



# ROCKLABS

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

ROCKLABS LIMITED

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# Certificate of Analysis

## Reference Material PD1

### Recommended Values and 95% Confidence Intervals

Platinum concentration: **0.456 (± 0.009) µg/g**

Palladium concentration: **0.563 (± 0.011) µg/g**

Gold concentration: **0.542 (± 0.014) µg/g**

The above values apply only to product in jars or sachets that have an identification number within the following Range: **185 926 to 186 506**.

**Prepared and Certified By:**

Malcolm Smith BSc, FNZIC  
Malcolm Smith Reference Materials Ltd  
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**NEW ZEALAND**  
Email: [Malcolm@MSRML.co.nz](mailto:Malcolm@MSRML.co.nz)

**Date of Certification:**

15 December 2008

**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:**

Concentrates containing platinum, palladium and gold that have been screened very finely in order to remove any nuggets and then blended with an appropriate matrix of barren minerals.

**Supplier of Reference Material:**

ROCKLABS Ltd  
P O Box 18 142  
Auckland 1743  
**NEW ZEALAND**  
Email: [sales@rocklabs.com](mailto:sales@rocklabs.com)

**Description:**

The component minerals have been well mixed and a homogeneity test carried out after the entire batch was packaged into the jars to ascertain that homogeneity has been achieved. 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 <sub>2</sub>	49.11
Al <sub>2</sub> O <sub>3</sub>	10.90
Na <sub>2</sub> O	3.51
Fe <sub>2</sub> O <sub>3</sub>	8.08
K <sub>2</sub> O	1.54
CaO	4.01
MgO	18.95
TiO <sub>2</sub>	1.08
MnO	0.13
P <sub>2</sub> O <sub>5</sub>	0.26
LOI	2.28

**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 not more than 0.5 % at extremes of naturally occurring temperature and humidity conditions.

**Instructions for Use:**

Weigh out quantity usually used for analysis and analyze by normal procedure. Do not dry before weighing.

**Method of Preparation:**

Finely screened concentrates containing platinum, palladium and gold were blended with an appropriate matrix of barren minerals. Once the powders were uniformly mixed, the composite was placed into 581 wide-mouthed jars, each bearing a unique number. 16 jars were selected randomly from the packaging run and material from these jars was used for both homogeneity assessment and consensus analysis for the assignment of platinum, palladium and gold values.

### **Homogeneity Assessment for Platinum, Palladium and Gold:**

An independent laboratory carried out all analyses by fire assay of 40g portions, followed by inductively coupled plasma optical emission spectrometry.

The homogeneity assessment was carried out after the material had been packaged into jars.

The contents of two 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. One sample was also removed from the top of 16 jars randomly selected from the 581 jars in the batch. The results of analysis of the 26 samples produced a coefficient of variation of 4.2% for platinum, 2.9% for palladium and 3.1% for gold.

### **Analytical Methodology:**

Once homogeneity had been established, sub-samples were submitted to a number of well-recognized laboratories in order to assign platinum, palladium and gold values by consensus testing. The sub-samples were drawn from the 16 randomly selected jars and each laboratory received samples from two different jars. Indicative concentration ranges were given. Most laboratories used a lead based fire assay fusion followed by an ICP determination. Some laboratories performed more than one analysis on each sub-sample and where this occurred the average of the results for each sub-sample was used in the statistical analysis.

### **Calculation of Certified Value:**

21 laboratories returned results for all 3 elements. Statistical analysis to identify outliers was carried out using Cochran's and Grubbs' tests. As a result of this examination one set of laboratory results was excluded for platinum, two sets for palladium and three sets for gold. Recommended values for each element were calculated from the average of the individual results from all the other laboratories. 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 n laboratory averages, and t is the 0.025 tail-value from Student's t-distribution with n-1 degrees of freedom). The recommended values are provided at the beginning of the certificate in µg/g (ppm) units. A summary of the results used to calculate the recommended values are listed on page 4 and the names of the laboratories that submitted results are listed on page 5.

