



African Mineral Standards

MATRIX REFERENCE MATERIALS

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## AMIS0351

### *Certified Reference Material*

Low grade epithermal gold ore,  
Masbate Gold Project, Philippines

### *Certificate of Analysis*

Recommended Concentrations and Limits<sup>1, 2.</sup>  
(at two Standard Deviations)

#### *Provisional Concentration*

Au Pb Collection 0.25 ± 0.04 g/t

#### *Certified Concentrations*

Cu M/ICP 465 ± 21 ppm  
Specific Gravity 2.74 ± 0.14

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, 10 and 13.
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>	13.65	±	0.16	%
CaO	5.10	±	0.06	%
Fe <sub>2</sub> O <sub>3</sub>	6.59	±	0.10	%
K <sub>2</sub> O	3.59	±	0.04	%
MgO	3.29	±	0.08	%
MnO	0.14	±	0.01	%
Na <sub>2</sub> O	1.95	±	0.04	%
SiO <sub>2</sub>	58.56	±	0.46	%
TiO <sub>2</sub>	0.61	±	0.02	%
LOI	5.28	±	0.26	%
S Comb/LECO	0.44	±	0.06	%

## Indicated Mean

Cr<sub>2</sub>O<sub>3</sub> 0.02 %

**1. Intended Use:** AMIS0351 is a certified reference material which may be used to demonstrate the validity of measurement results of a single analysis of low grade gold ore hosted by rocks 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 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 material for AMIS0351 was provided by SGS Minerals Services from the Filminera Resources Corp Masbate Gold Project. The Masbate gold deposits are located near the northern tip of the island of Masbate, 360 km south-east of the Philippines capital of Manila.

**3. Mineral and Chemical Composition:** The main deposit type in the region is a 'low-sulphidation' epithermal vein gold style of mineralisation. The principal host rocks to the gold mineralisation comprise fractured andesitic-dacitic, tuffaceous agglomerate. Mineralisation occurs within quartz veins within the agglomerate, and also within associated altered wall rocks, breccias and stockwork zones. Individual mineralised quartz veins can be traced up to 3 km. The primary

mineral associated with gold (+minor silver) mineralisation is quartz, both in the form of fracture-filling quartz veins and in the silicification of the host rocks. Calcite is a common vein mineral but is generally present in smaller amounts or absent in the oxidized ore. Sulphides associated with quartz veining average between 1 and 10 % with pyrite making up 85 % to 95 % of all sulphides and as high as 40 per cent in places. Other sulphides present in significant percentages are galena, sphalerite, chalcopyrite and manganite.

**4. Appearance:** The material is a very fine powder. It is colored a Medium Light Grey (10Y 6/2 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 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 blended in a bi-conical mixer, systematically divided and then 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 the consensus test results were carried out by independent statisticians.

**7. Methods of Analysis requested:**

1. Au – Pb collection ICP-OES or ICP-MS.
2. Multi-acid digest, including HF, ICP- OES or ICP-MS. Multi element scan.
3. Majors ( Al<sub>2</sub>O<sub>3</sub>, CaO, Cr<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, MgO, MnO, Na<sub>2</sub>O, SiO<sub>2</sub>, TiO<sub>2</sub>. LOI. ) XRF fusion.
4. SG – Gas Pycnometer.

**8. Information requested:**

1. State aliquots used for all determinations.
2. Report all results for gold in ppm.
3. All results for major elements to be reported as oxides in percentages.
4. All results for multi-element scans to be reported in ppm.
5. Report all QC data, to include replicates, blanks and certified reference materials used.
6. State and provide brief description of analytical techniques used.

