



African Mineral Standards

MATRIX REFERENCE MATERIALS

Tel: +27 (0) 11 923 0800 Fax: +27 (0) 11 392 4715 web: [www.amis.co.za](http://www.amis.co.za)  
11 Gewel Street (off Hulley Road), D1 Isando Business Park, Kempton Park, 1609  
P.O. Box 856, Isando, 1600, Gauteng, South Africa, a division of the Set Point Group

## AMIS0271

### *Certified Reference Material*

**Gold, silver, epithermal vein, tail material,  
Guanajuato, Mexico**

### *Certificate of Analysis*

**Recommended Concentrations and Limits<sup>1</sup>  
(at two Standard Deviations)**

#### ***Certified Concentrations<sup>2</sup>***

Au Pb Collection	38.47	±	2.70	g/t
Ag M/ICP	7530	±	490	g/t
Cu M/ICP	1.215	±	0.066	%
Cu P	1.198	±	0.067	%
Pb M/ICP	1.426	±	0.133	%
Pb P	1.375	±	0.071	%
Zn M/ICP	1.562	±	0.065	%
Specific Gravity	3.63	±	0.30	

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 <sub>2</sub> O <sub>3</sub>	2.52	±	0.14	%
CaO	1.86	±	0.04	%
Fe <sub>2</sub> O <sub>3</sub>	36.86	±	1.02	%
K <sub>2</sub> O	0.93	±	0.04	%
MgO	0.92	±	0.10	%
MnO	0.08	±	0.01	%
SiO <sub>2</sub>	24.38	±	0.26	%
TiO <sub>2</sub>	0.51	±	0.03	%
S Comb/LECO	30.01	±	1.22	%

## Provisional Concentration

Cr <sub>2</sub> O <sub>3</sub>	0.041	±	0.006	%
--------------------------------	-------	---	-------	---

**1. Intended Use:** AMIS0271 can be used to check analysis of samples of fissure hosted, low-sulphidation, epithermal gold-silver quartz vein ores, with a similar grade and matrix.

It is a matrix matched Certified Reference Material, 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 Section 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:** AMIS0271 is a commissioned CRM made from material supplied by SGS Minerals Services from the Guanajuato Mine Complex (GMC) located in Guanajuato State, Mexico. GMC is wholly owned by Great Panther Silver Limited through Minera Mexicana El Rosario, S.A. de C.V. The mine is located on the Central Plateau of Mexico. The City of Guanajuato, where the mines are located, is 380 km by road northwest of Mexico City. Mineralization occurs along regional scale faults, the largest of which is the 25 km long Veta Madre vein structure. The material supplied was described as "Tail".

**3. Mineral and Chemical Composition:** The economic mineralization is hosted in quartz-carbonate-adularia veins and stockwork systems with identifiable ore-shoots that carry the bulk of the economic mineralization. The ore shoots are discontinuous, 10-40m wide and typically equal in vertical dimensions to strike length. The argentiferous mineralization is hosted in quartz veins with gangue mineralogy of quartz, calcite, pyrite, adularia, and sericite. The principal Ag bearing mineralization is acanthite (argentite), aguilarite and naumannite while Au occurs a free Au and as electrum. The Au to Ag ratios vary from about 1:70 to 1:200. Base metal mineralization is not common; when it occurs it is observed as chalcopyrite, sphalerite and galena.

4. **Appearance:** The material is a very fine powder. It is colored a Dark Grey (Corstor)
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 ore is crushed, then dry-milled and air classified to 100% <math> < 54\mu </math>. This fine powder is mixed in a blender for 14 hours and then split down into numbered 1 kg tubs. These lots are sampled for quality control and for round robin analysis. Quality control will typically comprise sampling 30 tubs selected from the whole stream. Round robin samples are selected the same way, so that one laboratory will receive samples from the beginning, end, and from throughout the batch.
7. **Methods of Analysis requested:**
1. Au – Pb collection, ICP-OES or ICP-MS.
  2. Multi-acid digest multi-element scan - (to include Ag, Cu, Pb, Zn) ICP-OES or ICP-MS.
  3. Aqua regia digest multi-element scan - (to include Ag, Cu, Pb, Zn) ICP-OES or ICP-MS.
  4. Majors (  $Al_2O_3$ ,  $CaO$ ,  $Cr_2O_3$ ,  $Fe_2O_3$ ,  $K_2O$ ,  $MgO$ ,  $MnO$ ,  $Na_2O$ ,  $SiO_2$ ,  $TiO_2$ . LOI. ) XRF fusion.
  5. SG. Gas pycnometer.
8. **Information requested:**
1. State aliquots used for all determinations.
  2. All results for major elements to be reported as oxides in percentages.
  3. All results for multi-element scans to be reported in ppm.
  4. Report all QC data, to include replicates, blanks and certified reference materials used.
  5. State and provide brief description of analytical techniques used.
9. **Method of Certification:** Twenty four laboratories were each given eight randomly selected packages of sample. Twenty one of the laboratories submitted results.

