African Mineral Standards
MATRIX REFERENCE MATERIALS

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AMIS0087

Certified Reference Material

Uraniferous Alaskite Reference Material
Goanikontes, Namibia

Certificate of Analysis

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

Certified Concentrations[2.]

U M/ICP[3.]	205	±	19	ppm
U XRF[3.]	207	±	16	ppm
Specific Gravity	2.69	±	0.10	
S M/ICP	0.111	±	0.014	%

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. *Or, by applying a chemical conversion factor of U x 1.1793 = U3O8; U3O8 by multi acid digestion: 242 ± 22 ppm, U3O8 by XRF 244 ± 19 ppm.*

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

Certified Concentrations

Al_2O_3	12.11	±	0.32	%
CaO	2.44	±	0.06	%
Fe_2O_3	2.78	±	0.06	%
K_2O	5.34	±	0.18	%
MgO	1.12	±	0.09	%
MnO	0.11	±	0.01	%
Na_2O	1.80	±	0.14	%
SiO_2	71.67	±	1.16	%
TiO_2	0.24	±	0.02	%

Provisional Concentrations

Cr_2O_3	0.051	±	0.010	%
LOI	1.82	±	0.44	%

Indicated Mean

P_2O_5	0.088	%

1. Intended Use: AMIS0087 is suitable for monitoring the accuracy of a single analysis of uraniferous alaskite ore. This material can be used for routine quality control by inserting within a batch of samples.

Additional geochemical data is presented for this material that will enable its use for method development and for the calibration of equipment. This comprises certified major element data (p1) and uncertified trace element data (Appendix).

The recommended mean and "Between Lab" standard deviations for this standard reflect the average 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 and this is acceptable. Good laboratories however will report results within the two standard deviation levels with a failure of <10 %.

2. Origin of Material: This material was supplied by Bannerman Resources Ltd from their Goanikontes Project 30km east of Swakopmund in Namibia. This deposit represents one of the uraniferous alaskite occurrences first actively explored in the Namib Desert during the 1970's. The most significant of these deposits is Rössing Uranium, mined by Rio Tinto since the late 1970's.

The uranium is associated with Lower Palaeozoic age alaskite granites emplaced, predominantly along S_3 foliation planes, into heavily folded biotite-amphibole-pyroxene schists of the lower Khan Formation. The term "alaskite" is applied locally to a leucocratic variety of granite, often with a pegmatitic texture.

The most abundant primary uranium mineral is uraninite, but betafite is also present. The uraninite is commonly associated with chloritised biotite in the alaskite. Titanium bearing oxides, ilmenite and magnetite are also present. Goanikites uranium deposit does not show any fundamental qualitative differences compared to the Rössing uranium deposit situated 40 km to the North East.

This deposit is described in detail in Mouillac, J.L., Valois, J-P. and Walgenwitz, F. (1986). *The Goanikontes uranium occurrence in South West Africa/Namibia,* in Mineral Deposits of Southern

Africa, 1833-1843, Anhauser, C.R., and Maske, S. (Eds) (1986). Geol. Soc.S.Africa., Johannesburg

3. Mineral and Chemical Composition: Rössing South uranium mineralogy is dominated by uraninite and coffinite, minor brannerite, traces betafite, and the alteration products of the above.

4. Appearance: The material is a very fine Light Grey powder (Corstor colour chart – 5Y 7/1).

5. Radioactivity: Shipments of this material do not require special marking, labeling or placarding. AMIS0087 does contain U (2.6 Bq/g) and Th (0.21 Bq/g), but due to low activity concentrations it is classified as EXEMPT 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".

6. 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.

7. Method of Preparation: The material was crushed, dry-milled and air-classified to <54um. Wet sieve parti**c**le 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 consensus test results were carried out by an independent statistician.

8. Methods of Analysis requested:

1. Multi-acid digest, including HF, ICP- OES or ICP-MS. Multi element scan (to include U).
2. U XRF.
3. Majors (Al_2O_3, CaO, Cr_2O_3, Fe_2O_3, K_2O, MgO, MnO, Na_2O, SiO_2, TiO_2. LOI.) XRF fusion.
4 SG (gas pycnometer).

9. Information requested:

1. State and provide brief description of analytical techniques used.
2. State aliquots used for all determinations.
3. Results for individual analyses to be reported (not averages)
4. All results for multi-element scans to be reported in ppm.
5. All results for major elements to be reported in %.
6. Report all QC data, to include replicates, blanks and certified reference materials used.

