



AMIS0127

Certified Reference Material

Platinum (PGM) Platreef Ore Bushveld Complex, South Africa

Certificate of Analysis

Recommended Concentrations and two “Between Laboratory” Standard Deviations

Certified Concentrations

Pt NIS	1.34	±	0.14	g/t
Pt Pb Collection	1.36	±	0.12	g/t
Pd NIS	1.50	±	0.12	g/t
Pd Pb Collection	1.53	±	0.12	g/t
Au Pb Collection	0.173	±	0.018	g/t
Rh NiS	0.109	±	0.010	g/t
Co M/ICP	60.2	±	6.0	ppm
Cr XRF	836	±	67	ppm
Cu P	777	±	63	ppm
Cu XRF	790	±	52	ppm
Cu M/ICP	800	±	58	ppm
Ni P	1366	±	100	ppm
Ni M/ICP	1445	±	128	ppm
Ni XRF	1480	±	56	ppm
Specific Gravity	3.14	±	0.06	

Provisional Concentrations

Au NIS	0.17	±	0.02	g/t
Ir NiS	0.026	±	0.004	g/t
Ru NiS	0.10	±	0.02	g/t
Co P	50.2	±	7.4	ppm
Cr M/ICP	470	±	110	ppm
4E=	3.166			

Major Element Recommended Concentrations and two “Between Laboratory” Standard Deviations

Certified Concentrations

Al ₂ O ₃	6.08	±	0.10	%
CaO	14.75	±	0.28	%
Cr ₂ O ₃	0.122	±	0.01	%
Fe ₂ O ₃	9.48	±	0.15	%
K ₂ O	0.15	±	0.02	%
MgO	19.38	±	0.40	%
MnO	0.33	±	0.01	%
SiO ₂	43.93	±	1.06	%
TiO ₂	0.28	±	0.01	%

Provisional Concentration

LOI	4.68	±	0.72	%
Na ₂ O	0.27	±	0.04	%

Informational Mean

P ₂ O ₅	0.02	%
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1. **Intended Use:** AMIS0127 is a certified reference material which may be used to demonstrate the validity of measurement results of a single analysis of tails or low grade PGE, Cu and Ni ores, hosted by the Platreef or other mafic rocks, with a similar grade and matrix; when measured in parallel to the unknown to be characterised. The material can be used for routine quality control by inserting within a batch of samples, method development and for the calibration of equipment.

The recommended mean and "Between Lab" standard deviations for this material property values based on a measurement campaign (round robin) and reflect the average results from the laboratories that participated in the round robin, after examination of the data set and removal of technically and statistically invalid results (see Clause 9 - this certificate). 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 standard was made using Platreef material from the northern limb of the Bushveld Complex supplied by Anglo Platinum Limited. Platreef is a Pt/Pd/Ni/Cu ore. This specific material was obtained from the open pit, PPRust Mine.

3. **Mineral and Chemical Composition:** Mineralization in this Platreef comprises 2-5% disseminated or net textured magmatic sulphides, mainly pyrrhotite, pentlandite and chalcopyrite. The PGE's occur as micron-sized satellite grains around but rarely within the sulphides.

Major element chemistry data from 12 of the labs has been compiled and certified. Uncertified summary statistics for trace element data are set out in the appendix.

4. **Appearance:** The material is a very fine powder. It is colored a Blueish Grey (Corstor 5B 7/1).

5. **Handling instructions:** The material is packaged in Laboratory Packs and Explorer Packs that must be shaken or otherwise agitated before use. Normal safety precautions for handling fine

particulate matter are suggested, such as the use of safety glasses, breathing protection, gloves and a laboratory coat.

6. Method of Preparation: The material was crushed, dry-milled and air-classified to <54um. Wet sieve particle size analysis of random samples confirmed the material was 98.5% <54um. It was then blended in a bi-conical mixer, systematically divided and then sealed into 1kg Laboratory Packs. Explorer Packs are subdivided from the Laboratory packs as required. Samples were randomly selected for homogeneity testing and third party analysis. Statistical analysis of both homogeneity and the consensus test results were carried out by independent statisticians.

