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CERTIFICATE OF ANALYSIS FOR

CERTIFIED REFERENCE MATERIAL

OREAS C26f

Basalt Blank Chip

(Quaternary Newer Volcanics Province, Victoria, Australia)

Accredited for compliance with ISO 17034

COA-2054-OREAS C26f-R0 Template ID: BUP-70-10-03 Ver:1.0	5-Feb-2026

Table 1. Certified Values, Uncertainty & Tolerance Intervals in OREAS C26f.

Constituent	Certified Value	95% Expanded Uncertainty		95% Tolerance Limits	
		Low	High	Low	High
Pb Fire Assay					
Au, Gold (ppb)	< 2	IND	IND	IND	IND
4-Acid Digestion					
Al, Aluminium (wt.%)	7.38	7.15	7.60	7.23	7.52
As, Arsenic (ppm)	0.56	0.34	0.78	0.47	0.65
Ba, Barium (ppm)	256	245	267	246	266
Be, Beryllium (ppm)	1.07	1.02	1.13	1.02	1.13
Ca, Calcium (wt.%)	5.93	5.74	6.12	5.78	6.09
Cd, Cadmium (ppm)	0.059	0.037	0.081	0.053	0.065
Ce, Cerium (ppm)	36.2	34.7	37.6	35.1	37.2
Co, Cobalt (ppm)	44.3	43.6	44.9	43.8	44.8
Cr, Chromium (ppm)	191	182	200	190	193
Cs, Caesium (ppm)	0.70	0.66	0.74	0.66	0.74
Cu, Copper (ppm)	45.4	43.3	47.6	43.5	47.4
Eu, Europium (ppm)	1.74	1.52	1.96	IND	IND
Fe, Iron (wt.%)	7.70	7.54	7.85	7.66	7.73
Ga, Gallium (ppm)	20.2	19.2	21.2	19.5	20.9
Hf, Hafnium (ppm)	3.46	3.30	3.62	3.34	3.57
Ho, Holmium (ppm)	0.81	0.79	0.84	IND	IND
In, Indium (ppm)	0.062	0.053	0.070	0.057	0.066
K, Potassium (wt.%)	0.671	0.644	0.698	0.647	0.695
La, Lanthanum (ppm)	17.2	16.8	17.5	17.1	17.2
Li, Lithium (ppm)	7.28	6.81	7.75	7.01	7.55
Lu, Lutetium (ppm)	0.22	0.19	0.25	IND	IND
Mg, Magnesium (wt.%)	4.25	4.03	4.46	4.12	4.38
Mn, Manganese (wt.%)	0.106	0.102	0.111	0.103	0.109
Mo, Molybdenum (ppm)	1.44	1.29	1.60	1.32	1.56
Na, Sodium (wt.%)	2.32	2.23	2.40	2.26	2.37
Ni, Nickel (ppm)	149	137	161	142	155
P, Phosphorus (wt.%)	0.147	0.141	0.153	0.142	0.153
Pb, Lead (ppm)	2.80	2.43	3.17	2.57	3.02
Rb, Rubidium (ppm)	19.9	18.8	21.0	19.1	20.7
S, Sulphur (wt.%)	0.010	0.010	0.011	IND	IND
Sc, Scandium (ppm)	20.2	19.8	20.6	20.2	20.3
Sm, Samarium (ppm)	5.05	4.63	5.47	5.03	5.07
Sn, Tin (ppm)	1.47	1.35	1.59	1.35	1.58
Sr, Strontium (ppm)	422	408	437	414	431
Ta, Tantalum (ppm)	1.28	1.20	1.37	1.22	1.35
Tb, Terbium (ppm)	0.79	0.75	0.83	0.77	0.82
Te, Tellurium (ppm)	< 0.005	IND	IND	IND	IND

SI unit equivalents: ppb (parts per billion; 1 x 10^{-9}) ≡ µg/kg; ppm (parts per million; 1 x 10^{-6}) ≡ mg/kg; wt.% (weight per cent) ≡ % (mass fraction).