10. Method of Certification: Seventeen laboratories were each given eight packages, comprising eight samples scientifically selected from throughout the batch. Nineteen laboratories reported results in time for certification of the economic elements. Eight of these laboratories reported results for the major elements.

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 them 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 13), 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: (Not in same order as in the table of assays):

1. ACME Analytical Laboratories Ltd (Canada)
2. Activation Laboratories Pty Ltd (Canada)
3. ALS Chemex Laboratory Group Johannesburg (South Africa)
4. ALS Chemex Laboratory Group Perth (Australia)
5. ALS Chemex Laboratory Group Vancouver (Canada)
6. Ammtec Limited (West Australia)
7. Anglo Gold Ashanti - Vaal River Laboratory (South Africa)
8. Anglo Research (Crown Campus
9. Assayers Canada
10. Genalysis Laboratory Services (Australia)
11. Labtium Inc Finland
12. OMAC Laboratories Limited (Ireland)
13. Set Point Laboratories Isando (South Africa)
14. SGS Australia Pty Ltd (Australia)
15. SGS Mineral Services Lakefield (Canada)
16. SGS South Africa (Pty) Ltd (South Africa)
17. Ultra Trace (Pty) Ltd (Australia)

12. Assay Data: Data as received from the laboratories for the important certified elements listed on p1 is 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.

