QOTHO MINERALS (PTY) LTD
Physical Address: 36 Pelindaba Road, Broederstroom, Madibeng, 0240
PostNet Suite 173, Private Bag X0003, Ifafi, North West Province, 0260
South Africa
+27 (0)87 004 3200 / admin@qotho.co.za / www.qotho.co.za

QOTHO REFERENCE MATERIAL (QRM)

QRM-6-039

GOLD LOW GRADE

QOTHO REFERENCE MATERIAL REPORT

ASSIGNED VALUES			
ANALYTES	**UNITS**	**CONCENTRATIONS**	**EXPANDED UNCERTAINTY**
Au	g/t	1.13	±0.07

1. **Use:**
QRM-6-039 is a reference material which is suitable for use as random control samples in routine analytical laboratory quality control, when inserted within a batch of samples and measured in parallel to the unknown. The QRM can also be used as a control sample in the analysis of samples of a similar type and verification of analytical methods for Gold Low Grade.

2. **Origin of Material:**
This standard was sponsored by a Harmony Gold operation, in Welkom.

3. **Mineral and Chemical Composition:**
This material originates from the Welkom gold fields. The Welkom gold deposits are found in the sedimentary rock sequences of the Central Rand Group, which represent unconformity bounded genetic packages. The origin of gold in the Witwatersrand basin can be classified into the modified placer theory. The various placers contain vein quartz, chert, quartzite, quartz-porphyry, and 26% yellow shale. The gold is extracted from the ore, via conventional cyanide leach processes.

4. **Date of Initial Issue:**
18 October 2023.

5. **Packaging & Handling instructions:**
The material is packaged in 500g sealed plastic tub. Open the seal of the foil with care and shake or otherwise agitate prior to use. Normal safety precautions for handling fine particulate matter are recommended, such as the use of safety glasses, breathing protection, gloves, and a laboratory coat. Once opened, material must be stored in a cool, dry environment. Results on page 1 is presented on dry basis. Analysis should therefore be done on dry basis, after drying to constant mass, at 105 degrees Celsius.

6. **Method of Preparation:**
The material was sieved through a 75-micron screen and the oversize was re-milled to ensure 100% passing through the screen. It was then blended, systematically divided, and packaged into 500-gram sealed plastic tub. Randomly selected samples, from the bags, were tested in-house via XRF, to confirm homogeneity. Once confirmed and certification completed, the items were placed in geo-envelopes and vacuum sealed in aluminium foil bags.

7. **Methods of Analysis used:**
   - Sodium peroxide fusion with ICP-OES finish
   - Multi-acid digestion with AAS or ICP-OES finish
   - Aqua Regia digestion with AAS or ICP-OES finish
   - Sulphur by combustion analysis.
   - Gold and Silver by Lead collection fire assay and AAS or ICP-OES finish
   - Silver and Arsenic by Aqua Regia microwave digestions with ICP-MS finish

8. **Analysis required:**
An instruction letter was sent to all participants. The analysis required was noted in the instruction letter and reporting template, including but not limited to Ag, Al_2O_3, As, Au, CaO, Cr_2O_3, Cu, Fe_2O_3, LOI, MgO, MnO, P, S, SiO_2 and TiO_2.

9. Participating Laboratories:

NO	LABORATORY	COUNTRY
1.	Alex Stewart International	United Kingdom
2.	ALS Geochemistry Kempton Park	South Africa
3.	BMC Analysis	United Kingdom
4.	Dundee Precious Metals	Namibia
5.	Harmony Freegold	South Africa
6.	MP Mining	Botswana
7.	Rio Tinto Kennecott	United States of America
8.	SGS Vaal River Lab	South Africa
9.	UIS Analytical Services	South Africa

10. Assay Data:

Data used for Assigning Values.

LABORATORY	Ag	Al_2O_3	As	Au	CaO	Cr_2O_3	Cu	Fe_2O_3	LOI (950°C)	MgO	MnO	P	S	SiO_2	TiO_2
UNIT	g/t	%	ppm	g/t	%	%	%	%	%	%	%	%	%	%	%
LAB001				1.57											
LAB002	6.6		112.5												
LAB003				1.2											
LAB004				1.025											
LAB005	0.354	4.899	90.5	1.165	0.468	0.026	0.008	2.455		0.335	0.052	0.008	0.671	83.905	0.13
LAB006				1.08											
LAB007				1.145											
LAB008	0.2	5.82	83.5	1.155	0.486	0.072		2.51	0.102	0.35	0.056	0.008	0.621	86.465	0.229
LAB009				1.138											
LAB010				1.139											
LAB011	0.53		84.133												
LAB012				1.02											

11. Method of Assigning Values:

QM is a SANAS Accredited Proficiency Testing Scheme Provider, No. PTS0012

This material was distributed as test items, in the Qotho Gold PT Round 4 of 2023. The participating laboratories were each given 1 randomly selected sample from the batch, to analyse and report on in duplicate. Some laboratories reported results via more than one analytical method. Obvious blunders were resolved with the laboratories (if any), after which the data was processed using Robust Statistics, through PROLab Plus.

Where analytes could not be certified, as is the case for this report, estimate concentrations were assigned (using Robust Statistics), using all the data in the dataset.

12. Measurement of Uncertainty:

Standard uncertainty, uQRM, was calculated according to ISO 13528:2022 (equation 6), and it includes the effects of uncertainty due to inhomogeneity, transport, potential instability, and laboratory uncertainty. Because of all the uncertainties under consideration, QM further applies an expanded uncertainty, for value assignment purposes. The measurement uncertainty of the assigned or certified value is therefore calculated as follows: UQRM = k*uQRM, where k is a coverage factor, which is determined from the Student's t-distribution, based on the degrees of freedom, per analyte. This presents an assigned value, as follows: xQRM ± UQRM.

Laboratories which prefer to use the 95% measurement uncertainty, rather than the expanded uncertainty, all available information relating to measurement uncertainty of the certified/assigned values, are given below:

Analyte	Unit of measure	*s* (Standard Deviation of Dataset)	*v* (Degrees of Freedom)	*k* (Coverage Factor)	*u* (Standard Uncertainty)	95% Measurement Uncertainty	Expanded Uncertainty
Au	g/t	0.117	9	2.262	0.029	± 0.06	± 0.07

13. Minimum sample size:

The recommended minimum sample size for the use of this material is as per the participants method validation criteria.

14. Period of validity:

The assigned values are valid for this product, while still sealed in its original packaging, for a minimum period of 5 years from date of initial issue of this report. Stability monitoring of inventory will be done at regular intervals. Any concerns regarding potential instability of the material, will immediately be communicated to all consumers.

15. Legal:

This document and the reference material described in it were prepared with due care and attention. The requirements of ISO Guide 31, ISO 17043 and ISO 17034 were followed in the preparation of this reference material and its documentation.

Qotho Minerals, however, accepts no liability for any decisions or actions taken following the use of the reference material. The company has a complaints procedure, which will be made available upon request, should there be any dissatisfaction with either the product or the Report.

Technical Signatories	
Dr Hannelie de Beer (Pr. Sci. Nat.)	***Takudzwa Tsapayi (Pr. Sci. Nat.)***
18 October 2023	

This Reference Material Report has been electronically signed using an Advanced Electronic Signature (AES) in terms of the Electronic Communications and Transactions Act No. 15, 2002 (ECT Act). Any amendments to the Report can be detected by reference to the Signature Panel displayed in the electronic pdf version of the Report.

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