

# Certificate of Analysis

## Reference Material SP142

**Recommended Gold Concentration: 18.15 µg/g**  
**95% Confidence Interval: +/- 0.10 µg/g**

The above values apply only to product in jars or sachets which have an identification number within the following range: **554138–554427**

**Prepared and Certified By:**

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Rocklabs Reference Materials  
Scott Technology  
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**Date of Certification:**

07 August 2023

**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 no gold nugget effect.

**Supplier of Reference Material:**

ROCKLABS  
P O Box 18-142  
Glen Innes  
Auckland 1743  
**NEW ZEALAND**  
Email: [rocklabs.sales@scottautomation.com](mailto:rocklabs.sales@scottautomation.com)  
Website: [www.rocklabs.com](http://www.rocklabs.com)

**Description:** The reference material is a light grey powder that has been well mixed. A homogeneity test was carried out after the entire batch was packaged into wide-mouthed jars. There is no soil component. The product contains crystalline quartz, so dust from it should not be inhaled.

The approximate chemical composition is:  
(Uncertified Values)

	%
SiO <sub>2</sub>	56.18
Al <sub>2</sub> O <sub>3</sub>	15.90
Na <sub>2</sub> O	5.27
K <sub>2</sub> O	3.92
CaO	3.25
MgO	2.90
TiO <sub>2</sub>	0.89
MnO	0.07
P <sub>2</sub> O <sub>5</sub>	0.27
Fe <sub>2</sub> O <sub>3</sub>	4.43
Fe	3.06
S	3.5

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

**Stability:** The container (jar or sachet) and its contents should not be heated to, or stored at temperatures higher than 50 °C. Where the container remains unopened, the reference material will remain stable for more than 10 years from the date of certification. When exposed to the atmosphere iron pyrites are likely to oxidize. Tests have shown that the increase in weight of an exposed reference material of a similar matrix, in the Auckland climate, is less than 0.1% per year.

**Method of Preparation:** This reference material has been produced under quality management systems certified to ISO 9001:2015

Following ILAC Guidelines G12:2000 and G13:2000, 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 290 wide-mouthed jars, each bearing a unique number. 8 jars were randomly selected from the packaging run and material from these jars was used for both homogeneity and consensus testing.

## Homogeneity Assessment:

Sampling was performed by Rocklabs, and an independent laboratory carried out gold analysis 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: A sample was removed from the top of each of the 8 jars randomly selected from the 290 jars in the batch. The results of analysis of the 8 samples (randomly ordered then consecutively numbered before being sent to the laboratory) indicated produced a relative standard deviation of 0.3%.

Settling: The contents of 1 randomly selected jar were compacted by vibration (to simulate the effect of freighting) and 5 samples were removed successively from top to bottom from each jar. In addition, 5 samples were removed from the last jar in the series. No top to bottom gradation in the gold values was observed.

## 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 8 randomly selected jars and each laboratory received samples from two different jars.

Each laboratory was instructed to analyse the samples for gold using the method they believed would give the best results. Indicative concentration ranges were given.

The samples were analysed for gold by all participating laboratories using fire assay followed by either gravimetric or instrument finish (AAS or ICP). The amount of sample used in the analyses varied between laboratories, (range 10-50g).

## Calculation of Certified Value:

The 44 participating laboratories each returned replicate gold results using one finish method for both samples. 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, 5 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  $n = 39$  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  $\mu\text{g/g}$  (ppm) units. A summary of the results used to calculate the

recommended value is listed below 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.

Statistical analysis of the consensus test results has been carried out by independent statistician, Dr Daniel Walsh.

## Summary of Results Used to Calculate Gold Value

(Listed in increasing order of individual laboratory averages)

Gold ppm		
Sample 1	Sample 2	Set average
17.250	17.550	17.400
17.700	17.250	17.475
17.510	17.643	17.576
17.400	18.100	17.750
17.800	17.800	17.800
17.850	17.850	17.850
17.900	17.800	17.850
17.950	17.800	17.875
17.900	18.050	17.975
18.000	18.000	18.000
18.050	17.950	18.000
18.030	17.970	18.000
18.100	17.900	18.000
18.000	18.020	18.010
17.920	18.230	18.075
18.100	18.100	18.100
18.000	18.200	18.100
18.091	18.114	18.103
18.500	17.800	18.150
18.480	17.860	18.170
18.025	18.350	18.188
18.300	18.100	18.200
18.251	18.244	18.248
18.250	18.250	18.250
18.255	18.271	18.263
18.400	18.200	18.300
18.070	18.540	18.305
18.500	18.150	18.325
18.345	18.310	18.328
18.500	18.200	18.350
18.500	18.200	18.350
18.300	18.550	18.425
18.450		18.450
18.450	18.500	18.475
18.250	18.900	18.575
18.670	18.510	18.590
18.550	18.750	18.650
18.800	18.500	18.650
18.900	18.400	18.650
Average of the 39 sets		18.15 ppm
Standard deviation of the 39 sets		0.31 ppm
Relative standard deviation		1.7%
95% confidence interval for average		+/- 0.10 ppm

