



African Mineral Standards

MATRIX REFERENCE MATERIALS

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AMIS0360

Certified Reference Material

**Gold ore, Taylors Mine, Barberton Greenstone Belt,
South Africa**

Certificate of Analysis

**Recommended Concentrations and Limits^{1, 2}
(at two Standard Deviations)**

Certified Concentrations³

Au Pb Collection	2.94	±	0.14	g/t
As M/ICP	7951	±	877	ppm
Cu M/ICP	577	±	48	ppm
Specific Gravity	3.05	±	0.12	

Provisional Concentrations

Ni M/ICP	358	±	61	ppm
Zn M/ICP	1786	±	329	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.
3. Ag M/ICP was originally Certified at 10.0 ± 1.3 ppm on results from 10 laboratories and a bimodal spread of results (hence the wide limits). This Ag certification has been withdrawn until additional data can be gathered.

**Major Element
Recommended Concentrations and Limits¹.
(at two Standard Deviations)**

Certified Concentrations

Al ₂ O ₃	5.94	±	0.20	%
CaO	5.74	±	0.36	%
Fe ₂ O ₃	18.04	±	0.26	%
K ₂ O	0.95	±	0.04	%
MgO	3.47	±	0.32	%
MnO	0.39	±	0.02	%
Na ₂ O	0.29	±	0.03	%
SiO ₂	48.05	±	0.54	%
TiO ₂	0.30	±	0.01	%
S Comb / LECO	6.46	±	0.28	%

Provisional Concentrations

Cr ₂ O ₃	0.11	±	0.03	%
LOI	12.88	±	1.92	%

1. Intended Use: AMIS0360 is a certified reference material which may be used to demonstrate the validity of measurement results of a single analysis of a refractory greenstone 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 AMIS0360 was provided by Vantage Goldfields from Taylors Mine section of the Barbrook Mine. Barbrook is located 25 kilometres east north east of the town of Barberton in Mpumalanga Province, South Africa. The mine is situated in the Archaean Barberton Greenstone Belt. Gold is contained in mesothermal veins associated with late tectonic shears and fractures within rocks of the Barberton Supergroup, which comprises an assortment of ultramafic and mafic submarine volcanics, turbiditic greywacke sandstones and shales. Intense shearing, massive quartz veining, silicification of BIF and sulphide enrichment characterize the larger ore bodies. In the Barbrook area shearing has been focused along two lines, the Barbrook and Zwartkoppie.

1. *Primarily ICP data converted to oxides.*

3. Approximate Mineral and Chemical Composition: The Taylors ore body is on the Barbrook line and comprises 900 metres of disjointed orebodies aligned along E-W trending shear zones within a BIF unit. The BIF is bounded by greywacke's. Gold-bearing fluids migrated along major feeder fractures into zones where fluid reaction with the iron-rich host rock resulted in sulphide mineralization and gold precipitation. Gold is associated with disseminated pyrite, pyrrhotite and arsenopyrite, and to lesser extent base metal sulphides.