Note: intervals may appear asymmetric due to rounding.

IND = indeterminate (due to limited reading resolution of the methods employed. For practical purposes the 95% Expanded Uncertainty can be set between zero and a two times multiple of the upper bound/non-detect limit value).

Table 1 continued.

Constituent	Certified Value	95% Expanded Uncertainty		95% Tolerance Limits	
		Low	High	Low	High
4-Acid Digestion continued					
Th, Thorium (ppm)	2.72	2.54	2.90	2.64	2.79
Ti, Titanium (wt.%)	1.06	1.01	1.10	1.02	1.09
Tl, Thallium (ppm)	0.069	0.060	0.077	0.064	0.073
U, Uranium (ppm)	0.68	0.64	0.71	0.65	0.71
V, Vanadium (ppm)	156	150	162	150	162
W, Tungsten (ppm)	0.41	0.34	0.49	0.39	0.44
Y, Yttrium (ppm)	20.5	19.7	21.3	19.9	21.1
Yb, Ytterbium (ppm)	1.73	1.58	1.88	IND	IND
Zn, Zinc (ppm)	109	104	115	106	112
Zr, Zirconium (ppm)	139	133	145	134	144

SI unit equivalents: ppm (parts per million; 1 x 10^{-6}) ≡ mg/kg; wt.% (weight per cent) ≡ % (mass fraction).

Note: intervals may appear asymmetric due to rounding.

IND = indeterminate (due to limited reading resolution of the methods employed).

Table 2. Indicative Values for OREAS C26f.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Pb Fire Assay								
Pd	ppb	*0.633*	Pt	ppb	*0.333*			
4-Acid Digestion								
Ag	ppm	*0.027*	Ge	ppm	*0.15*	Sb	ppm	*0.072*
Bi	ppm	*0.010*	Nb	ppm	*21.4*	Se	ppm	*0.24*
Dy	ppm	*4.41*	Nd	ppm	*19.8*	Tm	ppm	*0.29*
Er	ppm	*2.12*	Pr	ppm	*4.61*			
Gd	ppm	*5.35*	Re	ppm	*0.001*			

SI unit equivalents: ppb (parts per billion; 1 x 10^{-9}) ≡ µg/kg; ppm (parts per million; 1 x 10^{-6}) ≡ mg/kg.

Note: the number of significant figures reported is not a reflection of the level of certainty of stated values. They are instead an artefact of ORE’s in-house CRM-specific LIMS.

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INTRODUCTION

OREAS reference materials are intended to provide a low-cost method of evaluating and improving the quality of analysis of geological samples. To the geologist they provide a means of implementing quality control in analytical data sets generated in exploration from the grass roots level through to prospect evaluation, and in grade control at mining operations. To the analyst they provide an effective means of calibrating analytical equipment, assessing new techniques and routinely monitoring in-house procedures. OREAS reference materials enable users to successfully achieve process control of these tasks because the observed variance from repeated analysis has its origin almost exclusively in the analytical process rather than the reference material itself. In evaluating laboratory performance with this CRM, the section headed ‘Instructions for handling and correct use’ should be read carefully.

Table 1 presents the certified values together with their associated 95 % expanded uncertainty and tolerance intervals. Table 2 provides indicative values, including major and trace element characterisation, Table 3 provides an indicative particle size distribution, Table 4 provides some indicative physical properties while Table 5 reports indicative mineralogy determined by semi-quantitative XRD analysis. Finally, Table 6 presents the performance gate intervals for all certified values.

Tabulated results of all analytes together with uncorrected means, medians, standard deviations, relative standard deviations and per cent deviation of laboratory means from the corrected mean of means (PDM[3]) are presented in the detailed certification data for this CRM (**OREAS C26f-DataPack.1.0.260130_095439.xlsx**). The certified values and uncertainties in this Certificate are the sole authoritative figures. Any additional significant figures in the DataPack are provided for reference only and do not affect the certified results.

