African Mineral Standards
MATRIX REFERENCE MATERIALS

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AMIS0208

Certified Reference Material

Gold and Uranium Ore
Witwatersrand, South Africa

Certificate of Analysis

Recommended Concentrations and Limits[1. 2.]
(at two Standard Deviations)

Certified Concentrations

Au Pb Collection	1.38	±	0.10	g/t
U M/ICP	58	±	6	ppm
U XRF	55	±	6	ppm
Specific Gravity	2.69	±	0.08	

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.*
3. *Or, by applying a chemical conversion factor of U x 1.1793 = U3O8; U3O8 by multi acid digestion: 68 ± 7ppm, U3O8 by XRF 64.8 ± 7ppm.*

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

Certified Concentrations

Al_2O_3	4.30	±	0.06	%
CaO	0.26	±	0.01	%
Cr_2O_3	0.14	±	0.01	%
Fe_2O_3	1.58	±	0.04	%
K_2O	0.24	±	0.01	%
MnO	0.04	±	0.002	%
SiO_2	91.06	±	0.46	%
TiO_2	0.19	±	0.01	%

Provisional Concentrations

MgO	0.11	±	0.02	%
LOI	1.95	±	0.42	%
S Comb / LECO	0.11	±	0.01	%

Indicated Means

Na_2O	0.04	%
P_2O_5	0.03	%

1. Intended Use: AMIS0208 can be used to check the analysis of gold and uranium ores, hosted by siliceous 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 20). 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: This standard is a blend of Ventersdorp Contact Reef, Carbon Leader Reef and Vaal Reef material provided by Anglo Gold Ashanti in South Africa. It was made from a mixture of pulp reject sample material, collected during routine underground sampling, sourced from mine assay laboratories and blended down to a required grade with silica.

3. Approximate Mineral and Chemical Composition: The major gangue mineral is quartz with minor pyrite, uraninite and thucolite. Gold occurs primarily as discrete grains. Trace element chemistry data from 12 of the labs has been compiled but has not been certified. Summary statistics for this data are set out in the appendix.

4. Appearance: The material is a very fine powder. It is colored a Medium Light Grey (Corstor 10Y 6/2).

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. Radioactivity: Shipments of this material require special labeling and placarding. AMIS0208 contains U (0.69 Bq/g) and Th (0.041Bq/g) and is classified as EXEMPTED MATERIAL in terms of "Safety Standards Series No. TS-R-1: Regulations for the Safe Transport of Radioactive Material, International Atomic Energy Agency, 2005, para 403, Table 1".

7. Method of Preparation: The material was crushed, dry-milled and air-classified to <54um. Wet sieve partic**l**e 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 into1kg 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.

8. Methods of Analysis requested:

1. Au – Pb collection ICP-OES or ICP-MS.
2. Multi-acid digest (M/ICP), including HF, ICP- OES or ICP-MS. Multi element scan to include U.
3. U – XRF.
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. S – Combustion analysis.
6. SG – Gas Pycnometer.

9. Information requested:

1. State aliquots used for all determinations.
2. Report all results for gold and uranium 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.

10. Method of Certification: Thirty three laboratories were each given eight randomly selected packages of sample. Thirty 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”.

11. Participating Laboratories: The 30 out of 33 laboratories that provided results timeously were (not in same order as in the table of assays):

1. ACME Analytical Laboratories Ltd (Vancouver CA)
2. Activation Laboratories Pty Ltd (ActLabs) (Toronto CA)
3. ALS Chemex Laboratory Group (Johannesburg ZA)
4. ALS Chemex Laboratory Group (Perth AU)
5. ALS Chemex Laboratory Group (Vancouver CA)
6. Anglo Gold Ashanti - Navachab Gold Mine Laboratory NA
7. Chromatech Services (Johannesburg ZA)
8. Genalysis Laboratory Services (Perth AU)
9. Intertek Utama Services (Djakarta ID)
10. Performance Laboratories (Barberton ZA)
11. Performance Laboratories (Allanridge, Freestate, ZA)
12. Performance Laboratories (Randfontein ZA)
13. Performance Laboratories (Harare ZW)
14. Rappa Research Laboratory (Johannesburg ZA)
15. Rossing Uranium Limited (NA)
16. Set Point Laboratories (Isando) (Isando ZA)
17. SGS Australia Pty Ltd (Newburn AU)
18. SGS Geosol Laboratories Ltda (BR)
19. SGS Mineral Services (Lakefield CA)
20. SGS Mwanza (Mwanza TZ)
21. SGS South Africa (Pty) Ltd – (Booysens ZA)
22. SGS Minerals Services (Toronto CA)
23. SGS Minerals Services (Townsville (AU)
24. SGS Minerals Services (Vancouver CA)
25. Super Laboratory Services (Balfour ZA)
26. Super Laboratory Services (Barberton ZA)
27. Super Laboratory Services (Klerksdorp ZA)
28. Super Laboratory Services (Springs ZA)
29. Super Laboratory Services (Randfontein ZA)
30. Ultra Trace (Pty) Ltd (Perth AU)