Lab Order	U M/ICP ppm	U XRF ppm	SG pyc	S M/ICP %	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	P2O5 XRF %	SiO2 XRF %	TiO2 XRF %	LOI %
A	210															
A	218															
A	225															
A	206															
A	230															
A	244															
A	200															
A	223															
B	205		2.73													
B	207		2.72													
B	205		2.73													
B	207		2.73													
B	203		2.73													
B	209		2.75													
B	211		2.75													
B	208		2.76													
C	210	207	2.69	0.13	12.00	2.45	0.06	3.16	5.41	1.00	0.09	1.70	0.06	71.60	0.25	1.80
C	210	209	2.68	0.12	12.00	2.45	0.06	3.15	5.37	0.90	0.09	1.70	0.06	71.40	0.25	1.83
C	217	206	2.68	0.12	12.00	2.47	0.05	3.17	5.41	0.90	0.09	1.70	0.06	72.00	0.24	1.79
C	215	207	2.69	0.13	12.00	2.48	0.06	3.17	5.40	0.90	0.09	1.70	0.06	72.00	0.24	1.82
C	213	209	2.68	0.12	12.00	2.47	0.05	3.16	5.39	0.90	0.09	1.70	0.06	71.70	0.24	1.77
C	214	209	2.68	0.13	12.00	2.44	0.06	3.16	5.39	0.90	0.09	1.70	0.06	71.50	0.24	1.77
C	215	206	2.68	0.13	12.00	2.44	0.06	3.15	5.38	0.90	0.09	1.70	0.06	71.30	0.24	1.74
C	216	209	2.68	0.12	12.00	2.47	0.05	3.18	5.41	1.00	0.09	1.70	0.06	72.00	0.25	1.81
D	218	211		0.11	12.20	2.44	0.05	2.81	5.42	1.14	0.11	1.90		71.90	0.23	1.55
D	215	217		0.11	12.20	2.44	0.05	2.79	5.42	1.15	0.11	1.89		71.80	0.24	1.53
D	229	218		0.11	12.20	2.43	0.05	2.80	5.41	1.15	0.11	1.90		71.80	0.24	1.54
D	213	219		0.10	12.20	2.42	0.05	2.79	5.41	1.14	0.11	1.89		71.90	0.23	1.52
D	216	216		0.10	12.20	2.42	0.05	2.78	5.41	1.14	0.11	1.90		71.80	0.23	1.52
D	219	222		0.10	12.20	2.44	0.05	2.79	5.43	1.15	0.11	1.89		71.80	0.23	1.50
D	225	219		0.11	12.20	2.42	0.05	2.79	5.40	1.13	0.11	1.92		71.90	0.23	1.53
D	214	214		0.11	12.20	2.43	0.05	2.80	5.41	1.14	0.11	1.90		71.80	0.24	1.52
E	210	204	2.73		12.10	2.42	0.05	2.74	5.31	1.15	0.10	1.86	0.09	69.60	0.23	2.05
E	200	205	2.71		12.30	2.46	0.04	2.78	5.39	1.16	0.10	1.93	0.09	71.00	0.24	1.94
E	210	203	2.70		12.20	2.44	0.04	2.76	5.38	1.16	0.11	1.90	0.09	71.00	0.23	2.00
E	210	205	2.70		12.20	2.41	0.04	2.72	5.27	1.16	0.10	1.88	0.09	70.00	0.23	1.97
E	200	202	2.72		12.30	2.44	0.03	2.76	5.21	1.15	0.11	1.85	0.09	70.40	0.24	1.97
E	200	205	2.72		12.50	2.48	0.04	2.80	5.22	1.17	0.11	1.91	0.09	72.00	0.24	2.00
E	200	204	2.72		12.50	2.49	0.04	2.90	5.42	1.17	0.10	1.87	0.09	71.70	0.24	1.50
E	200	203	2.72		12.20	2.48	0.05	2.72	5.29	1.17	0.10	1.94	0.09	69.80	0.23	2.07
F	220	220	2.66		12.00	2.39	0.04	2.79	5.35	1.11	0.12	1.37	0.11	71.90	0.23	2.07
F	220	220	2.64		12.00	2.40	0.07	2.80	5.34	1.11	0.12	1.43	0.11	71.90	0.22	2.08
F	220	220	2.61		12.00	2.39	0.05	2.78	5.29	1.12	0.11	1.44	0.11	72.10	0.22	2.07
F	210	220	2.63		12.10	2.38	0.05	2.75	5.28	1.17	0.10	1.42	0.09	71.80	0.23	2.07
F	210	220	2.66		12.00	2.42	0.05	2.79	5.30	1.11	0.11	1.44	0.10	71.60	0.22	1.99
F	210	220	2.67		12.00	2.41	0.06	2.79	5.30	1.13	0.12	1.38	0.10	71.90	0.23	2.04
F	210	220	2.67		12.00	2.36	0.06	2.81	5.32	1.13	0.11	1.38	0.10	71.60	0.23	2.02
F	210	220	2.66		12.10	2.40	0.05	2.79	5.29	1.07	0.11	1.35	0.10	72.10	0.22	2.00
G	205	211	2.60		12.09	2.43	0.06	2.82	5.41	1.10	0.11	1.79	0.09	71.25	0.24	2.05
G	202	210	2.59		12.01	2.42	0.06	2.82	5.37	1.07	0.11	1.83	0.09	71.37	0.24	2.12
G	212	212	2.63		12.09	2.43	0.06	2.82	5.42	1.10	0.11	1.88	0.09	71.60	0.24	2.07
G	210	210	2.60		12.09	2.45	0.06	2.82	5.41	1.09	0.11	1.81	0.10	71.50	0.30	2.05
G	223	210	2.60		12.01	2.43	0.06	2.81	5.41	1.08	0.11	1.85	0.09	71.14	0.24	2.13
G	197	206	2.62		12.11	2.43	0.06	2.81	5.40	1.10	0.11	1.81	0.09	71.61	0.25	2.07
G	212	211	2.58		12.04	2.42	0.06	2.80	5.44	1.09	0.11	1.83	0.09	71.35	0.24	2.03
G	213	211	2.62		11.96	2.39	0.06	2.81	5.44	1.10	0.11	1.85	0.09	71.23	0.24	2.11

Assay data (cont)