4. Appearance: The material is a very fine powder. It is colored a Pale Yellowish Brown (Corstor 10 YR 6/4).

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 <54µm. Wet sieve particle size analysis of random samples confirmed the material was 98.5% <54µm. It was then blended in a double cone blender, 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 (Al₂O₃, CaO, Cr₂O₃, Fe₂O₃, K₂O, MgO, MnO, Na₂O, SiO₂, TiO₂. 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 six laboratories were each given eight randomly selected packages of sample. Twenty four 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 24 out of 26 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. Genalysis Laboratory Services (South Africa) Pty
4. Genalysis Laboratory Services (W Australia P)
5. Intertek Utama Services (Indonesia)
6. MIMCO SA
7. Performance Laboratories Barberton
8. Performance Laboratories FS (Allanridge)
9. Performance Laboratories SA (Randfontein)
10. Performance Laboratories Zimbabwe
11. Set Point Laboratories (Isando) SA
12. SGS Australia Pty Ltd (Newburn) WA
13. SGS Geosol Laboratories Ltda (Brazil)
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. Super Laboratory Services (Balfour SA)
23. Super Laboratory Services (Springs SA)
24. 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 Pb Coll g/t	As M/ICP ppm	Cu M/ICP ppm	Ni M/ICP ppm	Zn M/ICP ppm	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 %	SiO ₂ XRF %	TiO ₂ XRF %	LOI %	S Comb/LECO %	SG pyc
A	2.96																	
A	3.05																	
A	2.93																	
A	3.01																	
A	2.94																	
A	2.96																	
A	2.93																	
A	2.92																	
B	3.02	7830	569	337	1751	6.01	5.75	0.12	18.00	0.94	3.73	0.38	0.29	48.40	0.31	10.82	6.84	3.04
B	2.95	7821	561	328	1660	5.98	5.71	0.11	17.80	0.94	3.77	0.38	0.31	48.20	0.30	11.08	6.77	3.02
B	2.84	7911	568	328	1739	6.06	5.87	0.12	18.30	0.94	3.73	0.39	0.31	49.00	0.31	10.61	6.70	3.02
B	2.99	7695	567	328	1756	5.93	5.75	0.11	18.00	0.93	3.67	0.38	0.29	47.90	0.31	10.63	6.81	3.01
B	2.94	7736	559	338	1782	5.88	5.65	0.12	17.70	0.91	3.70	0.38	0.30	47.40	0.30	11.17	7.56	3.03
B	2.95	7751	563	341	1752	5.93	5.69	0.12	17.70	0.92	3.75	0.38	0.29	47.80	0.31	11.17	7.75	3.02
B	3.02	7900	561	343	1764	5.92	5.69	0.11	17.80	0.92	3.77	0.37	0.30	47.70	0.30	11.17	6.82	3.04
B	2.94	8001	560	339	1670	5.98	5.70	0.12	17.90	0.93	3.76	0.38	0.29	48.10	0.30		6.83	3.02
C	3.01					6.01	5.89	0.11	18.19	0.96	3.65	0.38	0.18	49.08	0.30			3.06
C	2.98					6.11	5.87	0.11	18.06	0.96	3.68	0.38	0.19	49.03	0.31			3.05
C	3.00					6.02	5.85	0.11	18.09	0.96	3.63	0.38	0.18	48.91	0.30			2.99
C	2.95					5.95	5.85	0.12	18.04	0.96	3.63	0.38	0.17	48.80	0.30			3.10
C	2.98					5.95	5.85	0.11	18.00	0.95	3.61	0.38	0.19	48.74	0.30			3.01
C	2.84					5.99	5.87	0.12	18.01	0.96	3.64	0.38	0.17	48.90	0.30			3.01
C	2.88					6.02	5.86	0.13	18.11	0.96	3.63	0.38	0.17	48.94	0.30			3.04
C	2.99					5.98	5.87	0.11	18.07	0.96	3.63	0.38	0.16	49.01	0.31			3.10

Assay data (cont)

