

African Mineral Standards

Gold and Uranium Ore, Witwatersrand reference material Ore Grade

AMIS0078

Certificate of Analysis

**Recommended Concentration and two “Between Laboratory”
Standard Deviations**

Certified Concentrations

Au	8.36	±	0.50	g/t
U (M/ICP)*	332	±	34	ppm
U (XRF)*	346	±	22	ppm
Specific Gravity	2.71	±	0.20	g/cc

**** Or, by applying a chemical conversion factor of U x 1.1793 = U₃O₈
U₃O₈ by multi acid digestion: 392 ± 40 ppm
U₃O₈ by XRF: 408 ± 26 ppm**

Intended use: AMIS0078 is suitable for monitoring the accuracy of a single analysis of gold ores hosted by siliceous rocks. The material can be used for routine quality control by inserting within a batch of samples.

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 %.

Origin of material: This standard was made from grade-sorted pulp rejects sourced from Anglo Gold Ashanti mine assay laboratories in South Africa. It represents sample material from the basal contacts of the Vaal Reef and the Carbon Leader Reef collected during routine underground sampling.

Mineral and chemical composition: The major gangue mineral is quartz with minor pyrite, uraninite and thucolite. Gold occurs primarily as discrete grains.

The chemical composition of this material is set out in the appendix.

Appearance: The material is a fine Light Grey powder (Corstor 5Y 7/1).

Radioactivity: Shipments of this material do not require special marking, labeling or placarding. AMIS0078 does contain U (4.33 Bq/g) and Th (0.15 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".

Method of preparation: The material was crushed, dry-milled and air-classified to 100% <54um. Wet sieve particle size analysis of random samples confirmed the material was 100% <54um. It was then blended in a bi-conical mixer, systematically divided and then sealed into 1kg Laboratory Packs. Samples were randomly selected for homogeneity testing and third party analysis. Statistical analysis for the consensus test results were carried out by an independent statistician. Explorer Packs are subdivided from the Laboratory packs as required.

Methods of analysis requested:

1. Au – Pb collection ICP-OES or ICP-MS.
2. Multi-acid digest U ICP-OES or ICP-MS.
3. U XRF.
4. Majors (Al₂O₃, CaO, Cr₂O₃, Fe₂O₃, K₂O, MgO, MnO, Na₂O, SiO₂, TiO₂. LOI.) XRF fusion.
5. SG (gas pycnometer)

Method of certification: Twenty three laboratories were each given eight randomly selected packages of sample. The results from the twenty two laboratories that issued results timeously were used.

The mean and standard deviation for all data was calculated. Outliers were defined as samples beyond the mean ± 2 Standard Deviations from all data. These outliers were removed from the data and a new mean and standard deviation was determined. This method is different from that used to calculate the Confidence Interval shown on many Government-produced standards 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 Certified Limits published on other standards which quote a Confidence Interval.

Participating laboratories: (Not in same order as in the table of assays)

1. ACME Analytical Laboratories Ltd., (Canada).
2. Activation Laboratories Ltd., (ActLabs, Ancaster, ON, Canada).
3. AGA - West Wits Laboratory, (South Africa).
4. AGA - Navachab Gold Mine Laboratory, (Namibia).
5. AGA - Vaal River Laboratory (South Africa).
6. ALS Chemex South Africa (Pty) Ltd.
7. ALS Chemex, (Perth, Australia).
8. ALS Chemex, (Vancouver, Canada).
9. Anglo Research (Crown Campus, South Africa).
10. Assayers Canada, (Vancouver).
11. Genalysis Laboratory Services (Pty) Ltd., (Australia).
12. Labtium Inc. (Finland)
13. MAED Laboratories - Knights (South Africa)
14. OMAC Laboratories (Ireland).
15. Performance Laboratories, (South Africa).
16. Pt Intertek Utama Services (Intertek, Indonesia)
17. Set Point Laboratories (Pty) Ltd (South Africa)
18. SGS Lakefield Research (Canada)
19. SGS Lakefield Research Africa (Pty) Ltd. (Joburg, South Africa)
20. SGS Mineral Services - Barberton, (South Africa).
21. SGS Welshpool (Australia).
22. Ultra Trace (Pty) Ltd. (Australia)

Assay Data: Data as received from the laboratories is set out below. A proficiency report has been sent to the managers of the participating laboratories.