7. Methods of Analysis requested:

1. Pt, Pd and Au. ICP-OES or ICP-MS, Pb collection with Ag as a co-collector.
2. Au, Pt, Pd, Rh, Ru and Ir. ICP-MS, nickel sulphide collection.
3. Cu and Ni. Multi-acid total digestion, including HF, with ICP-OES finish.
4. Cu and Ni. Aqua regia digestion with ICP-OES finish.
5. Cr, Co, Cu and Ni. Pressed pellet XRF.
6. Cr, Co, Cu and Ni. Fusion, ICP-OES or ICP-MS
7. Specific Gravity. Gas pycnometer.
8. XRF (major elements).
9. Multi acid digest ICP scan – trace elements.

Additionally, XRF analyses were requested for the major elements and a multi-element multi acid digest and ICP scan was requested for the trace elements.

8. Information requested:

1. Aliquots used for all determinations.
2. Results for individual PGM's reported in ppb.
3. Results for base metals reported in ppm.
4. QC data, to include replicates, blanks and certified reference materials used.
5. Analytical techniques used.

9. Method of Certification: Twenty five laboratories were each given eight randomly selected packages of sample. Twenty two of the laboratories submitted results.

The final limits were calculated after a three step examination of the data, first removing incompatible data outside a spread normally expected for similar analytical methods done by reputable laboratories. Then, data from any one laboratory was removed from further calculations, if the mean of all analyses from that laboratory failed a t-test of the global means of the other laboratories. Next, data that fell outside of the 2 standard deviations were removed. The mean and standard deviations were then re-calculated.

Analytes with an RSD of near or less than 5 % are reported as "Certified Concentrations" with limits at two "Between Laboratory" standard deviations. Those with RSD's of between near 5 % and 15 % are reported as "Provisional Concentrations" with limits at two "Between Laboratory" standard deviations. Those with RSD's over 15 % are reported as "Informational Values".

This method is different from that used by Government agencies in that the actual "between-laboratory" standard deviation is used in the calculations. This produces upper and lower limits that reflect actual individual analyses rather than a grouped set of analyses. The limits can therefore be used to monitor accuracy from individual analyses, unlike the Confidence Limits published on other standards.

10. Participating Laboratories: The 25 laboratories that provided results timeously were (not in same order as in the table of assays):

1. ACME Analytical Laboratories Ltd CA
2. Activation Laboratories Pty Ltd (ActLabs) CA

3. ALS Chemex Laboratory Group Johannesburg SA
4. ALS Chemex Laboratory Group Perth WA
5. ALS Chemex Laboratory Group Vancouver CA
6. Ammtec Limited WA
7. Anglo Platinum - Eastern Bushveld Regional Laboratory
8. Anglo Research (Crown Campus)
9. Assayers Canada
10. Becquerel Laboratories Inc CA
11. Genalysis Laboratory Services (South Africa) Pty
12. Genalysis Laboratory Services WA
13. Intertek Utama Services (Indonesia)
14. Labtium Inc Finland
15. OMAC Laboratories Limited (Ireland)
16. Set Point Laboratories (Isando) SA
17. Set Point Laboratories (Mokopane) SA
18. SGS Australia Pty Ltd (Newburn) WA
19. SGS Lakefield Research Africa (Pty) Ltd (Booyens SA)
20. SGS Mineral Services Lakefield (Canada)
21. Ultra Trace (Pty) Ltd WA
22. Zimplats Head Office Assay Laboratory