SOURCE MATERIAL

OREAS C26f is a basalt blank chip certified reference material (CRM) with a nominal particle size of minus 8 mm to simulate RC drill chip samples. The CRM was prepared from olivine tholeiitic basalt from the Quaternary Newer Volcanics Province in Victoria, Australia. It is characterised by very low background gold of less than 2 parts per billion.

COMMINUTION AND HOMOGENISATION PROCEDURES

The materials constituting OREAS C26f was prepared in the following manner:

- Drying to constant mass at 105° C;
- Crushing to achieve a nominal particle size of minus 8 mm to simulate RC drill chip samples;
- Homogenisation using a high-speed rotary splitter;
- Packaging in 500 g units into sealed robust barrier bags and 200 kg units into 44-gallon (166L) drums.

PHYSICAL PROPERTIES

OREAS C26f was tested at ORE Research & Exploration Pty Ltd’s onsite facility for various physical properties. A sieve analysis was performed on a 1 kg sample to determine the particle size distribution of OREAS C26f. Table 3 presents the findings that should be used for informational purposes only.

Table 3. Particle size distribution of OREAS C26f.

Distribution	% (mass fraction)
Above 12.7mm	0
Under 12.7mm; Above 6.35mm	14.0
Under 6.35mm; Above 3.18mm	35.4
Under 3.18mm; Above 2mm	15.2
Under 2mm; Above 1.27mm	5.2
Under 1.27mm; Above 0.5mm	2.3
Under 0.5mm	27.9

Table 4 presents the bulk density, moisture percentage and Munsell colour code for OREAS C26e. These findings should be used for informational purposes only.

Table 4. Physical properties of OREAS C26f.

Bulk Density (kg/m^3)	Moisture (wt.%)	Munsell Notation‡	Munsell Color‡
1005	1.36	5Y 6/1	Light Olive Gray

‡The Munsell Rock Color Chart helps geologists and archeologists communicate with colour more effectively by cross-referencing ISCC-NBS colour names with unique Munsell alpha-numeric colour notations for rock colour samples.

MINERALOGY

The semi-quantitative XRD results shown in Table 5 below were undertaken by ALS Metallurgy in Balcatta, Western Australia. The results are normalised to 100 % and represent the relative proportion of crystalline material. Totals greater or less than 100 % are due to rounding errors. 'Clay mineral' appears to be mainly vermiculite, smectite, and palygorskite. Some amorphous material may be present including traces of marcasite and pyrrhotite.

Table 5. Indicative mineralogy of OREAS C26f by semi-quantitative XRD analysis.

Mineral / Mineral Group	% (mass ratio)
Clay mineral	3
Chlorite	1
Annite - biotite - phlogopite	< 1
Muscovite	< 1
Clinopyroxene	15
Plagioclase	63
K-feldspar	2
Olivine	6
Quartz	1
Siderite	3
Magnesite and/or ilmenite	2
Hematite	1
Magnetite	2

ANALYTICAL PROGRAM

Sixteen commercial analytical laboratories participated in the program to certify the elements reported in Table 1. The following methods were employed:

- Gold by Pb collection fire assay (25-50g charge weight) with ICP-MS (4 laboratories), ICP-OES (8 laboratories), AAS (1 laboratory) and NAA (1 laboratory) finish;
- Full ICP-OES and ICP-MS elemental suites by 4-acid (HNO_3-HF-$HClO_4$-HCl) digestion (up to 15 laboratories depending on the element).

Major and trace elements were also characterised by Bureau Veritas Geoanalytical (Perth, Australia) using borate fusion XRF (Al_2O_3 to TiO_2), laser ablation with ICP-MS (Ag to Zr), LOI at 1000°C and C+S by infrared combustion furnace (see Table 2 'Indicative Values').