**9. Method of Certification:** Twenty Five laboratories were each given eight randomly selected packages of sample. Twenty two of the laboratories submitted 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 22 out of 25 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. Anglo Gold Ashanti - Navachab Gold Mine Laboratory Namibia
5. Genalysis Laboratory Services (W Australia P)
6. Intertek Utama Services (Indonesia)
7. Performance Laboratories Barberton
8. Performance Laboratories FS (Allanridge)
9. Performance Laboratories SA (Randfontein)
10. Set Point Laboratories (Isando) SA
11. SGS Australia Pty Ltd (Newburn) WA
12. SGS Geosol Laboratories Ltda (Brazil)
13. SGS Mineral Services Callao (Peru)
14. SGS Mineral Services Lakefield (Canada)
15. SGS Mwanza (Tanzania)
16. SGS NSW (Australia)
17. SGS South Africa (Pty) Ltd - Booyens JHB
18. SGS Tarkwa (Ghana)
19. SGS Toronto (Canada)
20. SGS Townsville (Australia)
21. SGS Vancouver (Canada)
22. Ultra Trace (Pty) Ltd WA

**11. Assay Data:** Data as received from the laboratories for the important certified elements listed on p1 are set out below.

Lab Code	Au PbColl g/t	Cu M/ICP ppm	Ni M/ICP ppm	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	SiO2 XRF %	TiO2 XRF %	LOI %	S Comb LECO %	SG pyc
A	0.27	452	137												0.46	2.63
A	0.26	453	137												0.45	2.72
A	0.25	451	140												0.45	2.75
A	0.27	463	136												0.45	2.68
A	0.27	453	136												0.46	2.72
A	0.28	451	135												0.46	2.74
A	0.28	449	137												0.46	2.58
A	0.27	420	147												0.45	2.70
B	0.24	454	153												0.40	2.81
B	0.25	467	157												0.40	2.81
B	0.26	456	153												0.39	2.81
B	0.25	465	155												0.40	2.80
B	0.27	436	147												0.40	2.81
B	0.25	449	148												0.40	2.81
B	0.24	462	155												0.39	2.81
B	0.25	465	155												0.40	2.80
C	0.23	454	141												0.45	
C	0.27	444	139												0.45	
C	0.23	461	141												0.44	
C	0.24	466	143												0.44	
C	0.23	450	140												0.44	
C	0.25	450	137												0.44	
C	0.23	477	145												0.44	
C	0.24	458	140												0.45	
D	0.21															
D	0.22															
D	0.21															
D	0.22															
D	0.24															
D	0.24															
D	0.21															
D	0.23															
E	0.22															
E	0.22															
E	0.24															
E	0.25															
E	0.23															
E	0.23															
E	0.25															
E	0.21															
F	0.25	470	149	13.74	5.08	0.02	6.77	3.58	3.22	0.14	1.98	58.30	0.61	5.96		2.71
F	0.24	468	149	13.64	5.08	0.02	6.78	3.58	3.21	0.14	1.98	58.30	0.61	5.96		2.72
F	0.25	467	150	13.72	5.10	0.02	6.80	3.58	3.23	0.14	1.94	58.40	0.61	5.99		2.71
F	0.23	467	149	13.74	5.11	0.02	6.81		3.25	0.14	1.95	58.70	0.62	6.04		2.70
F	0.25	467	149	13.70	5.12	0.02	6.80	3.60	3.24	0.14	1.93	58.50	0.61	6.03		2.71
F	0.25	470	150	13.67	5.07	0.02	6.80	3.59	3.23	0.14	1.93	58.20	0.61	6.00		2.72
F	0.24	470	151	13.74	5.09	0.02	6.80	3.58	3.23	0.14	1.96	58.40	0.61	5.99		2.72
F	0.24	468	150	13.63	5.05	0.02	6.74	3.58	3.23	0.14	1.96	58.10	0.61	6.03		2.71

Assay data (cont)