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

Lab Code	Au NIS ppm	Ir NIS ppm	Pd NIS ppm	Pt NIS ppm	Rh NIS ppm	Ru NIS ppm	Au PbCol ppm	Pd PbCol ppm	Pt PbCol ppm	Co M/ICP ppm	Co P ppm	Co XRF ppm	Cr F ppm	Cr M/ICP ppm	Cr XRF ppm	Cu M/ICP ppm	Cu P ppm	Cu XRF ppm	Ni M/ICP ppm	Ni P ppm	Ni XRF ppm	SG	
B	0.17	0.03	1.46	1.39	0.10	0.09	0.17	1.47	1.30	60.0	52.0				814	832	776		1530	1340		3.15	
B	0.17	0.03	1.52	1.34	0.11	0.08	0.16	1.45	1.29	65.0	54.0				828	826	785		1510	1390		3.15	
B	0.17	0.03	1.44	1.33	0.10	0.09	0.17	1.49	1.31	65.0	52.0				800	832	771		1530	1350		3.16	
B	0.17	0.03	1.51	1.36	0.11	0.08	0.16	1.45	1.31	60.0	56.0				807	820	786		1500	1400		3.17	
B	0.16	0.03	1.47	1.32	0.10	0.09	0.16	1.51	1.32	65.0	55.0				800	828	794		1510	1440		3.17	
B	0.17	0.03	1.47	1.31	0.10	0.09	0.16	1.48	1.30	65.0	53.0				841	824	785		1500	1380		3.17	
B	0.16	0.03	1.56	1.38	0.11	0.09	0.17	1.49	1.34	65.0	55.0				828	830	799		1510	1430		3.18	
B	0.16	0.03	1.50	1.31	0.10	0.09	0.17	1.46	1.30	65.0	55.0				828	834	782		1530	1430		3.18	
C							0.16	1.43	1.36	70.0							770			1410			
C							0.18	1.49	1.40	70.0							780			1440			
C							0.16	1.35	1.28	70.0							770			1430			
C							0.16	1.49	1.36	70.0							760			1430			
C							0.16	1.30	1.22	70.0							770			1450			
C							0.18	1.48	1.35	60.0							750			1410			
C							0.18	1.48	1.38	60.0							760			1430			
C							0.17	1.48	1.42	60.0							760			1430			
E							0.18	1.59	1.47	70.0	48.0					821	837	733		1560			
E							0.18	1.57	1.43	68.0	49.0					752	820	736		1510			
E							0.18	1.56	1.43	71.0	49.0					889	825	741		1530			
E							0.18	1.65	1.47	70.0	47.0					821	831	740		1560			
E							0.19	1.61	1.47	68.0	48.0					821	826	741		1550			
E							0.18	1.58	1.43	69.0	49.0					889	813	746		1510			
E							0.18	1.55	1.42	70.0	49.0					821	816	735		1520			
E							0.19	1.65	1.47	69.0	49.0					821	812	738		1520			
F							0.19	1.62	1.38	59.0							813			1560			
F							0.17	1.58	1.36	60.0							810			1532			
F							0.18	1.61	1.42	58.0							788			1480			
F							0.18	1.62	1.42	59.0							779			1462			
F							0.18	1.60	1.38	57.0							716			1372			
F							0.18	1.62	1.39	57.0							805			1545			
F							0.18	1.67	1.41	58.0							738			1423			
F							0.17	1.58	1.35	60.0							771			1482			
G					0.11		0.17	1.56	1.38										792			1460	
G					0.11		0.17	1.54	1.35										796			1470	
G					0.11		0.17	1.55	1.34										805			1490	
G					0.10		0.18	1.52	1.34										799			1490	
G					0.11		0.18	1.57	1.40										798			1480	
G					0.10		0.17	1.56	1.38										793			1470	
G					0.11		0.17	1.56	1.39										801			1480	
G					0.11		0.18	1.56	1.36										792			1470	
H					0.12			1.48	1.22										772			1482	3.17
H					0.13			1.51	1.31										792			1519	3.14
H					0.10			1.45	1.23										780			1493	3.14
H					0.11			1.45	1.12										796			1510	3.18
H					0.11			1.59	1.21										781			1493	3.12
H					0.12			1.50	1.28										821			1556	3.10
H					0.11			1.50	1.24										801			1531	3.14
H					0.12			1.53	1.10										795			1522	3.17
I							0.12	1.11	1.08	61.6	55.0		87.0	530		766	764				1330		
I							0.13	1.14	1.14	62.0	54.0		80.0	461		768	735				1301		
I							0.13	1.25	1.14	59.6	55.0		81.0	491		766	741				1330		
I							0.12	1.08	1.00	58.6	55.0		80.0	482		768	737				1330		
I							0.12	1.11	1.02	58.8	56.0		77.0	487		755	748				1349		
I							0.13	1.18	1.09	59.9	55.0		86.0	465		753	746				1330		
I							0.13	1.16	1.10	59.8	54.0		95.0	475		751	722				1292		
I							0.13	1.24	1.24	61.4	55.0		90.0	520		766	742				1339		