12. 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	U M/ICP ppm	U XRF ppm	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	P2O5 XRF %	SiO2 XRF %	TiO2 XRF %	LOI XRF %	S Comb LECO %	SG pyc
A	1.36	65.0									0.04	0.02				0.11	2.69
A	1.41	67.3									0.04	0.02				0.11	2.69
A	1.36	65.3									0.04	0.02				0.11	2.68
A	1.32	65.2									0.04	0.02				0.11	2.69
A	1.41	63.4									0.04	0.02				0.11	2.69
A	1.38	65.0									0.04	0.02				0.10	2.70
A	1.36	67.2									0.04	0.02				0.10	2.71
A	1.40	67.7									0.04	0.02				0.11	2.73

Assay data (cont)

Lab Code	Au Pb Coll g/t	U M/ICP ppm	U XRF ppm	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	P2O5 XRF %	SiO2 XRF %	TiO2 XRF %	LOI XRF %	S Comb LECO %	SG pyc
B	1.40			4.29	0.27	0.13	1.58	0.24	0.11	0.04	0.05	0.03	91.0	0.20	1.70	0.12	
B	1.40			4.28	0.26	0.13	1.58	0.24	0.11	0.04	0.05	0.03	91.1	0.19	1.80	0.12	
B	1.40			4.30	0.26	0.13	1.56	0.24	0.11	0.04	0.05	0.03	90.9	0.19	1.70	0.12	
B	1.38			4.28	0.26	0.12	1.57	0.24	0.10	0.04	0.05	0.03	91.2	0.19	1.70	0.12	
B	1.40			4.29	0.26	0.12	1.58	0.24	0.11	0.04	0.05	0.03	91.1	0.19	1.80	0.12	
B	1.36			4.26	0.26	0.13	1.57	0.24	0.11	0.04	0.05	0.03	91.2	0.19	1.80	0.12	
B	1.39			4.28	0.26	0.15	1.61	0.24	0.11	0.04	0.04	0.03	91.3	0.19	1.70	0.12	
B	1.41			4.29	0.27	0.15	1.61	0.24	0.12	0.05	0.06	0.03	91.2	0.20	1.80	0.12	
C	1.37	59.7		4.07	0.27	0.15	1.56	0.22	0.13	0.04	0.01		90.4	0.19	2.22	0.10	2.68
C	1.37	57.5		4.13	0.26	0.14	1.64	0.24	0.12	0.04	0.01		90.4	0.18	2.22	0.10	2.74
C	1.34	58.8		4.02	0.27	0.15	1.69	0.24	0.14	0.04	0.01		91.2	0.19	2.26	0.11	2.66
C	1.32	58.3		4.08	0.27	0.14	1.55	0.24	0.13	0.04	0.01		91.3	0.19	2.30	0.10	2.73
C	1.31	59.5		4.11	0.28	0.14	1.62	0.23	0.13	0.04	0.01		90.5	0.19	2.28	0.11	2.52
C	1.37	57.1		4.07	0.27	0.14	1.62	0.23	0.14	0.04	0.02		91.2	0.19	2.36	0.10	2.60
C	1.37	58.8		4.04	0.26	0.13	1.59	0.24	0.13	0.04	0.01		89.7	0.19	2.31	0.11	2.48
C	1.25	59.1		4.07	0.26	0.14	1.62	0.22	0.12	0.04	0.01		91.5	0.19	2.32	0.11	2.46
E	1.41	54.0	53.0	4.45	0.26	0.14	1.57	0.24	0.16	0.04	0.05	0.03	92.6	0.20	2.23		2.69
E	1.39	54.6	54.0	4.44	0.25	0.14	1.51	0.23	0.21	0.04	0.05	0.03	92.5	0.19	2.32		2.67
E	1.35	54.2	55.0	4.44	0.26	0.14	1.51	0.23	0.20	0.04	0.05	0.03	92.6	0.19	2.10		2.69
E	1.42	53.5	55.0	4.42	0.26	0.13	1.51	0.23	0.21	0.04	0.05	0.03	92.5	0.20	2.24		2.68
E	1.42	54.9	53.0	4.27	0.24	0.13	1.57	0.23	0.20	0.04	0.05	0.03	92.6	0.19	2.20		2.68
E	1.41	54.8	54.0	4.32	0.24	0.13	1.55	0.23	0.21	0.04	0.05	0.03	92.8	0.19	2.35		2.68
E	1.42	55.6	54.0	4.28	0.25	0.14	1.55	0.23	0.20	0.04	0.05	0.03	92.6	0.20	2.15		2.66
E	1.41	54.8	55.0	4.30	0.26	0.14	1.58	0.22	0.21	0.04	0.05	0.03	92.9	0.19	2.23		2.68
F	1.38	53.5	50.0	4.29	0.26	0.13	1.58	0.24	0.12	0.04	0.04		91.1	0.19	1.82	0.12	2.69
F	1.43	53.5	50.0	4.30	0.26	0.13	1.58	0.24	0.12	0.04	0.04		91.0	0.19	1.81	0.11	2.73
F	1.39	54.4	50.0	4.32	0.26	0.14	1.57	0.24	0.12	0.04	0.04		91.0	0.19	1.79	0.12	2.71