Lab Order	U M/ICP ppm	U XRF ppm	SG pyc	S M/ICP %	Al2O3 XRF %	CaO XRF %	Cr2O3 XRF %	Fe2O3 XRF %	K2O XRF %	MgO XRF %	MnO XRF %	Na2O XRF %	P2O5 XRF %	SiO2 XRF %	TiO2 XRF %	LOI %
H		192			11.87	2.54	0.05	2.80	5.71	1.00	0.09	1.66	0.06	68.69	0.22	
H		197			11.85	2.55	0.05	2.90	5.56	1.01	0.09	1.70	0.08	72.97	0.22	
H		203			12.11	2.54	0.05	2.94	5.80	1.03	0.09	1.73	0.07	73.19	0.23	
H		200			12.15	2.55	0.05	2.91	5.35	1.04	0.09	1.76	0.08	71.48	0.23	
H		196			12.08	2.54	0.05	2.84	5.75	1.01	0.09	1.71	0.08	71.69	0.22	
H		190			12.17	2.60	0.05	2.90	5.66	1.00	0.09	1.69	0.09	71.48	0.23	
H		187			12.02	2.60	0.05	2.87	5.66	0.99	0.09	1.69	0.07	68.69	0.23	
H		195			12.38	2.56	0.05	2.97	5.74	1.02	0.09	1.73	0.10	71.69	0.23	
I		212			11.70	2.43			5.14	1.04		1.61		70.50	0.23	1.79
I		214			11.80	2.44			5.16	1.06		1.59		70.70	0.23	1.73
I		209			11.70	2.42			5.13	1.05		1.56		69.70	0.23	1.80
I		211			11.70	2.45			5.17	1.03		1.60		70.60	0.23	1.79
I		217			11.80	2.46			5.18	1.05		2.15		70.50	0.23	1.79
I		215			11.90	2.46			5.19	1.05		1.63		71.00	0.23	1.81
I		213			12.00	2.49			5.26	1.08		1.62		71.80	0.24	1.82
I		209			11.80	2.44			5.15	1.02		1.55		70.40	0.23	1.80
J	198	200	2.52	0.12	11.80	2.49	0.05	2.75	5.03	1.10	0.10	1.74		71.90	0.25	1.71
J	197	200	2.51	0.13	11.80	2.49	0.05	2.78	5.04	1.10	0.11	1.75		72.10	0.24	1.39
J	192	200	2.47	0.12	11.85	2.49	0.05	2.74	5.06	1.10	0.11	1.74		72.30	0.24	1.26
J	199	200	2.54	0.12	11.80	2.48	0.05	2.73	5.02	1.10	0.11	1.74		72.00	0.24	1.64
J	195	200	2.53	0.12	11.80	2.48	0.05	2.75	5.03	1.09	0.11	1.74		72.10	0.25	1.53
J	196	200	2.55	0.12	11.85	2.49	0.05	2.76	5.04	1.10	0.11	1.75		72.20	0.26	1.38
J	200	200	2.54	0.12	11.80	2.49	0.05	2.77	5.03	1.10	0.11	1.73		72.00	0.24	1.54
J	200	200	2.54	0.12	11.80	2.49	0.05	2.78	5.05	1.10	0.11	1.75		72.00	0.24	1.49
K	164	166	2.60	0.12	12.30	2.41	0.05	2.69	5.17	1.18	0.11	1.74	0.09	70.85	0.23	2.02
K	159	165	2.58	0.11	12.27	2.42	0.05	2.71	5.16	1.18	0.11	1.73	0.09	70.90	0.24	2.05
K	153	169	2.65	0.11	12.26	2.40	0.05	2.68	5.16	1.17	0.11	1.74	0.09	70.94	0.24	2.04
K	163	171	2.61	0.11	12.30	2.42	0.05	2.68	5.17	1.18	0.11	1.75	0.09	70.86	0.24	2.00
K	168	172	2.70	0.12	12.28	2.41	0.05	2.69	5.20	1.17	0.11	1.74	0.09	70.92	0.24	2.01
K	172	169	2.62	0.12	12.25	2.40	0.05	2.67	5.16	1.17	0.11	1.74	0.09	70.94	0.24	1.99
K	167	172	2.62	0.12	12.31	2.40	0.05	2.69	5.18	1.16	0.11	1.74	0.09	70.89	0.23	2.01
K	173	170	2.62	0.12	12.32	2.42	0.05	2.69	5.18	1.18	0.11	1.75	0.09	71.10	0.24	2.03
L	202	212	2.77	0.11												
L	206	211	2.74	0.11												
L	199	215	2.74	0.11												
L	204	215	2.74	0.11												
L	206	212	2.75	0.11												
L	186	215	2.78	0.10												
L	210	214	2.78	0.11												
L	190	210	2.75	0.11												
M	211	237	2.70	0.11	12.20	2.49	0.05	2.80	5.42	1.17	0.11	1.81		71.86	0.24	
M	207	229	2.68	0.11	12.20	2.49	0.05	2.79	5.42	1.17	0.11	1.81		71.87	0.24	
M	208	237	2.69	0.11	12.20	2.49	0.05	2.81	5.43	1.17	0.11	1.82		71.93	0.24	
M	214	229	2.68	0.11	12.20	2.49	0.05	2.80	5.42	1.18	0.11	1.81		71.91	0.24	
M	215	229	2.69	0.11	12.20	2.48	0.05	2.79	5.42	1.17	0.11	1.82		71.93	0.24	
M	206	229	2.69	0.11	12.20	2.48	0.05	2.82	5.42	1.17	0.11	1.81		71.88	0.24	
M	213	220	2.71	0.11	12.30	2.49	0.05	2.81	5.43	1.18	0.11	1.82		71.88	0.24	
M	211	229	2.71	0.11	12.20	2.49	0.05	2.83	5.43	1.17	0.11	1.82		71.78	0.24	
N	195															
N	205															
N	207															
N	190															
N	206															
N	197															
N	198															
N	198															
O	187	206	2.58	0.11	11.94	2.54			5.35	1.08		1.83		70.77	0.23	1.54
O	186	203	2.70	0.10	12.06	2.55			5.37	1.09		1.84		71.73	0.24	1.55
O	184	198	2.74	0.10	11.99	2.54			5.37	1.08		1.83		71.33	0.23	1.56
O	177	199	2.69	0.11	12.01	2.55			5.35	1.09		1.84		71.53	0.24	1.56
O	187	200	2.71	0.10	11.98	2.54			5.34	1.09		1.83		71.39	0.23	1.57
O	191	194	2.66	0.10	12.19	2.60			5.42	1.11		1.87		72.64	0.24	1.57
O	188	201	2.72	0.11	12.14	2.60			5.40	1.10		1.86		72.45	0.24	1.57
O	187	198	2.73	0.10	12.01	2.56			5.36	1.09		1.85		71.70	0.23	1.57
P	202	194	2.71	0.09	12.40	2.41	0.05	2.74	5.36	1.14	0.10	1.87	0.10	72.40	0.24	1.95
P	190	199	2.71	0.09	12.40	2.43	0.05	2.80	5.41	1.12	0.10	1.89	0.10	73.00	0.25	1.91
P	195	197	2.71	0.09	12.30	2.41	0.05	2.74	5.33	1.13	0.10	1.84	0.10	72.30	0.24	1.84
P	195	195	2.70	0.09	12.30	2.43	0.05	2.77	5.38	1.11	0.10	1.85	0.10	72.80	0.25	1.97
P	188	201	2.71	0.09	12.30	2.41	0.05	2.75	5.34	1.11	0.10	1.87	0.10	72.50	0.24	1.98
P	201	201	2.70	0.09	12.40	2.43	0.05	2.76	5.39	1.12	0.10	1.85	0.10	72.80	0.25	1.92
P	196	200	2.71	0.09	12.40	2.41	0.05	2.75	5.35	1.12	0.10	1.87	0.10	72.40	0.25	1.90
P	197	198	2.71	0.09	12.40	2.41	0.05	2.76	5.36	1.12	0.10	1.87	0.11	72.50	0.24	1.86
Q	202		2.67	0.12												
Q	196		2.68	0.12												
Q	198		2.67	0.11												
Q	202		2.66	0.12												
Q	200		2.67	0.12												
Q	203		2.68	0.11												
Q	204		2.66	0.11												
Q	202		2.66	0.11												