Assay data (cont)

Lab Code	Au NIS ppm	Ir NIS ppm	Pd NIS ppm	Pt NIS ppm	Rh NIS ppm	Ru NIS ppm	Au PbCol ppm	Pd PbCol ppm	Pt PbCol ppm	Co M/ICP ppm	Co P ppm	Co XRF ppm	Cr F ppm	Cr M/ICP ppm	Cr XRF ppm	Cu M/ICP ppm	Cu P ppm	Cu XRF ppm	Ni M/ICP ppm	Ni P ppm	Ni XRF ppm	SG
J	0.19	0.03	1.30	1.30	0.10	0.11	0.20			68.0					811				1560			
J	0.17	0.02	1.40	1.20	0.10	0.09	0.19			68.0					824				1500			
J	0.19	0.03	1.40	1.40	0.11	0.11	0.19			67.0					824				1500			
J	0.19	0.03	1.40	1.20	0.11	0.09	0.19			67.0					820				1510			
J	0.18	0.03	1.50	1.20	0.11	0.10	0.19			68.0					822				1540			
J	0.17	0.03	1.40	1.30	0.12	0.10	0.19			68.0					820				1540			
J	0.18	0.03	1.30	1.40	0.11	0.11	0.18			67.0					816				1460			
J	0.20	0.03	1.50	1.40	0.11	0.12	0.20			66.0					815				1510			
K	0.16	0.03	1.48	1.26	0.11	0.10	0.16	1.55	1.36	58.0	55.0			757	819	821	849	733	1380	1432	1426	
K	0.15	0.02	1.41	1.23	0.10	0.10	0.16	1.48	1.35	57.0	53.0			759	842	798	838	747	1369	1417	1452	3.14
K	0.17	0.03	1.47	1.29	0.11	0.10	0.16	1.57	1.36	58.0	54.0			763	843	792	846	752	1365	1424	1450	3.24
K	0.16	0.03	1.47	1.28	0.11	0.10	0.16	1.54	1.38	57.0	52.0			744	843	776	819	755	1346	1397	1464	3.17
K	0.16	0.03	1.48	1.26	0.11	0.11	0.16	1.48	1.32	57.0	53.0			753	843	791	823	747	1360	1394	1445	3.14
K	0.16	0.03	1.52	1.32	0.11	0.11	0.17	1.57	1.38	58.0	54.0			759	842	805	820	756	1387	1391	1461	3.14
K	0.16	0.02	1.54	1.31	0.11	0.10	0.17	1.54	1.38	58.0	54.0			762	852	804	830	752	1387	1405	1459	3.15
K	0.16	0.03	1.54	1.34	0.11	0.11	0.16	1.55	1.30	57.0	54.0			754	845	800	831	751	1374	1407	1457	3.23
L	0.17	0.03	1.47	1.24	0.11	0.10	0.17	1.51	1.36													
L	0.17	0.03	1.52	1.24	0.11	0.11	0.16	1.52	1.36													
L	0.16	0.02	1.38	1.14	0.11	0.11	0.17	1.53	1.37													
L	0.18	0.03	1.56	1.32	0.12	0.11	0.17	1.52	1.35													
L	0.17	0.03	1.50	1.27	0.11	0.10	0.16	1.45	1.34													
L	0.17	0.03	1.41	1.26	0.11	0.10	0.17	1.49	1.35													
L	0.15	0.02	1.42	1.24	0.11	0.11	0.17	1.52	1.38													
L	0.17	0.03	1.55	1.31	0.12	0.11	0.17	1.51	1.36													
N							0.18	1.60	1.33	56.0	48.0			570		796	793		1360	1340		
N							0.18	1.60	1.38	55.0	48.0			520		787	792		1350	1320		
N							0.18	1.60	1.35	56.0	48.0			560		783	784		1380	1310		
N							0.16	1.54	1.34	55.0	50.0			590		792	788		1350	1360		
N							0.16	1.60	1.35	54.0	48.0			540		798	773		1330	1300		
N							0.17	1.51	1.30	54.0	47.0			650		824	783		1330	1250		
N							0.19	1.56	1.30	57.0	48.0			620		795	808		1400	1300		
N							0.18	1.60	1.32	55.0	48.0			550		801	770		1330	1310		
O							0.18	1.49	1.33	61.0	47.0				850	750	730	740	1500	1300	1390	3.10
O							0.17	1.51	1.34	60.0	48.0				720	760	740	710	1400	1300	1380	3.11
O							0.17	1.50	1.36	61.0	48.0				740	720	740	750	1500	1300	1400	3.10
O							0.18	1.52	1.33	60.0	48.0				870	750	740	800	1400	1300	1420	3.10
O							0.16	1.50	1.34	61.0	48.0				860	770	740	690	1400	1300	1410	3.10
