.6	97.1	3.0	2.6	5.8	1.4
23.8	94.1	4.8	2.2	4.4	1.4
20.5	89.3	6.9	1.9	3.0	1.3

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2240
Volume Conc. = 0.0291 %
Log. Diff. =3.23
Model indp

D(v,0.5) = 10.8 µm
D(v,0.9) = 20.9 µm
D(v,0.1) = 3.5 µm
D(4,3) = 11.7 µm
D(3,2) = 7.1 µm
Span = 1.6
Spec. surf. area
0.28 sq.m./cc.

Sample details:-rpc 81446 1859-znclnr60min

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 11-58

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	99.9	0.1
45	355.0 µm	100.0	0.0	325	45.0 µm	99.7	0.2
50	300.0 µm	100.0	0.0	400	38.0 µm	99.4	0.3

Sample details:-rpc 81446 1859-znclnr60min

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 15-49

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	98.1	1.6
162.0	100.0	0.0	15.3	96.5	3.6
140.0	100.0	0.0	13.2	92.8	4.6
121.0	100.0	0.0	11.4	88.3	4.8
104.0	100.0	0.0	9.8	83.4	5.0
89.9	100.0	0.0	8.5	78.4	6.8
77.5	100.0	0.0	7.3	71.7	9.1
66.9	100.0	0.0	6.3	62.6	10.5
57.7	100.0	0.0	5.4	52.2	9.7
49.8	100.0	0.0	4.7	42.5	7.9
42.9	100.0	0.0	4.1	34.6	7.3
37.1	100.0	0.0	3.5	27.3	6.5
32.0	100.0	0.1	3.0	20.7	4.8
27.6	99.9	0.1	2.6	15.9	4.0
23.8	99.8	0.6	2.2	11.9	3.5
20.5	99.2	1.1	1.9	8.3	3.2

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2150
Volume Conc. = 0.0159 %
Log. Diff. =2.90
Model indp

D(v,0.5) = 5.3 µm
D(v,0.9) = 12.0 µm
D(v,0.1) = 2.1 µm
D(4,3) = 6.3 µm
D(3,2) = 4.1 µm
Span = 1.9
Spec. surf. area
0.50 sq.m./cc.

Sample details:-RPC 81559 1859-CuCln1-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 15-49

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-RPC 81559 1859-CuCln1-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 15-36

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	98.1	1.7
162.0	100.0	0.0	15.3	96.4	4.0
140.0	100.0	0.0	13.2	92.4	5.2
121.0	100.0	0.0	11.4	87.3	5.5
104.0	100.0	0.0	9.8	81.8	5.6
89.9	100.0	0.0	8.5	76.2	7.3
77.5	100.0	0.0	7.3	68.8	9.3
66.9	100.0	0.0	6.3	59.5	10.1
57.7	100.0	0.0	5.4	49.4	9.1
49.8	100.0	0.0	4.7	40.3	7.5
42.9	100.0	0.0	4.1	32.9	7.3
37.1	100.0	0.0	3.5	25.6	6.8
32.0	100.0	0.0	3.0	18.8	4.9
27.6	99.9	0.1	2.6	13.9	3.8
23.8	99.9	0.6	2.2	10.1	3.1
20.5	99.2	1.1	1.9	7.0	2.8

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2255
Volume Conc. = 0.0177 %
Log. Diff. =3.01
Model indp

D(v,0.5) = 5.5 µm
D(v,0.9) = 12.3 µm
D(v,0.1) = 2.2 µm
D(4,3) = 6.5 µm
D(3,2) = 4.3 µm
Span = 1.8
Spec. surf. area
0.51 sq.m./cc.

Sample details:-RPC 81559 1859-PbCln-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 15-36

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-RPC 81559 1859-PbCln-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 15-11

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	95.8	3.7
162.0	100.0	0.0	15.3	92.1	5.2
140.0	100.0	0.0	13.2	86.9	6.7
121.0	100.0	0.0	11.4	80.3	7.3
104.0	100.0	0.0	9.8	73.0	6.9
89.9	100.0	0.0	8.5	66.1	7.7
77.5	100.0	0.0	7.3	58.3	8.7
66.9	100.0	0.0	6.3	49.6	8.9
57.7	100.0	0.0	5.4	40.7	7.8
49.8	100.0	0.0	4.7	32.8	6.3
42.9	100.0	0.0	4.1	26.5	5.7
37.1	100.0	0.0	3.5	20.8	5.1
32.0	99.9	0.3	3.0	15.7	3.8
27.6	99.6	0.7	2.6	11.9	3.1
23.8	99.0	0.8	2.2	8.8	2.6
20.5	98.1	2.3	1.9	6.2	2.4

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1837
Volume Conc. = 0.0157 %
Log. Diff. =3.12
Model indp

D(v,0.5) = 6.3 µm
D(v,0.9) = 14.3 µm
D(v,0.1) = 2.4 µm
D(4,3) = 7.6 µm
D(3,2) = 4.8 µm
Span = 1.9
Spec. surf. area
0.42 sq.m./cc.

Sample details:-RPC 81568 1859-PbCl2-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 15-11

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-RPC 81568 1859-PbCl2-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 15-21

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	82.0	8.9
162.0	100.0	0.0	15.3	73.0	9.9
140.0	100.0	0.0	13.2	63.1	8.8
121.0	100.0	0.0	11.4	54.3	7.3
104.0	100.0	0.0	9.8	47.0	5.8
89.9	100.0	0.0	8.5	41.2	5.8
77.5	100.0	0.0	7.3	35.4	6.2
66.9	100.0	0.0	6.3	29.2	5.8
57.7	100.0	0.1	5.4	23.4	4.8
49.8	99.9	0.2	4.7	18.6	3.6
42.9	99.7	0.2	4.1	15.0	3.2
37.1	99.5	0.7	3.5	11.8	2.9
32.0	98.8	1.7	3.0	8.9	2.2
27.6	97.0	3.1	2.6	6.7	1.8
23.8	93.9	5.0	2.2	4.9	1.5
20.5	88.9	6.9	1.9	3.4	1.3

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2018
Volume Conc. = 0.0247 %
Log. Diff. =3.29
Model indp

D(v,0.5) = 10.5 µm
D(v,0.9) = 21.1 µm
D(v,0.1) = 3.2 µm
D(4,3) = 11.6 µm
D(3,2) = 6.7 µm
Span = 1.7
Spec. surf. area
0.29 sq.m./cc.

Sample details:-RPC 81645 1859-121-ZnCl40-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 15-22

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	99.8	0.2
50	300.0 µm	100.0	0.0	400	38.0 µm	99.5	0.3

Sample details:-RPC 81645 1859-121-ZnCl40-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 13-07

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	83.4	8.6
162.0	100.0	0.0	15.3	74.9	9.9
140.0	100.0	0.0	13.2	64.9	9.3
121.0	100.0	0.0	11.4	55.7	7.8
104.0	100.0	0.0	9.8	47.8	6.1
89.9	100.0	0.0	8.5	41.7	6.0
77.5	100.0	0.0	7.3	35.7	6.4
66.9	100.0	0.0	6.3	29.3	6.0
57.7	100.0	0.1	5.4	23.2	4.9
49.8	99.9	0.2	4.7	18.3	3.7
42.9	99.7	0.2	4.1	14.7	3.1
37.1	99.4	0.7	3.5	11.6	2.7
32.0	98.8	1.6	3.0	8.9	2.1
27.6	97.2	2.8	2.6	6.8	1.7
23.8	94.4	4.5	2.2	5.0	1.5
20.5	89.9	6.4	1.9	3.6	1.3

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2308
Volume Conc. = 0.0285 %
Log. Diff. =3.25
Model indp

D(v,0.5) = 10.3 µm
D(v,0.9) = 20.6 µm
D(v,0.1) = 3.2 µm
D(4,3) = 11.4 µm
D(3,2) = 6.6 µm
Span = 1.7
Spec. surf. area
0.29 sq.m./cc.

Sample details:-RPC 81657 1859-121-ZnCl2-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 13-07

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	99.7	0.2
50	300.0 µm	100.0	0.0	400	38.0 µm	99.5	0.3

Sample details:-RPC 81657 1859-121-ZnCl2-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 13-21

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	97.1	3.0
162.0	100.0	0.0	15.3	94.1	4.6
140.0	100.0	0.0	13.2	89.6	6.0
121.0	100.0	0.0	11.4	83.6	6.7
104.0	100.0	0.0	9.8	76.9	6.7
89.9	100.0	0.0	8.5	70.2	7.9
77.5	100.0	0.0	7.3	62.3	9.2
66.9	100.0	0.0	6.3	53.1	9.7
57.7	100.0	0.0	5.4	43.4	8.6
49.8	100.0	0.0	4.7	34.8	7.1
42.9	100.0	0.0	4.1	27.7	6.5
37.1	100.0	0.0	3.5	21.2	5.7
32.0	100.0	0.2	3.0	15.5	4.2
27.6	99.8	0.5	2.6	11.3	3.2
23.8	99.3	0.6	2.2	8.1	2.6
20.5	98.7	1.6	1.9	5.5	2.2

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2109
Volume Conc. = 0.0181 %
Log. Diff. =3.09
Model indp

D(v,0.5) = 6.0 µm
D(v,0.9) = 13.4 µm
D(v,0.1) = 2.5 µm
D(4,3) = 7.2 µm
D(3,2) = 4.7 µm
Span = 1.8
Spec. surf. area
0.45 sq.m./cc.

Sample details:-RPC 81685 1859-124-50:50-CuCl1-Head

Malvern Instruments MASTER Particle Sizer M3.1 Date 30-08-12 Time 13-21

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-RPC 81685 1859-124-50:50-CuCl1-Head

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23-Aug-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 81492					
1859-Seq07-CuRC	31.02	4.95	8.31	7.12	496
1859-Seq07-PbRC	36.16	0.39	4.86	7.32	109
1859-Seq07-ZnRC(1)	37.96	0.11	0.42	8.53	24
1859-Seq07-ZnRC(2)	44.72	0.072	0.32	0.41	17
1859-Seq07-RT	24.14	0.057	0.53	0.22	9
PO 81505					
1859-Seq08-CuRC	31.35	5.56	8.82	7.45	569
1859-Seq08-PbRC	35.86	0.28	6.13	5.85	94
1859-Seq08-ZnRC	34.91	0.15	0.59	9.40	31
1859-Seq08-RT	38.69	0.066	0.40	0.17	14
PO 81528					
1859-132SQ1-CuRC	35.48	2.08	10.73	7.00	687
1859-132SQ1-PbRC	36.75	0.12	10.00	7.97	107
1859-132SQ1-ZnRC	39.64	0.089	0.45	8.03	23
1859-132SQ1-RT	27.26	0.044	0.50	0.34	14
1859-132SQ2-CuRC	32.07	2.23	3.06	7.38	791
1859-132SQ2-PbRC	33.40	0.24	10.38	7.69	143
1859-132SQ2-ZnRC	33.07	0.12	0.53	12.31	27
1859-132SQ2-RT	37.23	0.055	0.46	0.48	16
PO 81533					
1859-132SQ3-CuRC	33.26	1.32	3.27	7.63	435
1859-132SQ3-PbRC	33.53	0.12	8.85	7.36	101
1859-132SQ3-ZnRC	32.91	0.10	0.51	11.54	25
1859-132SQ3-RT	37.80	0.057	0.44	0.67	16

CANMET Reference Standards	Wt. % Fe	Cu	Pb	Zn	mg/kg Ag
MP-1a	6.32	1.43	4.27	18.63	71
CZN-1	10.66	0.15	7.18	44.22	98
CCU-1c	9.04	0.26	65.95	4.57	612
CPB-1	27.78	25.33	0.36	4.09	128

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5-Sep-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 81538 - Repeat					
1859-132SQ4-ZnRC1	25.18	0.20	0.83	27.21	52
1859-132SQ5-ZnRC	30.94	0.14	0.70	15.01	39
PO 81645					
1859-121-PbCL1-CL4C	20.22	4.19	30.97	10.70	789
1859-121-PbCL1-CL4T	31.20	1.71	9.51	9.91	343
1859-121-PbCL1-CL3T	33.28	1.03	6.83	8.45	220
1859-121-PbCL1-CL2T	38.57	0.34	3.07	3.66	93
1859-121-PbCL1-ScavC	38.00	0.23	2.30	2.93	70
1859-121-PbCL1-ScavT	41.63	0.092	1.47	1.28	29
PO 81655					
1859-121-ZnCL1-CL4C	30.25	0.38	0.44	22.78	47
1859-121-ZnCL1-CL4T	45.58	0.13	0.29	1.35	21
1859-121-ZnCL1-CL3T	45.37	0.12	0.32	0.63	18
1859-121-ZnCL1-CL2T	44.70	0.14	0.40	0.81	25
1859-121-ZnCL1-ScavgC	39.38	0.18	0.71	0.84	24
1859-121-ZnCL1-ScavgT	29.91	0.15	0.94	0.50	18
1859-124SQ1-CuRC	35.17	0.94	2.49	5.23	154
1859-124SQ1-PbRC	38.38	0.33	8.01	4.93	118
1859-124SQ1-ZnRC	34.18	0.17	0.65	14.46	46
1859-124SQ1-RT	39.97	0.052	0.39	0.21	18
PO 81685					
1859-124 50:50 CuCL1-CL3C	34.08	6.48	7.29	3.73	238
1859-124 50:50 CuCL1-CL3T	36.71	1.94	4.92	4.94	214
1859-124 50:50 CuCL1-CL2T	35.88	1.13	3.99	5.26	189
1859-124 50:50 CuCL1-ScvgC	35.25	1.98	5.24	5.54	237
1859-124 50:50 CuCL1-ScvgT	32.36	0.52	2.10	4.94	140

CANMET Reference Standards	Wt. %				mg/kg
	Fe	Cu	Pb	Zn	Ag
MP-1a	6.10	1.38	4.32	19.04	73
CZN-1	10.77	0.15	7.35	44.04	91
CCU-1c	8.42	0.26	64.74	4.47	635
CPB-1	28.30	25.13	0.34	3.93	129

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23-Aug-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 81538					
1859-132SQ4-CuRC	31.33	1.27	2.70	7.18	397.10
1859-132SQ4-PbRC	30.93	0.13	13.22	7.48	133.05
1859-132SQ4-ZnRC1	24.94	0.21	0.80	27.65	53.86
1859-132SQ4-ZnRC2	40.37	0.09	0.69	2.47	30.78
1859-132SQ4-RT	33.68	0.05	0.53	0.30	14.97
1859-132SQ5-CuRC	31.40	1.07	2.46	7.20	346.56
1859-132SQ5-PbRC	32.31	0.09	10.31	6.83	104.25
1859-132SQ5-ZnRC	30.30	0.14	0.68	1.50	39.39
1859-132SQ5-RT	34.49	0.05	0.39	0.25	14.74
PO 81559					
1859-CuCln1-CL2C1	37.88	4.40	4.64	6.42	727
1859-CuCln1-CL2C2	33.49	2.76	4.31	7.00	593
1859-CuCln1-CL2T	32.45	1.36	3.05	6.86	456
1859-CuCln1-ScvgC	30.25	2.40	4.94	8.04	575
1859-CuCln1-ScvgT	32.09	0.69	1.98	6.57	288
PO 81568					
1859-CuCln1-Head	34.69	1.23	2.73	7.41	393
1859-PbCl-Head	31.90	0.12	10.38	7.23	113
1859-PbCl1-Cl3C	22.78	0.66	29.92	5.67	389
1859-PbCl1-Cl3T	28.18	0.18	16.93	6.89	185
1859-PbCl1-Cl2T	31.24	0.12	11.85	6.96	126
1859-PbCl1-ScvgC	27.27	0.14	16.97	7.56	164
1859-PbCl1-ScvgT	34.78	0.06	4.20	6.67	55
1859-PbCl2-Cl4C	14.48	0.51	49.20	5.61	464
1859-PbCl2-Cl4T	28.80	0.20	17.46	7.70	210
1859-PbCl2-Cl3T	31.08	0.13	10.96	8.06	131
1859-PbCl2-Cl2T	34.52	0.08	5.00	7.63	71
1859-PbCl2-ScvgC	29.85	0.12	13.37	9.01	139
1859-PbCl2-ScvgT	31.73	0.05	2.63	5.96	40

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 81633					
1859-121SQ1-CuRC	31.94	6.34	2.58	4.55	289
1859-121SQ1-PbRC	37.05	0.37	3.55	2.65	93
1859-121SQ1-ZnRC	38.32	0.16	0.47	5.47	26
1859-121SQ1-RT	33.69	0.07	0.33	0.15	11
1859-121SQ2-CuRC	30.56	6.33	1.59	3.95	271
1859-121SQ2-PbRC	35.98	0.40	3.40	2.41	88
1859-121SQ2-ZnRC	37.10	0.22	0.55	6.23	30
1859-121SQ2-RT	33.58	0.07	0.31	0.15	10
1859-121SQ3-CuRC	33.12	4.68	1.62	3.65	216
1859-121SQ3-PbRC	35.67	0.35	3.31	2.33	83
1859-121SQ3-ZnRC	37.57	0.17	0.48	5.00	27
1859-121SQ3-RT	32.38	0.07	0.33	0.15	10
1859-121CuCL1-CL3C	26.43	21.55	5.26	6.21	217
1859-121CuCL1-CL3T	25.98	7.98	2.37	6.90	299
1859-121CuCL1-CL2T	31.93	6.17	2.12	5.64	311
1859-121CuCL1-ScvgC	41.16	5.78	2.86	5.44	252
1859-121CuCL1-ScvgT	35.82	2.47	0.98	2.64	227

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	6.10	1.38	4.32	19.04	73
CZN-1	10.77	0.15	7.35	44.04	91
CCU-1c	8.42	0.26	64.74	4.47	635
CPB-1	28.30	25.13	0.34	3.93	129

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24-Sep-12

Research and Productivity Council,
921 College Hill Rd.,
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E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 81657					
1859-121-ZnCL2-CL4C	32.94	0.45	0.41	25.11	49
1859-121-ZnCL2-CL4T	43.72	0.12	0.27	0.93	17
1859-121-ZnCL2-CL3T	44.99	0.14	0.30	1.42	20
1859-121-ZnCL2-CL2T	44.76	0.12	0.33	0.55	16
1859-121-ZnCL2-ScavgC	42.36	0.19	0.53	1.49	21
1859-121-ZnCL2-ScavgT	39.48	0.12	0.57	0.38	14
1859-124 50:50 SQ2-CuRC	35.27	1.11	3.46	5.56	223
1859-124 50:50 SQ2-PbRC	37.12	0.22	6.94	4.89	100
1859-124 50:50 SQ2-ZnRC	35.40	0.16	0.64	13.17	43
1859-124 50:50 SQ2-RT	39.58	0.050	0.31	0.23	17
1859-124 50:50 SQ3-CuRC	35.72	1.06	3.75	5.24	210
1859-124 50:50 SQ3-PbRC	37.98	0.30	6.79	5.12	123
1859-124 50:50 SQ3-ZnRC	36.07	0.16	0.63	13.13	40
1859-124 50:50 SQ3-RT	40.22	0.053	0.32	0.25	17
PO 81657					
1859-124 50:50 PbCL1-CL4C	17.57	2.64	34.57	7.21	789
1859-124 50:50 PbCL1-CL4T	28.80	0.88	19.85	6.92	370
1859-124 50:50 PbCL1-CL3T	32.71	0.53	13.35	6.89	240
1859-124 50:50 PbCL1-CL2T	37.66	0.25	7.25	5.78	124
1859-124 50:50 PbCL1-ScavgC	35.16	0.29	9.85	7.44	147
1859-124 50:50 PbCL1-ScavgT	42.09	0.086	2.79	3.88	47

CANMET Reference Standards	Wt. %				mg/kg
	Fe	Cu	Pb	Zn	Ag
MP-1a	6.15	1.40	4.37	19.31	68
CZN-1	10.68	0.15	7.52	43.79	95
CCU-1c	8.34	0.26	61.52	4.52	663
CPB-1	29.72	25.23	0.33	3.98	125

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

Malvern Instruments MASTER Particle Sizer M3.1 Date 05-10-12 Time 12-32

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	87.8	8.1
162.0	100.0	0.0	15.3	79.7	9.5
140.0	100.0	0.0	13.2	70.1	9.1
121.0	100.0	0.0	11.4	61.1	7.8
104.0	100.0	0.0	9.8	53.2	6.2
89.9	100.0	0.0	8.5	47.0	6.5
77.5	100.0	0.0	7.3	40.5	7.2
66.9	100.0	0.0	6.3	33.3	6.8
57.7	100.0	0.0	5.4	26.5	5.3
49.8	100.0	0.0	4.7	21.1	3.8
42.9	100.0	0.1	4.1	17.3	3.4
37.1	99.9	0.4	3.5	13.9	3.1
32.0	99.5	0.5	3.0	10.8	2.4
27.6	99.1	1.7	2.6	8.5	2.0
23.8	97.4	3.8	2.2	6.4	1.8
20.5	93.6	5.9	1.9	4.6	1.7

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1779
Volume Conc. = 0.0192 %
Log. Diff. =3.38
Model indp

D(v,0.5) = 9.1 µm
D(v,0.9) = 18.6 µm
D(v,0.1) = 2.9 µm
D(4,3) = 10.2 µm
D(3,2) = 6.1 µm
Span = 1.7
Spec. surf. area
0.35 sq.m./cc.

