ROCKLABS

WORLD LEADERS IN SAMPLE PREPARATION EQUIPMENT AND REFERENCE MATERIALS FOR USE IN GOLD ASSAYING

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Certificate of Analysis

Reference Material SL51

Recommended Gold Concentration: 5.909 µg/g
95% Confidence Interval: +/- 0.047 µg/g

The above values apply only to product in jars or sachets which have an identification number within the following range: ***196 419 – 197 840.***

Prepared and Certified By:

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Date of Certification:

19 June 2009

Certificate Status:

Original

Available Packaging:

This reference material has been packed in wide-mouthed jars that contain 2.5 kg of product. The contents of some jars may be subsequently repacked into sealed polyethylene sachets.

Origin of Reference Material:

Feldspar minerals, basalt and iron pyrites with minor quantities of finely divided gold-containing minerals that have been screened to ensure there is no gold nugget effect.

Supplier of Reference Material:

ROCKLABS Ltd
P O Box 18 142
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Description: The reference material is a light grey powder that has been well mixed and a homogeneity test carried out after the entire batch was packaged into wide-mouthed jars. There is no soil component. The product contains crystalline quartz and therefore dust from it should not be inhaled.

The approximate chemical composition is**:**

(Uncertified Values)

	%
SiO_2	54.54
Al_2O_3	16.38
Na_2O	4.56
K_2O	4.65
CaO	3.84
MgO	3.25
TiO_2	1.00
MnO	0.07
P_2O_5	0.25
Fe_2O_3	4.6
Fe	2.9
S	3.2

Intended Use: This reference material is designed to be included with every batch of samples analysed and the results plotted for quality monitoring purposes.

Stability: The container (jar or sachet) and its contents should not be heated to temperatures higher than 50 °C. Iron pyrites are likely to oxidize in the air but tests have shown that the increase in weight of an exposed reference material of similar matrix, in the Auckland climate, is less than 0.1% per year.

Method of Preparation: Pulverized feldspar minerals, basalt rock and barren iron pyrites were blended with finely pulverized and screened, gold-containing minerals. Once the powders were uniformly mixed the composite was placed into 1422 wide-mouthed jars, each bearing a unique number. 40 jars were randomly selected from the packaging run and material from these jars was used for both homogeneity and consensus testing.

Homogeneity Assessment:

An independent laboratory carried out all gold analyses by fire assay of 30 g portions, using a gravimetric finish. Steps were taken to minimize laboratory method variation in order to better detect any variation in the candidate reference material.

Homogeneity Assessment continued:

The contents of five randomly selected jars were compacted by vibration (to simulate the effect of freighting) and five samples removed successively from top to bottom from each jar. In addition, five samples were removed from the last jar in the series. A sample was also removed from the top of each of the 40 jars randomly selected from the 1422 jars in the batch. The results of analysis of the 70 samples (randomly ordered and then consecutively numbered before being sent to the laboratory) produced a relative standard deviation of 0.7 %.

Analytical Methodology:

Once homogeneity had been established, two sub-samples were submitted to a number of well-recognized laboratories in order to assign a gold value by consensus testing. The sub-samples were drawn from the 40 randomly selected jars and each laboratory received samples from two different jars. Indicative concentration ranges were given. All laboratories used fire assay for the gold analysis, with some using an instrument finish and some a gravimetric finish

Calculation of Certified Value:

Results for gold were returned from 40 laboratories. Statistical analysis to identify outliers was carried out using the principles detailed in sections 7.3.2 – 7.3.4, ISO 5725-2: 1994. Assessment of each laboratory's performance was carried out on the basis of z-scores, partly based on the concept described in ISO/IEC Guide 43-1. Details of the criteria used in these examinations are available on request. As a result of these statistical analyses, five sets of results were excluded for the purpose of assigning a gold concentration value to this reference material. A recommended value was thus calculated from the average of the remaining n = 35 sets of replicate results. The 95 % confidence interval was estimated using the formula:-

$$X \pm ts/\sqrt{n}$$

(where X is the estimated average, s is the estimated standard deviation of the laboratory averages, and t is the 0.025 tail-value from Student's t-distribution with n-1 degrees of freedom). The recommended value is provided at the beginning of the certificate in µg/g (ppm) units. A summary of the results used to calculate the recommended value is listed on page 4 and the names of the laboratories that submitted results are listed on page 5. The results are listed in increasing order of the individual laboratory averages. A code also indicates the method used by the laboratory. The code starts with the sample weight used (where this is known) and finishes with either the instrument used (eg AAS or ICP-OES) or gravimetric finish (indicated by "grav"). Statistical analysis was carried out separately on two groups of samples – those analysed with an instrument finish and those completed by gravimetry. There was no significant difference in the calculated gold average for each group. This applied with outliers included as well as with outliers excluded; therefore the assigned value was calculated from the combined sets of results.

Independent statistician, Tim Ball, has carried out statistical analysis of the consensus test results.