O							0.17	1.51	1.34	62.0	48.0				730	770	740	670	1400	1300	1340	3.11
O							0.17	1.49	1.33	62.0	48.0				890	730	740	810	1500	1300	1480	3.11
O							0.16	1.49	1.33	60.0	47.0				820	770	740	810	1500	1300	1500	3.10
P	0.18	0.05	1.57	1.44	0.14	0.18	1.63	1.43	62.0	46.0	71.0				875	800	790	811	1500	1400	1486	3.15
P	0.16	0.05	1.62	1.45	0.13	0.17	1.64	1.41	61.0	47.0	71.0				889	790	790	814	1500	1400	1495	3.13
P	0.19	0.06	1.61	1.43	0.12	0.18	1.68	1.47	61.0	47.0	70.0				863	790	780	806	1500	1400	1478	3.15
P	0.15	0.04	1.56	1.47	0.12	0.18	1.63	1.44	61.0	47.0	73.0				908	800	790	811	1500	1400	1489	3.15
P	0.20	0.06	1.58	1.48	0.13	0.18	1.59	1.43	62.0	47.0	73.0				880	810	780	806	1500	1400	1477	3.16
P	0.17	0.06	1.61	1.42	0.12	0.17	1.63	1.44	61.0	46.0	73.0				880	800	780	801	1500	1400	1469	3.15
P	0.17	0.04	1.65	1.45	0.13	0.17	1.63	1.45	58.0	47.0	75.0				874	790	790	806	1500	1400	1480	3.14
P	0.17	0.06	1.61	1.45	0.13	0.18	1.62	1.44	61.0	47.0	67.0				898	800	790	814	1500	1400	1496	3.14
Q							0.16	1.60	1.38	58.6					837				1425			
Q							0.17	1.57	1.34	57.7					816				1408			
Q							0.17	1.53	1.33	58.5					825				1425			
Q							0.17	1.52	1.35	58.0					819				1422			
Q							0.17	1.52	1.36	57.4					809				1398			
Q							0.17	1.53	1.37	59.3					818				1418			
Q							0.17	1.56	1.36	58.2					822				1420			
Q							0.17	1.55	1.38	58.5					829				1430			
R	0.19	0.03	1.47	1.32	0.11	0.13	0.19	1.50	1.44	64.0	60.0	65.0		821	824	814	790	785	1506	1470	1494	3.10
R	0.18	0.04	1.45	1.33	0.13	0.11	0.18	1.52	1.44	65.0	64.0	65.0		828	833	815	800	771	1488	1493	1486	3.11
R	0.19	0.04	1.48	1.34	0.11	0.13	0.19	1.50	1.47	68.0	60.0	68.0		815	862	818	803	776	1504	1451	1490	3.09
R	0.20	0.04	1.50	1.35	0.12	0.11	0.19	1.52	1.46	64.0	60.0	60.0		817	885	820	801	792	1489	1456	1510	3.11
R	0.17	0.03	1.49	1.35	0.11	0.11	0.18	1.50	1.47	66.0	58.0	64.0		811	882	810	810	777	1483	1467	1505	3.10
R	0.19	0.04	1.49	1.35	0.12	0.13	0.19	1.54	1.51	64.0	60.0	64.0		816	852	811	792	768	1487	1435	1519	3.09
R	0.18	0.04	1.49	1.35	0.12	0.11	0.18	1.52	1.53	67.0	57.0	59.0		811	882	813	815	782	1481	1470	1503	3.10
R	0.18	0.03	1.48	1.34	0.11	0.12	0.18	1.50	1.42	66.0	61.0	66.0		811	830	799	823	794	1500	1491	1514	3.09
S							0.16	1.50	1.35			62.0			753				867			1517
S							0.16	1.49	1.36			60.0			759				869			1508
S							0.17	1.50	1.36			64.0			754				858			1504
S							0.17	1.52	1.33			65.0			755				866			1503
S							0.17	1.52	1.35			62.0			749				876			1518
S							0.16	1.48	1.32			60.0			756				862			1506
S							0.17	1.51	1.32			60.0			757				878			1505
S							0.17	1.51	1.34			65.0			754				886			1500
T							0.18	1.60	1.39	58.5	46.0			411		730	784		1320	1330		
T							0.17	1.47	1.30	59.8	47.0			408		753	785		1370	1350		
T							0.16	1.44	1.24	61.4	46.0			446		743	790		1370	1340		
T							0.18	1.54	1.36	58.1	46.0			404		742	784		1330	1270		
T				</																		