Lab Code	Au PbColl g/t	Cu M/ICP ppm	Ni M/ICP ppm	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	SiO2 XRF %	TiO2 XRF %	LOI %	S Comb LECCO	SG pyc
G	0.28	538	168	13.70	5.15	0.02	6.56	3.60	3.27	0.15	1.95	58.64	0.60	5.43	0.47	
G	0.28	544	142	13.72	5.07	0.02	6.58	3.58	3.24	0.14	1.97	58.34	0.59	5.44	0.46	
G	0.27	533	139	13.74	5.12	0.02	6.58	3.57	3.24	0.14	1.97	58.45	0.60	5.44	0.46	
G	0.27	444	157	13.72	5.07	0.02	6.59	3.57	3.25	0.14	1.99	58.35	0.59	5.39	0.49	
G	0.26	425	173	13.72	5.10	0.02	6.59	3.56	3.26	0.14	1.94	58.35	0.58	5.49	0.49	
G	0.27	424	152	13.54	5.04	0.02	6.51	3.55	3.23	0.14	1.92	58.36	0.57	5.44	0.45	
G	0.28	471	142	13.50	4.99	0.01	6.46	3.56	3.20	0.14	1.96	58.42	0.58	5.45	0.47	
G	0.27	438	152	13.73	5.05	0.02	6.56	3.56	3.23	0.14	1.94	58.32	0.58	5.44	0.48	
H	0.29	450		13.80	4.98	0.01	6.40	3.51	3.32	0.14	2.08	59.00	0.60	5.85	0.46	2.74
H	0.29	454		13.70	4.96	0.01	6.38	3.45	3.33	0.14	2.05	58.50	0.59	5.86	0.45	2.81
H	0.27	442		13.70	4.94	0.02	6.38	3.46	3.34	0.14	2.07	58.50	0.60	5.72	0.46	2.73
H	0.28	445		13.70	4.98	0.01	6.37	3.49	3.33	0.14	2.05	58.50	0.60	5.89	0.46	2.74
H	0.28	443		13.70	5.01	0.04	6.40	3.48	3.32	0.14	2.05	58.60	0.60	5.85	0.46	2.81
H	0.26	435		13.70	4.89	0.01	6.28	3.33	3.37	0.14	2.02	57.90	0.59	5.61	0.45	2.77
H	0.27	458		13.70	4.91	0.02	6.28	3.35	3.35	0.14	2.05	57.90	0.59	5.83	0.44	2.75
H	0.26	458		13.70	5.00	0.02	6.42	3.50	3.30	0.14	2.03	58.20	0.60	5.80	0.43	2.76
J		471	151												0.46	2.63
J		471	149												0.47	2.64
J		482	151												0.47	2.60
J		475	148												0.46	2.60
J		478	150												0.47	2.59
J		481	152												0.48	2.62
J		472	158												0.46	2.61
J		476	149												0.47	2.62
K	0.26			13.60	5.20	0.02	6.61	3.58	3.33	0.15	1.93	59.10	0.61	5.14	0.40	
K	0.26			13.70	5.24	0.02	6.65	3.63	3.34	0.14	1.94	58.60	0.62	5.10	0.43	
K	0.26			13.80	5.25	0.02	6.69	3.58	3.33	0.16	1.95	59.00	0.63	5.19	0.43	
K	0.26			13.80	5.28	0.02	6.72	3.60	3.35	0.15	1.93	59.20	0.63	5.17	0.43	
K	0.27			13.80	5.26	0.02	6.69	3.61	3.33	0.15	1.95	59.00	0.63	5.22	0.43	
K	0.25			13.70	5.26	0.02	6.73	3.64	3.37	0.15	1.93	59.60	0.62	5.07	0.42	
K	0.29			13.70	5.23	0.02	6.64	3.59	3.34	0.15	1.94	58.70	0.61	5.26	0.42	
K	0.27			13.60	5.19	0.02	6.63	3.60	3.31	0.15	1.92	58.50	0.61	5.38	0.43	
L	0.24	479	143	13.60	5.09	0.02	6.63	3.60	3.27	0.15	2.00	58.50	0.61	5.01	0.36	
L	0.20	445	138	13.60	5.11	0.02	6.63	3.50	3.29	0.15	1.98	58.60	0.61	4.99	0.38	
L	0.24	471	141	13.60	5.10	0.02	6.71	3.59	3.28	0.15	2.04	58.50	0.61	4.83	0.41	
L	0.25	485	136	13.50	5.13	0.02	6.67	3.59	3.27	0.15	1.98	58.60	0.61	5.00	0.42	
L	0.24	478	138	13.60	5.17	0.13	6.69	3.61	3.28	0.15	1.99	58.40	0.61	4.99	0.41	
L	0.25	460	134	13.50	5.16	0.02	6.72	3.64	3.29	0.15	2.02	58.40	0.61	5.05	0.42	
L	0.27	469	134	13.60	5.15	0.02	6.73	3.66	3.28	0.16	2.02	58.50	0.62	4.95	0.41	
L	0.23	467	140	13.60	5.11	0.02	6.61	3.62	3.27	0.15	2.02	58.40	0.60	5.06	0.42	
M	0.24	436	145	13.51	5.03	0.02	6.55	3.57	3.27	0.14	1.91	58.36	0.58	6.24		2.70
M	0.25	433	148	13.52	5.00	0.02	6.55	3.60	3.29	0.14	1.93	58.40	0.56	6.23		2.70