## Summary of Results Used to Calculate Platinum, Palladium and Gold Values

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

Platinum (ppm)			Palladium (ppm)			Gold (ppm)		
Sample 1	Sample 2	Average	Sample 1	Sample 2	Average	Sample 1	Sample 2	Average
0.403	0.450	0.4265	0.520	0.524	0.5220	0.5067	0.4971	0.5019
0.405	0.460	0.4325	0.510	0.545	0.5275	0.500	0.505	0.5025
0.438	0.428	0.4334	0.532	0.552	0.5420	0.508	0.511	0.5093
0.434	0.444	0.4390	0.540	0.545	0.5425	0.52	0.52	0.520
0.43	0.45	0.440	0.54	0.56	0.550	0.524	0.522	0.5230
0.435	0.450	0.4425	0.550	0.553	0.5515	0.530	0.527	0.5283
0.45	0.45	0.450	0.550	0.565	0.5575	0.524	0.533	0.5285
0.441	0.461	0.4510	0.562	0.558	0.5600	0.531	0.529	0.5300
0.444	0.458	0.4510	0.5663	0.5560	0.5612	0.54	0.53	0.535
0.453	0.450	0.4515	0.566	0.560	0.5630	0.544	0.541	0.5425
0.4570	0.448	0.4525	0.5565	0.570	0.5633	0.5515	0.542	0.5468
0.46	0.45	0.455	0.5715	0.563	0.5673	0.555	0.550	0.5525
0.4665	0.4540	0.4603	0.5700	0.5675	0.5688	0.551	0.555	0.5530
0.46	0.47	0.465	0.57	0.58	0.575	0.55	0.56	0.555
0.46	0.47	0.465	0.58	0.57	0.575	0.573	0.550	0.5613
0.460	0.475	0.4675	0.569	0.581	0.5750	0.565	0.563	0.5640
0.4550	0.4825	0.4688	0.5785	0.5850	0.5818	0.591	0.592	0.5915
0.468	0.494	0.4810	0.584	0.586	0.5850	0.610	0.614	0.6120
0.510	0.465	0.4875	0.615	0.630	0.6225			
0.5085	0.4850	0.4968						
Average of 20 sets = 0.456 ppm Standard deviation of 20 sets = 0.019 ppm			Average of 19 sets = 0.563 ppm Standard deviation of 19 sets = 0.022 ppm			Average of 18 sets = 0.542 ppm Standard deviation of 18 sets = 0.029 ppm		
<b><u>Note: As a general rule, these standard deviations should not be used as a basis to set control limits when plotting results from an individual laboratory.</u></b>								
Coefficient of variation = 4.1 % 95% Confidence interval for average = 0.009 ppm			Coefficient of variation = 4.0 % 95% Confidence interval for average = 0.011 ppm			Coefficient of variation = 5.3 % 95% Confidence interval for average = 0.014 ppm		

Statistical analysis of consensus test results has been carried out by independent statistician, Tim Ball.

## **Participating Laboratories**

### **Australia**

ALS Chemex, Perth  
Genalysis Laboratory Services Pty Ltd, Perth  
SGS Minerals Services, Perth  
Ultra Trace Analytical Laboratories, Perth

### **Canada**

Accurassay Laboratories, Ontario,  
Acme Analytical Laboratories Ltd, British Columbia  
ALS Chemex, British Columbia  
Assayers Canada, British Columbia,  
Bourlamaque Assay Laboratories Ltd, Quebec  
SGS Minerals Services, Lakefield, Ontario  
SGS Minerals Services, Toronto, Ontario  
TSL Laboratories Inc, Saskatchewan

### **Ireland**

OMAC Laboratories Ltd

### **Peru**

ALS Chemex, Lima

### **South Africa**

ALS Chemex, Johannesburg  
Anglo Research  
MINTEK: Analytical Services Division  
Northam Platinum Ltd  
Set Point Laboratories  
SGS Lakefield Research, Johannesburg

### **United States of America**

Stillwater Mining Company

### **Instructions and Recommendations for Use:**

Weigh out quantity usually used for analysis and analyze for total platinum, palladium and gold by normal procedure. All component concentrates have been very finely screened in order to remove any nuggets of mineral that could produce a high result on a 30g portion.

We quote a 95% confidence interval for our estimates of the declared values. This confidence interval reflects our uncertainty in estimating the true values for the platinum, palladium and gold content of the reference material. The interval is chosen such that, if

## **Instructions and Recommendations for Use (cont.):**

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 calculate limits for control charts on their own routine test results using the reference material. Such use may lead 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**

**Independent Statistician**

M G Smith BSc, FNZIC

Tim Ball BSc (Hons)