



African Mineral Standards

MATRIX REFERENCE MATERIALS

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AMIS0297

Certified Reference Material

**Cu Co Zn Au Ag Concentrate
Marcapunta Norte Mine, Peru**

Certificate of Analysis

**Recommended Concentrations and Limits¹
(at two Standard Deviations)**

Certified Concentrations²

Co Fus	1.10	±	0.09	%
Co M/ICP	1.11	±	0.05	%
Cu Fus	22.65	±	1.12	%
Cu M/ICP	23.14	±	0.76	%
Cu Titration	23.26	±	0.47	%
Ag M/ICP	354	±	28.0	ppm
As Fus	7.08	±	0.54	%
As M/ICP	7.11	±	0.61	%
Sb Fus	2995	±	250	ppm
Zn Fus	1.14	±	0.08	%
Zn M/ICP	1.14	±	0.06	%
Specific Gravity	4.10	±	0.10	

Provisional Concentrations

Au Pb Collection	2.18	±	0.28	g/t
Bi Fus	2615	±	500	ppm
Bi M/ICP	2612	±	549	ppm
Sn Fus	3053	±	466	ppm
Sn M/ICP	3013	±	729	ppm

1. Manufacturers recommended limits for use of the material as control samples, based on two standard deviations, calculated using "Between Laboratory" statistics for treatment of the data for trivial, non-trivial and technically invalid results. See sections 1, 9 and 12.
2. There is additional certified major element data presented on p2 and uncertified trace element data presented as an appendix.

Major Element Recommended Concentrations and Limits (at two Standard Deviations)

Certified Concentrations

Al ₂ O ₃	1.18	±	0.04	%
CaO	0.22	±	0.02	%
Fe ₂ O ₃	24.13	±	1.62	%
K ₂ O	0.21	±	0.02	%
MnO	0.40	±	0.04	%
S Comb/LECO	33.34	±	2.16	%

Provisional Concentration

MgO	0.48	±	0.08	%
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Indicated Means

Cr ₂ O ₃	0.024	%
Na ₂ O	0.07	%
TiO ₂	0.11	%

1. **Intended Use:** AMIS0297 can be used to check analysis of samples of arsenical polymetallic concentrates with a similar grade and matrix.

It is a matrix matched Certified Reference Material (CRM) fit for use as control samples in routine assay laboratory quality control when inserted within runs of samples and measured in parallel to the unknown. Its purpose is to monitor inter-laboratory or instrument bias and within lab precision. It can be used, indirectly, to establish the traceability of results to an SI system of units.

The recommended concentrations and limits for this material are property values based on a measurement campaign (round robin) and reflect consensus results from the laboratories that participated in the round robin.

Slight variations in analytical procedures between laboratories will reflect as slight biases to the recommended concentrations (see 19). Good laboratories will report results within the two standard deviation levels with a failure rate of <10 %.

The material can also be used for method development and for the calibration of equipment.

2. **Origin of Material:** The concentrate material for AMIS0297 was supplied by Namibia Custom Smelter (Dundee Precious Metals). The AMIS0297 concentrate is originally from the El Brocal - Marcapunta Norte copper mine located in Peru 285 kilometers east of the city of Lima and 10 kilometers south of the city of Cerro de Pasco. El Brocal (Sociedad Minera El Brocal S.A.A.) is a subsidiary of the Buenaventura Mining Company and is engaged in the extraction, concentration and sale of concentrates of polymetallic minerals—mainly zinc, copper, lead and silver.

3. **Mineral and Chemical Composition:** Marcapunta Norte is a high sulfidation epithermal polymetallic replacement vein Au-Cu deposit associated with a Miocene diatreme intrusion into Eocene limestone's and conglomerates. Marcapunta Norte Mine ore comprises gold mineralization in phreatomagmatic breccia's (vuggy silica) and arsenic copper enargite mineralization in mineralized mantles.

4. Appearance: The material is a very fine powder. It is colored Brownish Black (Corstor 5YR 2.5/1)

5. Handling instructions: The material is packaged in Laboratory Packs and Explorer Packs that must be shaken or otherwise agitated before use. Normal safety precautions for handling fine particulate matter are suggested, such as the use of safety glasses, breathing protection, gloves and a laboratory coat.