Assay data (cont)

Lab Code	Au NIS ppm	Ir NIS ppm	Pd NIS ppm	Pt NIS ppm	Rh NIS ppm	Ru NIS ppm	Au PbCol ppm	Pd PbCol ppm	Pt PbCol ppm	Co M/ICP ppm	Co P ppm	Co XRF ppm	Cr F ppm	Cr M/ICP ppm	Cr XRF ppm	Cu M/ICP ppm	Cu P ppm	Cu XRF ppm	Ni M/ICP ppm	Ni P ppm	Ni XRF ppm	SG	
W	0.15	0.03	1.67	1.43	0.11	0.10	0.18	1.57	1.40	59.3	48.4				790	729	775	782	1410	1380	1475	3.18	
W	0.15	0.03	1.66	1.41	0.11	0.11	0.19	1.59	1.41	58.3	49.0				799	719	761	804	1410	1380	1516	3.18	
W	0.14	0.03	1.65	1.41	0.11	0.11	0.18	1.60	1.42	60.8	48.8				792	724	774	786	1440	1380	1497	3.17	
W	0.15	0.03	1.65	1.37	0.10	0.11	0.18	1.56	1.39	62.1	48.6				792	731	775	793	1430	1390	1467	3.19	
W	0.15	0.03	1.64	1.40	0.11	0.11	0.18	1.58	1.41	59.2	47.8				785	715	770	801	1400	1370	1519	3.18	
W	0.17	0.03	1.69	1.37	0.11	0.11	0.18	1.60	1.41	59.9	48.6				779	732	770	799	1420	1380	1531	3.19	
W	0.16	0.03	1.80	1.54	0.11	0.11	0.18	1.59	1.41	60.8	49.2				787	745	763	797	1460	1380	1500	3.17	
W	0.16	0.03	1.76	1.49	0.12	0.11	0.17	1.57	1.38	58.5	49.7				795	714	771	784	1390	1380	1507	3.19	
X							0.16	1.43	1.30		54.1		80.0	532		888	765		1657	1396			
X							0.17	1.56	1.38		54.3		70.0	551		916	776		1616	1394			
X							0.16	1.45	1.36		55.6		60.0	563		935	779		1694	1398			
X							0.16	1.44	1.30		57.5		70.0	538		859	779		1604	1393			
X							0.17	1.50	1.35		54.5		140.0	488		872	789		1554	1383			
X							0.17	1.44	1.29		52.1		70.0	548		877	786		1643	1396			
X							0.16	1.51	1.38		52.3		60.0	613		885	783		1638	1399			
X							0.16	1.53	1.37		57.2		70.0	535		861	779		1597	1404			
Y	0.12	0.03	1.55	1.37	0.11	0.08	0.18	1.53	1.35	58.9	44.0	64.0			536	874	796	725	757	1410	1390	1440	3.11
Y	0.11	0.03	1.57	1.36	0.12	0.09	0.18	1.61	1.43	63.0	44.0	64.0			509	865	822	726	762	1520	1390	1430	3.08