13. Measurement of Uncertainty: The samples used in the certification process were 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]	Sw [3]	CSU [4]
U	M/ICP	ppm	9.594	6.125	5.313	1.715
U	XRF	ppm	7.872	6.598	2.373	2.006
SG	pyc		0.045	0.037	0.017	0.011
S	M/ICP	%	0.007	0.006	0.003	0.002
Al2O3	XRF	%	0.163	0.130	0.069	0.040
CaO	XRF	%	0.033	0.027	0.015	0.009
Cr2O3	XRF	%	0.005	0.004	0.003	0.001
Fe2O3	XRF	%	0.028	0.025	0.017	0.010
K2O	XRF	%	0.091	0.078	0.033	0.025
MgO	XRF	%	0.046	0.039	0.013	0.012
MnO	XRF	%	0.004	0.003	0.002	0.001
Na2O	XRF	%	0.074	0.067	0.019	0.021
P2O5	XRF	%	0.015	0.016	0.005	0.006
SiO2	XRF	%	0.580	0.384	0.339	0.116
TiO2	XRF	%	0.008	0.005	0.004	0.002
LOI		%	0.216	0.189	0.073	0.060

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.*

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

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, who have maintained measurement traceability during the analytical process.

16. Certification: AMIS0087 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 50g to 250g) of material. The Laboratory Packs

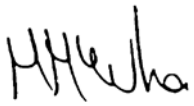
are sealed bottles delivered in sealed foil pouches. The Explorer Packs contain material in standard geochem envelopes, vacuum sealed in foil pouches.