M	0.25	397	138	13.55	5.02	0.02	6.53	3.59	3.27	0.14	1.93	58.32	0.57	6.26		2.70
M	0.24	408	140	13.56	5.00	0.02	6.56	3.58	3.30	0.14	1.92	58.47	0.57	6.24		2.71
M	0.21	426	148	13.57	5.06	0.02	6.56	3.60	3.29	0.14	1.94	58.56	0.57	6.26		2.71
M	0.24	399	143	13.50	5.02	0.02	6.57	3.54	3.27	0.14	1.92	58.31	0.55	6.25		2.71
M	0.23	409	142	13.57	5.06	0.02	6.51	3.54	3.30	0.14	1.96	58.42	0.56	6.23		2.70
M	0.27	438	155	13.52	5.03	0.02	6.54	3.58	3.30	0.14	1.92	58.32	0.57	6.25		2.70
N	0.26															
N	0.26															
N	0.29															
N	0.28															
N	0.28															
N	0.29															
N	0.27															
N	0.29															
O	0.25	470	150	13.60	5.09	0.01	6.54	3.57	3.27	0.14	1.94	58.40	0.59	5.33		2.65
O	0.22	470	140	13.60	5.11	0.02	6.61	3.58	3.28	0.15	1.94	58.30	0.60	5.26		2.68
O	0.22	470	140	13.60	5.11	0.01	6.59	3.58	3.27	0.14	1.94	58.40	0.60	5.26		2.67
O	0.22	480	150	13.65	5.12	0.01	6.56	3.58	3.26	0.14	1.92	58.40	0.59	5.22		2.67
O	0.24	480	150	13.65	5.10	0.01	6.57	3.58	3.27	0.14	1.94	58.40	0.60	5.28		2.67
O	0.22	470	160	13.60	5.09	0.01	6.60	3.58	3.27	0.14	1.93	58.40	0.60	5.24		2.68
O	0.27	470	150	13.65	5.09	0.01	6.55	3.58	3.26	0.14	1.94	58.40	0.59	5.34		2.69
O	0.25	470	150	13.65	5.11	0.01	6.62	3.57	3.26	0.14	1.94	58.40	0.60	5.26		2.67
P	0.27															
P	0.27															
P	0.24															
P	0.27															
P	0.24															
P	0.25															
P	0.25															
P	0.25															
R	0.24	481	146	13.75	5.12	0.02	6.65	3.63	3.31	0.15	1.99	58.74	0.61	5.22	0.46	2.71
R	0.24	482	144	13.73	5.12	0.01	6.63	3.62	3.31	0.15	2.00	58.68	0.61	5.24	0.46	2.80
R	0.26	466	142	13.72	5.13	0.02	6.64	3.63	3.31	0.15	2.00	58.62	0.61	5.22	0.46	2.86
R	0.23	468	143	13.72	5.11	0.02	6.64	3.62	3.31	0.15	2.00	58.72	0.61	5.28	0.45	2.85
R	0.24	465	142	13.73	5.12	0.02	6.64	3.62	3.31	0.15	1.99	58.71	0.61	5.27	0.46	2.74
R	0.25	469	141	13.73	5.09	0.02	6.65	3.60	3.31	0.15	1.97	58.59	0.61	5.28	0.46	2.73
R	0.24	480	140	13.74	5.14	0.02	6.63	3.62	3.31	0.15	2.00	58.67	0.61	5.27	0.46	2.74
R	0.24	478	145	13.77	5.11	0.02	6.64	3.60	3.30	0.15	1.97	58.64	0.61	5.25	0.45	2.85
S	0.26	460	150	13.62	5.13	0.02	6.56	3.59	3.29	0.14	1.96	58.73	0.61	5.31		2.83
S	0.27	470	155	13.66	5.14	0.02	6.57	3.60	3.29	0.15	1.96	58.72	0.61	5.33		2.86
S	0.26	470	160	13.59	5.11	0.02	6.54	3.59	3.28	0.14	1.96	58.64	0.60	5.33		2.85
S	0.24	460	160	13.62	5.12	0.02	6.55	3.59	3.28	0.14	1.95	58.65	0.60	5.29		2.83
S	0.26	470	160	13.67	5.14	0.02	6.58	3.60	3.30	0.15	1.96	58.68	0.61	5.30		2.84
S	0.28	460	160	13.68	5.15	0.02	6.59	3.60	3.29	0.15	1.97	58.66	0.61	5.32		2.85
S	0.25	470	150	13.63	5.13	0.02	6.55	3.60	3.28	0.14	1.96	58.68	0.61	5.29		2.84
S	0.24	475	160	13.68	5.14	0.02	6.58	3.60	3.28	0.14	1.95	58.63	0.61	5.32		2.82
T	0.27	474	153	13.65	5.11	0.03	6.54	3.59	3.34	0.14	1.96	58.90	0.60	5.50		
T	0.26	462	153	13.63	5.10	0.02	6.54	3.59	3.36	0.14	1.97	58.96	0.62	5.50		
T	0.25	471	152	13.66	5.12	0.01	6.56	3.60	3.34	0.14	1.95	58.98	0.61	5.40		
T	0.25	465	151	13.63	5.11	0.01	6.54	3.60	3.36	0.14	1.95	58.98	0.60	5.40		