Sample details:-1859 124 50:50 ZnC1-Head PO#81732

Malvern Instruments MASTER Particle Sizer M3.1 Date 05-10-12 Time 12-32

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	99.9	0.1

Sample details:-1859 124 50:50 ZnC1-Head PO#81732

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28-Sep-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 81839					
1859-bld SQ4-8-CuRC	48.78	5.98	3.03	6.70	354
1859-bld SQ4-8-PbRC	24.28	0.16	0.50	10.40	44
1859-bld SQ4-8-ZnRC	36.47	0.43	7.94	5.03	155
1859-bld SQ4-8-RT	27.53	0.051	0.24	0.14	11
PO 81858					
1859-bld Cu-Clnr3C	33.37	12.16	2.74	4.04	404
1859-bld Cu-Clnr2T	22.54	2.63	1.78	3.96	312
1859-bld Cu-Clnr3T	34.32	4.34	2.60	5.23	445
1859-bld Cu-ScvgC	27.56	5.46	3.68	6.50	465
1859-bld Cu-ScvgT	31.08	1.07	0.73	3.52	176
PO 81872					
1859-bld Zn-Clnr4C	22.63	0.35	0.50	32.08	56
1859-bld Zn-Clnr2T	33.66	0.10	0.56	1.40	27
1859-bld Zn-Clnr3T	34.92	0.10	0.46	1.50	27
1859-bld Zn-Clnr4T	37.33	0.11	0.40	2.16	23
1859-bld Zn-ScvgC	32.73	0.14	0.75	4.43	32
1859-bld Zn-ScvgT	30.57	0.078	0.60	0.78	20
1859-bld Pb-Clnr4C	1.99	0.21	2.29	0.53	62
1859-bld Pb-Clnr2T	31.47	0.15	4.28	4.95	81
1859-bld Pb-Clnr3T	30.95	0.24	6.54	5.90	121
1859-bld Pb-Clnr4T	28.85	0.35	7.97	5.96	150
1859-bld Pb-ScvgC	3.42	0.024	0.66	0.65	11
1859-bld Pb-ScvgT	36.18	0.079	1.89	3.72	35
PO 81759 Recheck					
1859-124 50:50 ZnCL1-CL4C	11.73	0.31	0.46	48.15	57

CANMET Reference Standards	Wt. %				mg/kg
	Fe	Cu	Pb	Zn	Ag
MP-1a	5.66	1.36	4.39	17.45	70
CZN-1	10.16	0.14	7.40	40.26	93
CCU-1d	7.09	0.12	38.12	6.05	357
CPB-2	29.68	23.92	0.26	2.62	127

Daniel Chevalier, MASc
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25-Sep-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 81759					
1859-124 50:50 ZnCL1-CL4C	15.14	0.32	0.45	62.29	59
1859-124 50:50 ZnCL1-CL4T	29.16	0.35	0.61	31.37	70
1859-124 50:50 ZnCL1-CL3T	44.32	0.18	0.58	5.72	42
1859-124 50:50 ZnCL1-CL2T	44.89	0.12	0.55	2.49	29
1859-124 50:50 ZnCL1-ScvgC	22.85	0.26	0.96	12.23	49
1859-124 50:50 ZnCL1-ScvgT	41.60	0.086	0.59	0.11	25
1859-124 Top SQ4-CuRC	29.90	3.81	5.27	11.21	380
1859-124 Top SQ4-PbRC	34.54	2.71	2.13	9.64	153
1859-124 Top SQ4-ZnRC	36.32	0.48	0.75	13.82	55
1859-124 Top SQ4-RT	38.43	0.095	0.44	0.20	36
1859-124 Top SQ5-CuRC	34.33	4.16	6.71	11.01	314
1859-124 Top SQ5-PbRC	39.84	1.71	2.10	8.95	134
1859-124 Top SQ5-ZnRC	37.16	0.38	0.71	13.55	52
1859-124 Top SQ5-RT	41.75	0.085	0.38	0.16	35
1859-124 BTM SQ6-CuRC	37.93	1.94	1.26	4.50	157
1859-124 BTM SQ6-PbRC	39.98	0.50	4.68	4.45	119
1859-124 BTM SQ6-ZnRC	36.62	0.20	0.46	11.79	38
1859-124 BTM SQ6-RT	41.90	0.059	0.25	0.19	13
1859-124 BTM SQ7-CuRC	43.38	1.89	1.38	4.63	168
1859-124 BTM SQ7-PbRC	37.86	0.19	4.12	3.25	76
1859-124 BTM SQ7-ZnRC	34.69	0.20	0.41	10.14	39
1859-124 BTM SQ7-RT	38.67	0.059	0.24	0.21	13
1859-124 BTM SQ8-CuRC	32.57	1.89	1.21	4.37	168
1859-124 BTM SQ8-PbRC	38.87	0.16	4.09	3.38	70
1859-124 BTM SQ8-ZnRC	40.85	0.16	0.39	8.83	29
1859-124 BTM SQ8-RT	39.57	0.059	0.24	0.18	13

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 81774					
1859-bld SQ1-CuRC	34.15	6.61	2.71	5.22	545
1859-bld SQ1-PbRC	36.28	0.66	7.94	5.16	188
1859-bld SQ1-ZnRC	32.58	0.23	0.57	15.00	40
1859-bld SQ1-RT	36.04	0.062	0.29	0.18	13
PO 81821					
1859-bld SQ2-CuRC	30.80	5.88	2.05	4.88	462
1859-bld SQ2-PbRC	38.56	0.49	9.69	5.49	188
1859-bld SQ2-ZnRC	35.07	0.23	0.55	12.82	43
1859-bld SQ2-RT	40.26	0.063	0.31	0.18	13
1859-bld SQ3-ZnRC1	31.61	0.26	0.52	20.93	45
1859-bld SQ3-ZnRC2	41.13	0.15	0.52	1.01	28
1859-bld SQ3-PbRC	39.25	0.32	7.02	4.87	122
1859-bld SQ3-CuRC	34.80	5.14	2.58	5.53	408
1859-bld SQ3-RT	39.29	0.064	0.28	0.19	10
1859-124 BTM CuCL1-CL3T	39.89	5.71	2.25	5.60	406
1859-124 BTM CuCL1-CL2T	41.77	2.60	1.64	4.47	203
1859-124 BTM CuCL1-CL3C	32.84	17.64	3.81	5.36	538
1859-124 BTM CuCL1-ScvgC	39.59	2.00	1.29	7.06	213
1859-124 BTM CuCL1-ScvgT	38.11	0.43	0.95	3.41	73

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	6.15	1.40	4.37	19.31	68
CZN-1	10.68	0.15	7.52	43.79	95
CCU-1c	8.34	0.26	61.52	4.52	663
CPB-1	29.72	25.23	0.33	3.98	125

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20-Sep-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	mg/kg
Sample	Au
RPC 81821	
1859-bld SQ2-CuRC	0.957
1859-bld SQ2-PbRC	0.784
1859-bld SQ2-ZnRC	0.623
1859-bld SQ2-RT	0.424
1859-bld SQ3-ZnRC1	0.558
1859-bld SQ3-ZnRC2	0.707
1859-bld SQ3-PbRC	0.692
1859-bld SQ3-CuRC	0.960
1859-bld SQ3-RT	0.416
1859-124 Btm CuCl1-CL3T	0.356
1859-124 Btm CuCl1-CL2T	0.335
1859-124 Btm CuCl1-CL3C	0.298
1859-124 Btm CuCl1-ScvgC	0.284
1859-124 Btm CuCl1-ScvgT	0.483
RPC 81774	
1859-bld SQ1-CuRC	1.010
1859-bld SQ1-PbRC	0.776
1859-bld SQ1-ZnRC	0.681
1859-bld SQ1-RT	0.425
RPC 81858	
1859-bld Cu-Clnr3C	1.424
1859-bld Cu-Clnr2T	0.818
1859-bld Cu-Clnr3T	1.039
1859-bld Cu-ScvgC	1.175
1859-bld Cu-ScvgT	0.607
1859-bld Cu-ScvgT-DUP	0.609

Certified Reference Standards	mg/kg Au	Recommended Value
OXC72	0.204	0.205±0.003
OXC72	0.210	0.205±0.003

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30-Sep-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids: Sample	mg/kg Au
RPC 81821	
1859-bld SQ4-8-CuRC	0.927
1859-bld SQ4-8-ZnRC	0.669
1859-bld SQ4-8-PbRC	0.632
1859-bld SQ4-8-RT	0.380
RPC PO 81872	
1859-bld Zn-Clnr4C	0.395
1859-bld Zn-Clnr2T	0.653
1859-bld Zn-Clnr3T	0.592
1859-bld Zn-Clnr4T	0.546
1859-bld Zn-ScvgC	1.035
1859-bld Zn-ScvgT	0.678
1859-bld Pb-Clnr4C	0.906
1859-bld Pb-Clnr2T	0.615
1859-bld Pb-Clnr3T	0.649
1859-bld Pb-Clnr4T	0.676
1859-bld Pb-ScvgC	0.634
1859-bld Pb-ScvgT	0.509
1859-bld Pb-ScvgT Lab Dup.	0.505

Certified Reference Standards	mg/kg Au	Recommended Value
CCU-1d	13.98	14.01±0.18

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12-Oct-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 82038					
1859-CuLC-Head	34.15	3.43	2.43	5.10	282
1859-PbLC-Head	35.39	0.37	7.58	5.28	135
1859-ZnLC-Head	34.82	0.21	0.73	13.01	40
1859-CuLC1-CL3C	32.93	16.57	3.79	3.18	678
1859-CuLC2-CL3C	30.19	16.52	3.44	5.90	708
1859-CuLC3-CL3C	29.61	19.51	6.69	4.15	578
1859-CuLC1-ScvgT	34.37	0.86	1.67	4.40	144
1859-CuLC2-ScvgT	33.80	1.04	1.89	4.59	174
1859-CuLC3-ScvgT	34.71	0.90	1.85	4.45	202

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	5.88	1.36	4.29	18.39	71
CZN-1	10.26	0.14	7.44	41.44	87
CCU-1d	7.09	0.13	56.27	6.06	333
CPB-2	29.37	23.86	0.27	2.67	123

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 10-28

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	96.2	3.4
162.0	100.0	0.0	15.3	92.7	4.9
140.0	100.0	0.0	13.2	87.8	6.3
121.0	100.0	0.0	11.4	81.6	6.9
104.0	100.0	0.0	9.8	74.7	6.7
89.9	100.0	0.0	8.5	68.1	7.7
77.5	100.0	0.0	7.3	60.4	8.9
66.9	100.0	0.0	6.3	51.5	9.3
57.7	100.0	0.0	5.4	42.2	8.2
49.8	100.0	0.0	4.7	34.0	6.5
42.9	100.0	0.0	4.1	27.4	5.9
37.1	100.0	0.0	3.5	21.5	5.2
32.0	99.9	0.3	3.0	16.3	4.0
27.6	99.6	0.7	2.6	12.4	3.2
23.8	99.0	0.8	2.2	9.1	2.7
20.5	98.2	2.0	1.9	6.4	2.5

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2096
Volume Conc. = 0.0178 %
Log. Diff. =3.05
Model indp

D(v,0.5) = 6.2 µm
D(v,0.9) = 14.0 µm
D(v,0.1) = 2.3 µm
D(4,3) = 7.0 µm
D(3,2) = 4.6 µm
Span = 1.9
Spec. surf. area
0.42 sq.m./cc.

Sample details:-1859 CuLC1-Head PO#82038

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 10-28

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 CuLC1-Head PO#82038

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 10-36

Size microns	under	% in band	Size microns	under	% in band
188.0	100.0	0.0	17.7	97.3	3.3
162.0	100.0	0.0	15.3	94.0	4.8
140.0	100.0	0.0	13.2	89.1	6.0
121.0	100.0	0.0	11.4	83.1	6.4
104.0	100.0	0.0	9.8	76.8	6.2
89.9	100.0	0.0	8.5	70.6	7.8
77.5	100.0	0.0	7.3	62.8	9.5
66.9	100.0	0.0	6.3	53.3	9.9
57.7	100.0	0.0	5.4	43.4	8.5
49.8	100.0	0.0	4.7	34.9	6.5
42.9	100.0	0.0	4.1	28.4	5.9
37.1	100.0	0.0	3.5	22.5	5.2
32.0	100.0	0.1	3.0	17.3	3.9
27.6	99.9	0.4	2.6	13.3	3.3
23.8	99.5	0.5	2.2	10.0	2.9
20.5	99.1	1.8	1.9	7.1	2.7

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2114
Volume Conc. = 0.0174 %
Log. Diff. =3.20
Model indp

D(v,0.5) = 6.0 µm
D(v,0.9) = 13.5 µm
D(v,0.1) = 2.2 µm
D(4,3) = 7.1 µm
D(3,2) = 4.6 µm
Span = 1.9
Spec. surf. area
0.47 sq.m./cc.

Sample details:-1859 CuC2-Head PO#82038

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 10-36

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 CuC2-Head PO#82038

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 10-43

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	97.6	3.1
162.0	100.0	0.0	15.3	94.6	4.9
140.0	100.0	0.0	13.2	89.7	6.4
121.0	100.0	0.0	11.4	83.3	6.7
104.0	100.0	0.0	9.8	76.6	6.1
89.9	100.0	0.0	8.5	70.4	7.6
77.5	100.0	0.0	7.3	62.9	9.5
66.9	100.0	0.0	6.3	53.4	10.1
57.7	100.0	0.0	5.4	43.3	8.7
49.8	100.0	0.0	4.7	34.6	6.6
42.9	100.0	0.0	4.1	28.0	6.1
37.1	100.0	0.0	3.5	22.0	5.5
32.0	100.0	0.1	3.0	16.4	4.1
27.6	99.9	0.3	2.6	12.3	3.3
23.8	99.6	0.4	2.2	9.0	2.8
20.5	99.1	1.5	1.9	6.3	2.5

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2167
Volume Conc. = 0.0183 %
Log. Diff. =3.28
Model indp

D(v,0.5) = 6.0 µm
D(v,0.9) = 13.3 µm
D(v,0.1) = 2.3 µm
D(4,3) = 7.1 µm
D(3,2) = 4.6 µm
Span = 1.8
Spec. surf. area
0.48 sq.m./cc.

Sample details:-1859 CuC3-Head PO#82038

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 10-44

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 CuC3-Head PO#82038

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 10-54

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	96.6	3.2
162.0	100.0	0.0	15.3	93.4	4.4
140.0	100.0	0.0	13.2	89.0	5.7
121.0	100.0	0.0	11.4	83.3	6.5
104.0	100.0	0.0	9.8	76.8	6.6
89.9	100.0	0.0	8.5	70.2	8.0
77.5	100.0	0.0	7.3	62.2	9.5
66.9	100.0	0.0	6.3	52.7	10.2
57.7	100.0	0.0	5.4	42.4	9.3
49.8	100.0	0.0	4.7	33.2	7.5
42.9	100.0	0.0	4.1	25.7	6.6
37.1	100.0	0.0	3.5	19.0	5.6
32.0	100.0	0.2	3.0	13.5	3.9
27.6	99.7	0.5	2.6	9.6	2.9
23.8	99.2	0.7	2.2	6.7	2.2
20.5	98.5	1.9	1.9	4.5	1.9

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2140
Volume Conc. = 0.0192 %
Log. Diff. =3.27
Model indp

D(v,0.5) = 6.1 µm
D(v,0.9) = 13.6 µm
D(v,0.1) = 2.6 µm
D(4,3) = 7.3 µm
D(3,2) = 4.9 µm
Span = 1.8
Spec. surf. area
0.44 sq.m./cc.

Sample details:-1859 CuLC4-Head PO#82038

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 10-54

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 CuLC4-Head PO#82038

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18-Oct-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	mg/kg
Sample	Au
PO 82038	
1859-CuLC-Head	0.839
1859-PbLC-Head	0.714
1859-ZnLC-Head	0.659
1859-CuLC1-CL3C	1.023
1859-CuLC2-CL3C	0.962
1859-CuLC3-CL3C	1.077
PO 82044	
1859-CuLC4-CL3C	1.077
1859-CuLC5-CL3C	1.003
1859-CuLC6-CL3C	1.084
PO 82071	
1859-CuLC7-CL3C	1.027
1859-CuLC7-ScvgT	0.735
1859-CuLC8-CL3C	1.044
1859-CuLC8-CL2T	1.068
1859-CuLC8-CL3T	1.054
1859-CuLC8-ScvgC	0.977
1859-CuLC8-ScvgT	0.779
1859-SqLC1-27-RT	0.386
1859-Hole 121	0.906
1859-Hole 132	0.591
1859-Hole 124	0.263
1859-Hole 124 Dup.	0.228

Certified Reference Standards	mg/kg Au	Recommended Value
CCU-1d	14.13	14.01±0.18

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

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26-Oct-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 82044					
1859-CuLC4-CL3C	30.39	16.71	5.66	5.80	555
1859-CuLC5-CL3C	31.31	16.36	4.96	5.37	548
1859-CuLC6-CL3C	28.25	18.44	7.50	4.49	518
1859-CuLC4-ScvgT	35.40	0.69	2.10	4.59	215
1859-CuLC5-ScvgT	35.19	0.76	1.73	5.10	216
1859-CuLC6-ScvgT	35.62	0.73	1.70	4.88	212

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	5.88	1.29	4.10	19.05	68
CZN-1	10.35	0.14	7.56	43.62	94
CCU-1d	7.01	0.12	63.02	6.07	353
CPB-2	32.17	24.18	0.27	2.82	125

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 12-07

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	96.7	3.0
162.0	100.0	0.0	15.3	93.8	4.2
140.0	100.0	0.0	13.2	89.5	5.5
121.0	100.0	0.0	11.4	84.0	6.3
104.0	100.0	0.0	9.8	77.8	6.4
89.9	100.0	0.0	8.5	71.4	7.7
77.5	100.0	0.0	7.3	63.6	9.4
66.9	100.0	0.0	6.3	54.2	10.3
57.7	100.0	0.0	5.4	44.0	9.4
49.8	100.0	0.0	4.7	34.6	7.8
42.9	100.0	0.0	4.1	26.8	6.8
37.1	100.0	0.0	3.5	20.0	5.7
32.0	100.0	0.2	3.0	14.3	4.0
27.6	99.7	0.5	2.6	10.3	3.0
23.8	99.2	0.7	2.2	7.2	2.4
20.5	98.5	1.8	1.9	4.9	2.1

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1686
Volume Conc. = 0.0144 %
Log. Diff. =3.06
Model indp

D(v,0.5) = 5.9 µm
D(v,0.9) = 13.4 µm
D(v,0.1) = 2.6 µm
D(4,3) = 7.2 µm
D(3,2) = 4.8 µm
Span = 1.8
Spec. surf. area
0.44 sq.m./cc.

Sample details:-1859 CuLC5-Head PO#82044

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 12-07

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 CuLC5-Head PO#82044

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 12-25

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	97.7	2.8
162.0	100.0	0.0	15.3	95.0	4.1
140.0	100.0	0.0	13.2	90.9	5.4
121.0	100.0	0.0	11.4	85.5	5.9
104.0	100.0	0.0	9.8	79.6	5.8
89.9	100.0	0.0	8.5	73.7	7.4
77.5	100.0	0.0	7.3	66.3	9.4
66.9	100.0	0.0	6.3	56.9	10.3
57.7	100.0	0.0	5.4	46.6	9.3
49.8	100.0	0.0	4.7	37.3	7.4
42.9	100.0	0.0	4.1	29.8	6.8
37.1	100.0	0.0	3.5	23.1	6.0
32.0	100.0	0.1	3.0	17.1	4.3
27.6	99.9	0.3	2.6	12.7	3.4
23.8	99.7	0.4	2.2	9.3	2.9
20.5	99.3	1.5	1.9	6.4	2.6

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1750
Volume Conc. = 0.0139 %
Log. Diff. =3.04
Model indp

D(v,0.5) = 5.7 µm
D(v,0.9) = 12.9 µm
D(v,0.1) = 2.3 µm
D(4,3) = 6.8 µm
D(3,2) = 4.5 µm
Span = 1.8
Spec. surf. area
0.49 sq.m./cc.