6. Method of Preparation: The material was crushed, dry-milled and air-classified to <54um. Wet sieve particle size analysis of random samples confirmed the material was 98.5% <54um. It was then homogenized in a double cone blender, systematically divided and sealed into 1kg Laboratory Packs. Explorer Packs are subdivided from the Laboratory packs as required. Samples were randomly selected for homogeneity testing and third party analysis. Statistical analysis of both homogeneity and consensus test results were carried out by an independent statistician.

7. Methods of Analysis requested:

1. Au – Pb collection.
2. Co,Cu, Ag, As, Bi, Sb, Sn, Zn. Fusion AAS or ICP-OES.
3. Multi-acid digest multi-element scan - ICP-OES or ICP-MS.
4. Majors (Co, Cu, As, Bi, Sb, Sn, Zn, Al₂O₃, CaO, Cr₂O₃, Fe₂O₃, K₂O, MgO, MnO, Na₂O, SiO₂, TiO₂. LOI.) XRF fusion.
5. S – combustion analysis.
6. SG. Gas pycnometer.

8. Information requested:

1. State and provide brief description of analytical techniques used.
2. State aliquots used for all determinations.
3. Results for individual analyses to be reported.
4. All results for base metals to be reported in ppm.
5. Report all QC data, to include replicates, blanks and certified reference materials used.

9. Method of Certification: Seventeen laboratories were each given eight packages, comprising eight samples scientifically selected from throughout the batch. Fifteen laboratories reported results in time for certification

Final limits were calculated after first determining if all data was compatible within a spread normally expected for similar analytical methods done by reputable laboratories. Data from any one laboratory was then removed from further calculations when the mean of all analyses from that laboratory failed a “t test” of the global means of the other laboratories. The means and standard deviations were then re-calculated using all remaining data. Any analysis that fell outside of the new two standard deviations was removed from the ensuing data base. The mean and standard deviations were again calculated using the remaining data.

The “between-laboratory” standard deviation is used in the calculation to eliminate technically and statistically invalid data. Upper and lower limits are based on the standard deviation of the remaining data, which reflect individual analyses and can be used to monitor accuracy in routine laboratory quality control.

This is different to limits based on standard deviations derived from grouped set of analyses (see 12), which provide important measures for precision and trueness, but which are less useful for routine QC.

Standards with an RSD of near or less than 5 % are termed “Certified”, RSD’s of between near 5 % and 15 % are termed “Provisional”, and RSD’s over 15 % are termed “Informational”.

10. Participating Laboratories: The 15 out of 17 laboratories that provided results timeously were (not in same order as in the table of assays):

1. Activation Laboratories Pty Ltd (ActLabs) CA
2. ALS Ammtec (Australia)
3. ALS OMAC (Ireland)
4. Genalysis Laboratory Services (W Australia P)
5. Rappa Research Laboratory
6. Set Point Laboratories (Isando) SA
7. SGS Australia Pty Ltd (Newburn) WA
8. SGS Chelopech (Bulgaria)
9. SGS Geosol Laboratories Ltda (Brazil)
10. SGS Mineral Services Callao (Peru)
11. SGS Mineral Services Lakefield (Canada)
12. SGS Philippines, Inc. (Philippines)
13. SGS South Africa (Pty) Ltd - Booysens JHB
14. SGS Townsville (Australia)
15. Ultra Trace (Pty) Ltd WA

11. Assay Data: Data as received from the laboratories for the important certified elements listed on p1 is set out below. **(Economic Elements)**