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 21 out of 24 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 Chemex Laboratory Group Johannesburg SA
3. ALS Chemex Laboratory Group Perth WA
4. Bureau Veritas (Namibia)
5. Bureau Veritas (USA)
6. BV (Canada)
7. Genalysis Laboratory Services (South Africa) Pty
8. Genalysis Laboratory Services (W Australia P)
9. Intertek Utama Services (Indonesia)
10. OMAC Laboratories Limited (Ireland)
11. SGS Australia Pty Ltd (Newburn) WA
12. SGS Chelopech (Bulgaria)
13. SGS Durango (Mexico)
14. SGS Geosol Laboratories Ltda (Brazil)
15. SGS Mineral Services Callao (Peru)
16. SGS Mineral Services Lakefield (Canada)
17. SGS Philippines, Inc. (Philippines)
18. SGS South Africa (Pty) Ltd - Booyens JHB
19. SGS Toronto (Canada)
20. SGS Vancouver
21. Ultra Trace (Pty) Ltd WA

**11. Assay Data:** Data as received from the laboratories for the important certified elements listed on p1 and 2 are set out below. A proficiency report has been sent to the managers of the participating laboratories. Additional digital data from this round robin is available on request.

**Assay data- Economic elements**

Lab Code	Au Pb Coll g/t	Ag M/ICP g/t	Ag P g/t	Cu M/ICP ppm	Cu P ppm	Pb M/ICP ppm	Pb P ppm	Zn M/ICP ppm	Zn P ppm
A	39.00		7490						
A	38.00		7260						
A	39.00		7410						
A	34.00		6940						
A	37.00		7660						
A	38.00		7750						
A	37.00		7250						
A	38.00		7320						
C	42.20		7380	12700	12800	14600	14300	16700	16300
C	41.60		7420	12000	11900	13600	13200	15300	15500
C	40.00		7370	11400	12800	13400	14100	15300	16300
C	41.50		7410	11500	11900	13700	13200	15500	15500
C	38.70		7380	12100	12500	14300	14000	16300	16500
C	40.50		7430	11900	12500	13900	14100	15800	16500
C	40.70		7310	12200	12100	14000	13700	16000	15900
C	39.50		7570	12200	12300	14100	13500	16100	15700
D	36.30						12800		
D	39.10						12700		
D	37.10						13200		
D	36.50						13400		
D	39.20						13200		
D	37.60						13300		
D	37.80						13200		
D	36.90						13100		