For the round robin program, twenty 3 kg test units were collected at predetermined intervals during rotary splitting and are considered representative of the entire prepared batch of OREAS C26f. The samples received by each laboratory were obtained by taking a 500 g sample from six different 3 kg test units to maximise representation.

Participating laboratories were instructed to dry all samples at 105 °C, followed by crushing to a nominal minus 2 mm using their routine primary crushing equipment. The crushed material was then riffle-split to an approx. 125 g aliquot and pulverised to achieve >85 % passing 75 µm, ensuring that the coarse chip matrix was fully reduced prior to subsampling for analysis.

The 20 individual INAA results upon which much of the homogeneity evaluation is based included paired 10 g samples taken from 10 different sampling units (odd sampling lots). As this CRM is supplied in chip form, the selected units were pulverised under controlled conditions to achieve a target fineness of >85 % passing 75 µm prior to subsampling for INAA analysis. This format enabled a nested ANOVA treatment of the INAA results to evaluate homogeneity (see 'Homogeneity Evaluation' section below).

STATISTICAL ANALYSIS

Certified Values and their uncertainty intervals (Table 1) have been determined for each analyte following removal of individual, laboratory dataset (batch) and 3SD outliers (single iteration). Outlier evaluation was conducted in accordance with ISO 17034:2017 and ISO 33405:2024. While formal statistical tests were applied, professional statistical judgment was also exercised in determining the validity of potential outliers. Assessment of systematic bias and performance using independent control materials (CRMs) was incorporated to ensure compliance with the referenced standards and to establish metrological traceability of the certified values.

95% Expanded Uncertainty provides a 95 % probability that the true value of the analyte under consideration lies between the upper and lower limits and is calculated according to the method outlined in [5] and [15]. All known or suspected sources of bias have been investigated or taken into account.

Indicative (uncertified) values (Table 2) are present where the number of laboratories reporting a particular analyte is insufficient (< 5) to support certification or where interlaboratory consensus is poor. This data is intended for 'informational purposes' only.

Standard Deviation intervals (see Table 6, ‘Performance Gates’) provide an indication of a level of performance that might reasonably be expected from a laboratory being monitored by this CRM in a QA/QC program. They take into account errors attributable to measurement uncertainty and CRM variability. For an effective CRM the contribution of the latter should be negligible in comparison to measurement errors. The Standard Deviation values include all sources of measurement uncertainty: between-lab variance, within-run variance (precision errors) and CRM variability.

The SD for each analyte’s certified value is calculated from the same filtered data set used to determine the certified value, i.e., after removal of all individual, lab dataset (batch) and 3SD outliers (single iteration). These outliers can only be removed after the absolute homogeneity of the CRM has been independently established, i.e., the outliers must be confidently deemed to be analytical rather than arising from inhomogeneity of the CRM. ***The standard deviation is then calculated for each analyte from the pooled accepted analyses generated from the certification program.***

Homogeneity Evaluation

The tolerance limits (ISO 16269:2014) shown in Table 1 were determined using an analysis of precision errors method and are considered a conservative estimate of true homogeneity. The meaning of tolerance limits may be illustrated for Cu by 4-acid digestion, where 99 % of the time (1-α=0.99) at least 95 % of subsamples (ρ=0.95) will have concentrations lying between 43.5 and 47.4 ppm. Put more precisely, this means that if the same number of subsamples were taken and analysed in the same manner repeatedly, 99 % of the tolerance intervals so constructed would cover at least 95 % of the total population, and 1 % of the tolerance intervals would cover less than 95 % of the total population. ***Please note that tolerance limits pertain to the homogeneity of the CRM only and should not be used as control limits for laboratory performance.***