Lab Code	Co Fus ppm	Co M/ICP ppm	Cu Fus ppm	Cu M/ICP ppm	Cu Titration ppm	Au Pb Coll g/t	Ag M/ICP ppm	As Fus ppm	As M/ICP ppm	Bi Fus ppm	Bi M/ICP ppm	Sb Fus ppm	Sn Fus ppm	Sn M/ICP ppm	Zn Fus ppm	Zn M/ICP ppm
A		8360			209000	2.11	350		70100				2870	2410		11200
A		8110			219000		380		75700				3010	2510		11400
A		8310			223000	2.17	360		74900				3010	2330		11100
A																
A																
A		8410			224000		370		74300				3020	2710		11200
A		8220			215000	2.27	360		72700				2910	2650		10900
A		9230			223000	2.15	350		73300				2950	2700		11100
B		11000		228600	231000	2.02										
B		11100		233700	231000	2.02										
B		11200		232100	231000	1.98										
B		11100		231600	231000	1.99										
B		11000		233200	229000	1.98										
B		11000		228800	231000	1.97										
B		11100		232700	230000	2.03										
B		11100		231800	230000	2.02										
C	10300	10700	224700	229100	222900		338	68800	75900	2500	2543	3000	3000	2483	11100	11500
C	10200	10700	223200	229400	222300		342	69800	75400	2500	2570	3100	3000	2463	11300	11500
C	10900	10800	226600	229700	223000		343	70500	74900	2600	2558	3000	3000	2425	11200	11500
C	10600	10800	225500	230300	223800		342	69700	75000	2700	2554	3100	3000	2464	11800	11600
C	10700	10800	224600	230200	222800		347	70600	75100	2500	2581	3000	3100	2501	11100	11800
C	10300	10800	223500	228900	222100		344	68700	75300	2600	2570	3000	3200	2515	11400	11800
C	10200	10700	227800	230000	223700		329	69300	74600	2600	2576	3000	3100	2489	11100	11800
C	10300	10800	226500	228500	223200		343	69600	75700	2500	2559	3000	3000	2528	11300	11700
E		10650		234600	229249											
E		11680		237400	231388											
E		11740		231700	232156											
E		11410		235600	229954											
E		11440		228800	229753											
E		11600		237300	231239											
E		11020		234200	232920											
E		12330		234800	230735											
F					231300											
F					231700											
F					231000											
F					232000											
F					231700											
F					232000											
F					232000											
F					232300											
G		11200		230000		2.41	354		73500	2700	2360			3250		11900
G		10800		223000		2.46	354		73200	2500	2480			3150		11300
G		10800		229000		2.41	348		72200	2750	2430			3200		11500
G		11100		233000		2.41	328		73600	2700	2330			3100		11700
G		11300		238000		2.45	352		70300	2800	2290			3250		12100
G		11300		236000		2.46	352		71200	2800	2510			3250		12100
G		11200		236000		2.69	338		71500	2700	2360			3100		11800
G		11000		228000		2.45	352		71900	2700	2450			3150		11500
H	11200		226000			2.28	330	68200				2830	3110			
H	11200		227000			2.29	290	68200				2810	3100			
H	11100		223000			2.35	290	67800				2800	3070			
H	10900		229000			2.31	310	67300				2800	3130			
H	11300		224000			2.32	300	68100				2810	3090			
H	10800		224000			2.35	300	67700				2790	3080			
H	11200		225000			2.32	300	67900				2830	3080			
H	11000		231000			2.28	310	67900				2800	3070			

Assay data (Major Oxides -cont)