Sample details:-1859 CuLC6-Head PO#82044

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 12-25

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 CuLC6-Head PO#82044

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 12-31

Size microns	under	% in band	Size microns	under	% in band
188.0	100.0	0.0	17.7	97.5	2.6
162.0	100.0	0.0	15.3	94.9	3.9
140.0	100.0	0.0	13.2	91.0	5.4
121.0	100.0	0.0	11.4	85.6	6.3
104.0	100.0	0.0	9.8	79.3	6.6
89.9	100.0	0.0	8.5	72.7	8.1
77.5	100.0	0.0	7.3	64.6	9.8
66.9	100.0	0.0	6.3	54.8	10.8
57.7	100.0	0.0	5.4	44.0	9.9
49.8	100.0	0.0	4.7	34.1	8.0
42.9	100.0	0.0	4.1	26.1	7.0
37.1	100.0	0.0	3.5	19.2	5.8
32.0	100.0	0.2	3.0	13.4	4.1
27.6	99.8	0.4	2.6	9.3	2.9
23.8	99.4	0.5	2.2	6.4	2.2
20.5	98.9	1.5	1.9	4.2	1.9

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 m
Obscuration =0.1790
Volume Conc. = 0.0156
Log. Diff. =3.10
Model indp

D(v,0.5) = 5.9 µm
D(v,0.9) = 12.8 µm
D(v,0.1) = 2.7 µm
D(4,3) = 7.0 µm
D(3,2) = 4.8 µm
Span = 1.7
Spec. surf. area
0.47 sq.m./cc.

Sample details:-1859 CuLC7-Head PO#82044

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 12-31

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 CuLC7-Head PO#82044

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 12-41

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	97.6	2.4
162.0	100.0	0.0	15.3	95.2	3.7
140.0	100.0	0.0	13.2	91.4	5.2
121.0	100.0	0.0	11.4	86.3	6.1
104.0	100.0	0.0	9.8	80.2	6.3
89.9	100.0	0.0	8.5	73.9	7.7
77.5	100.0	0.0	7.3	66.1	9.5
66.9	100.0	0.0	6.3	56.6	10.7
57.7	100.0	0.0	5.4	45.9	10.0
49.8	100.0	0.0	4.7	36.0	8.3
42.9	100.0	0.0	4.1	27.7	7.3
37.1	100.0	0.0	3.5	20.4	6.1
32.0	100.0	0.2	3.0	14.4	4.3
27.6	99.8	0.4	2.6	10.1	3.1
23.8	99.5	0.5	2.2	7.0	2.3
20.5	99.0	1.4	1.9	4.6	2.0

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1602
Volume Conc. = 0.0134 %
Log. Diff. =3.07
Model indp

D(v,0.5) = 5.7 µm
D(v,0.9) = 12.6 µm
D(v,0.1) = 2.6 µm
D(4,3) = 6.9 µm
D(3,2) = 4.7 µm
Span = 1.7
Spec. surf. area
0.47 sq.m./cc.

Sample details:-1859 CuLC8-Head PO#82044

Malvern Instruments MASTER Particle Sizer M3.1 Date 09-10-12 Time 12-42

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 CuLC8-Head PO#82044

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26-Oct-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 82071					
1859-CuLC7-CL3C	28.53	16.40	5.41	7.63	674
1859-CuLC7-ScvgT	34.65	0.81	1.94	4.40	219
1859-CuLC8-CL3C	29.45	17.49	5.62	6.00	582
1859-CuLC8-CL2T	33.47	4.16	2.86	8.29	469
1859-CuLC8-CL3T	31.51	9.33	3.90	8.94	597
1859-CuLC8-ScvgC	33.15	2.54	2.57	9.02	393
1859-CuLC8-ScvgT	35.69	0.69	1.81	4.46	205
1859-SqLC1-27-RT	37.11	0.062	0.32	0.20	11
1859-Hole 121	36.16	0.48	0.95	1.88	42
1859-Hole 132	34.92	0.14	1.68	5.46	59
1859-Hole 124	39.55	0.19	0.82	2.91	35

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	5.88	1.29	4.10	19.05	68
CZN-1	10.35	0.14	7.56	43.62	94
CCU-1d	7.01	0.12	63.02	6.07	353
CPB-2	32.17	24.18	0.27	2.82	125

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 09-52

Size microns	under	% in band	Size microns	under	% in band
188.0	100.0	0.0	17.7	96.2	3.9
162.0	100.0	0.0	15.3	92.3	5.7
140.0	100.0	0.0	13.2	86.7	7.4
121.0	100.0	0.0	11.4	79.3	8.2
104.0	100.0	0.0	9.8	71.1	8.0
89.9	100.0	0.0	8.5	63.1	8.8
77.5	100.0	0.0	7.3	54.3	9.5
66.9	100.0	0.0	6.3	44.8	9.2
57.7	100.0	0.0	5.4	35.5	7.7
49.8	100.0	0.0	4.7	27.8	6.1
42.9	100.0	0.0	4.1	21.7	5.3
37.1	100.0	0.0	3.5	16.4	4.6
32.0	100.0	0.2	3.0	11.8	3.3
27.6	99.8	0.6	2.6	8.6	2.5
23.8	99.2	0.8	2.2	6.1	2.0
20.5	98.4	2.2	1.9	4.1	1.7

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1797
Volume Conc. = 0.0171 %
Log. Diff. =3.33
Model indp

D(v,0.5) = 6.8 µm
D(v,0.9) = 14.3 µm
D(v,0.1) = 2.8 µm
D(4,3) = 7.9 µm
D(3,2) = 5.3 µm
Span = 1.7
Spec. surf. area
0.44 sq.m./cc.

Sample details:-1859 PbLC1B-Head PO#82071

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 09-52

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbLC1B-Head PO#82071

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 09-45

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	96.3	4.2
162.0	100.0	0.0	15.3	92.2	5.9
140.0	100.0	0.0	13.2	86.3	7.1
121.0	100.0	0.0	11.4	79.2	7.4
104.0	100.0	0.0	9.8	71.8	6.8
89.9	100.0	0.0	8.5	65.0	7.7
77.5	100.0	0.0	7.3	57.3	9.0
66.9	100.0	0.0	6.3	48.3	9.1
57.7	100.0	0.0	5.4	39.3	7.7
49.8	100.0	0.0	4.7	31.5	6.1
42.9	100.0	0.0	4.1	25.4	5.7
37.1	100.0	0.0	3.5	19.7	5.2
32.0	100.0	0.1	3.0	14.5	3.8
27.6	99.9	0.5	2.6	10.7	2.9
23.8	99.3	0.7	2.2	7.8	2.4
20.5	98.6	2.3	1.9	5.4	2.1

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1698
Volume Conc. = 0.0149 %
Log. Diff. =3.22
Model indp

D(v,0.5) = 6.5 µm
D(v,0.9) = 14.4 µm
D(v,0.1) = 2.5 µm
D(4,3) = 7.7 µm
D(3,2) = 4.9 µm
Span = 1.8
Spec. surf. area
0.45 sq.m./cc.

Sample details:-1859 PbLC1A-Head PO#82071

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 09-45

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbLC1A-Head PO#82071

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29-Oct-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 82116					
1859-PbLC1E-CL4C	13.46	1.84	51.10	6.72	810
1859-PbLC2-CL4C	16.86	1.62	41.42	7.90	694
1859-PbLC3-CL4C	15.63	1.71	45.27	6.74	785
1859-PbLC4-CL4C	13.98	1.63	51.69	5.68	751
1859-PbLC5-CL4C	13.50	1.74	53.21	5.00	796
1859-CuScvgT1-8	34.79	0.82	1.92	4.61	203
1859-Blend Feed (75 min)	36.02	0.29	1.17	3.12	43
1859-PbLC1E-ScvgT	39.07	0.29	1.86	3.92	31
1859-PbLC2-ScvgT	39.77	0.090	1.91	4.38	32
1859-PbLC3-ScvgT	41.62	0.098	2.22	4.62	39
1859-PbLC4-ScvgT	39.61	0.11	2.58	5.41	48
1859-PbLC5-ScvgT	39.04	0.12	2.34	5.22	41
1859-PbLC1D-CL4C	11.56	2.55	42.74	14.19	886
1859-PbLC1D-CL4T	25.42	1.94	22.20	10.47	568
1859-PbLC1D-CL3T	29.75	1.38	13.01	9.87	408
1859-PbLC1D-CL2T	36.39	0.46	5.66	5.74	135
1859-PbLC1D-ScvgC	37.39	0.28	4.61	4.76	88
1859-PbLC1D-ScvgT	40.38	0.11	2.16	2.25	27
1859-PbLC1C-CL4C	16.24	1.70	34.93	12.73	669
1859-PbLC1C-CL4T	33.09	1.17	11.72	8.97	357
1859-PbLC1C-CL3T	37.20	0.77	6.81	8.40	222
1859-PbLC1C-CL2T	37.71	0.39	3.91	5.92	108
1859-PbLC1C-ScvgC	39.43	0.21	2.97	4.91	60
1859-PbLC1C-ScvgT	41.67	0.095	1.83	2.49	24
1859-PbLC1B-CL4C	14.74	2.65	32.58	16.49	913
1859-PbLC1B-CL4T	33.03	1.65	10.16	10.60	513
1859-PbLC1B-CL3T	37.01	1.06	6.23	7.75	321
1859-PbLC1B-CL2T	37.93	0.60	4.30	5.91	170
1859-PbLC1B-ScvgC	37.95	0.29	4.14	5.58	94
1859-PbLC1B-ScvgT	39.57	0.14	1.98	2.97	36

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
1859-PbLC1A-CL4C	15.43	4.19	40.76	10.49	1200
1859-PbLC1A-CL4T	29.09	1.78	19.28	9.05	640
1859-PbLC1A-CL3T	35.18	0.99	11.81	9.08	363
1859-PbLC1A-CL2T	38.75	0.43	6.03	6.72	158
1859-PbLC1A-ScvgC	36.71	0.36	4.77	8.17	122
1859-PbLC1A-ScvgT	37.04	0.16	1.98	3.49	48

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	5.98	1.33	4.52	19.22	65
CZN-1	10.66	0.14	7.67	43.81	87
CCU-1d	7.28	0.13	60.01	5.90	360
CPB-2	32.53	23.17	0.28	2.80	123

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29-Oct-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 82116					
1859-PbLC1E-CL4C	13.46	1.84	51.10	6.72	810
1859-PbLC2-CL4C	16.86	1.62	41.42	7.90	694
1859-PbLC3-CL4C	15.63	1.71	45.27	6.74	785
1859-PbLC4-CL4C	13.98	1.63	51.69	5.68	751
1859-PbLC5-CL4C	13.50	1.74	53.21	5.00	796
1859-CuScvgT1-8	34.79	0.82	1.92	4.61	203
1859-Blend Feed (75 min)	36.02	0.29	1.17	3.12	43
1859-PbLC1E-ScvgT	39.07	0.29	1.86	3.92	31
1859-PbLC2-ScvgT	39.77	0.090	1.91	4.38	32
1859-PbLC3-ScvgT	41.62	0.098	2.22	4.62	39
1859-PbLC4-ScvgT	39.61	0.11	2.58	5.41	48
1859-PbLC5-ScvgT	39.04	0.12	2.34	5.22	41
1859-PbLC1D-CL4C	11.56	2.55	42.74	14.19	886
1859-PbLC1D-CL4T	25.42	1.94	22.20	10.47	568
1859-PbLC1D-CL3T	29.75	1.38	13.01	9.87	408
1859-PbLC1D-CL2T	36.39	0.46	5.66	5.74	135
1859-PbLC1D-ScvgC	37.39	0.28	4.61	4.76	88
1859-PbLC1D-ScvgT	40.38	0.11	2.16	2.25	27
1859-PbLC1C-CL4C	16.24	1.70	34.93	12.73	669
1859-PbLC1C-CL4T	33.09	1.17	11.72	8.97	357
1859-PbLC1C-CL3T	37.20	0.77	6.81	8.40	222
1859-PbLC1C-CL2T	37.71	0.39	3.91	5.92	108
1859-PbLC1C-ScvgC	39.43	0.21	2.97	4.91	60
1859-PbLC1C-ScvgT	41.67	0.095	1.83	2.49	24
1859-PbLC1B-CL4C	14.74	2.65	32.58	16.49	913
1859-PbLC1B-CL4T	33.03	1.65	10.16	10.60	513
1859-PbLC1B-CL3T	37.01	1.06	6.23	7.75	321
1859-PbLC1B-CL2T	37.93	0.60	4.30	5.91	170
1859-PbLC1B-ScvgC	37.95	0.29	4.14	5.58	94
1859-PbLC1B-ScvgT	39.57	0.14	1.98	2.97	36

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
1859-PbLC1A-CL4C	15.43	4.19	40.76	10.49	1200
1859-PbLC1A-CL4T	29.09	1.78	19.28	9.05	640
1859-PbLC1A-CL3T	35.18	0.99	11.81	9.08	363
1859-PbLC1A-CL2T	38.75	0.43	6.03	6.72	158
1859-PbLC1A-ScvgC	36.71	0.36	4.77	8.17	122
1859-PbLC1A-ScvgT	37.04	0.16	1.98	3.49	48

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	5.98	1.33	4.52	19.22	65
CZN-1	10.66	0.14	7.67	43.81	87
CCU-1d	7.28	0.13	60.01	5.90	360
CPB-2	32.53	23.17	0.28	2.80	123

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 10-19

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	96.1	4.1
162.0	100.0	0.0	15.3	92.0	5.9
140.0	100.0	0.0	13.2	86.1	7.5
121.0	100.0	0.0	11.4	78.6	7.9
104.0	100.0	0.0	9.8	70.7	7.3
89.9	100.0	0.0	8.5	63.4	8.1
77.5	100.0	0.0	7.3	55.3	9.2
66.9	100.0	0.0	6.3	46.2	9.1
57.7	100.0	0.0	5.4	37.0	7.6
49.8	100.0	0.0	4.7	29.4	5.7
42.9	100.0	0.0	4.1	23.7	5.0
37.1	100.0	0.0	3.5	18.8	4.4
32.0	100.0	0.2	3.0	14.4	3.4
27.6	99.8	0.6	2.6	11.0	2.8
23.8	99.3	0.7	2.2	8.2	2.4
20.5	98.5	2.4	1.9	5.7	2.2

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1599
Volume Conc. = 0.0141 %
Log. Diff. =3.33
Model indp

D(v,0.5) = 6.7 µm
D(v,0.9) = 14.5 µm
D(v,0.1) = 2.5 µm
D(4,3) = 7.8 µm
D(3,2) = 5.0 µm
Span = 1.8
Spec. surf. area
0.44 sq.m./cc.

Sample details:-1859 PbC1C-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 10-19

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbC1C-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 10-25

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	98.2	2.6
162.0	100.0	0.0	15.3	95.6	4.3
140.0	100.0	0.0	13.2	91.3	6.1
121.0	100.0	0.0	11.4	85.2	6.8
104.0	100.0	0.0	9.8	78.5	6.6
89.9	100.0	0.0	8.5	71.9	8.3
77.5	100.0	0.0	7.3	63.6	10.1
66.9	100.0	0.0	6.3	53.5	10.5
57.7	100.0	0.0	5.4	43.0	9.0
49.8	100.0	0.0	4.7	34.1	6.8
42.9	100.0	0.0	4.1	27.2	6.1
37.1	100.0	0.0	3.5	21.1	5.4
32.0	100.0	0.0	3.0	15.8	4.0
27.6	100.0	0.2	2.6	11.8	3.2
23.8	99.8	0.3	2.2	8.6	2.7
20.5	99.5	1.2	1.9	6.0	2.4

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1482
Volume Conc. = 0.0121 %
Log. Diff. =3.21
Model indp

D(v,0.5) = 6.0 µm
D(v,0.9) = 12.7 µm
D(v,0.1) = 2.4 µm
D(4,3) = 6.9 µm
D(3,2) = 4.7 µm
Span = 1.7
Spec. surf. area
0.51 sq.m./cc.

Sample details:-1859 PbLC1d-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 10-26

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbLC1d-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 10-34

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	97.3	3.8
162.0	100.0	0.0	15.3	93.5	5.9
140.0	100.0	0.0	13.2	87.6	7.5
121.0	100.0	0.0	11.4	80.2	8.0
104.0	100.0	0.0	9.8	72.2	7.4
89.9	100.0	0.0	8.5	64.8	8.5
77.5	100.0	0.0	7.3	56.3	9.5
66.9	100.0	0.0	6.3	46.8	9.3
57.7	100.0	0.0	5.4	37.5	7.8
49.8	100.0	0.0	4.7	29.7	6.1
42.9	100.0	0.0	4.1	23.6	5.7
37.1	100.0	0.0	3.5	17.9	5.1
32.0	100.0	0.1	3.0	12.8	3.6
27.6	99.9	0.3	2.6	9.2	2.7
23.8	99.6	0.5	2.2	6.5	2.1
20.5	99.1	1.8	1.9	4.4	1.8

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2110
Volume Conc. = 0.0198 %
Log. Diff. =3.30
Model indp

D(v,0.5) = 6.6 µm
D(v,0.9) = 13.9 µm
D(v,0.1) = 2.7 µm
D(4,3) = 7.6 µm
D(3,2) = 5.1 µm
Span = 1.7
Spec. surf. area
0.47 sq.m./cc.

Sample details:-1859 PbLC1e-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 10-34

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbLC1e-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 10-40

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	98.1	3.0
162.0	100.0	0.0	15.3	95.1	5.0
140.0	100.0	0.0	13.2	90.1	6.9
121.0	100.0	0.0	11.4	83.2	7.6
104.0	100.0	0.0	9.8	75.6	7.3
89.9	100.0	0.0	8.5	68.3	8.6
77.5	100.0	0.0	7.3	59.6	10.0
66.9	100.0	0.0	6.3	49.6	9.9
57.7	100.0	0.0	5.4	39.7	8.4
49.8	100.0	0.0	4.7	31.3	6.7
42.9	100.0	0.0	4.1	24.6	6.3
37.1	100.0	0.0	3.5	18.4	5.5
32.0	100.0	0.0	3.0	12.8	3.8
27.6	100.0	0.2	2.6	9.1	2.7
23.8	99.7	0.3	2.2	6.4	2.1
20.5	99.4	1.3	1.9	4.3	1.8

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1911
Volume Conc. = 0.0173 %
Log. Diff. =3.30
Model indp

D(v,0.5) = 6.3 µm
D(v,0.9) = 13.2 µm
D(v,0.1) = 2.7 µm
D(4,3) = 7.3 µm
D(3,2) = 5.0 µm
Span = 1.6
Spec. surf. area
0.50 sq.m./cc.

Sample details:-1859 PbC2-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 10-40

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbC2-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 10-50

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	98.3	1.7
162.0	100.0	0.0	15.3	96.6	4.3
140.0	100.0	0.0	13.2	92.3	6.0
121.0	100.0	0.0	11.4	86.3	6.9
104.0	100.0	0.0	9.8	79.5	7.2
89.9	100.0	0.0	8.5	72.2	8.9
77.5	100.0	0.0	7.3	63.3	10.4
66.9	100.0	0.0	6.3	52.9	10.6
57.7	100.0	0.0	5.4	42.3	9.2
49.8	100.0	0.0	4.7	33.1	7.4
42.9	100.0	0.0	4.1	25.6	6.9
37.1	100.0	0.0	3.5	18.7	6.0
32.0	100.0	0.0	3.0	12.7	4.0
27.6	100.0	0.0	2.6	8.7	2.7
23.8	100.0	0.5	2.2	6.0	2.1
20.5	99.4	1.1	1.9	3.9	1.7

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2285
Volume Conc. = 0.0208 %
Log. Diff. =3.26
Model indp

D(v,0.5) = 6.1 µm
D(v,0.9) = 12.4 µm
D(v,0.1) = 2.7 µm
D(4,3) = 6.6 µm
D(3,2) = 4.8 µm
Span = 1.6
Spec. surf. area
0.53 sq.m./cc.

Sample details:-1859 PbLC3-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 10-50

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbLC3-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 10-58

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	98.7	1.6
162.0	100.0	0.0	15.3	97.1	4.6
140.0	100.0	0.0	13.2	92.4	6.4
121.0	100.0	0.0	11.4	86.0	6.9
104.0	100.0	0.0	9.8	79.1	6.8
89.9	100.0	0.0	8.5	72.3	8.9
77.5	100.0	0.0	7.3	63.3	11.1
66.9	100.0	0.0	6.3	52.2	11.2
57.7	100.0	0.0	5.4	41.0	9.2
49.8	100.0	0.0	4.7	31.8	6.9
42.9	100.0	0.0	4.1	24.9	6.6
37.1	100.0	0.0	3.5	18.2	6.1
32.0	100.0	0.0	3.0	12.1	4.0
27.6	100.0	0.0	2.6	8.1	2.7
23.8	100.0	0.4	2.2	5.5	1.9
20.5	99.6	0.9	1.9	3.5	1.6

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2218
Volume Conc. = 0.0205 %
Log. Diff. =3.29
Model indp

D(v,0.5) = 6.1 µm
D(v,0.9) = 12.5 µm
D(v,0.1) = 2.8 µm
D(4,3) = 6.9 µm
D(3,2) = 5.0 µm
Span = 1.6
Spec. surf. area
0.54 sq.m./cc.