Analysis of Variance (ANOVA) Study

In addition to the precision error method outlined above, homogeneity was also evaluated using an ANOVA study. This involved sending 20 x 10 g pulp samples to the ANSTO laboratory for Sc, Cr, Fe, Co, La and Sm analysis by INAA. The 20 samples consisted of paired samples from the odd sampling intervals (representative of the prepared batch) that were randomised prior to assigning sample numbers. Duplicate samples enabled an Analysis of Variance (ANOVA) by comparison of within- and between-unit variances across the ten pairs. The ANOVA enables a relative measure of homogeneity and permits a test of the null hypothesis that all ‘units’ are drawn from the same population distribution. An ANOVA constructed in this way tests that no statistically significant difference exists in the variance between-units to that of the variance within-units. A *p*-value < 0.05 would indicate rejection of the null hypothesis at the 95 % confidence level (i.e., a significant difference likely does exist; meaning there is evidence of heterogeneity between the sample intervals).

No significant *p*-values were observed across the six reported elements. The Null Hypothesis is therefore accepted. It is important to note that ANOVA provides a relative measure of homogeneity and that a CRM having poor absolute homogeneity can still pass these tests if the within-unit heterogeneity is large and similar across all units. Based on the statistical analysis of the results of the interlaboratory certification program, it can be concluded that OREAS C26f is fit-for-purpose as a certified reference material (see ‘Intended Use’ below).

PERFORMANCE GATES

Table 6 below shows intervals calculated for two and three standard deviations. As a guide these intervals may be regarded as warning or rejection for multiple 2SD outliers, or rejection for individual 3SD outliers in QC monitoring, although their precise application should be at the discretion of the QC manager concerned (also see 'Intended Use' section below). Westgard Rules extend the basics of single-rule QC monitoring using multi-rules (for more information visit www.westgard.com/mltirule.htm). A second method utilises a 5 % window calculated directly from the certified value.

Standard deviation is also shown in relative percent for one, two and three relative standard deviations (1RSD, 2RSD and 3RSD) to facilitate an appreciation of the magnitude of these numbers and a comparison with the 5 % window. Caution should be exercised when concentration levels approach lower limits of detection of the analytical methods employed as performance gates calculated from standard deviations tend to be excessively wide whereas those determined by the 5 % method are too narrow. One approach used at commercial laboratories is to set the acceptance criteria at twice the detection level (DL) ± 10 %.

i.e., Certified Value ±10 % ±2DL [1].

Table 6. Performance Gates for OREAS C26f.

Constituent	Certified Value	Absolute Standard Deviations					Relative Standard Deviations			5 % window	
		1SD	2SD Low	2SD High	3SD Low	3SD High	1RSD	2RSD	3RSD	Low	High
Pb Fire Assay											
Au, ppb	< 2	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
4-Acid Digestion											
Al, wt.%	7.38	0.176	7.03	7.73	6.85	7.91	2.38%	4.77%	7.15%	7.01	7.75
As, ppm	0.56	0.13	0.30	0.81	0.18	0.94	22.72%	45.44%	68.15%	0.53	0.59
Ba, ppm	256	6	244	268	238	274	2.37%	4.74%	7.11%	243	269
Be, ppm	1.07	0.070	0.93	1.21	0.87	1.28	6.49%	12.99%	19.48%	1.02	1.13
Ca, wt.%	5.93	0.188	5.56	6.31	5.37	6.50	3.18%	6.35%	9.53%	5.64	6.23
Cd, ppm	0.059	0.014	0.030	0.088	0.016	0.102	24.34%	48.68%	73.03%	0.056	0.062
Ce, ppm	36.2	1.35	33.5	38.9	32.1	40.2	3.73%	7.46%	11.19%	34.4	38.0
Co, ppm	44.3	1.39	41.5	47.1	40.1	48.4	3.15%	6.29%	9.44%	42.1	46.5
Cr, ppm	191	17	158	225	141	242	8.82%	17.63%	26.45%	182	201
Cs, ppm	0.70	0.034	0.63	0.77	0.60	0.80	4.85%	9.70%	14.56%	0.66	0.73
Cu, ppm	45.4	2.06	41.3	49.6	39.2	51.6	4.54%	9.09%	13.63%	43.2	47.7
Eu, ppm	1.74	0.133	1.48	2.01	1.34	2.14	7.65%	15.31%	22.96%	1.65	1.83
Fe, wt.%	7.70	0.279	7.14	8.25	6.86	8.53	3.63%	7.26%	10.90%	7.31	8.08
Ga, ppm	20.2	0.64	18.9	21.5	18.3	22.1	3.16%	6.33%	9.49%	19.2	21.2
Hf, ppm	3.46	0.148	3.16	3.75	3.02	3.90	4.27%	8.55%	12.82%	3.29	3.63
Ho, ppm	0.81	0.024	0.76	0.86	0.74	0.89	2.96%	5.92%	8.87%	0.77	0.85
In, ppm	0.062	0.005	0.052	0.071	0.047	0.076	7.72%	15.45%	23.17%	0.059	0.065
K, wt.%	0.671	0.024	0.624	0.719	0.600	0.742	3.54%	7.08%	10.63%	0.638	0.705
La, ppm	17.2	0.63	15.9	18.4	15.3	19.1	3.70%	7.40%	11.09%	16.3	18.0
Li, ppm	7.28	0.460	6.36	8.20	5.90	8.66	6.32%	12.63%	18.95%	6.92	7.64