Lab Code	Au Pb Coll	As M/ICP ppm	Cu M/ICP ppm	Ni M/ICP ppm	Zn M/ICP ppm	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 %	SiO ₂ XRF %	TiO ₂ XRF %	LOI %	S Comb/LECO %	SG pyc
D	2.93	8770	646	487	2080		5.58	0.13			3.61		0.32				6.22	3.09
D	2.90	8550	641	474	2030		5.68	0.12			3.65		0.32				6.33	3.11
D	3.03	8600	661	484	2090		5.85	0.13			3.76		0.33				6.29	3.13
D	2.91	8470	728	488	2180		5.54	0.12			3.56		0.31				6.40	3.11
D	2.92	8550	640	469	2030		5.30	0.12			3.45		0.30				6.38	3.10
D	2.94	8410	641	470	2050		5.23	0.11			3.38		0.28				6.32	3.12
D	2.85	9280	649	474	2080		5.99	0.13			3.86		0.34				6.36	3.11
D	3.00	8890	663	489	2100		5.89	0.12			3.78		0.30				6.33	3.11
E	3.05																	
E	2.98																	
E	3.10																	
E	3.09																	
E	2.98																	
E	3.03																	
E	3.05																	
E	3.16																	
F	2.90																	
F	2.82																	
F	3.00																	
F	2.82																	
F	2.88																	
F	2.86																	
F	3.10																	
F	2.98																	
H	2.99																	
H	2.83																	
H	2.95																	
H	2.95																	
H	2.93																	
H	2.99																	
H	2.94																	
H	2.98																	
I	2.88	8520	625	375	1920		5.72	0.10		0.96	3.32	0.37	0.28					2.97
I	3.00	8260	596	369	1880		5.53	0.10		0.92	3.17	0.36	0.27					2.94
I	3.04	8580	625	373	1940		5.81	0.10		0.95	3.33	0.38	0.28					2.97
I	3.02	8460	613	368	1920		5.68	0.10		0.95	3.25	0.37	0.28					2.95
I	2.99	8330	611	367	1880		5.64	0.10		0.94	3.23	0.37	0.27					2.95
I	2.99	8450	617	368	1900		5.71	0.10		0.95	3.30	0.37	0.27					2.94
I	2.98	8470	617	372	1920		5.74	0.10		0.95	3.28	0.37	0.28					2.95
I	2.97	8900	655	391	2010		6.02	0.10		1.00	3.48	0.39	0.30					2.93
J	3.06																	
J	3.10																	
J	3.02																	
J	2.90																	
J	3.00																	
J	3.10																	
J	3.00																	
J	3.00																	
K	2.54																	
K	2.76																	
K	2.88																	
K	2.91																	
K	2.70																	
K	2.84																	
K	2.93																	
K	2.86																	
M	2.78	6730	540	328	1560		5.22	0.08		0.95	3.35		0.27				6.44	3.07
M	2.75	6730	555	343	1550		5.34	0.07		0.93	3.28		0.27				6.48	3.10
M	2.93	6720	550	340	1610		5.41	0.08		0.98	3.45		0.27				6.46	3.07
M	2.94	6580	541	341	1580		5.34	0.08		0.93	3.28		0.27				6.40	3.07
M	2.87	6680	549	341	1580		5.36	0.08		0.94	3.32		0.27				6.41	3.13
M	2.84	6620	572	344	1590		5.21	0.08		0.94	3.32		0.27				6.45	3.12
M	2.90	6700	546	345	1610		5.43	0.08		0.96	3.43		0.27				6.48	3.13
M	2.90	6740	553	321	1600		5.54	0.08		0.98	3.48		0.28				6.39	3.12
N	2.90	8154	585	363	1739	5.95	5.42	0.09			3.53		0.30					3.12
N	2.92	7978	576	355	1697	5.70	5.34	0.10			3.46		0.30					3.10
N	2.95	8083	578	365	1736	5.77	5.45	0.10			3.51		0.30					3.17
N	2.94	7844	568	350	1677	5.71	5.27	0.10			3.42		0.29					3.18
N	2.99	8074	570	354	1696	5.81	5.34	0.10			3.44		0.30					3.02
N	2.94	8051	566	349	1680	5.61	5.25	0.09			3.41		0.29					3.03
N	2.92	8078	565	357	1700	5.76	5.34	0.09			3.44		0.29					3.06
N	3.03	7976	567	350	1693	5.73	5.31	0.09			3.43		0.29					3.04
O	2.86	5910	546	368	1770	5.83	5.81	0.12	17.90	0.92	3.43	0.38	0.21	47.80	0.31	14.10	6.63	3.02
O	2.93	5840	535	359	1720	5.84	5.89	0.14	18.30	0.93	3.45	0.38	0.18	47.90	0.31	14.10	6.62	2.97
O	3.00	5660	537	363	1760	6.21	5.86	0.14	18.20	0.94	3.45	0.38	0.16	47.80	0.29	14.10	6.57	3.00
O	2.92	5950	555	371	1780	5.81	5.83	0.12	17.80	0.93	3.43	0.39	0.17	47.70	0.30	14.00	6.57	3.01
O	2.93	5870	538	356	1720	5.98	5.85	0.15	18.20	0.94	3.46	0.39	0.17	47.70	0.30	13.90	6.57	3.01
O	2.90	5430	524	350	1720	6.23	5.83	0.15	18.20	0.94	3.47	0.39	0.18	47.60	0.31	14.00	6.61	2.99
O	3.01	5770	490	329	1610	5.86	5.89	0.12	18.40	0.95	3.45	0.39	0.18	47.80	0.30	14.10	6.66	2.98
O	3.00	6000	525	353	1710	5.89	5.89	0.13	18.05	0.93	3.45	0.39	0.18	47.80	0.31	14.10	6.64	2.99
P	3.04																	
P	2.98																	
P	3.06																	
P	2.90																	
P	2.98																	
P	2.99																	
P	2.98																	
P	2.92																	

Assay data (cont)

