

AMIS0408

Li 1.60% Ta 30100ppm Pegmatite AU

Certified Reference Material

Certificate of Analysis

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

Certified Concentrations

Li FUS	1.60	±	0.24	%
Li M/ICP	1.53	±	0.07	%
Nb FUS	1.52	±	0.20	%
Th FUS	113	±	12	ppm
U FUS	406	±	67	ppm
U M/ICP	387	±	95	ppm
As M/ICP	123.8	±	7.4	ppm
Specific Gravity	3.27	±	0.13	Dimensionless

Provisional Concentrations

Ta XRF	3.01	±	0.43	%
F ISE	3012	±	501	ppm

Informational Concentrations

Sb M/ICP	85.4	ppm
Th M/ICP	79.4	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 13.*
2. *There is additional certified major element data presented on p2 and uncertified trace element data presented as an appendix.*

AMIS

(A Division of Torre Analytical Services (Pty) Limited)
 (Reg. No. 1989/000201/07)

A: 11 Avalon Road, West Lake View Ext 11, Modderfontein, South Africa

P: PO Box 856, Isando, 1600, Gauteng, South Africa

T: +27 (0) 11 923-0800

W: www.amis.co.za

Directors: JT Botes, R Naidoo, NN Robinson, M Padayachee

Major Elements

Certified Concentrations (at two Standard Deviations)

Al ₂ O ₃	17.4	±	0.54	%
CaO	3.88	±	0.27	%
Cr ₂ O ₃	0.24	±	0.02	%
Fe ₂ O ₃	7.30	±	0.46	%
K ₂ O	0.80	±	0.05	%
MnO	3.30	±	0.20	%
P ₂ O ₅	2.76	±	0.15	%
SiO ₂	48.2	±	0.89	%
TiO ₂	0.27	±	0.03	%

Provisional Concentrations

MgO	0.47	±	0.07	%
Na ₂ O	1.37	±	0.17	%

Informational Concentration

LOI	1.40	%
-----	------	---

1. Intended Use: AMIS0408 can be used to check analysis of samples of pegmatitic lithium tantalum ores, with a similar grade and matrix.

It is a 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: AMIS0408 is a commissioned CRM made using ore sourced from the Mt Cattlin Spodumene Mine situated at Ravensthorpe 430km east south east of Perth in Western Australia. The ore was supplied by Galaxy Resources through SGS Mineral Services Ltd. The Mt

AMIS

(A Division of Torre Analytical Services (Pty) Limited)
 (Reg. No. 1989/000201/07)

A: 11 Avalon Road, West Lake View Ext 11, Modderfontein, South Africa

P: PO Box 856, Isando, 1600, Gauteng, South Africa

T: +27 (0) 11 923-0800

W: www.amis.co.za

Directors: JT Botes, R Naidoo, NN Robinson, M Padayachee

Cattlin project is located in the Phillips River Mineral Field, within the Ravensthorpe Terrain, which forms part of the Archaean greenstone belt. The pegmatite's which comprise the orebodies comprise sub-horizontal dykes, hosted by both volcanic and intrusive rocks.

3. Mineral and Chemical Composition: The pegmatite's comprise quartz, albite, microcline, perthite, spodumene, muscovite and lepidolite. The predominant lithium mineral is spodumene. There are economically significant grades of tantalum present as columbite, tantalite and microlite.

4. Appearance: The material is a very fine powder. It is colored Pale Yellowish Brown (Corstor 10YR 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 bi-conical mixer, systematically divided and then sealed into 1kg Laboratory Packs. Explorer Packs are subdivided from the Laboratory packs as required. Samples were scientifically 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. Multi element scan to include Li, Ta, Nb, As, Bi, Sb, Sn, U, Th. Fusion, ICP-OES or ICP-MS.
2. Multi element scan. Multi-acid digest, ICP-OES or ICP-MS.
3. Ta, Nb, U, Th. XRF.
4. Majors (Al₂O₃, CaO, Cr₂O₃, Fe₂O₃, K₂O, MgO, MnO, Na₂O, P₂O₅, SiO₂, TiO₂, V₂O₅. LOI.) XRF fusion.
5. SG, gas pycnometer.