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.

30 May 2011

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 1. – Uncertified trace element statistics

Fifteen of the laboratories reported multi-element scan data. The iterated data is presented below for informational use.

Analyte	Method	Unit	Mean	2SD	RSD%	n
Ag	M/ICP	ppm	0.20	0.13	31.89	47
Al	M/ICP	%	6.33	0.57	4.51	103
As	M/ICP	ppm	24.83	2.33	4.69	69
B	M/ICP	ppm	15.11	28.97	95.90	16
Ba	M/ICP	ppm	452	40.97	4.54	95
Be	M/ICP	ppm	2.63	0.48	9.11	70
Bi	M/ICP	ppm	0.31	0.04	6.60	63
Ca	M/ICP	%	1.76	0.15	4.25	88
Cd	M/ICP	ppm	0.15	0.09	29.85	54
Ce	M/ICP	ppm	73.33	8.44	5.75	78
Co	M/ICP	ppm	13.23	1.95	7.37	93
Cr	M/ICP	ppm	276	48.99	8.89	77
Cs	M/ICP	ppm	4.96	0.49	4.97	62
Cu	M/ICP	ppm	354	21.39	3.02	90
Dy	M/ICP	ppm	7.58	1.17	7.73	32
Er	M/ICP	ppm	5.31	1.15	10.87	32
Eu	M/ICP	ppm	1.01	0.11	5.34	37
Fe	M/ICP	%	1.91	0.12	3.07	84
Ga	M/ICP	ppm	15.62	1.43	4.59	78
Gd	M/ICP	ppm	6.31	0.55	4.32	32
Ge	M/ICP	ppm	0.23	0.33	72.74	39
Hf	M/ICP	ppm	2.54	0.68	13.40	54
Ho	M/ICP	ppm	1.62	0.42	12.98	40
In	M/ICP	ppm	0.04	0.01	10.26	48
K	M/ICP	%	4.33	0.43	4.95	63
La	M/ICP	ppm	37.60	3.60	4.78	77
Li	M/ICP	ppm	21.51	2.93	6.80	62
Lu	M/ICP	ppm	0.70	0.23	16.35	40
Mg	M/ICP	ppm	0.64	0.08	6.39	95
Mn	M/ICP	ppm	793	44.10	2.78	76
Mo	M/ICP	ppm	2.62	0.46	8.87	79
Na	M/ICP	%	1.34	0.12	4.62	71
Nb	M/ICP	ppm	10.84	1.36	6.27	71
Nd	M/ICP	ppm	28.90	2.77	4.78	39
Ni	M/ICP	ppm	28.52	2.78	4.87	87
P	M/ICP	ppm	382	46.40	6.07	72
Pb	M/ICP	ppm	86.92	6.16	3.54	70
Pr	M/ICP	ppm	8.07	0.62	3.83	30
Rb	M/ICP	ppm	265	23.24	4.39	61
Re	M/ICP	ppm	0.03	0.04	74.88	16
Sb	M/ICP	ppm	5.96	1.16	9.72	78
Sc	M/ICP	ppm	5.05	0.54	5.33	48
Se	M/ICP	ppm	2.55	1.61	31.58	24
Si	M/ICP	%	33.49	0.62	0.92	8
Sm	M/ICP	ppm	6.13	0.65	5.28	39
Sn	M/ICP	ppm	3.05	0.33	5.36	68
Sr	M/ICP	ppm	91.46	7.39	4.04	93
Ta	M/ICP	ppm	1.12	0.19	8.23	64
Tb	M/ICP	ppm	1.15	0.12	5.34	31
Te	M/ICP	ppm	1.41	2.57	91.21	16
Th	M/ICP	ppm	50.21	6.27	6.24	77
Ti	M/ICP	%	0.14	0.02	5.71	86
Tl	M/ICP	ppm	1.11	0.15	6.58	61
Tm	M/ICP	ppm	0.80	0.17	10.74	32
V	M/ICP	ppm	29.17	3.62	6.21	85
W	M/ICP	ppm	1.55	0.24	7.78	61
Y	M/ICP	ppm	35.48	6.43	9.06	72
Yb	M/ICP	ppm	5.34	1.36	12.77	32
Zn	M/ICP	ppm	54.53	6.16	5.64	86
Zr	M/ICP	ppm	74.90	9.06	6.05	55