**Assay data (cont) - Economic elements**

Lab Code	Au Pb Coll g/t	Ag M/ICP g/t	Ag P g/t	Cu M/ICP ppm	Cu P ppm	Pb M/ICP ppm	Pb P ppm	Zn M/ICP ppm	Zn P ppm
E	39.30	7703							
E	40.40	7725							
E	39.60	7668							
E	39.40	7660							
E	39.30	7704							
E	40.30	7709							
E	38.90	7700							
E	39.30	7688							
F	41.96		729						
F	41.74		758						
F	41.51		666						
F	41.30		789						
F	41.22		738						
F	41.52		678						
F	41.31		800						
F	41.63		702						
G		7648		11500		14000		15800	
G		7643		11400		14000		15900	
G		7695		11300		13800		15700	
G		7484		11500		14100		15800	
G		7684		11100		13300		15100	
G		7644		10900		13100		14900	
G		7637		11300		13600		15500	
G		7621		11300		14000		15500	
H	37.60								
H	37.60								
H	37.20								
H	37.52								
H	37.60								
H	38.00								
H	37.60								
H	38.40								
J	39.00	7315							
J	38.10	7213							
J	39.40	7029							
J	38.20	7590							
J	39.80	7534							
J	38.70	7582							
J	39.10	7636							
J	38.40	7514							
K					13600		15000		17000
K					12600		14300		16100
K					11900		13900		15500
K					12900		14700		16400
K					12900		11800		16500
K					12500		11700		15300
K					12800		12200		16200
K					12000		12000		14800
L	37.78	7671	7606	11600	11500	13800		15500	
L	38.71	7672	7576	11800	11700	13700		15300	
L	38.30	7843	7538	11800	11600	13700		15400	
L	37.24	7743	7567	11900	11700	13700		15400	
L	38.16	7823	7698	11700	11600	13800		15700	
L	37.02	7813	7547	11800	11600	13800		15900	
L	37.07	7687	7616	11800	11700	13700		15500	
L	38.19	7701	7559	11800	11400	13800		15700	
M	39.30		9000						
M	38.80		9350						
M	38.90		9120						
M	38.90		9040						
M	38.10		8940						
M	38.30		8870						
M	37.80		9250						
M	38.20		9090						
N	25.10			11900	11850	13700	13800	15400	15700
N	40.70			11900	11650	13650	13500	15400	15400
N	42.20			11700	11800	13400	13550	15100	15550
N	31.70			12200	11750	14150	13550	15800	15500
N	41.20			11750	12050	13650	13700	15250	15850
N	39.10			11950	12200	14300	13900	15550	16150
N	39.50			11750	12150	13550	13700	15200	16000
N	39.30			11600	11800	13400	13750	15100	15500

Assay data (cont) - Economic elements

Lab Code	Au Pb Coll g/t	Ag M/ICP g/t	Ag P g/t	Cu M/ICP ppm	Cu P ppm	Pb M/ICP ppm	Pb P ppm	Zn M/ICP ppm	Zn P ppm
O	36.70			11650	11950	13400	13650	15300	16050
O	38.90			11600	12200	13450	13950	15450	16500
O	39.40			11850	11900	13650	13750	15700	16150
O	39.60			11750	12250	13500	14150	15500	16650
O	39.80			11700	12000	13450	13850	15550	16250
O	37.80			11700	11450	13400	13150	15350	15450
O	37.80			11650	11900	13450	13750	15500	16300
O	38.60			11750	11900	13550	13750	15500	16200
P	37.70								
P	38.50								
P	38.10								
P	37.10								
P	36.30								
P	37.80								
P	39.00								
P	39.50								
Q	38.70	7340		12300	11800	14600	13900	15900	
Q	38.70	7360		12600	12000	15900	13900	15900	
Q	39.30	7250		12500	12000	14800	13200	16000	
Q	37.90	7310		12500	11900	14500	13700	15900	
Q	37.40	7230		12500	11900	15300	13700	15800	
Q	37.60	7470		12500	11900	14300	13700	15600	
Q	38.40	7540		12600	12000	14100	14000	16000	
Q	39.10	7140		12000	11800	15500	14100	15900	
R	37.21	7520		12924	12000	13900	14400	15900	15700
R	34.77	7545		12427	12300	14000	14200	15800	15600
R	35.03	7673		12755	11800	14000	14200	15700	15500
R	39.57	7788		12672	12000	14000	14000	15500	15400
R	41.17	7653		12948	12200	14100	14000	15500	15400
R	38.83	7395		11998	11600	14100	14300	15500	15400
R	37.84	7374		12355	12000	13900	14200	15600	15400
R	30.88	7581		12485	11700	14100	14000	15600	15500
S	37.30			12100		14900		15950	
S	37.00			12200		14900		16120	
S	37.10			12000		14600		15810	
S	37.00			12400		15000		15890	
S	36.60			12200		15000		15710	
S	38.50			12300		14600		15730	
S	37.50			11900		14600		15830	
S	38.60			12300		14700		15930	
T	39.96	7641		12300		15100		15000	
T	38.97	6807		12000		15200		15000	
T	39.60	7955		11900		15000		14800	
T	36.36	7807		12000		14900		15100	
T	38.67	7727		12200		15200		15200	
T	39.36	7746		12300		15200		15700	
T	39.23	7979		12100		15400		15100	
T	35.08	7051		12200		15500		15200	
U		6931		12599		15090		17312	
U		6521		12227		13815		16511	
U		6630		12595		14187		17099	
U		7083		12385		13907		16724	
U		7354		12654		14574		17362	
U		7045		12632		14092		16782	
U		7225		12652		14142		17311	
U		6354		12423		14640		16825	
V	38.37			12162				16034	
V	37.66			12038				16119	
V	37.72			12369				16357	
V	36.90			12223				15983	
V	37.35			12445				16141	
V	37.45			11870				15639	
V	38.23			12771				17004	
V	35.38			11988				15773	
W	38.30	7030		12300		15300		15100	
W	40.00	7010		12200		15300		15900	
W	39.40	7220		12200		15200		15700	
W	39.30	7300		12500		15100		15400	
W	40.50	7170		12500		15300		15900	
W	39.40	7440		12400		15400		15700	
W	39.40	7060		12100		15200		15100	
W	39.60	7120		12300		15400		15700	