Y	0.11	0.02	1.53	1.31	0.11	0.08	0.18	1.63	1.34	62.0	45.0	63.0			434	884	805	715	764	1490	1390	1440	3.10
Y	0.11	0.02	1.56	1.34	0.11	0.11	0.17	1.47	1.33	64.4	44.0	63.0			454	864	841	721	763	1530	1370	1440	3.04
Y	0.11	0.02	1.54	1.34	0.11	0.08	0.16	1.43	1.29	61.0	40.0	62.0			422	854	792	628	740	1460	1220	1400	3.11
Y	0.12	0.02	1.55	1.37	0.12	0.08	0.16	1.43	1.30	59.9	47.0	63.0			432	878	780	784	756	1450	1490	1420	3.10
Y	0.12	0.03	1.58	1.45	0.12	0.08	0.16	1.52	1.33	62.4	43.0	65.0			397	872	796	722	759	1480	1340	1420	3.12
Y	0.11	0.02	1.53	1.34	0.11	0.10	0.16	1.44	1.31	62.3	40.0	65.0			472	883	818	656	766	1490	1230	1450	3.10

12. Measurement of Uncertainty:

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 ISO guidelines.

Analyte	CSU*	unit	Analyte	CSU*	unit	Analyte	CSU*	unit
Au NIS	0.004	ppm	Cr F	15.137	ppm	Cr2O3	0.001	%
Ir NiS	0.001	ppm	Cr M/ICP	20.992	ppm	Fe2O3	0.020	%
Pd NIS	0.020	ppm	Cr XRF	7.812	ppm	K2O	0.002	%
Pt NIS	0.021	ppm	Cu M/ICP	5.206	ppm	LOI	0.086	%
Rh NiS	0.001	ppm	Cu P	6.681	ppm	MgO	0.053	%
Ru NiS	0.004	ppm	Cu XRF	9.176	ppm	MnO	0.001	%
Au Pb Col	0.001	ppm	Ni M/ICP	10.687	ppm	Na2O	0.005	%
Pd Pb Col	0.007	ppm	Ni P	9.744	ppm	P2O5	0.002	%
Pt Pb Col	0.007	ppm	Ni XRF	8.379	ppm	SiO2	0.121	%
Co M/ICP	0.534	ppm	SG	0.011	%	TiO2	0.001	%
Co P	0.794	ppm	Al2O3	0.012	%	V2O5	0.006	%
Co XRF	2.672	ppm	CaO	0.032	%			

*CSU = Combined standard uncertainty

13. Uncertified values: The Certified, Provisional and Indicated 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.

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: AMIS0127 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. 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.