8. 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.
4. All results for base metals to be reported in ppm.
5. Report all QC data, to include replicates, blanks and certified reference materials used.

9. Method of Certification: Twenty laboratories were each given eight scientifically selected packages of sample. Sixteen 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

AMIS

(A Division of Torre Analytical Services (Pty) Limited)
(Reg. No. 1989/000201/07)

A: 11 Avalon Road, West Lake View Ext 11, Modderfontein, South Africa

P: PO Box 856, Isando, 1600, Gauteng, South Africa

T: +27 (0) 11 923-0800

W: www.amis.co.za

Directors: JT Botes, R Naidoo, NN Robinson, M Padayachee

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 16 out of 20 laboratories that provided results timeously and 2 laboratories that provided results for re-certification were (not in same order as in the table of assays):

1. ACME Analytical Laboratories Chile
2. ACME Analytical Laboratories Ltd CA
3. Activation Laboratories Pty Ltd (ActLabs) CA
4. ALS Chemex Laboratory Group Vancouver CA
5. Bureau Veritas (Namibia)
6. Genalysis Laboratory Services (W Australia P)
7. Intertek Utama Services (Indonesia)
8. Labtium Inc Finland
9. Set Point Laboratories (Isando) SA
10. SGS Australia Pty Ltd (Newburn) WA
11. SGS Geosol Laboratories Ltda (Brazil)
12. SGS Mineral Services Callao (Peru)
13. SGS Mineral Services Lakefield (Canada)
14. SGS South Africa (Pty) Ltd - Booysens JHB
15. SGS Vancouver (Canada)
16. Shiva Analyticals India
17. UIS Analytical Services (pty) Ltd
18. Ultra Trace (Pty) Ltd WA

AMIS

(A Division of Torre Analytical Services (Pty) Limited)
(Reg. No. 1989/000201/07)