## Assay data (cont)

Lab Code	Au PbColl g/t	Cu M/ICP ppm	Ni M/ICP ppm	Al <sub>2</sub> O <sub>3</sub> XRF %	CaO XRF %	Cr <sub>2</sub> O <sub>3</sub> XRF %	Fe <sub>2</sub> O <sub>3</sub> XRF %	K <sub>2</sub> O XRF %	MgO XRF %	MnO XRF %	Na <sub>2</sub> O XRF %	SiO <sub>2</sub> XRF %	TiO <sub>2</sub> XRF %	LOI %	S Comb LECO %	SG pyc
V	0.26	380	119													
V	0.27	360	118													
V	0.27	320	104													
V	0.26	380	118													
V	0.25	360	116													
V	0.26	420	131													
V	0.26	320	100													
V	0.26	440	138													
W	0.25															
W	0.26															
W	0.24															
W	0.25															
W	0.25															
W	0.25															
W	0.21															
W	0.23															
X	0.25	471	142													2.77
X	0.26	487	146													2.78
X	0.25	455	140													2.77
X	0.26	460	139													2.77
X	0.25	462	139													2.71
X	0.27	449	135													2.77
X	0.28	450	137													2.77
X	0.25	467	141													2.77

## 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 <sup>1</sup>	σL <sup>2</sup>	SW <sup>3</sup>	CSU <sup>4</sup>
Au	Pb Coll	g/t	0.017	0.008	0.011	0.002
Cu	M/ICP	ppm	10.5	6.10	7.61	1.93
Ni	M/ICP	ppm	7.10	4.74	3.95	1.37
Al <sub>2</sub> O <sub>3</sub>	XRF	%	0.077	0.055	0.050	0.018
CaO	XRF	%	0.040	0.033	0.025	0.012
Cr <sub>2</sub> O <sub>3</sub>	XRF	%	0.004	0.003	0.003	0.001
Fe <sub>2</sub> O <sub>3</sub>	XRF	%	0.049	0.043	0.025	0.016
K <sub>2</sub> O	XRF	%	0.019	0.013	0.013	0.005
MgO	XRF	%	0.040	0.035	0.013	0.011
MnO	XRF	%	0.004	0.003	0.002	0.001
Na <sub>2</sub> O	XRF	%	0.028	0.023	0.015	0.008
SiO <sub>2</sub>	XRF	%	0.226	0.168	0.131	0.055
TiO <sub>2</sub>	XRF	%	0.009	0.007	0.005	0.002
LOI		%	0.132	0.135	0.055	0.052
S	Comb/LECO	%	0.025	0.023	0.009	0.008
SG	pyc		0.068	0.058	0.027	0.019

1. S - Std Dev for use on control charts.
2. σL - 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 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 and who have maintained measurement traceability during the analytical process.