Assay data – Major Oxides

Lab Code	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	LOI XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	SiO2 XRF %	TiO2 XRF %	S Comb/LECO %	SG pyc
A												29.67	3.94
A												29.72	3.88
A												29.56	3.93
A												29.48	4.04
A												29.75	3.95
A												29.46	3.85
A												29.89	3.83
A												29.80	3.84
D	2.55	1.86		37.10	0.93	24.70	0.90	0.08	0.46	24.20	0.52	30.10	
D	2.55	1.87		37.10	0.93	24.50	0.89	0.08	0.43	24.20	0.51	29.70	
D	2.54	1.87		37.10	0.92	24.60	0.89	0.08	0.44	24.30	0.51	30.10	
D	2.53	1.87		37.10	0.92	24.70	0.89	0.08	0.45	24.20	0.51	29.30	
D	2.53	1.87		37.10	0.92	24.60	0.88	0.08	0.41	24.20	0.51	30.00	
D	2.56	1.87		37.10	0.93	24.70	0.89	0.08	0.44	24.20	0.51	29.20	
D	2.55	1.88		37.30	0.93	24.60	0.90	0.08	0.45	24.40	0.52	30.10	
D	2.54	1.87		37.20	0.93	24.60	0.90	0.08	0.44	24.30	0.51	30.00	
E												29.60	
E												29.70	
E												29.60	
E												29.70	
E												29.70	
E												29.50	
E												29.50	
E													
G	2.53		0.04	36.60	0.90		0.85	0.07					
G	2.53		0.03	36.74	0.92		0.85	0.07					
G	2.51		0.04	36.89	0.92		0.85	0.07					
G	2.46		0.04	36.60	0.89		0.83	0.07					
G	2.46		0.04	35.31	0.90		0.85	0.07					
G	2.48		0.04	34.74	0.89		0.85	0.07					
G	2.42		0.03	36.31	0.89		0.81	0.07					
G	2.42		0.04	36.17	0.88		0.83	0.07					
H												31.14	
H												30.83	
H												30.50	
H												30.67	
H												30.92	
H												31.03	
H												31.02	
H												30.96	
J	2.75	1.87	0.05	37.30	0.92	25.36	0.97	0.08	0.56	25.10	0.52	31.30	3.56
J	2.83	1.88	0.06	36.90	0.92	25.19	0.98	0.09	0.60	25.40	0.52	31.00	3.58
J	2.83	1.88	0.05	37.40	0.92	25.18	0.96	0.08	0.58	25.30	0.52	31.10	3.54
J	2.75	1.91	0.06	37.10	0.93	25.25	0.96	0.08	0.56	25.10	0.52	32.00	3.58
J	2.76	1.89	0.05	37.40	0.93	25.19	0.96	0.08	0.56	25.10	0.52	32.30	3.59
J	2.80	1.90	0.06	37.00	0.92	25.32	0.98	0.08	0.58	25.20	0.52	30.10	3.57
J	2.74	1.85	0.06	37.40	0.91	25.35	0.96	0.08	0.56	25.10	0.54	30.80	3.57
J	2.72	1.86	0.05	37.50	0.92	25.25	0.95	0.08	0.57	25.10	0.52	29.90	3.58
L												29.80	3.12
L												29.70	3.15
L												29.80	3.13
L												29.80	3.22
L												29.70	3.23
L												29.60	3.22
L												29.60	3.17
L												29.60	3.25
M	2.46	1.82	0.04	36.09	0.97	24.77	0.86	0.07	0.39	24.49	0.49		3.28
M	2.52	1.81	0.04	36.09	0.95	24.67	0.86	0.07	0.38	24.22	0.50		3.17
M	2.45	1.84	0.05	36.40	0.94	24.78	0.88	0.08	0.40	24.34	0.50		3.28
M	2.47	1.81	0.04	36.21	0.95	24.82	0.86	0.07	0.41	24.20	0.50		3.41
M	2.52	1.82	0.05	36.10	0.94	24.80	0.88	0.07	0.41	24.39	0.50		3.37
M	2.52	1.81	0.05	36.07	0.95	24.78	0.87	0.07	0.40	24.29	0.50		3.34
M	2.45	1.80	0.04	36.05	0.95	24.76	0.86	0.07	0.39	24.19	0.51		3.34
M	2.47	1.82	0.04	36.09	0.96	24.69	0.86	0.07	0.38	24.24	0.50		3.36
O												30.50	3.61
O												30.30	3.58
O												30.50	2.94
O												30.00	3.58
O												30.50	3.61
O												30.60	3.57
O												30.90	3.55
O												30.40	3.56
P												29.50	
P												29.10	
P												28.50	
P												29.30	
P												29.00	
P												29.50	
P												29.30	
P												29.30	