Lab code	Au g/t	U ppm (M-ICP)	U ppm (XRF)	SG g/cc
A			368	2.77
A			369	2.77
A			366	2.79
A			364	2.76
A			364	2.81
A			363	2.79
A			367	2.77
A			363	2.76
B	8.30		338	2.85
B	8.29		340	2.84
B	8.35			2.84
B	8.45		339	2.84
B	8.54		339	2.84
B	8.40		338	2.84
B	8.20		338	2.83
B	8.35		342	2.84
C	7.82			
C	7.83			
C	8.06			
C	8.03			
C	7.93			
C	8.34			
C	8.18			
C	8.29			
D	8.44	327		2.54
D	8.42	328		2.50
D	8.42	323		2.53
D	8.38	331		2.54
D	8.49	328		2.58
D	8.41	333		2.51
D	8.32	323		2.55
D	8.33	328		2.61

Lab code	Au g/t	U ppm (M-ICP)	U ppm (XRF)	SG g/cc
E	8.58	337	352	2.80
E	8.57	341	340	2.78
E	8.50	342	350	2.80
E	8.38	333	345	2.79
E	8.33	334	350	2.77
E	8.42	333	349	2.76
E	8.49	328	345	2.77
E	8.17	324	345	2.77
F	8.47	341	355	
F	8.70	337	348	
F	8.40	349	351	
F	8.15	339	340	
F	8.33	348	339	
F	9.13	346	347	
F	8.67	341	347	
F	8.72	358	353	
G	8.44		366	
G	8.12		354	
G	7.68		345	
G	8.42		338	
G	8.42		355	
G	8.16		342	
G	8.00		333	
G	8.04		334	
H				
H				
H				
H				
H				
H				
H				
H				
H				
H				
H				
H				

Lab code	Au g/t	U ppm (M-ICP)	U ppm (XRF)	SG g/cc
I	8.57	365		2.42
I	8.85	356		2.42
I	8.62	379		2.40
I	8.61	374		2.39
I	8.73	372		2.32
I	8.75	361		2.32
I	8.69	355		2.28
I	8.88	352		2.34
J	8.11	311	350	2.64
J	8.18	336	350	2.65
J	8.22	304	330	2.59
J	8.07	378	350	2.69
J	8.09	340	370	2.68
J	8.02	342	370	2.67
J	8.19	286	360	2.61
J	7.93	297	340	2.65
K	7.83		349	2.54
K	7.87		356	2.72
K	8.36		346	2.26
K	7.63		351	2.55
K	8.08		353	2.74
K	8.22		354	2.56
K	8.08		358	2.73
K	8.02		358	2.64
L	8.28			
L	7.96			
L	7.72			
L	7.92			
L	8.32			
L	8.44			
L	7.80			
L	8.04			

Lab code	Au g/t	U ppm (M-ICP)	U ppm (XRF)	SG g/cc
M	7.49	400	380	2.76
M	8.17	400	380	2.75
M	7.94	400	390	2.74
M	7.85	390	380	2.76
M	7.80	400	380	2.74
M	7.77	400	380	2.75
M	8.11	400	380	2.73
M	8.06	400	380	2.74
N	8.47	350	350	2.81
N	8.32	338	340	2.81
N	8.49	334	350	2.82
N	8.53	335	350	2.80
N	8.32	336	350	2.79
N	8.36	333	340	2.81
N	8.44	331	340	2.81
N	8.59	332	350	2.79
O	8.32			
O	8.72			
O	8.21			
O	8.35			
O	8.79			
O	8.52			
O	8.00			
O	8.44			
P	8.55	307	350	2.57
P	8.51	279	340	2.59
P	8.54	294	350	2.58
P	8.49	307	330	2.60
P	8.64	332	340	2.58
P	8.65	296	340	2.58
P	8.58	298	340	2.54
P	8.56	292	340	2.56

