# Certificate of Analysis

## Reference Material OxF41

**Recommended Gold Concentration: 0.815 µg/g**
**95% Confidence Interval: +/- 0.011 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:**

Malcolm Smith BSc, FNZIC
Malcolm Smith Reference Materials Ltd
40 Oakford Park Crescent, Greenhithe,
Auckland 1311
**NEW ZEALAND**
Email: mgs@xtra.co.nz
Telephone: +64 9 444 3534
Fax: +64 9 444 7739

**Date of Certification:** 25 January 2005

**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 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
Fax: +64 9 634 6896

**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)**

| | **%** |
|---|---|
| $SiO_2$ | 67.57 |
| $Al_2O_3$ | 19.24 |
| $Na_2O$ | 10.77 |
| $K_2O$ | 0.38 |
| CaO | 0.32 |
| MgO | 0.15 |
| $TiO_2$ | 0.05 |
| MnO | <0.01 |
| $P_2O_5$ | 0.09 |
| $Fe_2O_3$ | 0.64 |
| L O I | 0.34 |

**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. The reference material is stable, with weight changes of less than 0.5% at extremes of naturally occurring temperature and humidity conditions.

**Instructions for Use:** Weigh out quantity usually used for analysis and analyze for total gold by normal procedure. Do not dry before weighing. Homogeneity testing has shown that consistent results are obtainable for gold when 30g portions are taken for analysis. Homogeneity cannot be guaranteed if smaller weights are taken for analysis.

**Method of Preparation:** Pulverized feldspar minerals were blended with finely pulverized and screened, gold-containing minerals. Once the powders were uniformly mixed the composite was placed into 747 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 Assessment:**

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

**Homogeneity Assessment Prior to Packaging**

30 samples were removed at regular intervals from the prepared candidate reference material prior to packaging into 2.5 kg jars. The results of analysis of

the 30 samples produced a coefficient of variation of 0.7 %.

**Homogeneity Assessment After Packaging**

The contents of three randomly selected 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. In addition, five samples were removed from the last jar in the series. 30 samples were removed from the top of 30 jars randomly selected from the 747 jars in the batch. The results of analysis of 47 samples produced a coefficient of variation of 0.9 %. Three samples were unable to have their analyses completed. 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. All laboratories used fire assay for the gold analysis.

## Calculation of Certified Value:

Results for gold were returned from 26 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, four 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** |
| 0.77 | 0.78 | 0.775 |
| 0.778 | 0.776 | 0.777 |
| 0.80 | 0.79 | 0.795 |
| 0.799 | 0.800 | 0.800 |
| 0.80 | 0.80 | 0.800 |
| 0.79 | 0.81 | 0.800 |
| 0.81 | 0.79 | 0.800 |
| 0.82 | 0.80 | 0.810 |
| 0.80 | 0.82 | 0.810 |
| 0.8074 | 0.8143 | 0.8109 |
| 0.805 | 0.820 | 0.813 |
| 0.808 | 0.822 | 0.815 |
| 0.83 | 0.80 | 0.815 |
| 0.83 | 0.80 | 0.815 |
| 0.82 | 0.81 | 0.815 |
| 0.820 | 0.825 | 0.823 |
| 0.822 | 0.824 | 0.823 |
| 0.83 | 0.83 | 0.830 |
| 0.812 | 0.852 | 0.832 |
| 0.840 | 0.835 | 0.838 |
| 0.865 | 0.860 | 0.863 |
| 0.861 | 0.897 | 0.879 |

Average of 22 sets = 0.815 ppm
Standard deviation of 22 sets = 0.024 ppm
Coefficient of variation = 2.9 %
95% Confidence interval for average = 0.011 ppm

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

## Participating Laboratories

**Australia**
Amdel Ltd, Adelaide
Amdel Ltd, Perth
Amdel Ltd, Kalgoorlie
Genalysis Laboratory Services Pty Ltd, Perth

SGS Australia Pty Ltd, Perth
SGS Australia Pty Ltd, Townsville
Standard and Reference Laboratories, Perth

**Brazil**
Lakefield Geosol Laboratorios Ltda

**Canada**
Acme Analytical Laboratories Ltd, British Columbia
Activation Laboratories Ltd, Ontario
ALS Chemex, British Columbia
ALS Chemex Chimitec, Quebec
Bourlamaque Assay Laboratories Ltd, Quebec
SGS Lakefield Research Ontario

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

**Russia**
Irgiredmet, Irkutsk
Norilsk Nickel, Trans-Polar Division
Russian Academy of Science, Karelia
Tsnigri, Moscow

**South Africa**
Anglo American Research Laboratories
AngloGold Ashanti WWO Chemical Laboratory
Mintek, Analytical Science Division
SGS Lakefield Research Africa

**United States of America**
ALS Chemex, 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 BSc (Hons)