## Assay data (cont) – Major Oxides

Lab Code	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	LOI XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	SiO2 XRF %	TiO2 XRF %	S Comb/LECO %	SG pyc
Q	2.52	1.87	0.04	36.93	0.92	24.70	0.95	0.08		24.45	0.52	29.30	3.63
Q	2.52	1.89	0.05	36.95	0.93	24.60	0.95	0.08		24.52	0.52	29.40	3.62
Q	2.52	1.87	0.05	36.98	0.93	24.60	0.95	0.08		24.43	0.52	29.70	3.63
Q	2.50	1.88	0.04	36.99	0.93	24.70	0.96	0.08		24.50	0.51	29.60	3.65
Q	2.48	1.88	0.04	36.92	0.93	24.70	0.96	0.08		24.44	0.51	29.10	3.64
Q	2.52	1.88	0.05	36.95	0.93	24.70	0.96	0.08		24.45	0.52	29.20	3.63
Q	2.52	1.87	0.05	36.94	0.92	24.70	0.96	0.08		24.40	0.52	29.60	3.64
Q	2.52	1.87	0.05	36.93	0.92	24.70	0.95	0.08		24.50	0.51	29.40	3.62
R	2.59	1.85	0.04	36.33	0.92	22.22	0.96	0.07	0.13	24.47	0.49		
R	2.59	1.84	0.04	36.25	0.91	22.38	0.96	0.07	0.13	24.54	0.50		
R	2.60	1.85	0.04	36.40	0.91	22.16	0.95	0.07	0.11	24.50	0.50		
R	2.58	1.85	0.04	36.42	0.91	22.15	0.95	0.07	0.14	24.51	0.49		
R	2.61	1.85	0.04	36.31	0.91	22.15	0.96	0.07	0.12	24.51	0.50		
R	2.55	1.84	0.04	36.18	0.91	22.39	0.96	0.07	0.16	24.28	0.49		
R	2.61	1.85	0.04	36.46	0.91	22.11	0.95	0.07	0.15	24.54	0.50		
R	2.59	1.83	0.04	35.99	0.91	20.22	0.94	0.07	0.14	24.22	0.49		
S	2.55	1.86	0.04	37.50	0.90		0.93	0.08	0.07	24.60	0.52	29.50	3.67
S	2.55	1.87	0.04	37.90	0.90		0.93	0.08	0.05	25.00	0.53	29.70	3.69
S	2.53	1.82	0.04	38.30	0.89		0.91	0.08	0.05	24.40	0.52	29.80	3.67
S	2.59	1.87	0.04	37.30	0.90		0.95	0.08	0.05	24.60	0.54	29.80	3.69
S	2.57	1.87	0.04	37.80	0.89		0.95	0.08	0.05	24.40	0.53	29.90	3.70
S	2.55	1.87	0.04	37.00	0.90		0.93	0.08	0.04	24.40	0.52	29.70	3.69
S	2.53	1.86	0.04	37.00	0.89		0.93	0.08	0.05	24.40	0.52	29.90	3.67
S	2.57	1.86	0.04	37.20	0.90		0.93	0.08	0.05	24.40	0.52	29.70	3.69
T	2.38				0.93								
T	2.38				0.94								
T	2.42				0.91								
T	2.40				0.95								
T	2.42				0.96								
T	2.25				0.86								
T	2.40				0.95								
T	2.51				0.96								
U	2.72	1.87	0.05		0.98		0.98	0.08			0.50	30.60	3.59
U	2.57	1.85	0.04		0.93		0.91	0.08			0.48	30.79	3.54
U	2.68	1.89	0.05		0.98		0.95	0.08			0.49	30.96	3.63
U	2.63	1.86	0.04		0.94		0.95	0.08			0.45	30.92	3.65
U	2.72	1.89	0.04		0.99		0.98	0.08			0.45	31.04	3.60
U	2.65	1.89	0.04		0.96		0.95	0.08			0.47	30.77	3.64
U	2.72	1.89	0.05		0.99		0.98	0.08			0.51	30.79	3.63
U	2.65	1.86	0.04		0.95		0.95	0.08			0.49	31.11	3.65
V		1.82	0.04	37.40	0.95			0.08					3.77
V		1.85	0.04	37.92	0.94			0.08					3.73
V		1.89	0.04	38.39	0.96			0.08					3.72
V		1.85	0.04	37.63	0.95			0.08					3.77
V		1.88	0.04	38.30	0.95			0.08					3.76
V		1.80	0.04	36.82	0.93			0.08					3.72
V		1.98	0.04	36.75	0.93			0.08					3.74
V		1.82	0.04	37.19	0.94			0.08					3.73