SI unit equivalents: ppb (parts per billion; 1 x 10^{-9}) ≡ µg/kg;ppm (parts per million; 1 x 10^{-6}) ≡ mg/kg; wt.% (weight per cent) ≡ % (mass fraction); IND = indeterminate.

Notes: intervals may appear asymmetric due to rounding; the number of decimal places quoted does not imply accuracy of the certified value to this level but are given to minimise rounding errors when calculating 2SD and 3SD windows.

Table 6 continued.

Constituent	Certified Value	Absolute Standard Deviations					Relative Standard Deviations			5 % window	
		1SD	2SD Low	2SD High	3SD Low	3SD High	1RSD	2RSD	3RSD	Low	High
4-Acid Digestion continued											
Lu, ppm	0.22	0.02	0.17	0.27	0.15	0.29	10.82%	21.63%	32.45%	0.21	0.23
Mg, wt.%	4.25	0.141	3.97	4.53	3.83	4.67	3.31%	6.62%	9.93%	4.04	4.46
Mn, wt.%	0.106	0.004	0.098	0.114	0.094	0.118	3.67%	7.33%	11.00%	0.101	0.111
Mo, ppm	1.44	0.136	1.17	1.71	1.03	1.85	9.42%	18.84%	28.26%	1.37	1.51
Na, wt.%	2.32	0.066	2.18	2.45	2.12	2.51	2.86%	5.71%	8.57%	2.20	2.43
Ni, ppm	149	7	134	164	126	171	5.03%	10.05%	15.08%	141	156
P, wt.%	0.147	0.005	0.137	0.157	0.132	0.162	3.46%	6.93%	10.39%	0.140	0.155
Pb, ppm	2.80	0.36	2.07	3.52	1.71	3.88	12.97%	25.94%	38.90%	2.66	2.94
Rb, ppm	19.9	0.99	17.9	21.9	16.9	22.9	4.97%	9.94%	14.91%	18.9	20.9
S, wt.%	0.010	0.000	0.009	0.011	0.009	0.012	4.43%	8.86%	13.28%	0.010	0.011
Sc, ppm	20.2	0.82	18.6	21.9	17.8	22.7	4.06%	8.11%	12.17%	19.2	21.3
Sm, ppm	5.05	0.331	4.39	5.71	4.06	6.05	6.55%	13.11%	19.66%	4.80	5.30
Sn, ppm	1.47	0.110	1.25	1.69	1.14	1.80	7.51%	15.02%	22.53%	1.39	1.54
Sr, ppm	422	12	398	446	386	459	2.87%	5.75%	8.62%	401	443
Ta, ppm	1.28	0.059	1.17	1.40	1.11	1.46	4.62%	9.24%	13.86%	1.22	1.35
Tb, ppm	0.79	0.018	0.75	0.83	0.74	0.85	2.31%	4.61%	6.92%	0.75	0.83
Te, ppm	< 0.005	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Th, ppm	2.72	0.191	2.34	3.10	2.14	3.29	7.05%	14.09%	21.14%	2.58	2.85
Ti, wt.%	1.06	0.046	0.96	1.15	0.92	1.20	4.39%	8.78%	13.17%	1.00	1.11
Tl, ppm	0.069	0.007	0.054	0.083	0.046	0.091	10.75%	21.50%	32.25%	0.065	0.072
U, ppm	0.68	0.037	0.60	0.75	0.56	0.79	5.53%	11.05%	16.58%	0.64	0.71