A: 11 Avalon Road, West Lake View Ext 11, Modderfontein, South Africa

P: PO Box 856, Isando, 1600, Gauteng, South Africa

T: +27 (0) 11 923-0800

W: www.amis.co.za

Directors: JT Botes, R Naidoo, NN Robinson, M Padayachee

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

Li M/ICP ppm	Li FUS ppm	Nb FUS ppm	Ta XRF ppm	Th FUS ppm	F ISE ppm	Sb M/ICP ppm	Th M/ICP ppm	U FUS ppm	U M/ICP ppm
15377	15879	14262	30500	117.3	2729	88.9	99.0	363.0	399
15145	16364	14835	30450	116.1	2875	92.1	101	371	365
14959	15914	14707	30470	112.5	2729	90.2	98.9	360.0	398
15099	16000	14663	30430	114.5	2819	90.5	100	361	364
15191	16423	14609	30460	114.7	2902	95.1	99.8	372.0	401
15145	16003	14457	30500	113.7	2937	88.1	101	365	403
15006	16108	14874	30460	116.8	2722	96.3	103	373	402
15099	15945	14609	30430	109.6	2752	90.8	107	377	382
15300	17263	14905	27600	120	3060	129.0	104	430	437
15550	16718	14829	27300	120	3350	127.6	103	420	436
15200	16597	14536	27500	120	3130	121.3	98.9	410.0	433
15450	17480	14959	27400	120	3060	120.3	99.9	420.0	429
15200	17809	14682	27200	110	3150	123.1	98.8	420.0	436
15600	16483	14829	27400	120	3180	129.5	104	430	432
15550	16624	15174	27400	120	3160	126.0	102	430	429
15150	15166	15026	27500	110	3240	122.7	102	420	430
16232	15200	16640	31200	108	3333	38.2	53.3	430.0	447
15685	15400	16695	31000	107	3508	36.5	49.3	427.0	457
15377	15100	15890	31200	109	3466	40.0	46.4	423.0	436
15642	15100	16738	31200	105	3501	36.8	44.0	424.0	432
15398	15300	16176	31100	105	3447	40.5	47.6	428.0	431
16266	16100	16037	31200	109	3337	39.6	44.4	431.0	456
15915	15800	16301	30900	108	3458	39.2	49.4	432.0	459
15555	15900	15692	31100	108	2970	38.0	47.6	426.0	440
16300	14800	16500	29600		2940	113	102		320
16100	14700	16300	29600		2840	114	104		328
15800	15000	16100	29600		2810	115	104		317
16400	14700	16100	29400		2820	117	104		326
16000	14800	15800	29700		2920	116	107		309
16300	14700	16000	29500		2900	117	104		334
15900	14700	15900	29400		2890	120	107		342
16000	14800	16400	29600		4350	123	109		348
15099	17536	13600	27300		4280	57.4	70.4		348
15099	17547	13300	27100		4170	39.7	65.0		343
15052	17796	13400	26700		4300	44.7	66.7		356
15052	17475	13300	27100		4280	96.6	55.9		357
15099	17899	13200	27000		4290	73.3	71.8		353
15006	17989	15153	27300		4100	46.9	70.7		358
14820	17840	16526	27200		4350	46.0	74.7		342
14959	17608	15445	27100		2800	61.4	70.6		343
14880	14400	15384	29650		2900	80.2	53.4		360
15150	15390	14945	29720		2800	74.7	52.3		378
15260	15391	15558	29740		2700	82.3	52.1		371
15360	15528	15459	29790		2600	81.2	55.2		356
15400	14682	15367	29740		2700	74.7	53.6		364
15360	14992	16400	29690		2700	76.2	51.2		388
14750	14767	16500	29710		2600	75.3	50.8		405
14730	15135	15400	29820		3100	76.3	53.7		
15200		15200	34712		3000	89.0			
15400		15300	34314		3200	85.0			
14900		16400	35076		3000	97.0			
15100		16400	34603		3100	91.0			
14900		15500	34611		3200	92.0			
14700			35000		3100	89.0			
15200			34788		3100	91.0			
15000			34201		3800	86.0			
16700			31858		3000				
17800			32104		2600				
17400			31858		3100				
17600			31940		3900				
17100			31940		3100				
17200			31858		2900				
16900			31694		3400				
16800			31940						

AMIS

(A Division of Torre Analytical Services (Pty) Limited)
(Reg. No. 1989/000201/07)

A: 11 Avalon Road, West Lake View Ext 11, Modderfontein, South Africa

P: PO Box 856, Isando, 1600, Gauteng, South Africa

T: +27 (0) 11 923-0800

W: www.amis.co.za

Directors: JT Botes, R Naidoo, NN Robinson, M Padayachee

Assay Data Cont:

As 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 %	P ₂ O ₅ XRF %	SiO ₂ XRF %	TiO ₂ XRF %	LOI %	LOI %	SG pyc	SG pyc
125	17.7	3.99	0.25	7.36	0.83	0.49	3.40	1.29	2.81	48.5	0.29	1.00	1.50	3.25	3.27
121	17.7	4.02	0.25	7.39	0.83	0.49	3.41	1.31	2.81	48.5	0.29	1.00	1.50	3.29	3.25
122	17.7	4.00	0.25	7.39	0.82	0.49	3.41	1.30	2.80	48.5	0.29	1.00	1.50	3.26	3.26
127	17.7	3.99	0.25	7.38	0.82	0.49	3.41	1.29	2.81	48.4	0.29	1.00	1.50	3.37	3.27
127	17.7	4.00	0.25	7.38	0.82	0.49	3.41	1.31	2.81	48.6	0.29	1.00	1.50	3.31	3.24
120	17.8	4.01	0.25	7.39	0.83	0.49	3.40	1.30	2.81	48.6	0.29	1.00	1.50	3.32	3.27
125	17.7	4.00	0.25	7.39	0.83	0.49	3.41	1.31	2.82	48.5	0.29	1.00	1.60	3.37	3.28
123	17.7	4.02	0.25	7.36	0.82	0.49	3.40	1.30	2.82	48.6	0.29	1.00	1.50	3.29	3.24
133	17.8	3.91	0.44	7.38	0.83	0.52	3.39	1.42	2.77	48.5	0.26	1.19		2.98	3.30
134	17.7	3.89	0.44	7.38	0.81	0.48	3.36	1.40	2.74	48.1	0.27	1.28		2.96	3.29
123	17.7	3.88	0.44	7.33	0.82	0.50	3.35	1.40	2.74	48.0	0.27	1.27		3.07	3.28
122	17.8	3.92	0.43	7.40	0.81	0.49	3.36	1.38	2.76	48.4	0.26	1.26		3.05	3.30
124	17.7	3.95	0.44	7.41	0.81	0.45	3.37	1.39	2.76	48.3	0.27	1.25		2.87	3.29
131	17.6	3.86	0.42	7.29	0.81	0.52	3.35	1.38	2.72	47.7	0.26	1.25		2.89	3.30
130	17.6	3.86	0.43	7.35	0.81	0.46	3.35	1.37	2.73	48.1	0.26	1.30		2.91	3.30
124	17.5	3.89	0.43	7.32	0.81	0.52	3.35	1.39	2.74	47.8	0.27	1.21		3.02	3.31
110	17.0	3.64	0.22	6.65	0.76	0.50	3.20	1.26	2.66	46.5	0.25	1.29		3.23	3.30
100	17.1	3.67	0.23	6.69	0.77	0.50	3.22	1.28	2.67	46.8	0.25	1.28		3.25	3.27
110	17.1	3.65	0.23	6.68	0.76	0.50	3.20	1.26	2.66	46.7	0.25	1.30		3.24	3.29
100	17.0	3.63	0.23	6.65	0.76	0.50	3.17	1.26	2.65	46.5	0.25	1.32		3.22	3.28
110	17.0	3.66	0.22	6.68	0.76	0.50	3.20	1.26	2.65	46.6	0.25	1.26		3.24	3.26
110	17.0	3.66	0.22	6.68	0.76	0.49	3.21	1.27	2.66	46.6	0.25	1.33		3.25	3.27
110	17.0	3.64	0.22	6.67	0.77	0.50	3.20	1.27	2.65	46.4	0.25	1.30		3.24	3.30
110	16.9	3.64	0.23	6.98	0.76	0.49	3.20	1.27	2.65	46.4	0.25	1.45		3.24	3.29
125	17.5	3.95	0.26	7.28	0.82	0.47	3.37	1.37	2.61	48.5	0.28	1.38		3.39	
120	17.5	3.97	0.26	7.32	0.83	0.45	3.35	1.36	2.60	48.5	0.29	1.36		3.39	
123	17.6	3.96	0.26	7.33	0.83	0.47	3.35	1.36	2.53	48.4	0.28	1.33		3.48	
123	17.5	3.96	0.27	7.29	0.83	0.47	3.35	1.35	2.59	48.5	0.28	1.32		3.49	
119	17.5	3.96	0.27	7.32	0.82	0.47	3.36	1.35	2.60	48.4	0.28	1.42		3.43	
124	17.5	3.95	0.26	7.31	0.82	0.47	3.34	1.34	2.60	48.4	0.28	1.34		3.44	
129	17.5	3.97	0.26	7.31	0.82	0.47	3.36	1.34	2.59	48.5	0.28	1.29		3.43	
129	17.5	3.95	0.27	7.33	0.82	0.48	3.34	1.34	2.64	48.5	0.28	1.32		3.37	
126	17.0	3.63	0.24	6.69	0.78	0.40	3.05	1.29	2.77	46.2	0.24	2.33		3.18	
125	17.0	3.61	0.24	6.58	0.78	0.40	3.00	1.27	2.78	46.0	0.27	2.33		3.15	
127	17.1	3.51	0.24	6.41	0.78	0.39	2.96	1.27	2.81	45.8	0.25	2.32		3.14	
127	16.9	3.59	0.25	6.54	0.79	0.39	3.02	1.31	2.82	45.8	0.25	2.34		3.17	
127	17.0	3.58	0.24	6.54	0.78	0.41	3.00	1.31	2.78	45.9	0.26	2.34		3.07	