### 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:

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

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 <sup>1</sup>	$\sigma_L$ <sup>2</sup>	Sw <sup>3</sup>	CSU <sup>4</sup>
Au	Pb Coll	g/t	1.354	0.600	1.042	0.171
Ag	M/ICP	g/t	244.9	196.2	158.8	72.18
Cu	M/ICP	ppm	328.7	226.5	202.1	71.72
Cu	P	ppm	334.7	254.0	244.7	101.73
Pb	M/ICP	ppm	663.9	528.6	288.7	162.4
Pb	P	ppm	403.8	374.2	271.5	157.7
Zn	M/ICP	ppm	325.0	185.76	245.8	62.03
Al <sub>2</sub> O <sub>3</sub>	XRF	%	0.068	0.062	0.031	0.022
CaO	XRF	%	0.024	0.019	0.016	0.007
Cr <sub>2</sub> O <sub>3</sub>	XRF	%	0.003	0.003	0.001	0.001
Fe <sub>2</sub> O <sub>3</sub>	XRF	%	0.510	0.460	0.236	0.165
K <sub>2</sub> O	XRF	%	0.022	0.018	0.011	0.006
MgO	XRF	%	0.045	0.046	0.012	0.016
MnO	XRF	%	0.004	0.004	0.001	0.001
SiO <sub>2</sub>	XRF	%	0.160	0.137	0.126	0.064
TiO <sub>2</sub>	XRF	%	0.014	0.014	0.007	0.005
S	Comb/LECO	%	0.613	0.487	0.247	0.149
SG	pycnometer		0.146	0.148	0.030	0.052

1. S - Std Dev for use on control charts.
2.  $\sigma_L$  - 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 Indicated values listed on p1 of each certificate fulfil the AMIS statistical criteria regarding agreement for certification and have been independently validated by Dr Barry Smee, BSc, PhD, P.Geo, (B.C.).

**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 and who have maintained measurement traceability during the analytical process.