Lab Code	Al ₂ O ₃ XRF %	CaO XRF %	Cr ₂ O ₃ XRF %	Fe ₂ O ₃ XRF %	K ₂ O XRF %	MgO XRF %	MnO XRF %	Na ₂ O XRF %	TiO ₂ XRF %	S Comb/LECO %	SG pyc
B	1.16	0.13	0.02	25.4	0.14	6.45	0.46	0.85	0.16	35.4	4.16
B	1.13	0.11	0.02	25.3	0.14	6.48	0.46	0.84	0.16	35.5	4.15
B	1.14	0.11	0.02	25.3	0.14	6.53	0.46	0.87	0.16	35.5	4.11
B	1.16	0.12	0.02	25.3	0.14	6.51	0.46	0.87	0.16	35.5	4.14
B	1.17	0.12	0.02	25.2	0.14	6.55	0.46	0.87	0.17	35.1	4.15
B	1.16	0.12	0.02	25.2	0.14	6.54	0.46	0.88	0.16	35.7	4.12
B	1.18	0.12	0.02	25.2	0.14	6.50	0.46	0.88	0.17	35.3	4.15
B	1.15	0.12	0.02	25.2	0.14	6.57	0.46	0.87	0.16	35.4	4.17
C	1.21	0.21	0.02	23.4	0.20	0.45	0.39	0.08	0.07	33.6	4.12
C	1.25	0.21	0.02	23.3	0.22	0.43	0.39	0.05	0.05	33.5	4.11
C	1.15	0.18	0.02	23.1	0.20	0.45	0.39	0.07	0.05	33.4	4.10
C	1.17	0.20	0.02	23.3	0.20	0.45	0.39	0.05	0.07	33.4	4.09
C	1.21	0.18	0.02	23.5	0.22	0.45	0.39	0.05	0.05	33.6	4.11
C	1.15	0.21	0.02	23.1	0.22	0.46	0.39	0.07	0.05	33.6	4.12
C	1.19	0.20	0.02	23.5	0.22	0.43	0.39	0.05	0.07	33.6	4.10
C	1.17	0.22	0.02	23.2	0.23	0.46	0.39	0.05	0.05	33.6	4.10
G	1.21	0.21	0.06	23.9	0.20	0.58	0.41	0.08	0.15	36.0	
G	1.21	0.21	0.06	23.8	0.21	0.56	0.41	0.08	0.15	33.5	
G	1.21	0.22	0.04	23.7	0.21	0.56	0.41	0.08	0.16	33.2	
G	1.21	0.22	0.03	23.9	0.21	0.56	0.41	0.07	0.15	34.0	
G	1.21	0.21	0.05	23.7	0.20	0.56	0.41	0.08	0.16	33.7	
G	1.19	0.21	0.08	23.7	0.20	0.56	0.41	0.07	0.15	33.5	
G	1.20	0.22	0.09	23.8	0.20	0.56	0.41	0.07	0.15	33.5	
G	1.20	0.22	0.07	23.9	0.21	0.55	0.41	0.07	0.15	33.7	
H	1.17	0.22	0.02	24.9	0.20	0.46	0.38	0.08	0.05	33.4	4.05
H	1.15	0.21	0.02	25.4	0.20	0.46	0.38	0.08	0.05	34.3	
H	1.15	0.21	0.02	24.3	0.19	0.46	0.37	0.08	0.05	32.7	4.04
H	1.17	0.21	0.02	25.3	0.20	0.46	0.38	0.08	0.05	32.0	4.06
H	1.15	0.22	0.02	25.6	0.20	0.48	0.38	0.08	0.05	33.0	4.00
H	1.17	0.21	0.02	24.3	0.20	0.46	0.37	0.08	0.05	33.1	4.01
H	1.15	0.21	0.02	24.9	0.20	0.46	0.38	0.08	0.05	31.4	4.10
H	1.15	0.22	0.02	25.4	0.20	0.48	0.39	0.08	0.05		4.03
I										32.0	
I										31.6	
I										31.5	
I										31.9	
I										31.8	
I										32.4	
I										32.0	
I										32.3	
J	1.20	0.25	0.03	23.8	0.20	0.56	0.41	0.08	0.13	33.3	
J	1.20	0.22	0.03	24.0	0.20	0.56	0.41	0.07	0.13	33.5	
J	1.14	0.24	0.02	23.8	0.21	0.55	0.41	0.05	0.13	33.1	
J	1.12	0.22	0.03	24.0	0.21	0.56	0.40	0.05	0.12	33.8	
J	1.18	0.24	0.02	23.8	0.21	0.55	0.41	0.07	0.12	33.7	
J	1.19	0.24	0.02	23.8	0.21	0.57	0.41	0.07	0.12	33.6	
J	1.15	0.23	0.03	23.9	0.21	0.57	0.41	0.07	0.13	33.3	
J	1.15	0.23	0.03	23.8	0.21	0.60	0.41	0.05	0.12	33.1	
K										32.5	
K										32.5	
K										32.1	
K										32.1	
K										32.0	
K										32.5	
K										32.1	
K										31.8	
L			0.02	23.7		0.53	0.44		0.09	33.0	4.02
L			0.02	23.7		0.49	0.44		0.09	32.8	4.02
L			0.02	24.0		0.49	0.44		0.09	32.9	4.06
L			0.02	24.0		0.51	0.44		0.09	32.9	4.05
L			0.02	23.5		0.49	0.43		0.09	32.9	4.05
L			0.02	23.9		0.49	0.44		0.09	32.9	4.04
L			0.02	24.1		0.50	0.45		0.09	32.9	4.10
L			0.02	23.6		0.49	0.44		0.09	32.9	4.03
M	1.18	0.20	0.03		0.20	0.48	0.41	0.06	0.11	34.2	
M	1.19	0.21	0.03		0.21	0.48	0.42	0.06	0.11	34.0	
M	1.23	0.21	0.03		0.21	0.49	0.45	0.06	0.12	33.0	
M	1.13	0.20	0.02		0.20	0.45	0.42	0.06	0.11	33.5	
M	1.16	0.21	0.03		0.20	0.46	0.43	0.06	0.11	32.7	
M	1.15	0.20	0.03		0.20	0.46	0.43	0.06	0.11	34.6	
M	1.17	0.20	0.03		0.20	0.46	0.43	0.06	0.11	33.4	
M	1.16	0.20	0.03		0.20	0.46	0.42	0.06	0.12	34.3	

