Certificate of Analysis

Reference Material SF12

Recommended Gold Concentration: 0.819 µg/g
95% Confidence Interval: +/- 0.012 µg/g

The above values apply only to product in jars or sachets which have an identification number within the following range: *(The unique number range is not published on website)*

Prepared and Certified By:

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Date of Certification: 23 August 2002

Certificate Status: Original

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

Origin of Reference Material: Feldspars 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
Auckland
NEW ZEALAND
Email: rocklabs@clear.net.nz
Telephone: +64 9 634 7696

Description: The component minerals have been well mixed and a homogeneity test carried out after the entire batch was packaged into wide-mouthed jars to ascertain that the gold is

evenly distributed throughout the reference material. 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	63.92
Al_2O_3	17.99
Na_2O	8.93
K_2O	2.05
CaO	0.35
MgO	0.04
TiO_2	0.04
MnO	<0.01
P_2O_5	0.17
Fe	3.1
S	2.8

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 preliminary tests have shown that the overall increase in weight of the exposed reference material in the Auckland climate is less than 0.2% per year.

Instructions 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. Homogeneity cannot be guaranteed for gold if smaller weights are taken for analysis.

Method of Preparation: Pulverized feldspar minerals 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 748 wide-mouthed jars, each bearing a unique number. 30 jars were randomly selected from the packaging run and material from these jars was used for both homogeneity and consensus testing.

Homogeneity Test:

30g portions were selected as follows for homogeneity testing by an independent laboratory.

Between Jar - Samples from the top 6 each of the 30 randomly selected jars.

Within Jar - The contents of three jars were compacted by vibration (to simulate the effect of freighting) and five samples removed successively from top to bottom from each of the three jars.
Reference Group - 12 homogeneous sub-samples (ie a control group) were prepared from one jar by taking approximately 400g and mixing by mat rolling, followed by coning and quartering to obtain 30g (approximate) portions for gold analysis.

Statistical analysis of the data indicated no significant difference in variability between the *Reference Group* and each of the other groups of samples at the 0.05 level of significance. The results from the 45 jar samples had a coefficient of variation of less than 2.0%. This meets our acceptance criterion for candidate reference materials containing gold in the 0.5 – 2.0 ppm range. As the homogeneity testing was carried out using 30g analytical portions, the same degree of homogeneity cannot be guaranteed if smaller weights are taken for analysis.

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 30 randomly selected jars and each laboratory received samples from two different jars. Indicative concentration ranges were given. Two laboratories used neutron activation and the remainder used fire assay for gold analysis.

Calculation of Certified Value:

Results for gold were returned from 28 laboratories. 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. Statistical analysis to identify outliers was carried out using the principles detailed in sections 7.3.2 – 7.3.4, ISO 5725-2: 1994. Details of the criteria used in these examinations are available on request. As a result of these statistical analyses, six 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 = 22 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.

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.

Summary of Results Used to Calculate Gold Value

(not related to order of laboratories listed on page 5)

Gold (ppm)		
Sample 1	**Sample 2**	**Average**
0.770	0.760	0.765
0.77	0.78	0.775
0.786	0.769	0.778
0.78	0.78	0.780
0.79	0.79	0.790
0.804	0.783	0.794
0.824	0.799	0.812
0.812	0.813	0.813
0.82	0.82	0.820
0.83	0.81	0.820
0.82	0.82	0.820
0.825	0.820	0.823
0.826	0.837	0.832
0.829	0.834	0.832
0.83	0.84	0.835
0.83	0.84	0.835
0.840	0.840	0.840
0.85	0.83	0.840
0.830	0.855	0.843
0.86	0.83	0.845
0.876	0.823	0.850
0.87	0.87	0.870

Average of 22 sets = 0.819 ppm
Standard deviation = 0.028 ppm
Coefficient of variation = 3.4 %
95% Confidence interval = +/- 0.012 ppm

Statistical analysis of both homogeneity and consensus test results has been carried out by an independent statistician.

Participating Laboratories

Australia
Amdel Laboratories Ltd, Adelaide
Amdel Laboratories Ltd, Perth
Amdel Ltd, Kalgoorlie

Analabs Pty Ltd, Perth
Analabs Pty Ltd, Townsville
Becquerel Laboratories, Lucas Heights
Genalysis Laboratory Services Pty Ltd, Perth
Standard and Reference Laboratories, Perth

Brazil
Lakefield Geosol Limitada

Canada
Acme Analytical Laboratories Ltd, British Columbia
Activation Laboratories Ltd, Ontario
ALS Chemex, British Columbia
ALS Chemex Chimitec, Quebec
Bourlamaque Assay Laboratories Ltd, Quebec
Geoscience Laboratories, Ontario
Lakefield Research Limited, Ontario
XRAL Laboratories, Ontario

Ireland
OMAC Laboratories Ltd

New Zealand
Amdel New Zealand Ltd, Otago
SGS New Zealand Ltd, Waihi

South Africa
Anglo American Research Laboratories (Pty) Ltd
AngloGold, Vaal River
AngloGold, West Wits
Lakefield Research Africa (Pty) Ltd
Mintek, Analytical Science Division

United States of America
ALS Chemex, Nevada
Barrick Goldstrike Mines Inc, Nevada
Newmont Mining Corporation, Nevada

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

Tim Ball BSc (Hons)