Sample details:-1859 PbLC4-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 10-58

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbLC4-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 11-05

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	98.8	1.5
162.0	100.0	0.0	15.3	97.3	4.0
140.0	100.0	0.0	13.2	93.3	5.7
121.0	100.0	0.0	11.4	87.7	6.4
104.0	100.0	0.0	9.8	81.3	6.6
89.9	100.0	0.0	8.5	74.7	8.9
77.5	100.0	0.0	7.3	65.8	11.2
66.9	100.0	0.0	6.3	54.6	11.6
57.7	100.0	0.0	5.4	43.1	9.9
49.8	100.0	0.0	4.7	33.2	7.7
42.9	100.0	0.0	4.1	25.5	7.4
37.1	100.0	0.0	3.5	18.1	6.5
32.0	100.0	0.0	3.0	11.5	4.1
27.6	100.0	0.0	2.6	7.5	2.5
23.8	100.0	0.3	2.2	4.9	1.8
20.5	99.7	0.9	1.9	3.1	1.5

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2201
Volume Conc. = 0.0202 %
Log. Diff. =3.26
Model indp

D(v,0.5) = 5.9 µm
D(v,0.9) = 12.1 µm
D(v,0.1) = 2.9 µm
D(4,3) = 6.7 µm
D(3,2) = 5.0 µm
Span = 1.5
Spec. surf. area
0.55 sq.m./cc.

Sample details:-1859 PbLC5-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 11-05

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbLC5-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 11-18

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	99.1	1.1
162.0	100.0	0.0	15.3	98.0	3.1
140.0	100.0	0.0	13.2	94.9	4.7
121.0	100.0	0.0	11.4	90.2	5.6
104.0	100.0	0.0	9.8	84.6	6.1
89.9	100.0	0.0	8.5	78.4	8.0
77.5	100.0	0.0	7.3	70.4	10.2
66.9	100.0	0.0	6.3	60.2	11.3
57.7	100.0	0.0	5.4	48.9	10.2
49.8	100.0	0.0	4.7	38.7	8.3
42.9	100.0	0.0	4.1	30.4	7.9
37.1	100.0	0.0	3.5	22.5	7.0
32.0	100.0	0.0	3.0	15.5	4.8
27.6	100.0	0.0	2.6	10.6	3.3
23.8	100.0	0.2	2.2	7.3	2.5
20.5	99.7	0.7	1.9	4.8	2.1

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2090
Volume Conc. = 0.0172 %
Log. Diff. =3.26
Model indp

D(v,0.5) = 5.5 µm
D(v,0.9) = 11.3 µm
D(v,0.1) = 2.5 µm
D(4,3) = 6.3 µm
D(3,2) = 4.5 µm
Span = 1.6
Spec. surf. area
0.58 sq.m./cc.

Sample details:-1859 PbLC6-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 11-18

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbLC6-Head PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 11-35

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	51.9	6.5
162.0	100.0	0.0	15.3	45.4	6.1
140.0	100.0	0.0	13.2	39.3	5.8
121.0	100.0	0.0	11.4	33.5	5.0
104.0	100.0	0.0	9.8	28.5	3.7
89.9	100.0	0.3	8.5	24.8	3.6
77.5	99.7	0.5	7.3	21.2	3.9
66.9	99.2	0.5	6.3	17.3	3.6
57.7	98.6	0.9	5.4	13.8	2.8
49.8	97.7	3.5	4.7	11.0	2.2
42.9	94.3	4.8	4.1	8.8	2.4
37.1	89.4	5.6	3.5	6.5	2.0
32.0	83.9	7.0	3.0	4.5	1.3
27.6	76.9	8.8	2.6	3.1	1.1
23.8	68.1	8.8	2.2	2.0	0.6
20.5	59.3	7.4	1.9	1.4	0.5

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2715
Volume Conc. = 0.0518 %
Log. Diff. =3.05
Model indp

D(v,0.5) = 17.0 µm
D(v,0.9) = 37.7 µm
D(v,0.1) = 4.4 µm
D(4,3) = 19.3 µm
D(3,2) = 9.8 µm
Span = 2.0
Spec. surf. area
0.16 sq.m./cc.

Sample details:-1859-Blend Feed (75min) PO#82116

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 11-35

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	99.6	0.4
35	500.0 µm	100.0	0.0	230	63.0 µm	99.0	0.6
40	425.0 µm	100.0	0.0	270	53.0 µm	98.4	0.6
45	355.0 µm	100.0	0.0	325	45.0 µm	95.6	2.8
50	300.0 µm	100.0	0.0	400	38.0 µm	90.3	5.3

Sample details:-1859-Blend Feed (75min) PO#82116

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29-Oct-12

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E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 82130					
1859-PbLC6-CL4C	15.93	2.73	41.26	6.52	798
1859-PbLC7-CL4C	12.80	1.96	51.45	5.45	813
1859-PbLC6-ScvgT	40.48	0.12	2.29	5.12	53
1859-PbLC7-ScvgT	39.54	0.12	2.85	5.59	49

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	5.98	1.33	4.52	19.22	65
CZN-1	10.66	0.14	7.67	43.81	87
CCU-1d	7.28	0.13	60.01	5.90	360
CPB-2	32.53	23.17	0.28	2.80	123

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 11-42

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	99.1	1.0
162.0	100.0	0.0	15.3	98.1	2.7
140.0	100.0	0.0	13.2	95.4	4.1
121.0	100.0	0.0	11.4	91.3	5.1
104.0	100.0	0.0	9.8	86.2	5.9
89.9	100.0	0.0	8.5	80.3	8.0
77.5	100.0	0.0	7.3	72.2	10.3
66.9	100.0	0.0	6.3	62.0	11.3
57.7	100.0	0.0	5.4	50.7	10.4
49.8	100.0	0.0	4.7	40.2	8.8
42.9	100.0	0.0	4.1	31.5	8.3
37.1	100.0	0.0	3.5	23.2	7.2
32.0	100.0	0.0	3.0	16.0	4.8
27.6	100.0	0.0	2.6	11.1	3.4
23.8	100.0	0.3	2.2	7.7	2.6
20.5	99.7	0.6	1.9	5.1	2.3

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1719
Volume Conc. = 0.0135 %
Log. Diff. =3.14
Model indp

D(v,0.5) = 5.4 µm
D(v,0.9) = 11.0 µm
D(v,0.1) = 2.5 µm
D(4,3) = 6.1 µm
D(3,2) = 4.4 µm
Span = 1.6
Spec. surf. area
0.59 sq.m./cc.

Sample details:-1859 PbLC7-Head PO#82130

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 11-42

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbLC7-Head PO#82130

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30-Oct-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Repeat analysis using aqua regia digestion

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 82146					
1859-PbLC8-CL4C			43.46		
1859-PbLC9-CL4C			55.95		

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
CPB-2 (aqua regia digestion)			63.58		

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-11

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	98.9	1.2
162.0	100.0	0.0	15.3	97.7	3.5
140.0	100.0	0.0	13.2	94.2	5.1
121.0	100.0	0.0	11.4	89.2	5.8
104.0	100.0	0.0	9.8	83.3	6.2
89.9	100.0	0.0	8.5	77.2	8.6
77.5	100.0	0.0	7.3	68.6	11.3
66.9	100.0	0.0	6.3	57.2	12.4
57.7	100.0	0.0	5.4	44.8	10.9
49.8	100.0	0.0	4.7	33.9	8.4
42.9	100.0	0.0	4.1	25.5	8.1
37.1	100.0	0.0	3.5	17.4	7.2
32.0	100.0	0.0	3.0	10.3	4.3
27.6	100.0	0.0	2.6	6.0	2.4
23.8	100.0	0.3	2.2	3.6	1.5
20.5	99.7	0.8	1.9	2.1	1.2

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1704
Volume Conc. = 0.0154 %
Log. Diff. =3.23
Model indp

D(v,0.5) = 5.8 µm
D(v,0.9) = 11.7 µm
D(v,0.1) = 3.0 µm
D(4,3) = 6.6 µm
D(3,2) = 5.0 µm
Span = 1.5
Spec. surf. area
0.57 sq.m./cc.

Sample details:-1859 PbLC8-Head PO# 82146

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-12

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbLC8-Head PO# 82146

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-21

Size microns	under	% in band	Size microns	under	% in band
188.0	100.0	0.0	17.7	99.0	1.1
162.0	100.0	0.0	15.3	97.9	3.0
140.0	100.0	0.0	13.2	94.9	4.5
121.0	100.0	0.0	11.4	90.3	5.5
104.0	100.0	0.0	9.8	84.8	6.2
89.9	100.0	0.0	8.5	78.6	8.2
77.5	100.0	0.0	7.3	70.4	10.4
66.9	100.0	0.0	6.3	60.0	11.5
57.7	100.0	0.0	5.4	48.5	10.6
49.8	100.0	0.0	4.7	37.9	8.8
42.9	100.0	0.0	4.1	29.2	8.2
37.1	100.0	0.0	3.5	21.0	7.0
32.0	100.0	0.0	3.0	13.9	4.6
27.6	100.0	0.0	2.6	9.4	3.0
23.8	100.0	0.3	2.2	6.4	2.3
20.5	99.7	0.7	1.9	4.1	1.9

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1791
Volume Conc. = 0.0149 %
Log. Diff. =3.17
Model indp

D(v,0.5) = 5.5 µm
D(v,0.9) = 11.3 µm
D(v,0.1) = 2.7 µm
D(4,3) = 6.3 µm
D(3,2) = 4.6 µm
Span = 1.6
Spec. surf. area
0.58 sq.m./cc.

Sample details:-1859 PbLC9-Head PO#82146

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-21

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbLC9-Head PO#82146

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-31

Size microns	under	% in band	Size microns	under	% in band
188.0	100.0	0.0	17.7	87.8	8.0
162.0	100.0	0.0	15.3	79.8	9.7
140.0	100.0	0.0	13.2	70.1	9.7
121.0	100.0	0.0	11.4	60.4	8.7
104.0	100.0	0.0	9.8	51.7	6.8
89.9	100.0	0.0	8.5	44.8	6.5
77.5	100.0	0.0	7.3	38.4	6.6
66.9	100.0	0.0	6.3	31.7	6.3
57.7	100.0	0.0	5.4	25.4	5.2
49.8	100.0	0.0	4.7	20.1	4.0
42.9	100.0	0.1	4.1	16.1	3.5
37.1	99.9	0.4	3.5	12.6	3.0
32.0	99.5	0.5	3.0	9.5	2.3
27.6	99.0	1.6	2.6	7.2	1.9
23.8	97.3	3.7	2.2	5.3	1.6
20.5	93.6	5.8	1.9	3.7	1.4

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1871
Volume Conc. = 0.0213 %
Log. Diff. =3.44
Model indp

D(v,0.5) = 9.5 µm
D(v,0.9) = 18.6 µm
D(v,0.1) = 3.1 µm
D(4,3) = 10.4 µm
D(3,2) = 6.3 µm
Span = 1.6
Spec. surf. area
0.34 sq.m./cc.

Sample details:-1859 ZnLC1-Head PO#82146

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-32

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	99.9	0.1

Sample details:-1859 ZnLC1-Head PO#82146

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-11

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	98.9	1.2
162.0	100.0	0.0	15.3	97.7	3.5
140.0	100.0	0.0	13.2	94.2	5.1
121.0	100.0	0.0	11.4	89.2	5.8
104.0	100.0	0.0	9.8	83.3	6.2
89.9	100.0	0.0	8.5	77.2	8.6
77.5	100.0	0.0	7.3	68.6	11.3
66.9	100.0	0.0	6.3	57.2	12.4
57.7	100.0	0.0	5.4	44.8	10.9
49.8	100.0	0.0	4.7	33.9	8.4
42.9	100.0	0.0	4.1	25.5	8.1
37.1	100.0	0.0	3.5	17.4	7.2
32.0	100.0	0.0	3.0	10.3	4.3
27.6	100.0	0.0	2.6	6.0	2.4
23.8	100.0	0.3	2.2	3.6	1.5
20.5	99.7	0.8	1.9	2.1	1.2

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1704
Volume Conc. = 0.0154 %
Log. Diff. =3.23
Model indp

D(v,0.5) = 5.8 µm
D(v,0.9) = 11.7 µm
D(v,0.1) = 3.0 µm
D(4,3) = 6.6 µm
D(3,2) = 5.0 µm
Span = 1.5
Spec. surf. area
0.57 sq.m./cc.

Sample details:-1859 PbLC8-Head PO# 82146

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-12

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbLC8-Head PO# 82146

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-21

Size microns	under	% in band	Size microns	under	% in band
188.0	100.0	0.0	17.7	99.0	1.1
162.0	100.0	0.0	15.3	97.9	3.0
140.0	100.0	0.0	13.2	94.9	4.5
121.0	100.0	0.0	11.4	90.3	5.5
104.0	100.0	0.0	9.8	84.8	6.2
89.9	100.0	0.0	8.5	78.6	8.2
77.5	100.0	0.0	7.3	70.4	10.4
66.9	100.0	0.0	6.3	60.0	11.5
57.7	100.0	0.0	5.4	48.5	10.6
49.8	100.0	0.0	4.7	37.9	8.8
42.9	100.0	0.0	4.1	29.2	8.2
37.1	100.0	0.0	3.5	21.0	7.0
32.0	100.0	0.0	3.0	13.9	4.6
27.6	100.0	0.0	2.6	9.4	3.0
23.8	100.0	0.3	2.2	6.4	2.3
20.5	99.7	0.7	1.9	4.1	1.9

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1791
Volume Conc. = 0.0149 %
Log. Diff. =3.17
Model indp

D(v,0.5) = 5.5 µm
D(v,0.9) = 11.3 µm
D(v,0.1) = 2.7 µm
D(4,3) = 6.3 µm
D(3,2) = 4.6 µm
Span = 1.6
Spec. surf. area
0.58 sq.m./cc.

Sample details:-1859 PbLC9-Head PO#82146

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-21

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 PbLC9-Head PO#82146

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-31

Size microns	under	% in band	Size microns	under	% in band
188.0	100.0	0.0	17.7	87.8	8.0
162.0	100.0	0.0	15.3	79.8	9.7
140.0	100.0	0.0	13.2	70.1	9.7
121.0	100.0	0.0	11.4	60.4	8.7
104.0	100.0	0.0	9.8	51.7	6.8
89.9	100.0	0.0	8.5	44.8	6.5
77.5	100.0	0.0	7.3	38.4	6.6
66.9	100.0	0.0	6.3	31.7	6.3
57.7	100.0	0.0	5.4	25.4	5.2
49.8	100.0	0.0	4.7	20.1	4.0
42.9	100.0	0.1	4.1	16.1	3.5
37.1	99.9	0.4	3.5	12.6	3.0
32.0	99.5	0.5	3.0	9.5	2.3
27.6	99.0	1.6	2.6	7.2	1.9
23.8	97.3	3.7	2.2	5.3	1.6
20.5	93.6	5.8	1.9	3.7	1.4

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1871
Volume Conc. = 0.0213 %
Log. Diff. =3.44
Model indp

D(v,0.5) = 9.5 µm
D(v,0.9) = 18.6 µm
D(v,0.1) = 3.1 µm
D(4,3) = 10.4 µm
D(3,2) = 6.3 µm
Span = 1.6
Spec. surf. area
0.34 sq.m./cc.

Sample details:-1859 ZnLC1-Head PO#82146

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-32

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	99.9	0.1

Sample details:-1859 ZnLC1-Head PO#82146

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29-Oct-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 82146					
1859-PbLC8-CL4C	14.87	3.12	34.24	5.61	826
1859-PbLC9-CL4C	12.08	2.09	40.28	4.77	860
1859-PbLC9-CL4T	21.13	1.99	24.64	8.33	769
1859-PbLC9-CL3T	29.43	1.39	10.86	9.42	557
1859-PbLC9-CL2T	33.73	0.62	7.13	8.28	246
1859-PbLC9-ScvgC	37.40	0.27	5.09	7.89	114
1859-PbLC8-ScvgT	38.49	0.13	3.30	4.87	58
1859-PbLC9-ScvgT	37.99	0.11	3.25	5.36	53
PO 82174					
1859-PbLC1-CL4C	8.66	0.30	1.11	57.75	78
1859-PbLC1-ScvgT	43.46	0.11	0.58	0.60	21
1859-PbLC2-CL4C	11.64	0.36	0.97	53.17	69
1859-PbLC2-ScvgT	40.63	0.087	0.56	1.09	19

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	5.93	1.32	4.10	19.22	67
CZN-1	11.27	0.14	7.56	43.81	90
CCU-1d	7.22	0.13	63.02	5.90	354
CPB-2	31.03	23.57	0.27	2.80	128

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-37

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	90.2	7.2
162.0	100.0	0.0	15.3	83.0	9.0
140.0	100.0	0.0	13.2	73.9	9.4
121.0	100.0	0.0	11.4	64.6	8.6
104.0	100.0	0.0	9.8	56.0	6.9
89.9	100.0	0.0	8.5	49.1	6.6
77.5	100.0	0.0	7.3	42.5	6.8
66.9	100.0	0.0	6.3	35.7	6.7
57.7	100.0	0.0	5.4	29.0	5.9
49.8	100.0	0.0	4.7	23.1	4.8
42.9	100.0	0.1	4.1	18.3	4.5
37.1	99.9	0.3	3.5	13.8	4.0
32.0	99.6	0.4	3.0	9.8	2.9
27.6	99.2	1.3	2.6	6.9	2.1
23.8	98.0	2.9	2.2	4.8	1.6
20.5	95.0	4.9	1.9	3.2	1.3

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.1888
Volume Conc. = 0.0208 %
Log. Diff. =3.36
Model indp

D(v,0.5) = 8.6 µm
D(v,0.9) = 17.6 µm
D(v,0.1) = 3.0 µm
D(4,3) = 9.7 µm
D(3,2) = 6.1 µm
Span = 1.7
Spec. surf. area
0.36 sq.m./cc.

Sample details:-1859 ZnLC2-Head PO#82174

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-37

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	99.9	0.1

Sample details:-1859 ZnLC2-Head PO#82174

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-49

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	91.0	7.0
162.0	100.0	0.0	15.3	84.0	8.9
140.0	100.0	0.0	13.2	75.1	9.4
121.0	100.0	0.0	11.4	65.7	8.6
104.0	100.0	0.0	9.8	57.1	6.8
89.9	100.0	0.0	8.5	50.3	6.6
77.5	100.0	0.0	7.3	43.7	6.9
66.9	100.0	0.0	6.3	36.8	6.7
57.7	100.0	0.0	5.4	30.1	5.7
49.8	100.0	0.0	4.7	24.4	4.4
42.9	100.0	0.1	4.1	20.0	4.0
37.1	99.9	0.3	3.5	16.0	3.6
32.0	99.7	0.3	3.0	12.4	2.8
27.6	99.4	1.1	2.6	9.6	2.4
23.8	98.3	2.7	2.2	7.2	2.1
20.5	95.6	4.6	1.9	5.1	1.9

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2249
Volume Conc. = 0.0233 %
Log. Diff. =3.34
Model indp

D(v,0.5) = 8.4 µm
D(v,0.9) = 17.3 µm
D(v,0.1) = 2.7 µm
D(4,3) = 9.5 µm
D(3,2) = 5.6 µm
Span = 1.7
Spec. surf. area
0.37 sq.m./cc.

Sample details:-1859 ZnLC3-Head PO#82190

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 12-49

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 ZnLC3-Head PO#82190

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 13-02

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	91.8	6.9
162.0	100.0	0.0	15.3	84.9	8.6
140.0	100.0	0.0	13.2	76.3	9.1
121.0	100.0	0.0	11.4	67.3	8.3
104.0	100.0	0.0	9.8	59.0	6.5
89.9	100.0	0.0	8.5	52.5	6.7
77.5	100.0	0.0	7.3	45.8	7.3
66.9	100.0	0.0	6.3	38.5	6.9
57.7	100.0	0.0	5.4	31.6	5.8
49.8	100.0	0.0	4.7	25.8	4.6
42.9	100.0	0.0	4.1	21.2	4.4
37.1	100.0	0.1	3.5	16.8	4.1
32.0	99.9	0.1	3.0	12.8	3.0
27.6	99.8	0.8	2.6	9.8	2.5
23.8	99.0	2.5	2.2	7.3	2.1
20.5	96.5	4.7	1.9	5.1	1.9

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2399
Volume Conc. = 0.0245 %
Log. Diff. =3.39
Model indp

D(v,0.5) = 8.0 µm
D(v,0.9) = 17.0 µm
D(v,0.1) = 2.6 µm
D(4,3) = 9.2 µm
D(3,2) = 5.5 µm
Span = 1.8
Spec. surf. area
0.39 sq.m./cc.