Lab code	Au g/t	U ppm (M-ICP)	U ppm (XRF)	SG g/cc
Q	8.39	332	400	
Q	8.55	326	300	
Q	8.39	323	400	
Q	9.29	323	400	
Q	7.87	320	400	
Q	8.65	343	300	
Q	8.16	333	400	
Q	8.62	335	400	
R	8.48	342		2.69
R	8.51	330		2.65
R	8.38	338		2.70
R	8.43	318		2.60
R	8.51	310		2.69
R	8.34	316		2.67
R	8.33	343		2.61
R	8.38	323		2.60
S	7.17	402		
S	7.51	375		
S	7.66	375		
S	7.54	371		
S	6.99	390		
S	7.95	392		
S	7.74	395		
S	7.04	391		
T	8.58	346	330	2.79
T	8.43	352	328	2.78
T	8.43	354	330	2.79
T	8.39	349	327	2.81
T	8.43	347	332	2.82
T	8.39	353	329	2.79
T	8.44	359	332	2.80
T	8.44	359	331	2.80

Lab code	Au g/t	U ppm (M-ICP)	U ppm (XRF)	SG g/cc
U	8.72	318		
U	8.75	298		
U	8.83	313		
U	8.76	320		
U	8.67	324		
U	8.70	316		
U	8.74	306		
U	8.54	321		
V	8.31			2.49
V	8.18			2.45
V	8.17			2.53
V	8.28			2.46
V	8.62			2.54
V	8.35			2.53
V	8.19			2.48
V	8.08			2.53
W	8.38			
W	8.46			
W	8.40			
W	8.40			
W	8.44			
W	8.46			
W	8.34			
W	8.36			

Availability: This product is available in Laboratory Packs containing 1kg of material or in Explorer Packs containing client specified weights of material from 50g up to 250g. Laboratory Packs are sealed bottles delivered in sealed foil pouches. Explorer Packs contain material in standard geochem envelopes placed into foil pouches that are nitrogen flushed and vacuum sealed.

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.

14 April 2008

Certifying officers:



African Mineral Standards: _____

Mike McWha
BSc (Hons), FGSSA, MSAIMM, Pr.Sci.Nat



Geochemist: _____

Barry W. Smee
BSc, PhD, P.Geo, (B.C.)

APPENDIX

Uncertified major element statistics

This additional AMIS0078 major element chemistry has been calculated, from predominantly XRF data submitted by sixteen of the round robin laboratories, from the eight samples sent to each lab. Uncertified but iterated statistics from this data are:

	mean	2SD	RSD%	n
Al ₂ O ₃	1.6	0.1	2.7	79
CaO	3.4	0.1	1.4	86
Cr ₂ O ₃	0.1	0.01	5.8	77
Fe ₂ O ₃	2.7	0.1	2.7	90
K ₂ O	0.3	0.01	2.1	71
LOI	5.2	0.8	7.3	110
MgO	2.4	0.2	4.0	94
MnO	0.3	0.03	4.5	95
Na ₂ O	0.1	0.02	13.7	63
P ₂ O ₅	0.02	0.01	19.5	72
S	0.5	0.05	5.0	52
SiO ₂	83.1	1.5	0.9	94
TiO ₂	0.2	0.01	3.0	86

APPENDIX (cont)

Uncertified trace element statistics

This additional AMIS0078 trace element chemistry has been calculated, from data submitted by sixteen of the round robin laboratories, from the eight samples sent to each lab. Uncertified but iterated statistics from this data are:

	mean	2SD	RSD%	n
Ag	0.88	0.13	7.4	38
As	128	9	3.5	53
Ba	50	2	2.3	53
Cd	0.35	0.08	11.9	37
Ce	29.0	7.2	12.5	48
Co	25.0	3.0	6.1	55
Cr	433	58	6.7	39
Cu	28.5	3.3	5.8	48
Ga	2.31	0.42	9.1	48
Hf	1.34	0.43	16.0	38
La	14.8	1.8	6.0	55
Li	3.92	0.34	4.4	51
Mo	5.12	1.00	9.7	47
Nb	2.53	0.70	13.7	47
Ni	62	5	3.7	53
Pb	163	11	3.5	47
Rb	10.9	1.3	5.8	47
Sb	3.97	0.39	4.9	36
Sc	1.93	0.36	9.4	31
Sn	1.92	0.48	12.6	47
Sr	16.0	2.4	7.5	61
Ta	1.05	0.18	8.8	32
Th	36.1	3.5	4.9	47
V	24.4	2.9	5.9	53
Y	17.2	2.0	5.8	56
Zn	146	9	2.9	45
Zr	42.1	11.7	13.9	53