127	17.0	3.61	0.24	6.59	0.76	0.40	3.05	1.29	2.82	46.0	0.24	2.34		3.14	
125	17.0	3.62	0.24	6.59	0.77	0.40	3.05	1.30	2.80	46.0	0.25	2.35		3.05	
132	17.0	3.62	0.24	6.58	0.77	0.41	3.03	1.31	2.76	46.0	0.26	2.38		3.05	
75	17.3	3.72	0.23	7.18	0.77	0.50	3.20	1.48	2.89	47.3	0.27	1.23		3.18	
71	17.5	3.74	0.24	7.20	0.77	0.51	3.20	1.48	2.84	47.4	0.27	1.23		3.40	
70	17.4	3.79	0.23	7.24	0.78	0.49	3.22	1.48	2.88	47.6	0.28	1.20		3.36	
108	17.3	3.79	0.23	7.29	0.76	0.48	3.22	1.48	2.86	47.7	0.27	1.24		3.30	
80	17.5	3.78	0.23	7.25	0.78	0.50	3.21	1.49	2.87	47.7	0.27	1.25		3.33	
74	17.5	3.74	0.24	7.22	0.77	0.50	3.21	1.43	2.88	47.5	0.27	1.24		3.36	
75	17.4	3.75	0.25	7.23	0.77	0.50	3.19	1.48	2.88	47.5	0.27	1.18		3.18	
80	17.3	3.78	0.23	7.23	0.77	0.49	3.22	1.47	2.83	47.7	0.27	1.20		3.28	
119	17.5	4.00	0.24	7.47	0.86	0.43	3.47	1.50	2.80	47.6	0.27	1.88		3.20	
116	17.4	3.95	0.24	7.66	0.89	0.40	3.45	1.51	2.78	47.4	0.26	1.84		3.20	
117	17.7	4.02	0.24	7.67	0.90	0.43	3.48	1.54	2.80	48.1	0.27	1.84		3.19	
119	17.8	3.96	0.24	7.58	0.88	0.44	3.46	1.49	2.80	47.8	0.27	1.87		3.16	
119	17.7	3.97	0.25	7.69	0.88	0.45	3.45	1.51	2.79	47.7	0.26	1.82		3.20	
116	17.8	4.00	0.26	7.82	0.88	0.44	3.46	1.50	2.80	47.5	0.27	1.84		3.18	
117	17.6	3.97	0.24	7.86	0.87	0.44	3.46	1.49	2.80	47.5	0.26	1.87		3.17	
114	17.5	3.91	0.23	7.79	0.85	0.43	3.42	1.49	2.79	46.8	0.26	1.85		3.17	
121	17.4	3.95	0.25	7.27	0.83	0.48	3.33		2.78	48.7	0.28	0.35		3.30	
122	17.4	3.96	0.24	7.29	0.84	0.50	3.33		2.76	48.8	0.29	0.35		3.32	
121	17.4	3.97	0.24	7.27	0.84	0.49	3.32		2.78	48.7	0.29	0.40		3.34	
123	17.4	3.96	0.25	7.27	0.84	0.50	3.33		2.80	48.7	0.28	0.39		3.31	
124	17.5	3.93	0.25	7.29	0.83	0.49	3.32		2.79	48.7	0.28	0.39		3.33	
125	17.4	3.96	0.25	7.28	0.84	0.49	3.31		2.77	48.6	0.28	0.39		3.31	
123	17.4	3.95	0.25	7.30	0.83	0.47	3.33		2.79	48.8	0.28	0.34		3.33	
124	17.4	3.94	0.24	7.29	0.84	0.48	3.31		2.77	48.6	0.28	0.38		3.31	
240	17.7	3.93	0.25	7.19	0.79	0.46	3.28			48.6	0.28	1.79		3.19	
228	17.8	3.97	0.25	7.28	0.81	0.45	3.29			49.0	0.28	1.74		3.25	
237	17.7	3.96	0.25	7.27	0.83	0.44	3.29			48.8	0.28	1.70		3.19	
231	17.6	3.94	0.26	7.27	0.79	0.45	3.28			48.5	0.28	1.80		3.21	
234	17.8	3.96	0.27	7.27	0.80	0.45	3.29			48.8	0.28	1.72		3.20	
219	16.9	3.88	0.25	7.24	0.79	0.42	3.25			48.0	0.28	1.68		3.19	
226	17.6	3.93	0.25	7.26	0.79	0.44	3.27			48.4	0.28	1.74		3.21	
221	17.7	3.93	0.25	7.21	0.78	0.46	3.26			48.5	0.28	1.74		3.24	
124	17.4	3.96	0.42	7.08	0.80	0.59	3.13			48.1	0.26	1.32		3.32	
125	17.3	3.95	0.43	7.06	0.79	0.58	3.13			47.9	0.26	1.33		3.32	
127	17.4	3.98	0.42	7.09	0.80	0.58	3.15			48.1	0.26	1.34		3.33	
124	17.4	3.96	0.43	7.12	0.79	0.55	3.11			48.0	0.26	1.32		3.32	
127	17.3	3.97	0.43	7.11	0.80	0.58	3.18			48.0	0.26	1.30		3.33	
128	17.3	3.96	0.42	7.05	0.80	0.58	3.09			48.0	0.26	1.31		3.32	
128	17.4	3.95	0.44	7.11	0.79	0.56	3.10			48.0	0.27	1.34		3.32	
120	17.3	3.95	0.44	7.07	0.80	0.59	3.12			48.0	0.26	1.33		3.33	