F	1.44	55.2	50.0	4.29	0.26	0.13	1.57	0.24	0.12	0.04	0.04		91.1	0.19	1.82	0.11	2.70
F	1.47	55.3	50.0	4.30	0.26	0.14	1.58	0.24	0.12	0.04	0.04		91.1	0.19	1.82	0.12	2.71
F	1.41	55.8	60.0	4.33	0.26	0.14	1.59	0.24	0.12	0.04	0.04		91.0	0.19	1.82	0.12	2.71
F	1.41	53.7	60.0	4.32	0.26	0.13	1.59	0.24	0.12	0.04	0.05		91.1	0.19	1.79	0.11	2.72
F	1.46	53.4	60.0	4.32	0.26	0.13	1.58	0.24	0.12	0.04	0.05		91.1	0.19	1.78	0.11	2.71
G	1.31		56.1														
G	1.33		56.6														
G	1.38		57.7														
G	1.38		58.7														
G	1.38		58.3														
G	1.36		56.1														
G	1.43		57.2														
G	1.31		57.9														
H	1.35	59.2		4.33	0.26	0.13	1.58	0.23	0.10	0.04	0.05	0.03	91.1	0.19	1.79	0.12	2.71
H	1.44	57.0		4.29	0.26	0.13	1.60	0.23	0.11	0.04	0.04	0.02	91.0	0.19	1.76	0.12	2.67
H	1.35	56.1		4.29	0.26	0.13	1.58	0.23	0.11	0.04	0.05	0.02	91.0	0.19	1.79	0.12	2.75
H	1.38	57.0		4.32	0.26	0.13	1.58	0.24	0.11	0.04	0.04	0.03	91.2	0.19	1.79	0.12	2.76
H	1.35	58.6		4.28	0.26	0.13	1.58	0.23	0.11	0.04	0.05	0.03	91.2	0.19	1.76	0.12	2.77
H	1.34	57.9		4.29	0.26	0.13	1.58	0.24	0.11	0.04	0.04	0.03	91.0	0.19	1.80	0.12	2.70
H	1.36	55.8		4.30	0.26	0.13	1.59	0.23	0.11	0.04	0.04	0.03	91.1	0.19	1.80	0.12	2.69
H	1.38	59.0		4.32	0.26	0.13	1.58	0.23	0.11	0.04	0.04	0.03	91.1	0.19	1.78	0.12	2.73
I		57.2		4.35	0.27	0.13	1.58	0.23	0.12	0.04	0.05		90.9	0.18	1.82		2.56
I		52.2		4.37	0.27	0.13	1.58	0.24	0.11	0.04	0.05		90.9	0.19	1.83		2.56
I		56.3		4.35	0.26	0.12	1.60	0.23	0.11	0.04	0.05		90.9	0.18	1.82		2.51
I		56.7		4.38	0.27	0.13	1.60	0.24	0.12	0.04	0.06		90.9	0.18	1.80		2.56
I		54.8		4.35	0.27	0.13	1.58	0.23	0.12	0.04	0.05		90.9	0.18	1.80		2.55
I		55.9		4.35	0.27	0.13	1.58	0.24	0.12	0.04	0.05		90.9	0.18	1.82		2.55
I		52.7		4.38	0.27	0.13	1.59	0.23	0.12	0.04	0.05		90.8	0.19	1.82		2.49
I		56.4		4.35	0.27	0.14	1.59	0.23	0.12	0.04	0.06		90.8	0.18	1.85		2.56
J	1.40																
J	1.38																
J	1.37																
J	1.33																
J	1.36																
J	1.34																
J	1.32																
J	1.30																
K	1.36																
K	1.38																
K	1.32																
K	1.36																
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K	1.33																
K	1.37																
M	1.26																
M	1.36																
M	1.30																
M	1.32																
M	1.26																
M	1.28																
M	1.26																
M	1.26																
N	1.40																
N	1.40																
N	1.38																
N	1.38																
N	1.36																
N	1.32																
N	1.32																
N	1.32																
O	1.46	55.8	57.0														2.72
O	1.44	58.4	57.0														2.73
O	1.40	58.4	56.0														2.72
O	1.42	59.0	58.0														2.71
O	1.43	60.6	59.0														2.71
O	1.40	56.3	57.0														2.73
O	1.47	57.0	59.0														2.69
O	1.38	52.4	58.0														2.73