Lab Code	Au Pb Coll g/t	As M/ICP ppm	Cu M/ICP ppm	Ni M/ICP ppm	Zn M/ICP ppm	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 %	SiO ₂ XRF %	TiO ₂ XRF %	LOI %	S Comb/LECO %	SG pyc
Q	2.91																	
Q	2.98																	
Q	2.90																	
Q	3.08																	
Q	3.01																	
Q	3.10																	
Q	3.03																	
Q	3.01																	
R	2.95	7790	628	395	2040	5.97	5.82		17.96	0.95	3.46	0.39	0.24	48.25	0.29	12.30	6.47	
R	2.94	7900	605	388	2100	6.00	5.81		17.96	0.95	3.47	0.39	0.26	48.08	0.30	12.40	6.45	
R	2.96	7990	621	385	2050	5.99	5.85		17.95	0.96	3.49	0.39	0.30	48.30	0.30	12.30	6.44	
R	2.97	7810	604	385	2030	5.98	5.80		17.83	0.95	3.47	0.39	0.26	47.90	0.29	12.40	6.40	
R	2.97	7880	607	385	2020	5.96	5.83		17.96	0.95	3.47	0.39	0.24	48.10	0.29	12.50	6.42	
R	2.96	7900	610	386	2010	5.97	5.84		17.99	0.95	3.47	0.39	0.26	48.07	0.30	12.60	6.43	
R	2.92	7950	609	391	2050	5.98	5.80		17.96	0.95	3.52	0.39	0.27	48.17	0.30	12.30	6.41	
R	2.98	7940	625	397	2050	5.96	5.81		17.91	0.95	3.46	0.39	0.19	47.94	0.29	12.40	6.46	
S	2.86					6.04	5.91	0.12	18.00	0.96	3.68	0.39	0.30	47.80	0.31	12.50	6.61	
S	2.56					6.02	5.93	0.12	18.00	0.97	3.71	0.37	0.32	48.00	0.31	12.30	6.58	
S	2.70					6.07	5.94	0.12	18.10	0.97	3.69	0.39	0.31	48.10	0.32	12.60	6.58	
S	2.53					6.02	5.92	0.12	18.00	0.96	3.70	0.38	0.30	47.90	0.30	12.70	6.61	
S	2.85					6.04	5.91	0.12	17.90	0.96	3.68	0.38	0.30	47.90	0.31	12.60	6.62	
S	2.93					6.03	5.93	0.12	18.00	0.97	3.69	0.38	0.30	48.10	0.31	12.50	6.63	
S	2.88					6.04	5.88	0.13	17.90	0.96	3.65	0.38	0.30	47.70	0.31	12.50	6.59	
S	2.87					6.00	5.93	0.12	17.90	0.96	3.66	0.39	0.31	48.10	0.30	12.80	6.61	
T	2.96																	
T	2.94																	
T	2.90																	
T	2.88																	
T	2.94																	
T	2.84																	
T	2.80																	
T	2.89																	
U	2.93		565	345	1489												6.31	
U	2.90		572	334	1538												6.09	
U	2.89		605	353	1588												6.28	
U	2.85		582	349	1539												6.50	
U	2.91		562	340	1480												6.44	
U	2.90		536	334	1429												6.26	
U	2.96		584	344	1570												6.66	
U	2.92		635	337	1736												6.76	
V	2.81	7900	585	342	1750	5.82	5.60	0.09		0.96	3.25		0.27				6.62	
V	2.90	7900	594	344	1760	5.91	5.61	0.09		0.98	3.28		0.27				6.62	
V	2.89	7900	571	333	1690	5.84	5.60	0.09		0.98	3.23		0.27				6.60	
V	3.06	7540	586	330	1710	5.80	5.55	0.09		0.98	3.25		0.27				6.59	
V	2.99	7820	569	335	1700	5.76	5.53	0.09		0.96	3.20		0.27				6.63	
V	2.97	8180	586	337	1740	5.78	5.55	0.09		0.98	3.32		0.27				6.57	
V	2.79	7890	575	329	1710	5.84	5.50	0.09		0.96	3.23		0.27				6.65	
V	2.71	8120	582	344	1730	5.84	5.53	0.09		0.99	3.25		0.27				6.57	
W	2.90		573	306		5.93	5.81	0.08	17.94	0.95	3.56	0.40	0.29	48.55	0.31	14.07	6.40	3.02
W	2.92		567	306		5.90	5.82	0.06	17.96	0.96	3.49	0.40	0.30	48.22	0.31	14.08	6.40	3.03
W	2.97		575	307		5.86	5.78	0.07	17.90	0.95	3.49	0.40	0.30	47.92	0.30	14.15	6.40	3.03
W	2.90		573	311		5.85	5.79	0.06	17.89	0.94	3.55	0.40	0.30	47.97	0.30	13.98	6.42	3.02
W	2.90		572	304		5.90	5.84	0.06	18.02	0.94	3.51	0.40	0.30	48.40	0.30	14.01	6.40	3.03
W	2.90		575	310		5.91	5.81	0.06	17.88	0.95	3.48	0.40	0.29	48.33	0.30	13.89	6.40	3.02
W	2.89		571	299		5.93	5.84	0.06	17.99	0.95	3.51	0.40	0.29	48.60	0.30	13.92	6.41	3.02
W	2.93		571	307		5.91	5.79	0.06	17.89	0.95	3.52	0.40	0.29	48.32	0.30	13.70	6.40	3.02
X	2.96																	
X	2.94																	
X	2.98																	
X	3.06																	
X	3.06																	
X	3.02																	
X	2.90																	
X	2.96																	
Y	3.05	7420	600	400	1750	6.09	5.94	0.12	18.18	0.99	3.35	0.40		48.33	0.31	12.51		3.10
Y	2.97	7390	570	410	1690	6.11	5.96	0.12	18.24	0.99	3.36	0.40		48.41	0.31	12.58		3.12
Y	3.03	7370	585	410	1690	6.10	5.95	0.12	18.23	0.99	3.35	0.40		48.46	0.31	12.56		3.13
Y	2.95	6810	585	390	1720	6.09	5.94	0.12	18.25	0.98	3.35	0.40		48.34	0.31	12.54		3.10
Y	3.01	6800	580	390	1680	6.10	5.96	0.12	18.27	0.99	3.35	0.40		48.39	0.31	12.51		3.10
Y	2.98	7030	575	400	1720	6.09	5.96	0.12	18.26	0.99	3.35	0.40		48.45	0.31	12.52		3.12
Y	2.98	6860	585	390	1690	6.08	5.94	0.12	18.22	0.98	3.35	0.39		48.40	0.31	12.51		3.11
Y	2.96	7300	590	400	1740	6.09	5.96	0.12	18.26	0.99	3.36	0.40		48.42	0.31	12.51		3.10
Z	2.74	7410	568	387	1820	5.88	5.78	0.12	18.10	0.95	3.30	0.39	0.30	47.80	0.30	8.15	6.26	
Z	2.89	7130	576	392	1810	5.84	5.78	0.13	18.10	0.95	3.29	0.39	0.29	47.80	0.30	8.53	6.16	
Z	2.68	7400	601	409	1890	5.90	5.81	0.13	18.10	0.95	3.30	0.39	0.28	47.80	0.31	8.22	6.47	
Z	2.87	7480	569	417	1900	5.87	5.77	0.12	18.10	0.95	3.30	0.38	0.28	47.80	0.30	9.46	6.18	
Z	2.96	7350	613	407	1970	5.83	5.79	0.12	18.10	0.94	3.31	0.38	0.28	47.80	0.30	8.32	6.16	
Z	2.99	7420	580	409	1890	5.89	5.77	0.12	18.00	0.95	3.29	0.38	0.28	47.80	0.30	8.34	6.15	
Z	2.91	7420	564	411	1900	5.87	5.78	0.12	18.00	0.95	3.28	0.38	0.30	47.80	0.30	8.95	6.29	
Z	2.90	7440	569	413	1900	5.89	5.80	0.12	18.10	0.96	3.28	0.39	0.28	47.80	0.31	9.45	6.26	