***Note:*** Neither the Standard deviation nor the Confidence interval should be used as a basis to set control limits when plotting individual laboratory results.  
See notes under "Instructions and Recommendations for Use" (pg 6)

# Participating Laboratories

Australia	ALS Minerals, Kalgoorlie
	ALS Minerals, Perth
	ALS Minerals, Townsville
	Bureau Veritas Amdel, Adelaide
	Intertek Genalysis Laboratory Services, Perth
Burkina Faso	ALS Minerals, Burkina Faso
Canada	Actlabs Val d'Or
	ALS Minerals, Vancouver
	ALS Minerals, Val d'Or
	Bourlamaque Assay Laboratories, Quebec
	Bureau Veritas Commodities Canada Ltd, Vancouver
	MSALABS Inc., Langley BC
	SGS Minerals Services, Lakefield, Ontario
	SGS Minerals Services, Vancouver
	Techni-lab, Ste-Germaine-Boule
Chile	ALS Minerals, Santiago
China	Fujian Zijin Mining and Metallurgical Testing, Xiamen
Côte d'Ivoire	Bureau Veritas Mineral Laboratories, Abidjan
	ENVAL, Yamoussoukro
Ghana	ALS Minerals, Kumasi
	Intertek Minerals, Samahu
	MSALABS, East Coast Demerara.
Guyana	
Ireland	ALS Minerals, Loughrea
Kyrgyz Republic	Stewart Assay and Environmental Laboratories LLC, Kara-
Laos	ALS Geochemistry, Vientiane
Mali	Bureau Veritas, Mali
	MSALABS, Bamako
	BV Minerals, Hermosillo
Mexico	
Mangolia	ALS Minerals, Ulaanbaatar
	ALS Mongolia, You Tolgoi
	REMINEX Research Center, Casablanca
Morocco	
New Zealand	SGS New Zealand Ltd, Otago
	SGS New Zealand Ltd, Waihi
	ALS Minerals, Lima
Peru	Minera Yanacocha SRL – Newmont, Lima
Romania	ALS Minerals, Rosia Montana
South Africa	ALS Minerals, Edenvale – Johannesburg
Tanzania	MSA Laboratories, Mwanza
Turkey	ALS Minerals, Izmir
USA	ALS Minerals, Reno
	Bureau Veritas Commodities and Trade, Sparks
	Nevada Gold Mines, Goldstrike
	McClelland Laboratories, Sparks
	Performance Laboratories, Ruwa
Zimbabwe	

## Instructions and Recommendations for Use:

Weigh out quantity usually used for analysis and analyse 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 of the gold content of the reference material. The interval is chosen such that, if the same procedure used here to estimate the declared value were used again and again, 95% of the trials would give intervals that contained the true value. It reflects 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 have used our consensus testing statistical data to establish control limits for assessing acceptance of laboratory results. Our certification process produces precise statistical data based on the proficiency program and not on an individual laboratory. 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.

Our suggested best practice would be to accumulate a history of the test results obtained and plot them on a control chart to determine any laboratory bias and variability. The appropriate centre line and control limits for this chart should be based on the average level and variation 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, we can provide a free Excel template that will produce sensible graphs, with intelligently chosen limits, from the customer's own data.

Our instructions are recommendations for the appropriate use of reference materials. If our statistical data is used for control limits due to practicality and particular circumstances, please consult us; we will be happy to assist and advise.

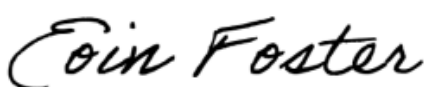
## Legal Notice:

This certificate and the reference material described in it have been prepared with due care and attention. However, Scott Technology Ltd and Nano Consulting 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 Eoin Foster.

### Certifying Officer



Eoin Foster  
Manufacturing Manager

### Independent Statistician



Dr Daniel Walsh, PhD