**15. Certification:** AMIS0271 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](http://www.amis.co.za) website.

**17. Minimum sample size:** The majority of laboratories reporting used a 0.5g sample size for the ICP and a 30g sample size for the fire assay. These are the recommended minimum sample sizes 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 50 to 250g) of material. The Laboratory Packs are sealed bottles delivered in sealed foil pouches. The Explorer Packs contain material in standard geochem envelopes, nitrogen flushed and 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.

18 October 2012

**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	%	1.3	0.15	5.7	115
Ag	ICP P	g/t	6439	5926	46.0	40
As	M/ICP	ppm	534	128	12.0	118
Ba	M/ICP	ppm	109	159	72.6	103
Be	M/ICP	ppm	1.0	0.34	16.8	73
Bi	M/ICP	ppm	7.9	4.6	29.2	73
Ca	M/ICP	%	1.3	0.18	7.2	120
Cd	M/ICP	ppm	111	17.4	7.9	121
Ce	M/ICP	ppm	51.9	89.1	85.9	32
Co	M/ICP	ppm	115	25.0	10.8	112
Cr	M/ICP	ppm	253	89.5	17.7	120
Cs	M/ICP	ppm	2.3	0.25	5.5	32
Dy	M/ICP	ppm	3.1	0.66	10.5	32
Er	M/ICP	ppm	1.8	0.19	5.3	31
Eu	M/ICP	ppm	0.67	0.11	8.1	32
Fe	M/ICP	%	25.6	3.3	6.5	72
Ga	M/ICP	ppm	4.1	1.2	14.4	40
Gd	M/ICP	ppm	3.2	0.56	8.9	32
Ge	M/ICP	ppm	2.5	0.21	4.3	8
Hf	M/ICP	ppm	1.5	0.75	24.3	39
Ho	M/ICP	ppm	0.63	0.10	8.3	31
In	M/ICP	ppm	0.89	0.10	5.8	38
K	M/ICP	%	0.74	0.10	6.8	115
La	M/ICP	ppm	12.1	4.3	17.7	88
Li	M/ICP	ppm	27.0	4.3	8.0	88
Lu	M/ICP	ppm	0.24	0.08	16.8	32
Mg	M/ICP	%	0.52	0.08	7.2	126
Mn	M/ICP	ppm	570	92.6	8.1	120
Mo	M/ICP	ppm	30.6	6.2	10.2	118
Na	M/ICP	%	0.04	0.02	28.8	121
Nb	M/ICP	ppm	6.0	0.58	4.8	41
Nd	M/ICP	ppm	14.7	2.1	7.1	32
Ni	M/ICP	ppm	212	46.5	11.0	104
P	M/ICP	ppm	556	235	21.2	108
Pr	M/ICP	ppm	3.7	0.42	5.6	32
Rb	M/ICP	ppm	38.6	3.1	4.0	38
Re	M/ICP	ppm	0.02	0.14	385	24
S	M/ICP	%	29.0	0.91	1.6	31
Sb	M/ICP	ppm	161	41.6	12.9	120
Sc	M/ICP	ppm	5.7	1.5	13.3	97
Se	M/ICP	ppm	484	136	14.1	48
Si	M/ICP	%	11.5	0.43	1.9	8
Sm	M/ICP	ppm	3.1	0.55	8.7	32
Sn	M/ICP	ppm	5.9	5.8	49.8	42
Sr	M/ICP	ppm	54.1	10.8	9.9	111
Ta	M/ICP	ppm	0.46	0.10	11.3	36
Tb	M/ICP	ppm	0.49	0.09	9.5	32
Te	M/ICP	ppm	9.4	1.9	10.1	37
Th	M/ICP	ppm	4.3	1.3	15.0	39
Ti	M/ICP	%	0.27	0.06	10.4	99
Tl	M/ICP	ppm	4.0	7.5	95.4	48
Tm	M/ICP	ppm	0.26	0.08	15.2	32
V	M/ICP	ppm	67.2	23.9	17.8	120
W	M/ICP	ppm	41.8	139	167	72
Y	M/ICP	ppm	16.2	2.8	8.5	88
Yb	M/ICP	ppm	1.6	0.45	14.6	31
Zn	ICP P	%	1.59	837	2.6	38
Zr	M/ICP	ppm	45.5	26.0	28.5	101