Sample details:-1859 ZnLC4-Head PO#82190

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 13-02

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 ZnLC4-Head PO#82190

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 13-12

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	92.2	6.8
162.0	100.0	0.0	15.3	85.5	8.8
140.0	100.0	0.0	13.2	76.6	9.2
121.0	100.0	0.0	11.4	67.4	8.4
104.0	100.0	0.0	9.8	59.0	6.7
89.9	100.0	0.0	8.5	52.4	6.8
77.5	100.0	0.0	7.3	45.5	7.4
66.9	100.0	0.0	6.3	38.1	7.0
57.7	100.0	0.0	5.4	31.1	5.7
49.8	100.0	0.0	4.7	25.4	4.5
42.9	100.0	0.0	4.1	20.9	4.3
37.1	100.0	0.1	3.5	16.7	4.0
32.0	99.9	0.1	3.0	12.6	3.0
27.6	99.7	0.8	2.6	9.6	2.5
23.8	98.9	2.3	2.2	7.1	2.1
20.5	96.6	4.3	1.9	5.0	1.9

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2465
Volume Conc. = 0.0255 %
Log. Diff. =3.24
Model indp

D(v,0.5) = 8.0 µm
D(v,0.9) = 16.8 µm
D(v,0.1) = 2.7 µm
D(4,3) = 9.2 µm
D(3,2) = 5.6 µm
Span = 1.8
Spec. surf. area
0.39 sq.m./cc.

Sample details:-1859 ZnLC5-Head PO#82190

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 13-12

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 ZnLC5-Head PO#82190

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 13-21

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	90.7	7.0
162.0	100.0	0.0	15.3	83.6	9.0
140.0	100.0	0.0	13.2	74.6	9.4
121.0	100.0	0.0	11.4	65.3	8.6
104.0	100.0	0.0	9.8	56.7	7.0
89.9	100.0	0.0	8.5	49.7	6.7
77.5	100.0	0.0	7.3	43.1	6.8
66.9	100.0	0.0	6.3	36.2	6.6
57.7	100.0	0.0	5.4	29.7	5.6
49.8	100.0	0.0	4.7	24.1	4.6
42.9	100.0	0.1	4.1	19.5	4.3
37.1	99.9	0.3	3.5	15.2	3.8
32.0	99.6	0.3	3.0	11.4	2.9
27.6	99.3	1.2	2.6	8.5	2.3
23.8	98.1	2.8	2.2	6.2	1.9
20.5	95.3	4.6	1.9	4.3	1.7

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2340
Volume Conc. = 0.0252 %
Log. Diff. =3.34
Model indp

D(v,0.5) = 8.5 µm
D(v,0.9) = 17.4 µm
D(v,0.1) = 2.8 µm
D(4,3) = 9.6 µm
D(3,2) = 5.8 µm
Span = 1.7
Spec. surf. area
0.36 sq.m./cc.

Sample details:-1859 ZnC6-Head PO#82190

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 13-21

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	99.9	0.1

Sample details:-1859 ZnC6-Head PO#82190

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29-Oct-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 82190					
1859-PbLC3-CL4C	10.57	0.48	2.18	52.71	76
1859-PbLC3-ScvgT	42.61	0.084	0.61	0.69	18
1859-PbLC4-CL4C	9.98	0.41	1.13	54.47	85
1859-PbLC4-ScvgT	43.88	0.12	0.71	0.68	26
1859-PbLC5-CL4C	10.00	0.40	1.03	54.50	87
1859-PbLC5-ScvgT	42.29	0.12	0.66	0.65	26
PO 82203					
1859-PbLC6-CL4C	10.69	0.51	1.09	51.68	94
1859-PbLC6-ScvgT	42.13	0.11	0.66	0.60	21
1859-PbLC7-CL4C	10.39	0.47	1.05	55.50	95
1859-PbLC7-ScvgT	43.85	0.13	0.67	0.62	27
1859-PbLC8-CL4C	10.49	0.46	1.10	54.43	95
1859-PbLC8-CL2T	33.11	0.60	1.04	19.81	72
1859-PbLC8-CL3T	23.63	0.71	1.15	32.39	95
1859-PbLC8-CL4T	19.09	0.75	1.28	40.05	111
1859-PbLC8-ScvgC	39.77	0.41	0.82	6.68	52
1859-PbLC8-ScvgC	43.09	0.13	0.64	0.71	26

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	5.93	1.32	4.10	19.22	67
CZN-1	11.27	0.14	7.56	43.81	90
CCU-1d	7.22	0.13	63.02	5.90	354
CPB-2	31.03	23.57	0.27	2.80	128

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 13-29

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	91.1	6.8
162.0	100.0	0.0	15.3	84.2	8.9
140.0	100.0	0.0	13.2	75.4	9.4
121.0	100.0	0.0	11.4	66.0	8.7
104.0	100.0	0.0	9.8	57.3	7.1
89.9	100.0	0.0	8.5	50.2	6.8
77.5	100.0	0.0	7.3	43.3	7.0
66.9	100.0	0.0	6.3	36.3	6.7
57.7	100.0	0.0	5.4	29.6	5.7
49.8	100.0	0.0	4.7	23.9	4.5
42.9	100.0	0.1	4.1	19.3	4.1
37.1	99.9	0.3	3.5	15.2	3.7
32.0	99.7	0.3	3.0	11.5	2.8
27.6	99.4	1.2	2.6	8.7	2.3
23.8	98.2	2.7	2.2	6.4	1.9
20.5	95.5	4.5	1.9	4.5	1.7

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2478
Volume Conc. = 0.0267 %
Log. Diff. =3.33
Model indp

D(v,0.5) = 8.4 µm
D(v,0.9) = 17.2 µm
D(v,0.1) = 2.8 µm
D(4,3) = 9.5 µm
D(3,2) = 5.7 µm
Span = 1.7
Spec. surf. area
0.37 sq.m./cc.

Sample details:-1859 ZnLC7-Head PO#82203

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 13-29

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 ZnLC7-Head PO#82203

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 13-39

Size microns	% under	% in band	Size microns	% under	% in band
188.0	100.0	0.0	17.7	92.6	6.7
162.0	100.0	0.0	15.3	85.9	8.9
140.0	100.0	0.0	13.2	77.0	9.4
121.0	100.0	0.0	11.4	67.6	8.6
104.0	100.0	0.0	9.8	59.1	6.9
89.9	100.0	0.0	8.5	52.1	7.1
77.5	100.0	0.0	7.3	45.0	7.6
66.9	100.0	0.0	6.3	37.4	7.2
57.7	100.0	0.0	5.4	30.2	5.9
49.8	100.0	0.0	4.7	24.3	4.7
42.9	100.0	0.0	4.1	19.6	4.5
37.1	100.0	0.1	3.5	15.1	4.1
32.0	99.9	0.1	3.0	11.0	2.9
27.6	99.7	0.8	2.6	8.1	2.2
23.8	98.9	2.2	2.2	5.9	1.8
20.5	96.7	4.1	1.9	4.1	1.6

Result source=Sample
Record No. = 0
Focal length = 100 mm.
Experiment type pil
Volume distribution
Beam length = 2.0 mm.
Obscuration =0.2183
Volume Conc. = 0.0231 %
Log. Diff. =3.38
Model indp

D(v,0.5) = 8.1 µm
D(v,0.9) = 16.6 µm
D(v,0.1) = 2.9 µm
D(4,3) = 9.2 µm
D(3,2) = 5.7 µm
Span = 1.7
Spec. surf. area
0.39 sq.m./cc.

Sample details:-1859 ZnLC8-Head PO#82203

Malvern Instruments MASTER Particle Sizer M3.1 Date 24-10-12 Time 13-39

Result source Sample Record No. 0
BS 410:1976, ASTM E11:81

Mesh	Aperture	% under	% in sieve	Mesh	Aperture	% under	% in sieve
10	2000.0 µm	100.0	0.0	60	250.0 µm	100.0	0.0
12	1700.0 µm	100.0	0.0	70	212.0 µm	100.0	0.0
14	1400.0 µm	100.0	0.0	80	180.0 µm	100.0	0.0
16	1180.0 µm	100.0	0.0	100	150.0 µm	100.0	0.0
18	1000.0 µm	100.0	0.0	120	125.0 µm	100.0	0.0
20	850.0 µm	100.0	0.0	140	106.0 µm	100.0	0.0
25	710.0 µm	100.0	0.0	170	90.0 µm	100.0	0.0
30	600.0 µm	100.0	0.0	200	75.0 µm	100.0	0.0
35	500.0 µm	100.0	0.0	230	63.0 µm	100.0	0.0
40	425.0 µm	100.0	0.0	270	53.0 µm	100.0	0.0
45	355.0 µm	100.0	0.0	325	45.0 µm	100.0	0.0
50	300.0 µm	100.0	0.0	400	38.0 µm	100.0	0.0

Sample details:-1859 ZnLC8-Head PO#82203

Quality Analysis ... *Innovative Technologies*

Date Submitted: 16-Oct-12
Invoice No.: A12-11514
Invoice Date: 09-Nov-12
Your Reference:

Research and Productivity Council
921 College Hill Rd.
Fredericton NB E3B 6Z9
Canada

ATTN: P.Eng Leo W.C. Cheung

CERTIFICATE OF ANALYSIS

3 Crushed Rock samples and 6 Pulp samples were submitted for analysis.

The following analytical packages were requested: Code 1G Hg-Cold Vapour FIMS(HGFIMS)
Code 4F-S Infrared
Code UT-4 Total Digestion ICP/MS

REPORT **A12-11514**

Notes:
Values which exceed the upper limit should be assayed for accurate numbers.

CERTIFIED BY :

Emmanuel Eseme , Ph.D.
Quality Control

ISO/IEC 17025
SCC Accredited
LAB 266
LAB 266
Accrédité CCN

ACTIVATION LABORATORIES LTD.

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E-MAIL Ancaster@actlabs.com ACTLABS GROUP WEBSITE www.actlabs.com

Activation Laboratories Ltd. Report: A12-11514

Analyte Symbol	Hg	Total S	Li	Na	Mg	Al	K	Ca	Cd	V	Cr	Mn	Fe	Hf	Ni	Er	Be	Ho	Ag	Cs	Co	Eu	Bi	Se
Unit Symbol	ppb	%	ppm	%	%	%	%	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	5	0.01	0.5	0.01	0.01	0.01	0.01	0.01	0.1	1	0.5	1	0.01	0.1	0.5	0.1	0.1	0.1	0.05	0.05	0.1	0.05	0.02	0.1
Analysis Method	Hg-FIMS	IR	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
1859-CULC7-CL3C	53700	35.9	< 0.5	< 0.01	0.03	0.05	< 0.01	0.14	170	4	73.6	203	24.8	0.1	55.2	0.1	< 0.1	< 0.1	> 100	0.10	66.1	0.10	242	84.2
1859-CULC8-CL3C	45200	36.0	< 0.5	< 0.01	0.02	0.04	< 0.01	0.13	136	3	72.8	179	24.8	0.2	49.2	0.1	< 0.1	< 0.1	> 100	0.10	70.9	0.12	282	82.2
1859-PBLC-HEAD	24000	42.7	0.9	0.01	0.11	0.15	0.03	0.46	103	8	197	534	30.2	0.3	135	0.1	0.2	< 0.1	> 100	0.19	69.6	0.20	151	61.2
1859-PCULC-HEAD	29400	37.9	2.1	0.03	0.27	0.44	0.11	1.21	105	14	515	1070	30.6	0.4	344	0.4	0.4	0.1	> 100	0.39	130	0.43	127	44.0
1859-ZNULC-HEAD	47700	42.8	1.1	0.01	0.13	0.15	0.03	0.64	254	4	270	645	31.3	< 0.1	198	0.1	0.2	< 0.1	46.3	0.19	84.6	0.19	44.2	29.0
1859-HOLE 132	22100	40.4	1.7	0.02	0.27	0.33	0.12	1.18	109	16	18.6	1160	31.7	< 0.1	11.0	0.2	0.2	< 0.1	66.0	0.42	57.7	0.38	25.5	22.5
1859-HOLE 124	18000	44.3	2.7	0.01	0.17	0.23	0.07	0.59	42.1	17	22.5	772	34.8	< 0.1	10.5	0.2	0.2	< 0.1	36.7	0.27	143	0.25	36.6	25.2
1859-HOLE 121	11100	36.0	4.2	0.07	0.61	0.88	0.14	2.36	53.8	51	12.6	1530	32.9	0.7	9.3	0.6	0.5	0.2	43.3	0.44	130	0.65	106	48.2
1859-SQLC1-27-RT	3420	37.6	3.2	0.05	0.43	0.59	0.13	1.56	2.6	25	396	1460	32.4	0.3	320	0.4	0.4	0.2	12.3	0.43	120	0.51	39.6	22.2

Analyte Symbol	Zn	Ga	As	Rb	Y	Sr	Zr	Nb	Mo	In	Sn	Sb	Te	Ba	La	Ce	Pr	Nd	Sm	Gd	Tb	Dy	Cu	Ge
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.2	0.1	0.1	0.2	0.1	0.2	1	0.1	0.1	0.1	1	0.1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
1859-CULC7-CL3C	> 10000	2.4	3170	0.9	1.1	3.1	18	0.1	39.9	77.4	147	> 500	< 0.1	9	< 0.1	1.8	0.2	0.7	0.2	0.2	< 0.1	0.2	> 10000	0.9
1859-CULC8-CL3C	> 10000	2.2	3500	0.7	1.1	2.9	20	0.1	44.2	77.0	158	> 500	< 0.1	9	< 0.1	1.8	0.2	0.8	0.2	0.2	< 0.1	0.2	> 10000	1.0
1859-PBLC-HEAD	> 10000	2.9	4480	2.6	1.1	5.6	17	1.3	40.4	14.7	19	> 500	< 0.1	8	< 0.1	2.4	0.3	1.1	0.2	0.2	< 0.1	0.2	3090	1.5
1859-PCULC-HEAD	> 10000	5.8	6170	8.6	3.2	13.3	32	1.4	92.4	26.8	43	> 500	< 0.1	11	1.0	6.3	0.7	2.8	0.6	0.7	0.1	0.7	> 10000	1.6
1859-ZNULC-HEAD	> 10000	4.8	5990	2.8	1.2	7.5	17	1.2	54.2	39.2	21	> 500	< 0.1	11	1.2	2.8	0.3	1.1	0.2	0.3	< 0.1	0.2	1920	1.5
1859-HOLE 132	> 10000	4.8	5920	9.8	2.2	8.1	20	0.9	13.2	20.1	58	> 500	< 0.1	19	2.2	5.2	0.6	2.1	0.4	0.4	< 0.1	0.4	1220	3.1
1859-HOLE 124	> 10000	4.0	6500	5.6	2.3	5.9	21	1.2	14.3	11.7	30	> 500	< 0.1	21	1.1	3.2	0.4	1.4	0.3	0.3	< 0.1	0.4	1780	2.0
1859-HOLE 121	> 10000	7.4	2850	11.6	6.2	43.2	42	5.0	9.4	4.1	31	> 500	< 0.1	46	4.5	10.1	1.2	5.0	1.1	1.3	0.2	1.2	4860	0.7
1859-SQLC1-27-RT	1630	5.6	4530	10.4	3.9	20.7	28	3.6	78.4	1.7	13	265	< 0.1	34	3.3	7.5	0.8	3.1	0.7	0.8	0.1	0.8	548	0.9

Analyte Symbol	Tm	Yb	Lu	Ta	W	Re	Tl	Pb	Th	U
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.1	0.1	0.1	0.1	0.1	0.001	0.05	0.5	0.1	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
1859-CULC7-CL3C	< 0.1	0.1	< 0.1	< 0.1	0.2	0.027	87.5	> 5000	1.7	2.0
1859-CULC8-CL3C	< 0.1	0.2	< 0.1	< 0.1	0.2	0.033	90.7	> 5000	1.1	2.2
1859-PBLC-HEAD	< 0.1	< 0.1	< 0.1	0.7	2.0	0.011	82.2	> 5000	1.1	2.0
1859-PCULC-HEAD	< 0.1	0.3	< 0.1	0.2	1.4	0.021	56.8	> 5000	1.2	2.8
1859-ZNULC-HEAD	< 0.1	0.1	< 0.1	0.3	2.2	0.013	36.9	> 5000	0.5	2.4
1859-HOLE 132	< 0.1	0.2	< 0.1	0.5	1.7	0.004	63.3	> 5000	1.0	2.8
1859-HOLE 124	< 0.1	0.2	< 0.1	0.4	1.6	0.011	51.2	> 5000	0.5	1.5
1859-HOLE 121	< 0.1	0.5	< 0.1	0.7	1.6	0.004	30.2	> 5000	1.0	2.4
1859-SQLC1-27-RT	< 0.1	0.3	< 0.1	0.5	3.3	0.009	41.5	2930	0.9	2.0

Quality Control

Analyte Symbol	Hg	Total S	Li	Na	Mg	Al	K	Ca	Cd	V	Cr	Mn	Fe	Hf	Ni	Er	Be	Ho	Ag	Cs	Co	Eu	Bi	Se
Unit Symbol	ppb	%	ppm	%	%	%	%	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	5	0.01	0.5	0.01	0.01	0.01	0.01	0.01	0.1	1	0.5	1	0.01	0.1	0.5	0.1	0.1	0.1	0.05	0.05	0.1	0.05	0.02	0.1
Analysis Method	Hg-FIMS	IR	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
GXR-1 Meas	3780		8.5	0.04	0.19	1.84	0.04	0.78	2.1	73	16.7	712	21.9	< 0.1	33.4		1.0		27.9	2.48	7.3	0.62	1460	16.3
GXR-1 Cert	3900		8.20	0.0520	0.217	3.52	0.050	0.960	3.30	80.0	12.0	852	23.6	0.960	41.0		1.22		31.0	3.00	8.20	0.690	1380	16.6
GXR-4 Meas	111		12.9	0.50	1.57	5.60	2.68	0.93	0.1	78	33.1	119	2.68	0.9	35.1		2.4		2.56	2.39	13.1	1.37	16.0	5.8
GXR-4 Cert	110		11.1	0.564	1.66	7.20	4.01	1.01	0.860	87.0	64.0	155	3.09	6.30	42.0		1.90		4.00	2.80	14.6	1.63	19.0	5.60
SDC-1 Meas			43.2	1.63	1.02	7.59	0.59	0.99	< 0.1	71	59.0	773	4.45	1.0	32.0	3.8	3.6	1.3	< 0.05	3.56	17.2	1.60	0.23	
SDC-1 Cert			34.00	1.52	1.02	8.34	2.72	1.00	0.0800	102.00	64.00	880.00	4.82	8.30	38.0	4.10	3.00	1.50	0.0410	4.00	18.0	1.70	2.60	
SCO-1 Meas			52.6	0.69	1.53	6.36	0.60	1.76	0.1	118	47.2	332	3.20		24.7		2.2		< 0.05	6.97	10.7		0.32	
SCO-1 Cert			45	0.670	1.64	7.24	2.30	1.87	0.140	130	68.0	410	3.59		27		1.80		0.134	7.80	11.00		0.37	
GXR-6 Meas	66		45.9	0.11	0.62	> 10.0	0.68	0.18	< 0.1	169	59.5	905	5.19	2.1	23.3		1.6		0.19	3.73	13.6	0.62	0.15	1.1
GXR-6 Cert	68.0		32.0	0.104	0.609	17.7	1.87	0.180	1.00	186	96.0	1010	5.58	4.30	27.0		1.40		1.30	4.20	13.8	0.760	0.290	0.940
LKSD-4 Meas		0.92																						
LKSD-4 Cert		0.990																						
BaSO4 Meas		13.6																						
BaSO4 Cert		14.0																						
SAR-M (U.S.G.S.) Meas			36.4	1.29	0.48	5.66	0.81	0.57	4.3	63	69.0	4530	3.04		39.1		3.4		2.09	4.51	10.5		1.69	0.7
SAR-M (U.S.G.S.) Cert			27.4	1.140	0.50	6.30	2.94	0.61	5.27	67.20	79.7	5220	2.99		41.50		2.20		3.64	5.15	10.70		1.94	0.39
DNC-1a Meas			5.8							140	160				250						56.5	0.62		
DNC-1a Cert			5.20							148.0	270				247						57.0	0.59		
1859-PBLC-HEAD Orig	24500																							
1859-PBLC-HEAD Dup	23500																							
1859-SQLC1-27-RT Orig			3.1	0.06	0.44	0.59	0.13	1.57	2.6	27	397	1470	31.7	0.3	314	0.4	0.4	0.2	12.3	0.43	116	0.52	40.8	21.3
1859-SQLC1-27-RT Dup			3.2	0.05	0.43	0.58	0.13	1.55	2.6	23	394	1460	33.2	0.3	326	0.4	0.4	0.2	12.4	0.43	124	0.49	38.5	23.1
Method Blank		< 0.01																						
Method Blank			< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.1	< 1	< 0.5	< 1	< 0.01	< 0.1	< 0.5	< 0.1	< 0.1	< 0.1	< 0.05	< 0.05	< 0.1	< 0.05	< 0.02	< 0.1
Method Blank	< 5																							
Method Blank	< 5																							