Assay data (Major Oxides -cont)

Lab Code	Al ₂ O ₃ XRF %	CaO XRF %	Cr ₂ O ₃ XRF %	Fe ₂ O ₃ XRF %	K ₂ O XRF %	MgO XRF %	MnO XRF %	Na ₂ O XRF %	TiO ₂ XRF %	S Comb/LECO %	SG pyc
N		0.22		25.5	0.23	0.44	0.40	0.06	0.09	35.4	3.93
N		0.23		25.6	0.23	0.44	0.40	0.06	0.09	35.1	4.14
N		0.22		24.5	0.22	0.42	0.39	0.06	0.09	35.6	4.01
N		0.22		24.9	0.22	0.43	0.39	0.06	0.09	35.5	4.21
N		0.22		24.5	0.23	0.43	0.40	0.05	0.09	35.3	4.14
N		0.22		25.4	0.23	0.43	0.40	0.06	0.09	34.7	3.89
N		0.22		25.3	0.22	0.43	0.40	0.06	0.09	34.6	4.02
N		0.22		25.6	0.22	0.42	0.39	0.05	0.09	35.0	3.89
O	1.19	0.22	0.02	22.9	0.24	0.45	0.37	0.09	0.07	33.1	
O	1.17	0.21	0.02	22.9	0.24	0.45	0.37	0.11	0.07	33.3	
O	1.19	0.21	0.02	23.1	0.24	0.45	0.37	0.09	0.07	32.8	
O	1.15	0.20	0.02	22.8	0.24	0.45	0.37	0.08	0.07	33.1	
O	1.17	0.21	0.02	23.0	0.24	0.45	0.37	0.09	0.07	33.2	
O	1.19	0.21	0.02	23.1	0.25	0.45	0.37	0.09	0.05	32.9	
O	1.21	0.25	0.02	23.0	0.25	0.45	0.37	0.09	0.05	33.0	
O	1.19	0.21	0.02	23.3	0.25	0.46	0.37	0.09	0.05	32.8	
P	1.20	0.22	0.03	24.0	0.21	0.46	0.40	0.07	0.14	33.7	4.16
P	1.21	0.22	0.03	24.0	0.21	0.45	0.41	0.07	0.14	33.9	4.15
P	1.20	0.22	0.03	23.9	0.21	0.46	0.40	0.07	0.13	33.9	4.13
P	1.20	0.22	0.03	23.9	0.21	0.47	0.40	0.05	0.14	33.7	4.12
P	1.19	0.22	0.03	23.9	0.21	0.47	0.40	0.07	0.13	33.8	4.14
P	1.20	0.22	0.03	23.9	0.21	0.46	0.40	0.07	0.14	32.8	4.18
P	1.19	0.22	0.03	23.9	0.21	0.47	0.40	0.07	0.14	33.2	4.13
P	1.20	0.22	0.03	24.0	0.21	0.46	0.40	0.07	0.14	33.1	4.15

12. Measurement of Uncertainty : (ref Dr Hugh Bartlett, Hugh Bartlett Consulting CC.)

The samples used in this certification process have been selected in such a way as to represent the entire batch of material and were taken from the final packaged units; therefore all possible sources of uncertainty (sample uncertainty and measurement uncertainty) are included in the final combined standard uncertainty determination.

The uncertainty measurement takes into consideration the between lab and the within lab variances and is calculated from the square roots of the variances of these components using the formula:

$$\text{Combined standard uncertainty} = \sqrt{(\text{between lab.var/no of labs}) + (\text{mean square within lab.var /no of assays})}$$

These uncertainty measurements may be used, by laboratories, as a component for calculating the total uncertainty for method validation according to the relevant ISO guidelines.