AMIS

(A Division of Torre Analytical Services (Pty) Limited)
(Reg. No. 1989/000201/07)

A: 11 Avalon Road, West Lake View Ext 11, Modderfontein, South Africa

P: PO Box 856, Isando, 1600, Gauteng, South Africa

T: +27 (0) 11 923-0800

W: www.amis.co.za

Directors: JT Botes, R Naidoo, NN Robinson, M Padayachee

12. Measurement of Uncertainty : (ref Dr Hugh Bartlett, Hugh Bartlett Consulting CC.)

The samples used in this certification process have been selected in such a way as to represent the entire batch of material and were taken from the final packaged units; therefore all possible sources of uncertainty (sample uncertainty and measurement uncertainty) are included in the final combined standard uncertainty determination.

The uncertainty measurement takes into consideration the between lab and the within lab variances and is calculated from the square roots of the variances of these components using the formula:

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

These uncertainty measurements may be used, by laboratories, as a component for calculating the total uncertainty for method validation according to the relevant ISO guidelines.

Analyte	Method	unit	S ¹	σ_L ²	SW ³	CSU ⁴
Li	FUS	%	0.118	0.128	0.042	0.052
Li	M/ICP	%	0.037	0.033	0.021	0.013
Nb	FUS	%	0.100	0.097	0.036	0.037
Ta	XRF	%	2171	2262	131	800
As	M/ICP	ppm	3.72	2.87	2.68	1.15
F	ISE	ppm	250	246	117	94.4
Sb	M/ICP	ppm	29.4	32.5	7.7	12.3
Th	FUS	ppm	5.98	8.27	3.18	4.82
Th	M/ICP	ppm	24.4	30.3	3.17	12.4
U	FUS	ppm	33.6	54.1	5.78	31.3
U	M/ICP	ppm	47.6	52.5	12.40	21.5
Al ₂ O ₃	XRF	%	0.271	0.229	0.117	0.074
CaO	XRF	%	0.133	0.121	0.021	0.038
Cr ₂ O ₃	XRF	%	0.011	0.010	0.005	0.004
Fe ₂ O ₃	XRF	%	0.230	0.219	0.035	0.073
K ₂ O	XRF	%	0.026	0.025	0.008	0.008
MgO	XRF	%	0.033	0.029	0.013	0.010
MnO	XRF	%	0.100	0.098	0.015	0.033
Na ₂ O	XRF	%	0.087	0.098	0.014	0.037
P ₂ O ₅	XRF	%	0.076	0.077	0.015	0.027
SiO ₂	XRF	%	0.444	0.426	0.183	0.152
TiO ₂	XRF	%	0.013	0.011	0.004	0.004
LOI		%	0.253	0.249	0.034	0.083
SG	pyc		0.066	0.048	0.031	0.014