Assay data (cont)

Lab Code	Au Pb Coll g/t	U M/ICP ppm	U XRF ppm	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	P2O5 XRF %	SiO2 XRF %	TiO2 XRF %	LOI XRF %	S Comb LECO %	SG pyc
P	1.45																
P	1.39																
P	1.38																
P	1.37																
P	1.44																
P	1.47																
P	1.44																
P	1.38																
R	1.32																
R	1.32																
R	1.50																
R	1.44																
R	1.44																
R	1.40																
R	1.46																
R	1.52																
S	1.32																
S	1.38																
S	1.34																
S	1.31																
S	1.37																
S	1.31																
S	1.33																
S	1.38																
T		58.1														0.12	
T		58.0														0.12	
T		58.4														0.11	
T		58.7														0.12	
T		57.6														0.12	
T		56.5														0.11	
T		57.5														0.12	
T		56.1														0.12	
U	1.40																
U	1.31																
U	1.33																
U	1.37																
U	1.36																
U	1.33																
U	1.35																
U	1.41																
V	1.33																
V	1.38																
V	1.35																
V	1.49																
V	1.16																
V	1.14																
V	1.06																
V	1.50																
W	1.42	61.4	61.0	4.26	0.26	0.14	1.58	0.24	0.10	0.04	0.04	0.02	90.8	0.16	2.56	0.11	2.60
W	1.44	62.5	70.0	4.27	0.26	0.14	1.57	0.23	0.10	0.04	0.04	0.02	90.7	0.18	2.29	0.10	2.62
W	1.41	59.5	66.0	4.29	0.26	0.14	1.58	0.23	0.10	0.04	0.04	0.02	91.3	0.17	2.25	0.11	2.61
W	1.47	60.4	61.0	4.28	0.26	0.14	1.56	0.23	0.10	0.04	0.04	0.02	90.6	0.17	2.25	0.11	2.60
W	1.44	62.8	58.0	4.27	0.25	0.14	1.57	0.24	0.10	0.04	0.03	0.02	90.9	0.18	2.30	0.11	2.61
W	1.38	65.3	66.0	4.28	0.26	0.14	1.58	0.24	0.11	0.04	0.05	0.02	91.0	0.17	2.30	0.11	2.60
W	1.46	64.2	67.0	4.27	0.26	0.14	1.58	0.23	0.10	0.04	0.04	0.02	91.0	0.16	2.29	0.11	2.60
W	1.52	64.5	64.0	4.26	0.26	0.14	1.56	0.23	0.10	0.04	0.03	0.02	90.9	0.17	2.35	0.11	2.59
X	1.44	57.8	59.0	4.29	0.27	0.14	1.60	0.24	0.11	0.04	0.04		91.4	0.21	1.81	0.12	