Quality Control

Analyte Symbol	Zn	Ga	As	Rb	Y	Sr	Zr	Nb	Mo	In	Sn	Sb	Te	Ba	La	Ce	Pr	Nd	Sm	Gd	Tb	Dy	Cu	Ge
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.2	0.1	0.1	0.2	0.1	0.2	1	0.1	0.1	0.1	1	0.1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
GXR-1 Meas	738	6.0	383	2.7	28.8	278	11	0.9	15.9	0.7	29	54.2	10.2	641	6.7	12.7		7.4	2.5	4.0	0.8	5.1	990	
GXR-1 Cert	760	13.8	427	14.0	32.0	275	38.0	0.800	18.0	0.770	54.0	122	13.0	750	7.50	17.0		18.0	2.70	4.20	0.830	4.30	1110	
GXR-4 Meas	67.7	12.0	91.3	133	13.5	207	38	8.3	278	0.2	6	4.3	0.6	476	52.3	94.6		35.7	5.7	4.6	0.6	2.9	5460	
GXR-4 Cert	73.0	20.0	98.0	160	14.0	221	186	10.0	310	0.270	5.60	4.80	0.970	1640	64.5	102		45.0	6.60	5.25	0.360	2.60	6520	
SDC-1 Meas	105	19.5	0.9	43.7	34.4	174	47	8.1	0.2		1	0.3		621	38.0	80.0		37.9	7.5	6.8	1.1	6.5	27.5	
SDC-1 Cert	103.00	21.00	0.220	127.00	40.0	180.00	290.00	21.00	0.250		3.00	0.54		630	42.00	93.00		40.00	8.20	7.00	1.20	6.70	30.00	
SCO-1 Meas	99.0	11.7	11.4	38.5	19.4	160	93	7.0	1.0		2	1.7		591	27.0	49.7	6.0	22.1					25.9	
SCO-1 Cert	100	15	12.00	110.0	26	170	160	11	1.4		3.7	2.50		570	30.0	62.00	6.6	26.0					29	
GXR-6 Meas	135	24.0	294	46.0	13.9	42.3	92	3.9	2.1	< 0.1	1	1.7	< 0.1	1390	12.4	32.9		12.0	2.4	2.2	0.4	2.6	65.8	
GXR-6 Cert	118	35.0	330	90.0	14.0	35.0	110	7.50	2.40	0.260	1.70	3.60	0.0180	1300	13.9	36.0		13.0	2.67	2.97	0.415	2.80	66.0	
LKSD-4 Meas																								
LKSD-4 Cert																								
BaSO4 Meas																								
BaSO4 Cert																								
SAR-M (U.S.G.S.) Meas	933	12.8	37.6	50.1	35.2	154		30.8	11.3	0.9	3	7.2	0.7	830	53.3	107							320	
SAR-M (U.S.G.S.) Cert	930.0	16.8	38.8	146.0	28.00	151.0		29.90	13.10	1.08	2.76	6.00	0.96	801	57.4	122.00							331	
DNC-1a Meas	65.3				17.0	140	35					0.9		110	3.5			4.4					90.5	
DNC-1a Cert	70.0				18.0	144.0	38					0.96		118	3.6			5.20					100.0	
1859-PBLC-HEAD Orig																								
1859-PBLC-HEAD Dup																								
1859-SQLC1-27-RT Orig	1610	5.7	4450	10.2	3.8	20.6	28	3.7	77.4	1.7	16	263	< 0.1	35	3.2	7.3	0.8	3.2	0.7	0.8	0.1	0.8	532	0.9
1859-SQLC1-27-RT Dup	1660	5.5	4610	10.6	3.9	20.8	28	3.5	79.4	1.8	10	267	< 0.1	33	3.4	7.6	0.8	3.0	0.7	0.8	0.1	0.8	563	0.9
Method Blank																								
Method Blank	< 0.2	< 0.1	< 0.1	< 0.2	< 0.1	< 0.2	< 1	< 0.1	< 0.1	< 0.1	< 1	< 0.1	< 0.1	< 1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
Method Blank																								
Method Blank																								

Quality Control

Analyte Symbol	Tm	Yb	Lu	Ta	W	Re	Tl	Pb	Th	U
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.1	0.1	0.1	0.1	0.1	0.001	0.05	0.5	0.1	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
GXR-1 Meas	0.4	1.9	0.3	0.3	145		0.41	809	3.8	30.9
GXR-1 Cert	0.430	1.90	0.280	0.175	164		0.390	730	2.44	34.9
GXR-4 Meas	0.2	0.8	0.1	0.9	31.8		3.15	47.4	15.4	5.0
GXR-4 Cert	0.210	1.60	0.170	0.790	30.8		3.20	52.0	22.5	6.20
SDC-1 Meas	0.6	3.0		0.9	0.3		0.67	25.2	11.8	2.5
SDC-1 Cert	0.65	4.00		1.20	0.800		0.70	25.00	12.00	3.10
SCO-1 Meas					0.9			29.4	8.8	
SCO-1 Cert					1.4			31.0	9.70	
GXR-6 Meas	0.3	1.5	0.2	0.3	0.6		2.36	100	6.0	1.3
GXR-6 Cert	0.0320	2.40	0.330	0.485	1.90		2.20	101	5.30	1.54
LKSD-4 Meas										
LKSD-4 Cert										
BaSO4 Meas										
BaSO4 Cert										
SAR-M (U.S.G.S.) Meas					10.6		3.08	1090	18.5	4.0
SAR-M (U.S.G.S.) Cert					9.78		2.88	982	17.2	3.57
DNC-1a Meas		1.8								
DNC-1a Cert		2.0								
1859-PBLC-HEAD Orig										
1859-PBLC-HEAD Dup										
1859-SQLC1-27-RT Orig	< 0.1	0.3	< 0.1	0.6	3.4	0.010	42.2	3040	0.9	2.1
1859-SQLC1-27-RT Dup	< 0.1	0.3	< 0.1	0.4	3.2	0.009	40.8	2810	0.9	2.0
Method Blank										
Method Blank	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.001	< 0.05	< 0.5	< 0.1	< 0.1
Method Blank										
Method Blank										

Quality Analysis ... *Innovative Technologies*

Date Submitted: 18-Oct-12
Invoice No.: A12-11581
Invoice Date: 05-Nov-12
Your Reference:

Research and Productivity Council
921 College Hill Rd.
Fredericton NB E3B 6Z9
Canada

ATTN: P.Eng Leo W.C. Cheung

CERTIFICATE OF ANALYSIS

2 Pulp samples were submitted for analysis.

The following analytical packages were requested: Code 1G Hg-Cold Vapour FIMS(HGFIMS)
Code 4F-S Infrared
Code UT-4 Total Digestion ICP/MS

REPORT **A12-11581**

Notes:
Values which exceed the upper limit should be assayed for accurate numbers.

CERTIFIED BY :

Emmanuel Eseme , Ph.D.
Quality Control

ISO/IEC 17025
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LAB 266
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Accrédité CCN

ACTIVATION LABORATORIES LTD.

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E-MAIL Ancaster@actlabs.com ACTLABS GROUP WEBSITE www.actlabs.com

Analyte Symbol	Hg	Total S	Li	Na	Mg	Al	K	Ca	Cd	V	Cr	Mn	Fe	Hf	Ni	Er	Be	Ho	Ag	Cs	Co	Eu	Bi	Se
Unit Symbol	ppb	%	ppm	%	%	%	%	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	5	0.01	0.5	0.01	0.01	0.01	0.01	0.01	0.1	1	0.5	1	0.01	0.1	0.5	0.1	0.1	0.1	0.05	0.05	0.1	0.05	0.02	0.1
Analysis Method	Hg-FIMS	IR	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
1859-CUSCVGT1-8	24600	36.3	2.3	0.04	0.27	0.48	0.13	1.04	77.1	31	576	1110	27.7	1.1	374	0.4	0.2	0.1	> 100	0.42	114	0.39	75.7	30.7
1859-BLEND FEED (75MIN)	17000	39.6	1.7	0.02	0.27	0.36	0.09	0.91	53.2	17	333	1040	27.6	0.5	237	0.3	0.2	< 0.1	44.4	0.33	89.3	0.36	45.5	27.9

Analyte Symbol	Zn	Ga	As	Rb	Y	Sr	Zr	Nb	Mo	In	Sn	Sb	Te	Ba	La	Ce	Pr	Nd	Sm	Gd	Tb	Dy	Cu	Ge
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.2	0.1	0.1	0.2	0.1	0.2	1	0.1	0.1	0.1	1	0.1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
1859-CUSCVGT1-8	> 10000	5.9	5960	10.6	3.5	17.9	40	2.7	91.7	17.2	41	> 500	< 0.1	27	2.4	7.2	0.8	3.0	0.6	0.6	0.1	0.6	6910	1.7
1859-BLEND FEED (75MIN)	> 10000	4.9	4420	7.8	3.0	14.9	26	2.5	67.1	11.8	18	> 500	< 0.1	25	2.5	5.9	0.7	2.6	0.6	0.5	< 0.1	0.5	2340	1.1

Analyte Symbol	Tm	Yb	Lu	Ta	W	Re	Tl	Pb	Th	U
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.1	0.1	0.1	0.1	0.1	0.001	0.05	0.5	0.1	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
1859-CUSCVGT1-8	< 0.1	0.3	< 0.1	< 0.1	0.5	0.016	47.7	> 5000	3.8	2.7
1859-BLEND FEED (75MIN)	< 0.1	0.3	< 0.1	< 0.1	2.8	0.016	45.0	> 5000	0.6	2.0

Quality Control

Analyte Symbol	Hg	Total S	Li	Na	Mg	Al	K	Ca	Cd	V	Cr	Mn	Fe	Hf	Ni	Er	Be	Ho	Ag	Cs	Co	Eu	Bi	Se
Unit Symbol	ppb	%	ppm	%	%	%	%	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	5	0.01	0.5	0.01	0.01	0.01	0.01	0.01	0.1	1	0.5	1	0.01	0.1	0.5	0.1	0.1	0.1	0.05	0.05	0.1	0.05	0.02	0.1
Analysis Method	Hg-FIMS	IR	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
GXR-1 Meas	3590		9.5	0.05	0.25	3.23	0.05	0.82	2.3	75	17.1	747	21.7	0.4	34.1		0.9		29.7	2.78	7.3	0.62	1500	14.7
GXR-1 Cert	3900		8.20	0.0520	0.217	3.52	0.050	0.960	3.30	80.0	12.0	852	23.6	0.960	41.0		1.22		31.0	3.00	8.20	0.690	1380	16.6
GXR-1 Meas	3750																							
GXR-1 Cert	3900																							
GXR-4 Meas	103		10.7	0.52	1.82	6.14	2.83	1.01	0.2	92	41.3	121	2.84	1.1	36.1		1.9		2.98	2.55	14.2	1.51	19.2	5.8
GXR-4 Cert	110		11.1	0.564	1.66	7.20	4.01	1.01	0.860	87.0	64.0	155	3.09	6.30	42.0		1.90		4.00	2.80	14.6	1.63	19.0	5.60
GXR-4 Meas	97																							
GXR-4 Cert	110																							
SDC-1 Meas			28.7	1.27	0.90	6.51	1.68	0.95	< 0.1	87	61.3	771	4.32	2.0	29.8	3.5	2.5	1.2	0.53	3.99	17.1	1.63	0.38	
SDC-1 Cert			34.00	1.52	1.02	8.34	2.72	1.00	0.0800	102.00	64.00	880.00	4.82	8.30	38.0	4.10	3.00	1.50	0.0410	4.00	18.0	1.70	2.60	
SCO-1 Meas			45.0	0.59	1.46	6.13	1.81	1.87	0.2	128	54.1	324	3.46		25.8		1.8		0.23	7.41	11.5		0.40	
SCO-1 Cert			45	0.670	1.64	7.24	2.30	1.87	0.140	130	68.0	410	3.59		27		1.80		0.134	7.80	11.00		0.37	
GXR-6 Meas	81		36.3	0.09	0.65	> 10.0	1.89	0.17	0.1	129	57.7	976	5.53	1.9	22.9		1.2		0.40	4.23	13.9	0.68	0.22	0.8
GXR-6 Cert	68.0		32.0	0.104	0.609	17.7	1.87	0.180	1.00	186	96.0	1010	5.58	4.30	27.0		1.40		1.30	4.20	13.8	0.760	0.290	0.940
GXR-6 Meas	64																							
GXR-6 Cert	68.0																							
SAR-M (U.S.G.S.) Meas			32.8	1.20	0.50	5.49	2.22	0.64	4.2	62	86.0	3980	3.16		42.4		3.1		2.29	4.75	10.4		1.52	1.5
SAR-M (U.S.G.S.) Cert			27.4	1.140	0.50	6.30	2.94	0.61	5.27	67.20	79.7	5220	2.99		41.50		2.20		3.64	5.15	10.70		1.94	0.39
DNC-1a Meas			4.4							141	239				252						57.8	0.61		
DNC-1a Cert			5.20							148.0	270				247						57.0	0.59		
OREAS 13b (4-Acid) Meas		1.16																						
OREAS 13b (4-Acid) Cert		1.20																						
OREAS 13b (4-Acid) Meas		1.17																						
OREAS 13b (4-Acid) Cert		1.20																						
Method Blank			< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.1	< 1	< 0.5	< 1	< 0.01	< 0.1	< 0.5	< 0.1	< 0.1	< 0.1	< 0.05	< 0.05	< 0.1	< 0.05	< 0.02	< 0.1
Method Blank	< 5																							
Method Blank	< 5																							

Quality Control

Analyte Symbol	Zn	Ga	As	Rb	Y	Sr	Zr	Nb	Mo	In	Sn	Sb	Te	Ba	La	Ce	Pr	Nd	Sm	Gd	Tb	Dy	Cu	Ge
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.2	0.1	0.1	0.2	0.1	0.2	1	0.1	0.1	0.1	1	0.1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
GXR-1 Meas	707	13.4	385	3.0	28.2	276	27	1.0	16.4	0.8	29	45.4	9.4	983	7.3	14.2		7.9	2.6	3.8	0.7	4.6	941	
GXR-1 Cert	760	13.8	427	14.0	32.0	275	38.0	0.800	18.0	0.770	54.0	122	13.0	750	7.50	17.0		18.0	2.70	4.20	0.830	4.30	1110	
GXR-1 Meas																								
GXR-1 Cert																								
GXR-4 Meas	73.7	20.2	98.4	128	14.4	225	46	8.6	305	0.2	7	4.8	0.8	1290	61.5	108		41.1	6.1	4.7	0.6	2.8	6020	
GXR-4 Cert	73.0	20.0	98.0	160	14.0	221	186	10.0	310	0.270	5.60	4.80	0.970	1640	64.5	102		45.0	6.60	5.25	0.360	2.60	6520	
GXR-4 Meas																								
GXR-4 Cert																								
SDC-1 Meas	99.2	22.4	2.2	106	33.0	170	60	12.2	0.2		2	0.5		630	39.9	85.5		39.0	7.4	7.0	1.1	6.3	28.8	
SDC-1 Cert	103.00	21.00	0.220	127.00	40.0	180.00	290.00	21.00	0.250		3.00	0.54		630	42.00	93.00		40.00	8.20	7.00	1.20	6.70	30.00	
SCO-1 Meas	100	15.5	13.3	105	20.5	165	77	8.3	1.1		3	2.5		563	28.5	53.5	6.5	23.8					27.3	
SCO-1 Cert	100	15	12.00	110.0	26	170	160	11	1.4		3.7	2.50		570	30.0	62.00	6.6	26.0					29	
GXR-6 Meas	129	28.2	252	84.6	13.3	35.9	70	1.0	0.9	< 0.1	< 1	1.1	< 0.1	1220	13.0	34.4		12.5	2.6	2.6	0.4	2.5	64.5	
GXR-6 Cert	118	35.0	330	90.0	14.0	35.0	110	7.50	2.40	0.260	1.70	3.60	0.0180	1300	13.9	36.0		13.0	2.67	2.97	0.415	2.80	66.0	
GXR-6 Meas																								
GXR-6 Cert																								
SAR-M (U.S.G.S.) Meas	822	19.7	34.4	122	40.0	151		23.6	9.0	0.9	3	5.6	0.7	782	62.0	124							296	
SAR-M (U.S.G.S.) Cert	930.0	16.8	38.8	146.0	28.00	151.0		29.90	13.10	1.08	2.76	6.00	0.96	801	57.4	122.00							331	
DNC-1a Meas	66.3				17.3	141	36					0.9		109	3.8			4.6					94.0	
DNC-1a Cert	70.0				18.0	144.0	38					0.96		118	3.6			5.20					100.0	
OREAS 13b (4-Acid) Meas																								
OREAS 13b (4-Acid) Cert																								
OREAS 13b (4-Acid) Meas																								
OREAS 13b (4-Acid) Cert																								
Method Blank	< 0.2	< 0.1	< 0.1	< 0.2	< 0.1	< 0.2	< 1	< 0.1	< 0.1	< 0.1	< 1	< 0.1	< 0.1	< 1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1
Method Blank																								
Method Blank																								

Quality Control

Analyte Symbol	Tm	Yb	Lu	Ta	W	Re	Tl	Pb	Th	U
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.1	0.1	0.1	0.1	0.1	0.001	0.05	0.5	0.1	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
GXR-1 Meas	0.3	2.1	0.3	< 0.1	152		0.43	680	2.9	30.0
GXR-1 Cert	0.430	1.90	0.280	0.175	164		0.390	730	2.44	34.9
GXR-1 Meas										
GXR-1 Cert										
GXR-4 Meas	0.2	1.0	0.1	0.5	33.6		3.48	47.5	20.0	5.4
GXR-4 Cert	0.210	1.60	0.170	0.790	30.8		3.20	52.0	22.5	6.20
GXR-4 Meas										
GXR-4 Cert										
SDC-1 Meas	0.5	3.2		0.7	< 0.1		0.72	23.8	13.3	2.7
SDC-1 Cert	0.65	4.00		1.20	0.800		0.70	25.00	12.00	3.10
SCO-1 Meas					< 0.1			28.4	7.8	
SCO-1 Cert					1.4			31.0	9.70	
GXR-6 Meas	0.3	1.6	0.3	< 0.1	0.4		2.44	97.6	5.9	1.4
GXR-6 Cert	0.0320	2.40	0.330	0.485	1.90		2.20	101	5.30	1.54
GXR-6 Meas										
GXR-6 Cert										
SAR-M (U.S.G.S.) Meas					5.2		3.05	830	16.8	4.2
SAR-M (U.S.G.S.) Cert					9.78		2.88	982	17.2	3.57
DNC-1a Meas		1.8								
DNC-1a Cert		2.0								
OREAS 13b (4-Acid) Meas										
OREAS 13b (4-Acid) Cert										
OREAS 13b (4-Acid) Meas										
OREAS 13b (4-Acid) Cert										
Method Blank	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.001	< 0.05	< 0.5	< 0.1	< 0.1
Method Blank										
Method Blank										

Quality Analysis ... *Innovative Technologies*

Date Submitted: 19-Oct-12
Invoice No.: A12-11663
Invoice Date: 05-Nov-12
Your Reference:

Research and Productivity Council
921 College Hill Rd.
Fredericton NB E3B 6Z9
Canada

ATTN: P.Eng Leo W.C. Cheung

CERTIFICATE OF ANALYSIS

2 Pulp samples were submitted for analysis.

The following analytical packages were requested: Code 1G Hg-Cold Vapour FIMS(HGFIMS)
Code 4F-S Infrared
Code UT-4 Total Digestion ICP/MS

REPORT **A12-11663**

Notes:
Values which exceed the upper limit should be assayed for accurate numbers.