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 Informational values listed on p1 of this certificate fulfil the AMIS statistical criteria regarding agreement for certification and have been independently validated by Margaret Fairhurst. The Certified values listed on p1 FUS (Th, U, Li, Nb) and M/ICP (U) of this certificate fulfil the AMIS statistical criteria regarding agreement for certification and have been independently validated by Allan Fraser.

AMIS

(A Division of Torre Analytical Services (Pty) Limited)
(Reg. No. 1989/000201/07)

A: 11 Avalon Road, West Lake View Ext 11, Modderfontein, South Africa

P: PO Box 856, Isando, 1600, Gauteng, South Africa

T: +27 (0) 11 923-0800

W: www.amis.co.za

Directors: JT Botes, R Naidoo, NN Robinson, M Padayachee

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: AMIS0408 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. 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 (A Division of Torre Analytical Services (Pty) Ltd), Nozibele Mbangula, Margaret Fairhurst, Thivhafuni Matodzi and Allan Fraser; accept no liability for any decisions or actions taken following the use of the reference material.

AMIS

(A Division of Torre Analytical Services (Pty) Limited)
(Reg. No. 1989/000201/07)

A: 11 Avalon Road, West Lake View Ext 11, Modderfontein, South Africa

P: PO Box 856, Isando, 1600, Gauteng, South Africa

T: +27 (0) 11 923-0800

W: www.amis.co.za

Directors: JT Botes, R Naidoo, NN Robinson, M Padayachee

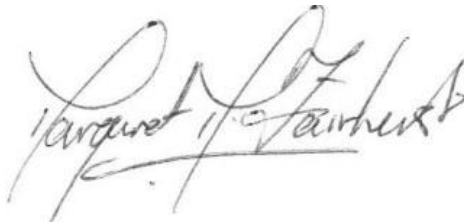
26 May 2015

Amended – 09 January 2017-Certified by Allan Fraser FUS (Th, U)
Amended – 20 July 2017-Certified by Allan Fraser FUS (Li,Nb) and M/ICP(U)
Amended- 27 January 2020- Amendment to COA name

Certifying Officers:



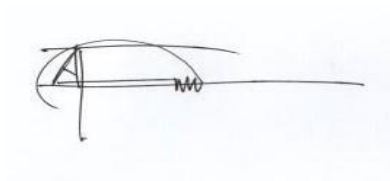
African Mineral Standards: _____
Nozibele Mbangula



Geochemist: _____
Margaret M. Fairhurst, PG, MAusIMM
Oreval



African Mineral Standards: _____
Thivhafuni Matodzi



Geochemist: _____
Allan Fraser
M.Sc. (Geology), N.D. (Analytical Chem.), Pr.Sci.Nat.

AMIS

(A Division of Torre Analytical Services (Pty) Limited)
(Reg. No. 1989/000201/07)