X	1.44	58.3	55.0	4.28	0.26	0.14	1.59	0.25	0.11	0.04	0.04		91.4	0.22	1.83	0.11	
X	1.46	63.0	58.0	4.26	0.26	0.14	1.58	0.25		0.04	0.04		91.2	0.21	1.83	0.12	
X	1.45	61.5	65.0	4.30	0.25	0.14	1.60	0.24	0.10	0.04	0.04		91.1	0.18	1.79	0.12	
X	1.46	59.4	59.0	4.33	0.25	0.14	1.61	0.25	0.11	0.04	0.04		91.2	0.21	1.79	0.12	
X	1.44	59.9	59.0	4.38	0.27	0.13	1.61	0.24	0.10	0.04	0.04		91.0	0.19	1.84	0.12	
X	1.45	63.9	59.0	4.31	0.26	0.14	1.60	0.25	0.10	0.04	0.04		90.7	0.20	1.85	0.11	
X	1.45	60.9	67.0	4.27	0.26	0.13	1.58	0.24	0.10	0.04	0.04		90.8	0.21	1.90	0.11	
Y	1.37																
Y	1.38																
Y	1.41																
Y	1.40																
Y	1.26																
Y	1.38																
Y	1.45																
Y	1.36																
Z	1.33		70.0	4.29	0.26	0.13	1.59	0.24	0.11	0.02	0.03	0.03	91.2	0.19	2.04	0.10	
Z	1.41		60.0	4.29	0.26	0.14	1.60	0.23	0.11	0.02	0.03	0.02	91.4	0.19	2.04	0.10	
Z	1.36		60.0	4.29	0.26	0.13	1.60	0.23	0.11	0.02	0.03	0.02	91.7	0.19	2.02	0.10	
Z	1.43		60.0	4.28	0.27	0.13	1.61	0.23	0.11	0.01	0.03	0.03	91.4	0.19	2.10	0.10	
Z	1.32		60.0	4.29	0.26	0.13	1.58	0.23	0.12	0.01	0.04	0.03	91.5	0.20	2.13	0.11	
Z	1.34		60.0	4.28	0.26	0.14	1.58	0.23	0.13	0.02	0.03	0.02	91.2	0.19	2.09	0.11	
Z	1.34		60.0	4.29	0.26	0.14	1.57	0.23	0.12	0.01	0.03	0.02	91.9	0.19	2.10	0.11	
Z	1.31		60.0	4.28	0.26	0.13	1.57	0.23	0.13	0.02	0.04	0.02	91.3	0.20	2.09	0.11	
ZA	1.24	62.2	53.0	4.28	0.26	0.14	1.59	0.24	0.11	0.04	0.04	0.03	91.1	0.19	1.78	0.09	
ZA	1.26	64.9	53.0	4.25	0.27	0.14	1.58	0.24	0.11	0.04	0.04	0.03	91.1	0.19	1.79	0.09	
ZA	1.32	64.6	54.0	4.26	0.26	0.14	1.57	0.24	0.11	0.04	0.05	0.03	91.1	0.19	1.79	0.10	
ZA	1.26	66.6	54.0	4.29	0.26	0.14	1.58	0.24	0.11	0.04	0.04	0.03	91.1	0.19	1.79	0.10	
ZA	1.33	63.7	53.0	4.28	0.26	0.14	1.59	0.24	0.11	0.04	0.05	0.03	91.1	0.19	1.77	0.10	
ZA	1.28	62.2	53.0	4.26	0.26	0.14	1.60	0.24	0.10	0.04	0.03	0.03	91.1	0.19	1.77	0.10	
ZA	1.25	64.6	51.0	4.31	0.26	0.14	1.56	0.24	0.11	0.04	0.05	0.03	91.1	0.19	1.77	0.10	
ZA	1.29	62.9	54.0	4.28	0.26	0.14	1.59	0.24	0.11	0.04	0.04	0.03	91.1	0.19	1.76	0.10	

Assay data (cont)