CERTIFIED BY :

Emmanuel Eseme , Ph.D.
Quality Control

ISO/IEC 17025
SCC Accredited
LAB 266
LAB 266
Accrédité CCN

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Analyte Symbol	Hg	Total S	Li	Na	Mg	Al	K	Ca	Cd	V	Cr	Mn	Fe	Hf	Ni	Er	Be	Ho	Ag	Cs	Co	Eu	Bi	Se
Unit Symbol	ppb	%	ppm	%	%	%	%	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	5	0.01	0.5	0.01	0.01	0.01	0.01	0.01	0.1	1	0.5	1	0.01	0.1	0.5	0.1	0.1	0.1	0.05	0.05	0.1	0.05	0.02	0.1
Analysis Method	Hg-FIMS	IR	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
1859-PBLC8-CL4C	39100	25.4	< 0.5	< 0.01	0.03	0.06	0.01	0.26	122	3	45.2	214	12.3	0.2	32.2	< 0.1	< 0.1	< 0.1	> 100	0.08	22.8	0.07	702	281
1859-PBLC9-CL4C	33300	23.9	< 0.5	< 0.01	0.01	0.04	< 0.01	0.16	101	1	27.5	114	9.44	0.1	19.4	< 0.1	0.1	< 0.1	> 100	0.05	15.8	< 0.05	800	320

Analyte Symbol	Zn	Ga	As	Rb	Y	Sr	Zr	Nb	Mo	In	Sn	Sb	Te	Ba	La	Ce	Pr	Nd	Sm	Gd	Tb	Dy	Cu	Ge
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.2	0.1	0.1	0.2	0.1	0.2	1	0.1	0.1	0.1	1	0.1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
1859-PBLC8-CL4C	> 10000	1.9	2240	0.8	0.4	5.6	7	< 0.1	15.6	22.8	50	> 500	0.1	1	< 0.1	0.8	< 0.1	0.4	< 0.1	< 0.1	< 0.1	< 0.1	> 10000	1.2
1859-PBLC9-CL4C	> 10000	1.2	1920	0.4	0.3	5.9	5	< 0.1	19.2	16.6	42	> 500	< 0.1	2	< 0.1	0.5	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	> 10000	1.4

Analyte Symbol	Tm	Yb	Lu	Ta	W	Re	Tl	Pb	Th	U
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.1	0.1	0.1	0.1	0.1	0.001	0.05	0.5	0.1	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
1859-PBLC8-CL4C	< 0.1	< 0.1	< 0.1	< 0.1	0.2	0.017	336	> 5000	0.8	1.5
1859-PBLC9-CL4C	< 0.1	< 0.1	< 0.1	< 0.1	0.1	0.018	375	> 5000	0.3	1.2

Quality Control

Analyte Symbol	Hg	Total S	Li	Na	Mg	Al	K	Ca	Cd	V	Cr	Mn	Fe	Hf	Ni	Er	Be	Ho	Ag	Cs	Co	Eu	Bi	Se
Unit Symbol	ppb	%	ppm	%	%	%	%	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	5	0.01	0.5	0.01	0.01	0.01	0.01	0.01	0.1	1	0.5	1	0.01	0.1	0.5	0.1	0.1	0.1	0.05	0.05	0.1	0.05	0.02	0.1
Analysis Method	Hg-FIMS	IR	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
GXR-1 Meas	3660		6.3	0.04	0.19	1.68	0.04	0.79	2.4	86	13.8	766	23.0	0.3	35.6		0.9		33.3	2.51	7.5	0.59	1550	16.1
GXR-1 Cert	3900		8.20	0.0520	0.217	3.52	0.050	0.960	3.30	80.0	12.0	852	23.6	0.960	41.0		1.22		31.0	3.00	8.20	0.690	1380	16.6
GXR-1 Meas	3810																							
GXR-1 Cert	3900																							
GXR-4 Meas	100		11.8	0.50	1.75	6.42	3.74	1.13	0.2	89	36.3	131	3.04	1.2	41.4		2.0		3.15	2.47	15.0	1.39	17.5	6.1
GXR-4 Cert	110		11.1	0.564	1.66	7.20	4.01	1.01	0.860	87.0	64.0	155	3.09	6.30	42.0		1.90		4.00	2.80	14.6	1.63	19.0	5.60
GXR-4 Meas	109																							
GXR-4 Cert	110																							
SDC-1 Meas			35.3	1.31	0.94	7.36	1.44	1.06	< 0.1	33	42.2	770	4.57	0.8	31.8	3.4	2.8	1.2	0.79	3.81	17.7	1.62	0.86	
SDC-1 Cert			34.00	1.52	1.02	8.34	2.72	1.00	0.0800	102.00	64.00	880.00	4.82	8.30	38.0	4.10	3.00	1.50	0.0410	4.00	18.0	1.70	2.60	
SCO-1 Meas			47.4	0.67	1.39	4.09	1.57	1.81	0.2	132	62.6	347	3.12		25.2		1.9		0.22	6.10	11.0		0.52	
SCO-1 Cert			45	0.670	1.64	7.24	2.30	1.87	0.140	130	68.0	410	3.59		27		1.80		0.134	7.80	11.00		0.37	
GXR-6 Meas	61		37.1	0.10	0.69	> 10.0	1.38	0.19	0.1	193	66.2	970	5.31	2.7	21.4		1.1		0.31	3.88	12.9	0.65	0.29	1.1
GXR-6 Cert	68.0		32.0	0.104	0.609	17.7	1.87	0.180	1.00	186	96.0	1010	5.58	4.30	27.0		1.40		1.30	4.20	13.8	0.760	0.290	0.940
GXR-6 Meas	66																							
GXR-6 Cert	68.0																							
LKSD-4 Meas		1.04																						
LKSD-4 Cert		0.990																						
BaSO4 Meas		14.7																						
BaSO4 Cert		14.0																						
SAR-M (U.S.G.S.) Meas			32.6	1.27	0.56	6.64	1.91	0.65	4.8	69	82.6	5030	3.36		40.2		2.7		2.45	4.84	11.5		1.84	1.2
SAR-M (U.S.G.S.) Cert			27.4	1.140	0.50	6.30	2.94	0.61	5.27	67.20	79.7	5220	2.99		41.50		2.20		3.64	5.15	10.70		1.94	0.39
DNC-1a Meas			5.5							159	170				264						60.1	0.58		
DNC-1a Cert			5.20							148.0	270				247						57.0	0.59		
OREAS 13b (4-Acid) Meas		1.21																						
OREAS 13b (4-Acid) Cert		1.20																						
OREAS 13b (4-Acid) Meas		1.30																						
OREAS 13b (4-Acid) Cert		1.20																						
Method Blank		< 0.01																						
Method Blank	< 5																							
Method Blank	< 5																							
Method Blank			< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.1	< 1	< 0.5	< 1	< 0.01	< 0.1	< 0.5	< 0.1	< 0.1	< 0.1	< 0.05	< 0.05	< 0.1	< 0.05	< 0.02	< 0.1

Quality Control

Analyte Symbol	Zn	Ga	As	Rb	Y	Sr	Zr	Nb	Mo	In	Sn	Sb	Te	Ba	La	Ce	Pr	Nd	Sm	Gd	Tb	Dy	Cu	Ge
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.2	0.1	0.1	0.2	0.1	0.2	1	0.1	0.1	0.1	1	0.1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
GXR-1 Meas	768	13.1	412	2.6	30.5	285	18	0.7	17.2	0.8	28	33.3	9.3	625	7.2	14.0		7.9	2.6	3.9	0.7	4.5	1070	
GXR-1 Cert	760	13.8	427	14.0	32.0	275	38.0	0.800	18.0	0.770	54.0	122	13.0	750	7.50	17.0		18.0	2.70	4.20	0.830	4.30	1110	
GXR-1 Meas																								
GXR-1 Cert																								
GXR-4 Meas	71.4	17.3	97.0	139	13.8	209	40	8.5	296	0.2	6	4.4	0.9	171	54.8	99.9		36.6	5.6	4.4	0.5	2.7	6150	
GXR-4 Cert	73.0	20.0	98.0	160	14.0	221	186	10.0	310	0.270	5.60	4.80	0.970	1640	64.5	102		45.0	6.60	5.25	0.360	2.60	6520	
GXR-4 Meas																								
GXR-4 Cert																								
SDC-1 Meas	96.5	19.0	1.1	70.2	32.2	164	27	0.8	< 0.1		< 1	0.3		652	39.4	81.4		36.6	7.1	7.1	1.1	6.3	27.0	
SDC-1 Cert	103.00	21.00	0.220	127.00	40.0	180.00	290.00	21.00	0.250		3.00	0.54		630	42.00	93.00		40.00	8.20	7.00	1.20	6.70	30.00	
SCO-1 Meas	100	16.1	11.4	49.7	12.7	144	91	9.4	1.1		3	2.6		525	14.7	30.2	3.9	14.4					27.2	
SCO-1 Cert	100	15	12.00	110.0	26	170	160	11	1.4		3.7	2.50		570	30.0	62.00	6.6	26.0					29	
GXR-6 Meas	122	30.4	290	64.4	12.0	35.6	94	4.6	2.0	< 0.1	1	2.9	0.2	1240	12.0	31.4		11.6	2.4	2.3	0.4	2.3	60.7	
GXR-6 Cert	118	35.0	330	90.0	14.0	35.0	110	7.50	2.40	0.260	1.70	3.60	0.0180	1300	13.9	36.0		13.0	2.67	2.97	0.415	2.80	66.0	
GXR-6 Meas																								
GXR-6 Cert																								
LKSD-4 Meas																								
LKSD-4 Cert																								
BaSO4 Meas																								
BaSO4 Cert																								
SAR-M (U.S.G.S.) Meas	922	17.3	38.4	94.7	34.1	149		18.8	11.7	1.0	3	5.1	0.8	798	57.2	111							314	
SAR-M (U.S.G.S.) Cert	930.0	16.8	38.8	146.0	28.00	151.0		29.90	13.10	1.08	2.76	6.00	0.96	801	57.4	122.00							331	
DNC-1a Meas	67.5				17.1	143	40					1.0		108	3.6			4.5					94.7	
DNC-1a Cert	70.0				18.0	144.0	38					0.96		118	3.6			5.20					100.0	
OREAS 13b (4-Acid) Meas																								
OREAS 13b (4-Acid) Cert																								
OREAS 13b (4-Acid) Meas																								
OREAS 13b (4-Acid) Cert																								
Method Blank																								
Method Blank																								
Method Blank																								
Method Blank	< 0.2	< 0.1	< 0.1	< 0.2	< 0.1	< 0.2	< 1	< 0.1	< 0.1	< 0.1	< 1	< 0.1	< 0.1	< 1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1

Quality Control

Analyte Symbol	Tm	Yb	Lu	Ta	W	Re	Tl	Pb	Th	U
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.1	0.1	0.1	0.1	0.1	0.001	0.05	0.5	0.1	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
GXR-1 Meas	0.4	2.1	0.3	< 0.1	127		0.44	722	3.5	29.6
GXR-1 Cert	0.430	1.90	0.280	0.175	164		0.390	730	2.44	34.9
GXR-1 Meas										
GXR-1 Cert										
GXR-4 Meas	0.2	0.9	0.1	0.5	33.0		3.15	42.4	16.5	5.1
GXR-4 Cert	0.210	1.60	0.170	0.790	30.8		3.20	52.0	22.5	6.20
GXR-4 Meas										
GXR-4 Cert										
SDC-1 Meas	0.5	3.1		< 0.1	< 0.1		0.72	23.3	12.2	2.7
SDC-1 Cert	0.65	4.00		1.20	0.800		0.70	25.00	12.00	3.10
SCO-1 Meas					1.6			29.1	4.6	
SCO-1 Cert					1.4			31.0	9.70	
GXR-6 Meas	0.2	1.6	0.3	0.3	1.6		2.30	94.6	5.7	1.4
GXR-6 Cert	0.0320	2.40	0.330	0.485	1.90		2.20	101	5.30	1.54
GXR-6 Meas										
GXR-6 Cert										
LKSD-4 Meas										
LKSD-4 Cert										
BaSO4 Meas										
BaSO4 Cert										
SAR-M (U.S.G.S.) Meas					6.5		2.86	950	17.5	4.3
SAR-M (U.S.G.S.) Cert					9.78		2.88	982	17.2	3.57
DNC-1a Meas		1.8								
DNC-1a Cert		2.0								
OREAS 13b (4-Acid) Meas										
OREAS 13b (4-Acid) Cert										
OREAS 13b (4-Acid) Meas										
OREAS 13b (4-Acid) Cert										
Method Blank										
Method Blank										
Method Blank										
Method Blank	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.001	< 0.05	< 0.5	< 0.1	< 0.1

Quality Analysis ... *Innovative Technologies*

Date Submitted: 23-Oct-12
Invoice No.: A12-11752
Invoice Date: 09-Nov-12
Your Reference:

Research and Productivity Council
921 College Hill Rd.
Fredericton NB
Canada

ATTN: Keith Mclellan

CERTIFICATE OF ANALYSIS

6 Pulp samples were submitted for analysis.

The following analytical packages were requested: Code 1G Hg-Cold Vapour FIMS(HGFIMS)
Code 4F-S Infrared
Code UT-4 Total Digestion ICP/MS

REPORT **A12-11752**

Notes:
Values which exceed the upper limit should be assayed for accurate numbers.

CERTIFIED BY :

Emmanuel Eseme , Ph.D.
Quality Control

ISO/IEC 17025
SCC Accredited
LAB 266
LAB 266
Accrédité CCN

ACTIVATION LABORATORIES LTD.

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Analyte Symbol	Hg	Total S	Li	Na	Mg	Al	K	Ca	Cd	V	Cr	Mn	Fe	Hf	Ni	Er	Be	Ho	Ag	Cs	Co	Eu	Bi	Se
Unit Symbol	ppb	%	ppm	%	%	%	%	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	5	0.01	0.5	0.01	0.01	0.01	0.01	0.01	0.1	1	0.5	1	0.01	0.1	0.5	0.1	0.1	0.1	0.05	0.05	0.1	0.05	0.02	0.1
Analysis Method	Hg-FIMS	IR	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
1859ZnLC6-CL4C	> 100000	33.3	< 0.5	< 0.01	0.01	0.01	< 0.01	0.09	1020	< 1	16.9	220	9.09	< 0.1	17.4	< 0.1	0.2	< 0.1	90.1	< 0.05	5.4	< 0.05	28.5	28.0
1859ZnLC6-ScvgT	4340	45.9	1.8	0.01	0.21	0.33	0.06	1.14	9.1	6	318	691	37.3	0.2	281	0.1	0.1	< 0.1	15.8	0.21	111	0.22	40.5	18.9
1859ZnLC7-CL4C	> 100000	34.1	< 0.5	< 0.01	0.01	0.01	< 0.01	0.08	1030	< 1	13.3	196	7.87	< 0.1	14.0	< 0.1	0.2	< 0.1	88.4	< 0.05	4.1	< 0.05	25.6	28.1
1859ZnLC7-ScvgT	4270	45.7	1.0	0.01	0.16	0.20	0.04	0.75	9.7	7	249	750	34.8	0.1	220	0.2	0.3	< 0.1	26.1	0.23	85.6	0.23	44.4	18.7
1859ZnLC8-CL4C	> 100000	33.3	< 0.5	< 0.01	0.01	< 0.01	< 0.01	0.08	1060	< 1	15.8	217	8.07	< 0.1	15.8	< 0.1	0.1	< 0.1	95.1	< 0.05	4.3	< 0.05	28.2	29.7
1859ZnLC8-ScvgT	4410	45.7	0.9	0.01	0.15	0.19	0.04	0.68	12.1	6	263	716	33.8	0.1	213	0.2	0.2	< 0.1	27.4	0.23	83.9	0.23	44.2	19.0

Analyte Symbol	Zn	Ga	As	Rb	Y	Sr	Zr	Nb	Mo	In	Sn	Sb	Te	Ba	La	Ce	Pr	Nd	Sm	Gd	Tb	Dy	Cu	Ge
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.2	0.1	0.1	0.2	0.1	0.2	1	0.1	0.1	0.1	1	0.1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
1859ZnLC6-CL4C	> 10000	9.2	1470	< 0.2	0.1	1.0	2	0.3	10.5	> 100	29	344	< 0.1	1	< 0.1	0.3	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	4280	0.2
1859ZnLC6-ScvgT	5040	2.8	6950	3.1	1.5	8.8	20	1.4	55.9	3.5	9	305	< 0.1	8	1.4	3.2	0.4	1.4	0.3	0.3	< 0.1	0.3	1000	0.8
1859ZnLC7-CL4C	> 10000	9.1	1440	< 0.2	0.1	1.0	2	0.3	9.6	> 100	26	263	0.2	6	< 0.1	0.3	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1	3570	0.3
1859ZnLC7-ScvgT	4850	2.7	7000	3.2	1.6	9.5	17	1.4	62.2	4.2	11	90.7	< 0.1	8	1.6	3.4	0.4	1.7	0.3	0.3	< 0.1	0.3	1130	0.5
1859ZnLC8-CL4C	> 10000	9.0	1470	< 0.2	0.1	0.9	2	< 0.1	11.0	> 100	29	305	< 0.1	1	< 0.1	0.3	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1	3680	0.4
1859ZnLC8-ScvgT	5340	2.6	7310	3.1	1.6	9.0	17	1.6	62.9	4.5	11	179	< 0.1	8	1.6	3.3	0.4	1.6	0.3	0.3	< 0.1	0.3	1200	0.4

Analyte Symbol	Tm	Yb	Lu	Ta	W	Re	Tl	Pb	Th	U
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.1	0.1	0.1	0.1	0.1	0.001	0.05	0.5	0.1	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
1859ZnLC6-CL4C	< 0.1	< 0.1	< 0.1	< 0.1	0.3	0.014	30.2	> 5000	0.1	1.3
1859ZnLC6-ScvgT	< 0.1	< 0.1	< 0.1	0.7	5.1	0.010	26.9	4760	0.7	2.2
1859ZnLC7-CL4C	< 0.1	< 0.1	< 0.1	< 0.1	0.2	0.009	30.4	> 5000	< 0.1	1.3
1859ZnLC7-ScvgT	< 0.1	0.2	< 0.1	< 0.1	1.9	0.021	31.4	> 5000	0.4	2.5
1859ZnLC8-CL4C	< 0.1	< 0.1	< 0.1	0.2	0.2	0.009	31.3	> 5000	< 0.1	1.3
1859ZnLC8-ScvgT	< 0.1	0.1	< 0.1	0.7	1.8	0.020	31.5	> 5000	0.4	2.5