A: 11 Avalon Road, West Lake View Ext 11, Modderfontein, South Africa

P: PO Box 856, Isando, 1600, Gauteng, South Africa

T: +27 (0) 11 923-0800

W: www.amis.co.za

Directors: JT Botes, R Naidoo, NN Robinson, M Padayachee

Appendix – uncertified element statistics

Analyte	Method	Unit	Mean	2SD	RSD%	n
Al	M/ICP	ppm	7.5	3.6	24.3	71
As	M/ICP	ppm	137	31.6	11.5	22
Ba	M/ICP	ppm	574	52.8	4.6	52
Be	M/ICP	ppm	80.4	13.4	8.3	45
Bi	FUS	ppm	7592	315	2.1	32
Bi	M/ICP	ppm	7554	409	2.7	47
Ca	M/ICP	%	2.8	0.17	3.0	68
Cd	M/ICP	ppm	41.5	6.6	8.0	70
Ce	M/ICP	ppm	14.8	7.0	23.6	40
Co	M/ICP	ppm	21.5	4.3	10.1	68
Cr	M/ICP	ppm	1301	439	16.9	70
Cs	M/ICP	ppm	65.9	16.8	12.8	40
Cu	M/ICP	ppm	702	219	15.6	64
Dy	M/ICP	ppm	8.8	3.5	20.2	24
Er	M/ICP	ppm	1.3	0.46	18.0	23
Eu	M/ICP	ppm	0.36	0.07	9.2	23
Fe	M/ICP	%	4.9	0.37	3.8	69
Ga	M/ICP	ppm	57.8	7.7	6.7	40
Gd	M/ICP	ppm	10.0	4.3	21.8	24
Ge	M/ICP	ppm	4.7	6.9	73.5	24
Hf	M/ICP	ppm	19.0	20.3	53.5	48
Ho	M/ICP	ppm	0.78	0.36	22.9	24
In	M/ICP	ppm	0.09	0.15	81.5	23
K	M/ICP	%	0.67	0.06	4.3	69
La	M/ICP	ppm	5.6	3.9	34.6	48
Lu	M/ICP	ppm	0.12	0.03	12.3	23
Mg	M/ICP	%	0.27	0.06	11.5	66
Mn	M/ICP	ppm	24996	2154	4.3	32
Mo	M/ICP	ppm	17.5	5.1	14.6	55
Na	M/ICP	%	1.01	0.10	4.9	69
Nb	M/ICP	ppm	13252	4364	16.5	32
Nb	XRF	ppm	16842	1866	5.5	47
Nd	M/ICP	ppm	6.4	3.1	24.0	24
Ni	M/ICP	ppm	124	86.1	34.8	64
P	M/ICP	ppm	7254	5348	36.9	56
Pb	M/ICP	ppm	400	55.9	7.0	43
Pr	M/ICP	ppm	1.9	1.0	28.1	24
Rb	M/ICP	ppm	508	192	18.9	40
Re	M/ICP	ppm	0.00	0.01	82.7	13
S	M/ICP	%	0.63	0.07	5.5	63
Sb	M/ICP	ppm	139	22.1	7.9	24
Sc	M/ICP	ppm	3.0	0.72	11.8	49
Se	M/ICP	ppm	3.1	1.4	22.5	31
Si	M/ICP	%	22.9	0.14	0.30	7
Sm	M/ICP	ppm	7.4	2.7	18.6	24
Sn	FUS	ppm	3513	155	2.2	24
Sn	M/ICP	ppm	357	160	22.4	32
Sr	M/ICP	ppm	57.6	8.0	6.9	55
Ta	FUS	ppm	26930	6226	11.6	31
Ta	M/ICP	ppm	19256	16781	43.6	24
Tb	M/ICP	ppm	2.5	1.0	19.8	32
Te	M/ICP	ppm	1.8	1.4	38.3	44
Ti	M/ICP	%	0.12	0.05	21.7	56
Tl	M/ICP	ppm	5.3	0.90	8.5	46
Tm	M/ICP	ppm	0.18	0.06	17.4	22
U	XRF	ppm	422	193	22.8	40
V	M/ICP	ppm	30.3	11.2	18.5	62
V2O5	XRF	%	0.01	0.0	15.6	20
W	M/ICP	ppm	77.6	119	76.8	48
Y	M/ICP	ppm	37.5	13.4	17.9	54
Yb	M/ICP	ppm	1.1	0.51	22.5	32
Zn	M/ICP	ppm	3066	451	7.4	71
Zr	M/ICP	ppm	94.3	78.4	41.6	48

AMIS

(A Division of Torre Analytical Services (Pty) Limited)
(Reg. No. 1989/000201/07)

A: 11 Avalon Road, West Lake View Ext 11, Modderfontein, South Africa

P: PO Box 856, Isando, 1600, Gauteng, South Africa

T: +27 (0) 11 923-0800

W: www.amis.co.za

Directors: JT Botes, R Naidoo, NN Robinson, M Padayachee