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 ²	CSU ⁴
Au	Pb Coll	g/t	0.067	0.021	0.056	0.006
Ag	M/ICP	ppm	0.658	0.564	0.255	0.181
As	M/ICP	ppm	438.2	425.7	141.6	151.6
Cu	M/ICP	ppm	24.20	18.76	11.17	5.784
Ni	M/ICP	ppm	30.36	26.07	7.894	7.906
Zn	M/ICP	ppm	164.4	139.6	42.33	42.34
Al ₂ O ₃	XRF	%	0.101	0.083	0.044	0.027
CaO	XRF	%	0.184	0.130	0.082	0.037
Cr ₂ O ₃	XRF	%	0.016	0.013	0.005	0.0041
Fe ₂ O ₃	XRF	%	0.134	0.097	0.097	0.036
K ₂ O	XRF	%	0.017	0.013	0.009	0.004
MgO	XRF	%	0.161	0.122	0.056	0.034
MnO	XRF	%	0.009	0.008	0.005	0.003
Na ₂ O	XRF	%	0.009	0.008	0.005	0.003
SiO ₂	XRF	%	0.269	0.247	0.156	0.096
TiO ₂	XRF	%	0.005	0.002	0.004	0.001
LOI		%	0.964	1.159	0.115	0.473
S	Comb/LECO	%	0.135	0.116	0.064	0.039
SG	pyc		0.056	0.049	0.023	0.017

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 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: AMIS0360 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 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.