Quality Control

Analyte Symbol	Hg	Li	Na	Mg	Al	K	Ca	Cd	V	Cr	Mn	Fe	Hf	Ni	Er	Be	Ho	Ag	Cs	Co	Eu	Bi	Se	Zn
Unit Symbol	ppb	ppm	%	%	%	%	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	5	0.5	0.01	0.01	0.01	0.01	0.01	0.1	1	0.5	1	0.01	0.1	0.5	0.1	0.1	0.1	0.05	0.05	0.1	0.05	0.02	0.1	0.2
Analysis Method	Hg-FIMS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
GXR-1 Meas	3780	8.0	0.05	0.21	1.93	0.04	0.79	2.3	74	9.5	895	25.0	0.4	39.3		1.1		30.7	2.75	7.8	0.55	1510	16.1	817
GXR-1 Cert	3900	8.20	0.0520	0.217	3.52	0.050	0.960	3.30	80.0	12.0	852	23.6	0.960	41.0		1.22		31.0	3.00	8.20	0.690	1380	16.6	760
GXR-1 Meas		7.5	0.05	0.18	1.85	0.04	0.78	2.4	75	17.9	906	25.1	0.4	38.2		1.1		33.6	2.88	7.5	0.62	1530	16.2	808
GXR-1 Cert		8.20	0.0520	0.217	3.52	0.050	0.960	3.30	80.0	12.0	852	23.6	0.960	41.0		1.22		31.0	3.00	8.20	0.690	1380	16.6	760
GXR-4 Meas	111	12.8	0.61	1.71	6.22	3.73	0.92	0.2	80	38.3	159	3.10	1.1	39.6		2.3		3.02	2.52	14.0	1.29	19.2	5.9	78.3
GXR-4 Cert	110	11.1	0.564	1.66	7.20	4.01	1.01	0.860	87.0	64.0	155	3.09	6.30	42.0		1.90		4.00	2.80	14.6	1.63	19.0	5.60	73.0
GXR-4 Meas		10.9	0.56	1.47	5.91	3.58	0.90	< 0.1	79	35.8	149	3.07	1.2	37.9		2.0		3.25	2.56	13.3	1.50	18.7	6.1	71.5
GXR-4 Cert		11.1	0.564	1.66	7.20	4.01	1.01	0.860	87.0	64.0	155	3.09	6.30	42.0		1.90		4.00	2.80	14.6	1.63	19.0	5.60	73.0
SDC-1 Meas		34.5	1.61	0.93	6.86	2.32	0.88	< 0.1	30	37.2	812	4.54	0.7	32.0	3.5	2.9	1.2	0.13	3.79	17.0	1.40	0.29		106
SDC-1 Cert		34.00	1.52	1.02	8.34	2.72	1.00	0.0800	102.00	64.00	880.00	4.82	8.30	38.0	4.10	3.00	1.50	0.0410	4.00	18.0	1.70	2.60		103.00
SDC-1 Meas		32.6	1.55	0.83	6.83	2.20	0.89	< 0.1	26	37.2	811	4.62	0.6	32.2	3.8	2.9	1.2	0.23	3.73	16.9	1.61	0.27		103
SDC-1 Cert		34.00	1.52	1.02	8.34	2.72	1.00	0.0800	102.00	64.00	880.00	4.82	8.30	38.0	4.10	3.00	1.50	0.0410	4.00	18.0	1.70	2.60		103.00
SCO-1 Meas		43.3	0.77	1.53	6.23	1.94	1.70	0.2	107	44.9	369	3.39		25.5		1.9		0.10	7.30	10.4		0.39		103
SCO-1 Cert		45	0.670	1.64	7.24	2.30	1.87	0.140	130	68.0	410	3.59		27		1.80		0.134	7.80	11.00		0.37		100
SCO-1 Meas		40.8	0.73	1.39	6.21	1.90	1.73	0.2	104	42.5	380	3.50		26.0		1.9		0.09	7.23	10.4		0.37		101
SCO-1 Cert		45	0.670	1.64	7.24	2.30	1.87	0.140	130	68.0	410	3.59		27		1.80		0.134	7.80	11.00		0.37		100
GXR-6 Meas	66	37.6	0.11	0.59	> 10.0	1.62	0.16	0.1	128	49.3	1020	5.42	2.2	23.0		1.3		0.22	4.04	12.7	0.60	0.20	1.1	130
GXR-6 Cert	68.0	32.0	0.104	0.609	17.7	1.87	0.180	1.00	186	96.0	1010	5.58	4.30	27.0		1.40		1.30	4.20	13.8	0.760	0.290	0.940	118
GXR-6 Meas		34.1	0.10	0.52	> 10.0	1.52	0.16	< 0.1	120	51.1	997	5.42	2.1	22.3		1.2		0.25	4.03	12.2	0.64	0.20	0.7	134
GXR-6 Cert		32.0	0.104	0.609	17.7	1.87	0.180	1.00	186	96.0	1010	5.58	4.30	27.0		1.40		1.30	4.20	13.8	0.760	0.290	0.940	118
SAR-M (U.S.G.S.) Meas		31.9	1.33	0.50	5.43	2.23	0.56	4.0	49	70.8	4490	3.30		43.9		3.1		2.44	4.60	10.6		1.51	0.6	893
SAR-M (U.S.G.S.) Cert		27.4	1.140	0.50	6.30	2.94	0.61	5.27	67.20	79.7	5220	2.99		41.50		2.20		3.64	5.15	10.70		1.94	0.39	930.0
SAR-M (U.S.G.S.) Meas		30.6	1.29	0.45	5.48	2.56	0.56	4.1	36	70.6	4710	3.37		43.0		2.9		2.83	4.78	10.0		1.59	1.1	841
SAR-M (U.S.G.S.) Cert		27.4	1.140	0.50	6.30	2.94	0.61	5.27	67.20	79.7	5220	2.99		41.50		2.20		3.64	5.15	10.70		1.94	0.39	930.0
DNC-1a Meas		4.8							138	138				263						56.7	0.52			70.2
DNC-1a Cert		5.20							148.0	270				247						57.0	0.59			70.0
DNC-1a Meas		4.5							141	123				258						54.8	0.57			68.7
DNC-1a Cert		5.20							148.0	270				247						57.0	0.59			70.0
Method Blank	< 5																							
Method Blank	< 5																							
Method Blank		< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.1	< 1	< 0.5	< 1	< 0.01	< 0.1	< 0.5	< 0.1	< 0.1	< 0.1	< 0.05	< 0.05	< 0.1	< 0.05	< 0.02	< 0.1	< 0.2

Quality Control

Analyte Symbol	Ga	As	Rb	Y	Sr	Zr	Nb	Mo	In	Sn	Sb	Te	Ba	La	Ce	Pr	Nd	Sm	Gd	Tb	Dy	Cu	Ge	Tm
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.1	0.1	0.2	0.1	0.2	1	0.1	0.1	0.1	1	0.1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
GXR-1 Meas	10.0	427	2.6	27.3	272	18	0.9	17.2	0.8	25	20.1	7.7	607	6.9	13.7		7.9	2.7	3.6	0.7	4.7	1180		0.4
GXR-1 Cert	13.8	427	14.0	32.0	275	38.0	0.800	18.0	0.770	54.0	122	13.0	750	7.50	17.0		18.0	2.70	4.20	0.830	4.30	1110		0.430
GXR-1 Meas	9.2	395	2.7	29.9	293	18	0.6	17.4	0.8	25	27.7	8.6	642	7.2	14.0		8.0	2.6	3.9	0.8	5.0	1120		0.4
GXR-1 Cert	13.8	427	14.0	32.0	275	38.0	0.800	18.0	0.770	54.0	122	13.0	750	7.50	17.0		18.0	2.70	4.20	0.830	4.30	1110		0.430
GXR-4 Meas	17.4	98.4	146	13.1	209	40	8.7	304	0.2	7	4.3	0.8	82	55.4	107		40.3	6.0	4.2	0.5	2.8	6450		0.2
GXR-4 Cert	20.0	98.0	160	14.0	221	186	10.0	310	0.270	5.60	4.80	0.970	1640	64.5	102		45.0	6.60	5.25	0.360	2.60	6520		0.210
GXR-4 Meas	17.0	88.3	151	14.0	215	40	8.6	304	0.2	7	4.1	0.7	78	56.5	103		40.3	5.8	4.4	0.6	3.0	6040		0.2
GXR-4 Cert	20.0	98.0	160	14.0	221	186	10.0	310	0.270	5.60	4.80	0.970	1640	64.5	102		45.0	6.60	5.25	0.360	2.60	6520		0.210
SDC-1 Meas	19.9	< 0.1	120	31.4	169	28	1.5	0.2		< 1	< 0.1		608	38.4	85.2		37.8	7.4	6.2	1.0	6.3	28.7		0.5
SDC-1 Cert	21.00	0.220	127.00	40.0	180.00	290.00	21.00	0.250		3.00	0.54		630	42.00	93.00		40.00	8.20	7.00	1.20	6.70	30.00		0.65
SDC-1 Meas	19.5	< 0.1	113	33.0	169	24	0.5	< 0.1		< 1	< 0.1		618	39.2	83.7		38.3	7.2	6.5	1.0	6.4	29.5		0.5
SDC-1 Cert	21.00	0.220	127.00	40.0	180.00	290.00	21.00	0.250		3.00	0.54		630	42.00	93.00		40.00	8.20	7.00	1.20	6.70	30.00		0.65
SCO-1 Meas	14.8	10.1	106	19.1	158	98	2.0	0.8		3	0.4		548	27.5	53.7	6.4	25.0					28.7		
SCO-1 Cert	15	12.00	110.0	26	170	160	11	1.4		3.7	2.50		570	30.0	62.00	6.6	26.0					29		
SCO-1 Meas	14.5	8.1	106	20.0	164	43	2.5	0.5		2	0.4		574	27.8	53.1	6.5	23.8					27.6		
SCO-1 Cert	15	12.00	110.0	26	170	160	11	1.4		3.7	2.50		570	30.0	62.00	6.6	26.0					29		
GXR-6 Meas	26.4	262	77.8	11.9	38.0	78	1.3	1.1	< 0.1	< 1	1.1	< 0.1	1340	11.9	32.4		11.9	2.4	2.2	0.4	2.4	66.7		0.2
GXR-6 Cert	35.0	330	90.0	14.0	35.0	110	7.50	2.40	0.260	1.70	3.60	0.0180	1300	13.9	36.0		13.0	2.67	2.97	0.415	2.80	66.0		0.0320
GXR-6 Meas	25.5	227	79.5	12.9	40.0	73	0.7	1.0	< 0.1	< 1	1.4	< 0.1	1360	12.5	33.1		12.2	2.4	2.2	0.4	2.5	62.4		0.3
GXR-6 Cert	35.0	330	90.0	14.0	35.0	110	7.50	2.40	0.260	1.70	3.60	0.0180	1300	13.9	36.0		13.0	2.67	2.97	0.415	2.80	66.0		0.0320
SAR-M (U.S.G.S.) Meas	15.3	27.3	114	33.8	140		2.1	7.1	0.9	3	4.0	0.3	745	58.7	124							299		
SAR-M (U.S.G.S.) Cert	16.8	38.8	146.0	28.00	151.0		29.90	13.10	1.08	2.76	6.00	0.96	801	57.4	122.00							331		
SAR-M (U.S.G.S.) Meas	15.8	23.1	132	36.1	144		1.4	4.3	0.9	3	3.0	0.2	749	62.2	127							300		
SAR-M (U.S.G.S.) Cert	16.8	38.8	146.0	28.00	151.0		29.90	13.10	1.08	2.76	6.00	0.96	801	57.4	122.00							331		
DNC-1a Meas				15.8	138	35					0.7		109	3.5			4.5					101		
DNC-1a Cert				18.0	144.0	38					0.96		118	3.6			5.20					100.0		
DNC-1a Meas				17.0	144	37					0.7		102	3.7			4.8					95.1		
DNC-1a Cert				18.0	144.0	38					0.96		118	3.6			5.20					100.0		
Method Blank																								
Method Blank																								
Method Blank	< 0.1	< 0.1	< 0.2	< 0.1	< 0.2	< 1	< 0.1	< 0.1	< 0.1	< 1	< 0.1	< 0.1	< 1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1	< 0.1

Quality Control

Analyte Symbol	Yb	Lu	Ta	W	Re	Tl	Pb	Th	U
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.1	0.1	0.1	0.1	0.001	0.05	0.5	0.1	0.1
Analysis Method	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS
GXR-1 Meas	2.1	0.3	< 0.1	134		0.38	724	2.7	30.9
GXR-1 Cert	1.90	0.280	0.175	164		0.390	730	2.44	34.9
GXR-1 Meas	2.3	0.3	< 0.1	151		0.39	737	2.9	31.6
GXR-1 Cert	1.90	0.280	0.175	164		0.390	730	2.44	34.9
GXR-4 Meas	1.0	0.1	1.4	31.5		3.02	45.5	18.9	5.1
GXR-4 Cert	1.60	0.170	0.790	30.8		3.20	52.0	22.5	6.20
GXR-4 Meas	1.0	0.1	0.6	33.9		3.11	46.0	18.1	5.3
GXR-4 Cert	1.60	0.170	0.790	30.8		3.20	52.0	22.5	6.20
SDC-1 Meas	3.1		0.1	< 0.1		0.58	22.6	11.2	2.9
SDC-1 Cert	4.00		1.20	0.800		0.70	25.00	12.00	3.10
SDC-1 Meas	3.4		< 0.1	< 0.1		0.57	23.7	11.6	2.8
SDC-1 Cert	4.00		1.20	0.800		0.70	25.00	12.00	3.10
SCO-1 Meas				< 0.1			29.4	9.1	
SCO-1 Cert				1.4			31.0	9.70	
SCO-1 Meas				< 0.1			28.5	8.5	
SCO-1 Cert				1.4			31.0	9.70	
GXR-6 Meas	1.6	0.3	< 0.1	< 0.1		2.01	91.6	5.1	1.3
GXR-6 Cert	2.40	0.330	0.485	1.90		2.20	101	5.30	1.54
GXR-6 Meas	1.7	0.3	< 0.1	< 0.1		2.04	92.6	5.4	1.3
GXR-6 Cert	2.40	0.330	0.485	1.90		2.20	101	5.30	1.54
SAR-M (U.S.G.S.) Meas				0.3		2.62	808	18.1	4.0
SAR-M (U.S.G.S.) Cert				9.78		2.88	982	17.2	3.57
SAR-M (U.S.G.S.) Meas				0.2		2.70	869	19.0	4.2
SAR-M (U.S.G.S.) Cert				9.78		2.88	982	17.2	3.57
DNC-1a Meas	1.8								
DNC-1a Cert	2.0								
DNC-1a Meas	1.9								
DNC-1a Cert	2.0								
Method Blank									
Method Blank									
Method Blank	< 0.1	< 0.1	< 0.1	< 0.1	< 0.001	< 0.05	< 0.5	< 0.1	< 0.1

DALHOUSIE UNIVERSITY
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Minerals Engineering Centre

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10-Nov-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	mg/kg
Sample	Au
PO 82116	
1859-PbLC1E-ScvgT	0.564
1859-PbLC2-ScvgT	0.603
1859-PbLC3-CL4C	0.878
1859-PbLC3-CL4C Dup.	0.985
PO 82038	
1859-CuLC1-ScvgT	0.717
1859-CuLC2-ScvgT	0.713
1859-CuLC3-ScvgT	0.748
PO 82044	
1859-CuLC4-ScvgT	0.768
1859-CuLC5-ScvgT	0.713
1859-CuLC6-ScvgT	0.721
PO 82130	
1859-PbLC6-CL4C	1.206

Certified Reference Standards	mg/kg Au	Recommended Value
OXC72	0.205	0.205±0.003
CCU-1d	13.99	14.01±0.18
SK62	4.098	4.075±0.045

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

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7-Nov-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids: Sample	mg/kg Au
PO 82146	
1859-PbLC9-CL3T	0.998
1859-PbLC9-CL2T	0.861
1859-PbLC9-ScvgC	0.745
1859-PbLC8-ScvgT	0.523
1859-PbLC9-ScvgT	0.649
1859-PbLC9-ScvgT Dup.	0.592
PO 82116	
1859-PbLC1E-CL4C	0.877
1859-PbLC2-CL4C	0.900
1859-PbLC3-CL4C	6.987
1859-PbLC4-CL4C	0.943
1859-PbLC5-CL4C	1.019
1859-CuScvgT1-8	0.800
1859-Blend Feed (75 min)	0.668
1859-Blend Feed (75 min)	0.595
1859-PbLC2-ScvgT	5.639
1859-PbLC3-ScvgT	0.607
1859-PbLC4-ScvgT	0.609
1859-PbLC5-ScvgT	0.605
PO 82130	
1859-PbLC6-ScvgT	0.582
1859-PbLC7-ScvgT	0.588
1859-PbLC7-ScvgT Dup.	0.601

Certified Reference Standards	mg/kg Au	Recommended Value
CCU-1d	13.92	14.01±0.18

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

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5-Nov-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	mg/kg
Sample	Au
PO 82174	
1859-ZnLC1-CL4C	0.222
1859-ZnLC1-ScvgT	0.545
1859-ZnLC2-CL4C	0.221
1859-ZnLC2-ScvgT	0.618
1859-ZnLC2-ScvgT Dup.	0.610
PO 82190	
1859-ZnLC3-CL4C	0.319
1859-ZnLC3-ScvgT	0.602
1859-ZnLC4-CL4C	0.310
1859-ZnLC4-ScvgT	0.600
1859-ZnLC5-CL4C	0.302
1859-ZnLC5-ScvgT	0.616
1859-ZnLC5-ScvgT Dup.	0.610
PO 82203	
1859-ZnLC6-CL4C	0.358
1859-ZnLC6-ScvgT	0.572
1859-ZnLC7-CL4C	0.343
1859-ZnLC7-ScvgT	0.614
1859-ZnLC8-CL4C	0.384
1859-ZnLC8-CL2T	0.857
1859-ZnLC8-CL3T	0.827
1859-ZnLC8-CL4T	0.700
1859-ZnLC8-ScvgC	1.039
1859-ZnLC8-ScvgT	0.629
1859-ZnLC8-ScvgT Dup.	0.643
PO 82229	
1859-PbLC1-9-ScvgT	0.502
1859-PbScvg-ZnScvgT2	0.473
1859-CuScvg-ZnScvgT2	0.385
1859-PbScvg-ZnConc	0.564
1859-CuScvg-ZnConc	0.805
1859-CuScvg-ZnConc Dup.	0.825
PO 82146	
1859-PbLC8-CL4C	0.987
1859-PbLC9-CL4C	0.860
1859-PbLC9-CL4T	0.923

Certified Reference Standards	mg/kg Au	Recommended Value
CCU-1d	14.02	14.01±0.18

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre

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5-Nov-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Solids:	mg/kg
Sample	Au
PO 82174	
1859-ZnLC1-CL4C	0.222
1859-ZnLC1-ScvgT	0.545
1859-ZnLC2-CL4C	0.221
1859-ZnLC2-ScvgT	0.618
1859-ZnLC2-ScvgT Dup.	0.610
PO 82190	
1859-ZnLC3-CL4C	0.319
1859-ZnLC3-ScvgT	0.602
1859-ZnLC4-CL4C	0.310
1859-ZnLC4-ScvgT	0.600
1859-ZnLC5-CL4C	0.302
1859-ZnLC5-ScvgT	0.616
1859-ZnLC5-ScvgT Dup.	0.610
PO 82203	
1859-ZnLC6-CL4C	0.358
1859-ZnLC6-ScvgT	0.572
1859-ZnLC7-CL4C	0.343
1859-ZnLC7-ScvgT	0.614
1859-ZnLC8-CL4C	0.384
1859-ZnLC8-CL2T	0.857
1859-ZnLC8-CL3T	0.827
1859-ZnLC8-CL4T	0.700
1859-ZnLC8-ScvgC	1.039
1859-ZnLC8-ScvgT	0.629
1859-ZnLC8-ScvgT Dup.	0.643
PO 82229	
*1859-Zn?Pb?LC1-9-ScvgT	0.502
1859-PbScvg-ZnScvgT2	0.473
1859-CuScvg-ZnScvgT2	0.385
1859-PbScvg-ZnConc	0.564
1859-CuScvg-ZnConc	0.805
1859-CuScvg-ZnConc Dup.	0.825
PO 82146	
1859-PbLC8-CL4C	0.987
1859-PbLC9-CL4C	0.860
1859-PbLC9-CL4T	0.923

Certified Reference Standards	mg/kg Au	Recommended Value
CCU-1d	14.02	14.01±0.18

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5-Nov-12

Research and Productivity Council,
921 College Hill Rd.,
Fredericton, N.B.,
E3B 6Z9
Attention: J. Jewett

Label corrections 82203
1859-ZnLC8-ScvgT

Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 82190					
1859-ZnLC3-CL4C	10.57	0.48	2.18	52.71	76
1859-ZnLC3-ScvgT	42.61	0.084	0.61	0.69	18
1859-ZnLC4-CL4C	9.98	0.41	1.13	54.47	85
1859-ZnLC4-ScvgT	43.88	0.12	0.71	0.68	26
1859-ZnLC5-CL4C	10.00	0.40	1.03	54.50	87
1859-ZnLC5-ScvgT	42.29	0.12	0.66	0.65	26
PO 82203					
1859-ZnLC6-CL4C	10.69	0.51	1.09	51.68	94
1859-ZnLC6-ScvgT	42.13	0.11	0.66	0.60	21
1859-ZnLC7-CL4C	10.39	0.47	1.05	55.50	95
1859-ZnLC7-ScvgT	43.85	0.13	0.67	0.62	27
1859-ZnLC8-CL4C	10.49	0.46	1.10	54.43	95
1859-ZnLC8-CL2T	33.11	0.60	1.04	19.81	72
1859-ZnLC8-CL3T	23.63	0.71	1.15	32.39	95
1859-ZnLC8-CL4T	19.09	0.75	1.28	40.05	111
1859-ZnLC8-ScvgC	39.77	0.41	0.82	6.68	52
1859-ZnLC8-ScvgT	43.09	0.13	0.64	0.71	26

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	5.93	1.32	4.10	19.22	67
CZN-1	11.27	0.14	7.56	43.81	90
CCU-1d	7.22	0.13	63.02	5.90	354
CPB-2	31.03	23.57	0.27	2.80	128

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Solids:	Wt. %				mg/kg
Sample	Fe	Cu	Pb	Zn	Ag
PO 82229					
1859-PbLC1-9-ScvgT	38.49	0.12	2.69	5.09	48
1859-PbScvg-ZnScvgT2	39.83	0.11	2.28	0.73	21
1859-CuScvg-ZnScvgT2	35.05	0.17	1.97	0.73	21
1859-PbScvg-ZnConc	32.94	0.26	2.72	11.99	82
1859-CuScvg-ZnConc	30.03	1.54	1.66	8.78	369

CANMET Reference	Wt. %				mg/kg
Standards	Fe	Cu	Pb	Zn	Ag
MP-1a	5.93	1.32	4.10	19.22	67
CZN-1	11.27	0.14	7.56	43.81	90
CPB-2	7.22	0.13	63.02	5.90	354
CCU-1d	31.03	23.57	0.27	2.80	128

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