Analyte	Method	Unit	S ¹	σ_L ²	SW ³	CSU ⁴
Co	Fus	ppm	450	465	185	177
Co	M/ICP	ppm	240	125	208	51.5
Cu	Fus	ppm	5599	6078	2361	2507
Cu	M/ICP	ppm	3808	2883	2993	1257
Cu	Titration	ppm	2332	2310	1100	886
Au	Pb Coll	g/t	0.14	0.10	0.06	0.03
Ag	M/ICP	ppm	14.0	12.4	7.40	4.49
As	Fus	ppm	2692	2762	1095	1055
As	M/ICP	ppm	3027	3089	1267	1180
Bi	Fus	ppm	250	267	70	102
Bi	M/ICP	ppm	274	335	61	137
Sb	Fus	ppm	125	144	46	59
Sn	Fus	ppm	233	239	89	91
Sn	M/ICP	ppm	365	435	82	178
Zn	Fus	%	385	352	215	136
Zn	M/ICP	%	301	266	180	104
Al ₂ O ₃	XRF	%	0.02	0.02	0.02	0.006
CaO	XRF	%	0.01	0.008	0.006	0.003
Cr ₂ O ₃	XRF	%	0.004	0.003	0.002	0.001
Fe ₂ O ₃	XRF	%	0.81	0.77	0.26	0.26
K ₂ O	XRF	%	0.012	0.011	0.005	0.004
MgO	XRF	%	0.044	0.042	0.009	0.014
MnO	XRF	%	0.019	0.018	0.004	0.006
Na ₂ O	XRF	%	0.013	0.012	0.006	0.004
TiO ₂	XRF	%	0.04	0.03	0.004	0.01
S	Comb/LECO	%	1.08	0.79	0.41	0.22
SG	pyc		0.054	0.049	0.035	0.021

1. S - Std Dev for use on control charts.
2. σ_L - Betw Lab Std Dev, for use to calculate a measure of accuracy.
3. SW - Within Lab Stc Dev, for use to calculate a measure of precision.
4. CSU - Combined Standard Uncertainty, a component for use to calculate the total uncertainty in method validation.

13. Certified values: The Certified, Provisional and Informational values listed on p1 and p2 of this certificate fulfill the AMIS statistical criteria regarding agreement for certification and have been independently validated by Dr Barry Smee.

14. Metrological Traceability: The values quoted herein are based on the consensus values derived from statistical analysis of the data from an inter laboratory measurement program. Traceability to SI units is via the standards used by the individual laboratories, the majority of which are accredited, who have maintained measurement traceability during the analytical process.

15. Certification: AMIS0297 is a new material.

16. Period of validity: The certified values are valid for this product, while still sealed in its original packaging, until notification to the contrary. The stability of the material will be subject to continuous testing for the duration of the inventory. Should product stability become an issue, all customers will be notified and notification to that effect will be placed on the www.amis.co.za website.

17. Minimum sample size: The majority of laboratories reporting used a 0.5g sample size for the ICP. This is the recommended minimum sample size for the use of this material.

18. Availability: This product is available in Laboratory Packs containing 1kg of material and Explorer Packs containing custom weights (from 50g to 250g) of material. The Laboratory Packs are sealed bottles delivered in sealed foil pouches. The Explorer Packs contain material in standard geochem envelopes, vacuum sealed in foil pouches.

19. Recommended use: The data used to characterize this CRM has been scrutinized using outlier treatment techniques. This, together with the number of participating laboratories, should overcome any "inter-laboratory issues" and should lead to a very accurate measure for the given methods, notwithstanding the underlying assumption that what the good inter-laboratory labs reported was accurate. However an amount of bad data might have had an effect, resulting in limits which in some situations might be too broad for the effective monitoring of a single analytical method, laboratory or production process. Users should set their own limits based on their own data quality objectives and control measurements, after determining the performance characteristics of their own particular method, using a minimum of 20 analyses using this CRM. User set limits should normally be within the limits recommended on p1 and 2 of this certificate.

20. Legal Notice: This certificate and the reference material described in it have been prepared with due care and attention. However AMIS, Set Point Technology (Pty) Ltd, Mike McWha, Dr Barry Smee and Smee and Associates Ltd; accept no liability for any decisions or actions taken following the use of the reference material.