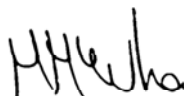
19. Recommended use: The data used to characterize this CRM has been scrutinized using outlier treatment techniques. This, together with the number of participating laboratories, should overcome any "inter-laboratory issues" and should lead to a very accurate measure for the given methods; notwithstanding 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.

30 November 2012*

** Ag removed from Page 1 under "Certified Concentrations" – 10 September 2014*

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	10.1	1.2	6.1	64
Al	M/ICP	%	3.1	0.29	4.7	78
Ba	M/ICP	ppm	94.3	14.6	7.7	76
Be	M/ICP	ppm	1.0	0.31	15.4	64
Bi	M/ICP	ppm	0.40	0.10	12.4	56
Ca	M/ICP	%	4.0	0.32	4.0	77
Cd	M/ICP	ppm	63.4	9.7	7.7	65
Ce	M/ICP	ppm	21.3	4.6	10.8	48
Co	M/ICP	ppm	55.6	8.7	7.9	96
Cr	M/ICP	ppm	654	270	20.7	79
Cs	M/ICP	ppm	1.2	1.3	54.1	40
Dy	M/ICP	ppm	2.0	0.51	13.1	32
Er	M/ICP	ppm	1.2	0.35	14.6	31
Eu	M/ICP	ppm	1.0	0.18	8.9	32
Fe	M/ICP	%	12.4	1.6	6.6	79
Ga	M/ICP	ppm	9.2	1.4	7.5	70
Gd	M/ICP	ppm	2.1	0.31	7.3	30
Ge	M/ICP	ppm	0.16	0.24	77.0	23
Hf	M/ICP	ppm	1.0	0.19	9.1	57
Ho	M/ICP	ppm	0.40	0.11	13.6	32
In	M/ICP	ppm	0.31	0.05	8.2	61
K	M/ICP	%	0.79	0.08	5.1	74
La	M/ICP	ppm	10.4	2.1	10.0	61
Li	M/ICP	ppm	21.4	4.9	11.4	72
Lu	M/ICP	ppm	0.19	0.06	14.7	48
Mg	M/ICP	%	2.0	0.23	5.6	72
Mn	M/ICP	ppm	2850	445	7.8	75
Mo	M/ICP	ppm	2.1	0.87	20.7	66
Na	M/ICP	%	0.20	0.02	6.1	75
Nb	M/ICP	ppm	1.7	1.9	55.1	72
Nd	M/ICP	ppm	9.8	2.5	12.7	31
P	M/ICP	ppm	332	70.9	10.7	63
Pb	M/ICP	ppm	3671	355	4.8	78
Pr	M/ICP	ppm	2.5	0.23	4.5	31
Rb	M/ICP	ppm	32.6	4.7	7.2	57
S	M/ICP	%	6.5	0.33	2.5	28
Sb	M/ICP	ppm	294	90.6	15.4	77
Sc	M/ICP	ppm	9.9	2.2	11.3	71
Se	M/ICP	ppm	4.6	1.01	11.1	58
Si	M/ICP	%	22.5	0.21	0.5	7
Sm	M/ICP	ppm	2.2	0.33	7.5	31
Sn	M/ICP	ppm	2.1	0.43	10.3	56
Sr	M/ICP	ppm	72.5	10.9	7.5	78
Ta	M/ICP	ppm	0.15	0.16	51.3	72
Tb	M/ICP	ppm	0.32	0.11	17.8	48
Te	M/ICP	ppm	0.62	0.13	10.4	57
Th	M/ICP	ppm	2.2	0.52	11.9	50
Ti	M/ICP	%	0.09	0.04	21.8	64
Tl	M/ICP	ppm	0.52	0.07	6.3	56
Tm	M/ICP	ppm	0.29	0.35	61.3	40
V	M/ICP	ppm	80.5	9.6	6.0	65
W	M/ICP	ppm	7.8	2.8	17.9	59
Y	M/ICP	ppm	8.7	3.1	17.7	76
Yb	M/ICP	ppm	1.2	0.29	12.3	47
Zr	M/ICP	ppm	38.4	11.6	15.1	77