19. 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.

15 July 2009

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

AMIS0127 Trace

Analyte	Method	Unit	mean	2SD	RSD%	n
Ag	M/ICP	ppm	0.36	0.1	18.9	35
Al	M/ICP	ppm	3.27	0.2	2.5	68
As	M/ICP	ppm	1.57	1.0	33.2	25
Ba	M/ICP	ppm	39.2	3.8	4.8	81
Be	M/ICP	ppm	0.13	0.09	32.1	34
Bi	M/ICP	ppm	0.51	0.1	10.8	53
Ca	M/ICP	ppm	10.2	0.9	4.6	70
Cd	M/ICP	ppm	0.15	0.09	30.6	32
Ce	M/ICP	ppm	8.02	0.6	3.5	44
Cs	M/ICP	ppm	1.01	0.1	7.2	48
Dy	M/ICP	ppm	1.38	0.1	5.4	39
Er	M/ICP	ppm	0.85	0.08	4.9	40
Eu	M/ICP	ppm	0.34	0.03	5.0	40
Fe	M/ICP	ppm	6.56	0.5	3.9	79
Ga	M/ICP	ppm	6.85	0.6	4.4	54
Gd	M/ICP	ppm	1.39	0.1	4.4	32
Ge	M/ICP	ppm	0.14	0.1	36.3	23
Hf	M/ICP	ppm	1.32	0.2	6.8	55
Ho	M/ICP	ppm	0.29	0.03	4.8	38
In	M/ICP	ppm	0.04	0.002	2.1	24
K	M/ICP	ppm	0.13	0.01	4.9	72
La	M/ICP	ppm	3.69	0.6	8.2	64
Li	M/ICP	ppm	14.7	3.4	11.5	54
Lu	M/ICP	ppm	0.11	0.02	8.7	39
Mg	M/ICP	ppm	11.5	0.6	2.5	53
Mn	M/ICP	ppm	2390	192	4.0	78
Mo	M/ICP	ppm	0.53	0.2	23.2	38
Na	M/ICP	ppm	0.21	0.02	5.0	70
Nb	M/ICP	ppm	0.84	0.3	20.7	55
Nd	M/ICP	ppm	4.88	0.3	2.8	36
P	M/ICP	%	0.01	0.004	24.2	42
Pb	M/ICP	ppm	15.8	3.8	12.0	62
Pr	M/ICP	ppm	1.07	0.09	4.1	29
Rb	M/ICP	ppm	7.56	0.4	2.8	45
Re	M/ICP	ppm	0.01	0.003	17.8	24
Sb	M/ICP	ppm	1.50	0.3	10.2	62
Sc	M/ICP	ppm	21.7	2.8	6.5	55
Se	M/ICP	ppm	2.97	0.1	1.9	21
Sm	M/ICP	ppm	1.25	0.1	4.5	38
Sn	M/ICP	ppm	0.70	0.09	6.2	27
Sr	M/ICP	ppm	33.9	2.7	3.9	76
Ta	M/ICP	ppm	0.15	0.3	93.1	29
Tb	M/ICP	ppm	0.23	0.04	7.8	37
Te	M/ICP	ppm	0.66	0.2	13.6	46
Th	M/ICP	ppm	0.69	0.2	11.4	55
Ti	M/ICP	%	0.17	0.02	4.6	70
Tl	M/ICP	ppm	0.20	0.02	5.8	39
Tm	M/ICP	ppm	0.11	0.02	7.5	40
U	M/ICP	ppm	0.49	0.04	4.1	45
V	M/ICP	ppm	112	10.6	4.7	63
W	M/ICP	ppm	0.59	0.2	20.9	41
Y	M/ICP	ppm	7.85	1.2	7.9	71
Yb	M/ICP	ppm	0.75	0.09	5.8	40
Zn	M/ICP	ppm	58.1	12.8	11.0	70
Zr	M/ICP	ppm	34.8	4.64	6.7	62