Summary of Results Used to Calculate Gold Value

(Listed in increasing order of individual laboratory averages)

Gold (ppm)			
Method	**Sample 1**	**Sample 2**	**Average**
20gfa/AAS	5.65	5.51	5.580
30gfa/grav	5.76	5.43	5.595
15gfa/grav	5.76	5.66	5.710
30gfa/AAS	5.69	5.76	5.725
30gfa/AAS	5.774	5.678	5.726
50gfa/AAS	5.70	5.80	5.750
fa/AAS	5.730	5.890	5.810
30gfa/AAS	5.85	5.800	5.825
fa/grav	5.863	5.806	5.835
25gfa/grav	5.92	5.76	5.840
30gfa/AAS	5.820	5.89	5.855
50gfa/ICP	5.86	5.86	5.860
30gfa/grav	5.84	5.88	5.860
fa/grav	5.78	5.95	5.865
50gfa/AAS	5.85	5.97	5.910
fa/AAS	5.930	5.917	5.924
30gfa/AAS	5.925	5.933	5.929
30gfa/AAS	5.91	5.97	5.940
fa/grav	5.967	5.934	5.951
10gfa/AAS	5.98	5.94	5.960
30gfa/AAS	5.95	5.97	5.960
15gfa/AAS	5.983	5.949	5.966
50gfa/AAS	6.13	5.81	5.970
30gfa/AAS	5.97	5.98	5.975
30gfa/AAS	6.03	5.94	5.985
30gfa/grav	6.01	5.97	5.990
30gfa/grav	6.020	5.997	6.009
30gfa/ICP-ES	5.95	6.09	6.020
25gfa/AAS	6.110	5.940	6.025
30gfa/AAS	6.049	6.028	6.039
fa/grav	6.080	6.020	6.050
30gfa/grav	6.08	6.02	6.050
40gfa/ICP-OES	6.145	6.005	6.075
30gfa/AAS	5.99	6.19	6.090
30gfa/AAS	6.12	6.21	6.165

Average of 35 sets = 5.909 ppm

Standard deviation of 35 sets = 0.136 ppm

Note: this standard deviation should not be used as a basis to set control limits when plotting results from an individual laboratory.

Relative standard deviation = 2.3 %

95% Confidence interval for average = 0.047 ppm

Participating Laboratories

Australia	ALS Chemex, Kalgoorlie ALS Chemex, Perth Amdel Ltd, Adelaide Amdel Ltd, Kalgoorlie Genalysis Laboratory Services Pty Ltd, Perth SGS Australia Pty Ltd, Perth SGS Australia Pty Ltd, Townsville Standard and Reference Laboratories, Perth Ultra Trace Pty Ltd, Perth
Burkina Faso	ALS Chemex, Ouagadougou
Canada	Accurassay Laboratories, Thunder Bay Acme Analytical Laboratories Ltd, Vancouver ALS Chemex, Val d'Or ALS Chemex, Vancouver Assayers Canada, Vancouver Bourlamaque Assay Laboratories Ltd, Val d'Or International Plasma Labs Ltd, Richmond Loring Laboratories Ltd, Calgary SGS Mineral Services, Lakefield Techni-Lab S.G.B. Abitibi Inc, Quebec TSL Laboratories Inc, Saskatoon
Chile	Acme Analytical Laboratories Ltd, Santiago
Kyrgyzstan	Alex Stewart Assay and Environmental Laboratories Ltd, Kara-Balta
Mali	ALS Chemex, Bamako
New Zealand	Amdel NZ Ltd, Macraes, Otago Amdel Ltd, Reefton SGS Minerals, Waihi
Peru	ALS Chemex, Lima Minera Yanacocha SRL – Newmont, Lima Inspectorate Services Peru S.A.C., Callao
Russia	Irgiredmet JSC, Analytical Centre, Irkutsk
South Africa	AB Analytical Laboratory Services, Boksburg Anglo Research, Johannesburg Performance Laboratories, Randfontein SGS South Africa (Pty) Ltd, Barberton SGS South Africa (Pty) Ltd, Southdale
United States of America	ALS Chemex, Reno Barrick Goldstrike Mines Inc, Carlin Newmont Mining Corporation, Carlin Laboratory Newmont Mining Corporation, Lone Tree Laboratory

Instructions and Recommendations for Use:

Weigh out quantity usually used for analysis and analyze for total gold by normal procedure. Homogeneity testing has shown that consistent results are obtainable for gold when 30g portions are taken for analysis.

We quote a 95% confidence interval for our estimate of the declared value. This confidence interval reflects our uncertainty in estimating the true value for the gold content of the reference material. The interval is chosen such that, if the same procedure as used here to estimate the declared value were used again and again, then 95% of the trials would give intervals that contained the true value. It is a reflection of how precise the trial has been in estimating the declared value. It **does not** reflect the variability any particular laboratory will experience in its own repetitive testing.

Some users in the past have misinterpreted this confidence interval as a guide as to how different an individual test result should be from the declared value. Some mistakenly use this interval, or the standard deviation from the consensus test, to set limits for control charts on their own routine test results using the reference material. Such use inevitably leads to many apparent out-of-control points, leading to doubts about the laboratory's testing, or of the reference material itself.
A much better way of determining the laboratory performance when analysing the reference material is to accumulate a history of the test results obtained, and plot them on a control chart. The appropriate centre line and control limits for this chart should be based on the average level and variability exhibited in the laboratory's **own** data. This chart will provide a clear picture of the long-term stability or otherwise of the laboratory testing process, providing good clues as to the causes of any problems. To help our customers do this more simply for themselves, we can provide a free Excel template that will produce sensible graphs, with intelligently chosen limits, from the customer's own data.

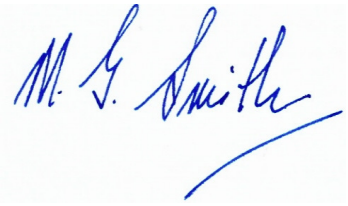
Legal Notice:

This certificate and the reference material described in it have been prepared with due care and attention. However ROCKLABS Ltd, Malcolm Smith Reference Materials Ltd and Tim Ball Ltd accept no liability for any decisions or actions taken following the use of the reference material.

References:

For further information on the preparation and validation of this reference material please contact Malcolm Smith.

Certifying Officer



M G Smith BSc, FNZIC

Independent Statistician

Tim Ball BSc (Hons)