Lab Code	Au Pb Coll g/t	U M/ICP ppm	U XRF ppm	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	P2O5 XRF %	SiO2 XRF %	TiO2 XRF %	LOI XRF %	S Comb LECO %	SG pyc
ZB	1.35																
ZB	1.32																
ZB	1.34																
ZB	1.32																
ZB	1.37																
ZB	1.34																
ZB	1.34																
ZB	1.32																
ZC	1.40	58.6		4.28	0.26	0.13	1.52	0.24	0.11	0.04	0.05	0.03	91.0	0.20	1.88		2.76
ZC	1.43	57.5		4.28	0.26	0.13	1.52	0.23	0.11	0.04	0.04	0.03	90.5	0.20	1.89		2.66
ZC	1.41	57.5		4.28	0.26	0.12	1.51	0.24	0.12	0.04	0.04	0.03	90.8	0.21	1.89		2.68
ZC	1.41	59.4		4.29	0.26	0.13	1.52	0.23	0.11	0.04	0.05	0.03	90.7	0.20	1.90		2.68
ZC	1.44	60.0		4.28	0.28	0.13	1.52	0.24	0.10	0.04	0.05	0.03	90.6	0.18	1.90		2.65
ZC	1.42	60.4		4.32	0.27	0.13	1.53	0.24	0.13	0.04	0.09	0.03	90.8	0.19	1.91		2.76
ZC	1.42	57.3		4.29	0.26	0.13	1.53	0.24	0.10	0.04	0.05	0.03	90.9	0.19	1.89		2.67
ZC	1.43	60.2		4.27	0.26	0.13	1.52	0.23	0.10	0.04	0.05	0.03	90.6	0.19	1.91		2.69
ZD	1.39	62.8														0.12	2.67
ZD	1.38	61.1														0.12	2.69
ZD	1.35	59.9														0.11	2.65
ZD	1.36	59.2														0.12	2.67
ZD	1.37	60.8														0.12	2.69
ZD	1.41	60.6														0.12	2.69
ZD	1.35	61.3														0.11	2.68
ZD	1.35	54.2														0.12	2.70
ZE	1.20	39.8	50.0	3.98	0.27	0.14	1.68	0.21	0.12	0.03			91.4	0.19		0.11	2.69
ZE	1.17	39.5	53.0	3.93	0.25	0.13	1.68	0.21	0.12	0.03			91.4	0.19		0.10	2.68
ZE	1.35	40.1	54.0	4.00	0.25	0.14	1.70	0.21	0.10	0.03			91.3	0.19		0.11	2.69
ZE	1.28	39.4	53.0	4.02	0.24	0.14	1.69	0.21	0.12	0.03			91.3	0.18		0.11	2.70
ZE	1.34	39.2	54.0	4.05	0.25	0.14	1.68	0.21	0.12	0.03			91.3	0.19		0.11	2.69
ZE	1.36	39.3	53.0	4.00	0.24	0.15	1.69	0.21	0.12	0.03			91.3	0.19		0.10	2.68
ZE	1.15	40.4	53.0	3.93	0.26	0.13	1.68	0.21	0.12	0.03			91.4	0.19		0.11	2.68
ZE	1.37	40.6	54.0	4.00	0.25	0.14	1.71	0.21	0.12	0.03			91.3	0.19		0.10	2.70
ZF	1.49																
ZF	1.50																
ZF	1.39																
ZF	1.41																
ZF	1.37																
ZF	1.41																
ZF	1.35																
ZF	1.36																
ZG			49.0														
ZG			50.0														
ZG			51.0														
ZG			51.0														
ZG			50.0														
ZG			52.0														
ZG			51.0														
ZG			50.0														

13. 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:

Combined standard uncertainty=sqrt((between lab.var/no of labs) + (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]	S_W [3]	CSU [4]
Au	Pb Coll	g/t	0.047	0.019	0.038	0.005
U	M/ICP	ppm	3.14	2.51	1.577	0.851
U	XRF	ppm	2.88	4.01	1.121	2.008
Al_2O_3	XRF	%	0.030	0.026	0.020	0.009
CaO	XRF	%	0.005	0.003	0.004	0.001
Cr_2O_3	XRF	%	0.005	0.003	0.004	0.001
Fe_2O_3	XRF	%	0.016	0.007	0.015	0.003
K_2O	XRF	%	0.005	0.003	0.004	0.001
LOI	XRF	%	0.210	0.216	0.043	0.072
MgO	XRF	%	0.009	0.008	0.005	0.003
MnO	XRF	%	0.001	0.001	0.001	0.000
Na_2O	XRF	%	0.008	0.007	0.004	0.002
P_2O_5	XRF	%	0.004	0.005	0.002	0.002
SiO_2	XRF	%	0.228	0.118	0.175	0.046
TiO_2	XRF	%	0.005	0.004	0.004	0.001
S Comb	LECO	%	0.007	0.005	0.004	0.002
SG	pycnometer		0.040	0.042	0.024	0.016

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. *S_W - 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.*

14. 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.