28 August 2013

Certifying Officers:



African Mineral Standards: _____

Mike McWha
BSc (Hons), FGSSA, MAusIMM, Pr.Sci.Nat



Geochemist: _____

Barry W. Smee
BSc, PhD, P.Geo, (B.C.)

Appendix - Uncertified trace element statistics

Analyte	Method	Unit	Mean	2SD	RSD%	n
Al	M/ICP	%	0.61	0.05	4.1	57
As	XRF	ppm	72340	300	0.21	15
Ba	M/ICP	ppm	69.2	93.5	67.6	70
Be	M/ICP	ppm	1.3	0.56	22.1	50
Bi	XRF	ppm	2406	200	4.1	16
Ca	M/ICP	%	0.15	0.02	6.9	62
Cd	M/ICP	ppm	56.9	189	166	54
Ce	M/ICP	ppm	16.5	3.9	11.9	38
Co	XRF	ppm	11275	977	4.3	24
Cr	M/ICP	ppm	159.5	40.6	12.7	70
Cs	M/ICP	ppm	0.47	0.57	60.4	32
Cu	XRF	ppm	230896	5558	1.2	24
Dy	M/ICP	ppm	3.3	0.36	5.4	31
Er	M/ICP	ppm	1.8	0.24	6.6	31
Eu	M/ICP	ppm	0.48	0.10	10.5	32
Fe	M/ICP	%	16.7	1.9	5.8	67
Ga	M/ICP	ppm	20.1	7.6	19.0	32
Gd	M/ICP	ppm	3.5	0.54	7.7	31
Ge	M/ICP	ppm	1.7	0.32	9.4	8
Hf	M/ICP	ppm	0.83	0.18	10.8	32
Ho	M/ICP	ppm	0.63	0.07	5.9	31
In	M/ICP	ppm	26.1	2.2	4.3	31
K	M/ICP	%	0.18	0.04	11.8	58
La	M/ICP	ppm	5.5	1.8	16.4	46
Li	M/ICP	ppm	4.1	2.0	25.2	49
LOI		%	30.6	4.7	7.6	24
Lu	M/ICP	ppm	0.30	0.50	83.8	36
Mg	M/ICP	%	0.28	0.03	5.8	68
Mn	M/ICP	ppm	3048	332	5.4	66
Mo	M/ICP	ppm	11.8	6.5	27.5	59
Na	M/ICP	%	0.05	0.02	19.4	64
Nb	M/ICP	ppm	3.0	1.1	18.9	31
Nd	M/ICP	ppm	7.4	1.2	8.3	32
Ni	M/ICP	ppm	93.9	27.0	14.4	63
Pb	M/ICP	ppm	4302	720	8.4	63
Pr	M/ICP	ppm	1.8	0.21	6.0	30
Rb	M/ICP	ppm	5.0	2.3	23.2	32
S	M/ICP	%	33.0	3.6	5.4	32
Sb	M/ICP	ppm	3031	555	9.2	37
Sb	XRF	ppm	3000	185	3.1	8
Sc	M/ICP	ppm	6.5	10.3	79.5	41
Se	M/ICP	ppm	17.1	15.5	45.3	29
Si	M/ICP	%	3.0	0.06	1.0	8
SiO ₂	XRF	%	6.0	1.3	11.0	32
Sm	M/ICP	ppm	2.3	0.4	9.0	32
Sr	M/ICP	ppm	124	25.7	10.3	65
Ta	M/ICP	ppm	0.21	0.07	15.6	25
Tb	M/ICP	ppm	0.55	0.07	6.3	32
Te	M/ICP	ppm	157	58.4	18.5	41
Th	M/ICP	ppm	1.7	0.23	6.5	29
Ti	M/ICP	%	0.05	0.04	38.2	54
Tl	M/ICP	ppm	9.1	8.6	47.7	36
Tm	M/ICP	ppm	0.23	0.04	8.5	31
U	M/ICP	ppm	28.4	4.5	8.0	31
V	M/ICP	ppm	608	124	10.2	70
W	M/ICP	ppm	51.5	28.3	27.5	39
Y	M/ICP	ppm	15.4	5.0	16.2	69
Yb	M/ICP	ppm	1.5	0.22	7.4	31
Zn	XRF	ppm	11608	348	1.5	24
Zr	M/ICP	ppm	20.7	17.1	41.4	54