**15. Certification:** AMIS0351 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. Laboratory Packs are sealed bottles delivered in sealed foil pouches. 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 therefore 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.

**13 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
Ag	M/ICP	ppm	0.87	0.29	16.9	82
Al	M/ICP	%	7.1	0.49	3.4	99
As	M/ICP	ppm	40.6	6.7	8.2	74
Ba	M/ICP	ppm	270	44.3	8.2	91
Be	M/ICP	ppm	0.65	0.16	12.3	74
Bi	M/ICP	ppm	0.28	0.04	6.9	76
Ca	M/ICP	%	3.6	0.23	3.3	97
Cd	M/ICP	ppm	0.15	0.06	20.9	56
Ce	M/ICP	ppm	24.5	2.5	5.2	71
Co	M/ICP	ppm	38.3	3.7	4.8	90
Cr	M/ICP	ppm	85.0	23.8	14.0	107
Cs	M/ICP	ppm	4.2	0.35	4.2	55
Dy	M/ICP	ppm	2.6	0.36	7.0	31
Er	M/ICP	ppm	1.5	0.18	6.1	31
Eu	M/ICP	ppm	0.89	0.14	7.6	31
Fe	M/ICP	%	4.6	0.39	4.2	97
Ga	M/ICP	ppm	14.4	2.7	9.5	80
Gd	M/ICP	ppm	2.7	0.58	10.6	32
Ge	M/ICP	ppm	0.56	1.0	87.7	24
Hf	M/ICP	ppm	1.6	0.36	11.4	72
Ho	M/ICP	ppm	0.52	0.04	3.4	31
In	M/ICP	ppm	0.05	0.01	10.7	56
K	M/ICP	%	2.8	0.53	9.3	100
La	M/ICP	ppm	12.2	2.1	8.5	78
Li	M/ICP	ppm	42.0	6.1	7.2	93
Lu	M/ICP	ppm	0.19	0.03	7.8	59
Mg	M/ICP	%	1.9	0.16	4.3	99
Mn	M/ICP	ppm	1105	92.5	4.2	100
Mo	M/ICP	ppm	1.9	0.25	6.5	83
Na	M/ICP	%	1.4	0.16	5.5	101
Nb	M/ICP	ppm	5.7	1.1	9.8	81
Ni	M/ICP	ppm	146.0	14.0	4.8	102
Nd	M/ICP	ppm	12.4	1.0	4.0	30
P	M/ICP	ppm	704	123.3	8.8	72
Pb	M/ICP	ppm	7.4	3.6	24.2	85
Pr	M/ICP	ppm	3.0	0.61	10.1	32
Rb	M/ICP	ppm	101	15.6	7.7	76
S	M/ICP	%	0.46	0.04	4.6	90
Sb	M/ICP	ppm	2.4	0.50	10.5	74
Sc	M/ICP	ppm	16.1	2.0	6.3	77
Se	M/ICP	ppm	1.3	0.92	35.7	15
Si	M/ICP	%	27.4	0.24	0.43	8
Sm	M/ICP	ppm	2.7	0.32	5.9	31
Sn	M/ICP	ppm	0.89	0.25	14.0	56
Sr	M/ICP	ppm	251	20.6	4.1	91
Ta	M/ICP	ppm	0.27	0.17	30.6	72
Tb	M/ICP	ppm	0.40	0.06	7.4	61
Te	M/ICP	ppm	0.27	0.08	14.9	69
Th	M/ICP	ppm	1.8	0.27	7.5	74
Ti	M/ICP	%	0.35	0.04	5.1	85
Tl	M/ICP	ppm	1.6	0.17	5.5	77
Tm	M/ICP	ppm	0.21	0.02	5.1	28
U	M/ICP	ppm	0.69	0.13	9.5	79
V	M/ICP	ppm	157	12.2	3.9	89
W	M/ICP	ppm	1.2	0.54	22.3	75
Y	M/ICP	ppm	13.1	1.4	5.3	84
Yb	M/ICP	ppm	1.3	0.17	6.5	61
Zn	M/ICP	ppm	84.0	11.0	6.6	95
Zr	M/ICP	ppm	51.7	13.4	12.9	94