15. 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.

16. Certification: AMIS0208 is a new material.

17. 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.

18. 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.

19. 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.

20. 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.

21. 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.

22 February 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
Ag	M/ICP	ppm	0.23	0.10	22.4	79
Al	M/ICP	%	2.3	0.15	3.4	103
As	M/ICP	ppm	30.9	4.5	7.3	98
Ba	M/ICP	ppm	110	10.8	4.9	96
Be	M/ICP	ppm	0.53	0.21	19.5	76
Bi	M/ICP	ppm	0.35	0.07	10.4	94
Ca	M/ICP	%	0.19	0.02	4.6	104
Cd	M/ICP	ppm	0.12	0.08	32.6	69
Ce	M/ICP	ppm	26.2	3.7	7.1	83
Co	M/ICP	ppm	15.0	2.6	8.6	107
Cr	M/ICP	ppm	672	365	27.1	112
Cs	M/ICP	ppm	0.79	0.15	9.2	59
Cu	M/ICP	ppm	61.8	6.2	5.0	105
Dy	M/ICP	ppm	1.6	0.39	12.0	40
Er	M/ICP	ppm	0.86	0.18	10.7	39
Eu	M/ICP	ppm	0.4	0.08	11.2	40
Fe	M/ICP	%	1.1	0.06	2.7	104
Ga	M/ICP	ppm	6.0	0.59	5.0	84
Gd	M/ICP	ppm	1.6	0.35	10.6	38
Ge	M/ICP	ppm	0.4	0.74	87.5	23
Hf	M/ICP	ppm	1.8	0.45	12.1	87
Ho	M/ICP	ppm	0.30	0.06	10.7	39
In	M/ICP	ppm	0.02	0.01	19.5	46
K	M/ICP	%	0.2	0.03	6.9	111
La	M/ICP	ppm	12.8	1.8	6.9	89
Li	M/ICP	ppm	13.5	3.3	12.2	101
Lu	M/ICP	ppm	0.12	0.03	13.8	62
Mg	M/ICP	%	0.07	0.01	7.3	105
Mn	M/ICP	ppm	305	35.9	5.9	108
Mo	M/ICP	ppm	3.6	0.9	12.2	98
Na	M/ICP	%	0.03	0.01	15.5	102
Nb	M/ICP	ppm	3.7	0.6	7.8	88
Nd	M/ICP	ppm	10.3	2.0	9.7	37
Ni	M/ICP	ppm	28.5	4.1	7.2	107
P	M/ICP	ppm	99.1	16.6	8.4	77
Pb	M/ICP	ppm	34.1	5.5	8.0	100
Pr	M/ICP	ppm	2.8	0.37	6.5	39
Rb	M/ICP	ppm	10.5	1.6	7.5	95
S	M/ICP	%	0.11	0.02	6.7	94
Sb	M/ICP	ppm	4.0	1.1	13.3	98
Sc	M/ICP	ppm	3.1	0.4	7.2	80
Se	M/ICP	ppm	1.0	0.21	11.2	19
Sm	M/ICP	ppm	1.9	0.40	10.3	39
Sn	M/ICP	ppm	1.8	0.38	10.5	87
Sr	M/ICP	ppm	28.6	4.5	7.9	99
Ta	M/ICP	ppm	0.46	0.32	34.2	90
Tb	M/ICP	ppm	0.28	0.06	9.9	64
Te	M/ICP	ppm	0.06	0.02	18.0	32
Th	M/ICP	ppm	10.1	1.1	5.6	92
Ti	M/ICP	%	0.11	0.01	5.5	89
Tl	M/ICP	ppm	0.11	0.04	18.6	63
Tm	M/ICP	ppm	0.12	0.04	15.2	40
U3O8	XRF	ppm	56.4	20.9	18.5	32
V	M/ICP	ppm	32.7	3.4	5.2	99
W	M/ICP	ppm	1.8	0.34	9.3	88
Y	M/ICP	ppm	7.3	1.3	9.1	96
Yb	M/ICP	ppm	0.79	0.15	9.5	63
Zn	M/ICP	ppm	33.0	10.0	15.2	104
Zr	M/ICP	ppm	68.1	9.7	7.1	99