V, ppm	156	6	145	167	139	173	3.57%	7.15%	10.72%	148	164
W, ppm	0.41	0.035	0.34	0.48	0.31	0.52	8.57%	17.14%	25.71%	0.39	0.43
Y, ppm	20.5	0.66	19.2	21.8	18.5	22.5	3.24%	6.47%	9.71%	19.5	21.5
Yb, ppm	1.73	0.104	1.52	1.94	1.42	2.04	6.00%	12.01%	18.01%	1.64	1.82
Zn, ppm	109	5	99	119	94	124	4.56%	9.11%	13.67%	104	115
Zr, ppm	139	6	127	151	121	157	4.28%	8.57%	12.85%	132	146
V, ppm	156	6	145	167	139	173	3.57%	7.15%	10.72%	148	164
W, ppm	0.41	0.035	0.34	0.48	0.31	0.52	8.57%	17.14%	25.71%	0.39	0.43
Y, ppm	20.5	0.66	19.2	21.8	18.5	22.5	3.24%	6.47%	9.71%	19.5	21.5
Yb, ppm	1.73	0.104	1.52	1.94	1.42	2.04	6.00%	12.01%	18.01%	1.64	1.82
Zn, ppm	109	5	99	119	94	124	4.56%	9.11%	13.67%	104	115
Zr, ppm	139	6	127	151	121	157	4.28%	8.57%	12.85%	132	146

SI unit equivalents: ppm (parts per million; 1 x 10^{-6}) ≡ mg/kg; wt.% (weight per cent) ≡ % (mass fraction).

Note 1: intervals may appear asymmetric due to rounding; IND = indeterminate.

Note 2: the number of decimal places quoted does not imply accuracy of the certified value to this level but are given to minimise rounding errors when calculating 2SD and 3SD windows.

PARTICIPATING LABORATORIES

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11. Intertek, Perth, WA, Australia
12. Intertek Genalysis, Adelaide, SA, Australia
13. PT Geoservices Ltd, Cikarang, Jakarta Raya, Indonesia
14. PT Intertek Utama Services, Jakarta Timur, DKI Jakarta, Indonesia
15. SGS Canada Inc., Vancouver, BC, Canada
16. SGS del Peru, Lima, Peru

PREPARER AND SUPPLIER

Certified reference material OREAS C26f is prepared, certified and supplied by:

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METROLOGICAL TRACEABILITY

The interlaboratory results that underpin the certified values are metrologically traceable to the international measurement scale (SI) of mass (either as a % mass fraction or as milligrams per kilogram (mg/kg)) [14]. In line with popular use, all data within tables in this certificate are expressed as the mass fraction in either weight percent (wt.%) or parts per million (ppm).

The analytical samples sent to participating laboratories were selected in a manner to be representative of the entire prepared batch of CRM. This representativeness was maintained in each submitted laboratory sample batch and ensures the user that the data is traceable from sample selection through to the analytical results. The systematic sampling method was chosen due to the low risk of overlooking repetitive effects or trends in the batch due to the way the CRM was processed. In line with ISO 17025 [8], each analytical data set received from the participating laboratories has been validated by its assayer through the inclusion of internal reference materials and QC checks during and post analysis.

Participating laboratories were selected based on demonstrated analytical competence, including prior performance in interlaboratory comparison programs conducted by ORE Pty Ltd, with consideration given to their expertise in relevant analytical methods, measurands, and sample matrices. For the measurands reported in this certificate (Table 1), data were sourced from laboratories accredited to ISO/IEC 17025. Where formal accreditation was not held for specific operationally defined measurands, metrological traceability was verified through the use of well-characterised, independently certified reference materials (CRMs) included as control samples in the round robin study.

In accordance with ISO 33405:2024-05 [5], clause 9.2.5, and ISO 17034:2016 [9], clause 7.12.4 b), the use of such control samples provides an acceptable means of demonstrating traceability in the absence of formal accreditation. In this certification program, traceability was further supported by the agreement of measured values for control samples with their known certified values, thereby offering additional confidence in the calibration and validity of measurement results across participating laboratories.

Operationally Defined Measurands

In accordance with ISO 33405:2024-05, Clause 9.2.4, measurands (analytes) may be certified as operationally defined. For these measurands, traceability to the SI may not be achievable because the analytical procedure involves sample transformations (e.g., leaching or extraction). While instrument calibration can be traceable to appropriate units, the transformation steps themselves are not directly traceable and can only be evaluated through reference comparisons or harmonized procedures.

Accordingly, characterisation of these measurands has been based on the concordance of results obtained from multiple laboratories using a common, well-defined procedure. This approach ensures fitness-for-purpose and fulfils the requirements for metrological traceability as specified in ISO 17034 and ISO 33405 for operationally defined measurands.

COMMUTABILITY

The certified values reported herein are derived from measurements performed using analytical methods involving sample pre-treatment steps, such as fusion or acid digestion. These processes convert the sample matrix into a chemically simplified and stable form, facilitating calibration traceable to primary standards via solution-based calibration protocols. Due to the established robustness and effectiveness of these pre-treatment methods, issues related to commutability are not expected to impact the suitability of this Certified Reference Material (CRM) for its intended use.

OREAS CRMs are prepared from natural ore materials, ensuring the presence of matrix and mineralogical characteristics representative of typical exploration, mine and process samples. Consistent with ISO 17034:2016 and ISO Guide 30, users are advised to select CRMs with matrix and mineralisation styles closely matching those of their routine samples to minimize matrix effects and enhance analytical comparability. Detailed descriptions of the CRM’s source material and mineralogical characteristics are provided in the ‘Source Material’ section to guide appropriate CRM selection.

INTENDED USE

OREAS C26f is intended to cover all activities needed to produce a measurement result. This includes extraction, possible separation steps and the actual measurement process (the signal producing step). OREAS C26f may be used to calibrate the entire procedure by producing a pure substance CRM transformed into a calibration solution.

OREAS C26f is intended for the following uses:

- For the monitoring of sample contamination (due to preparation and/or analysis) in the analysis of analytes reported in Table 1 in geological samples;
- For the monitoring of laboratory performance in the analysis of analytes reported in Table 1 in geological samples;
- For the verification/ validation of analytical methods for analytes reported in Table 1;
- For the calibration of instruments used in the determination of the concentration of analytes reported in Table 1. When a value provided in this certificate is used to calibrate a measurement process, the uncertainty associated with that value should be appropriately propagated into the user’s uncertainty calculation. Users can determine an approximation of the standard uncertainty by calculating one fourth of the width of the Expanded Uncertainty interval given in this certificate (Expanded Uncertainty intervals are provided in Tables 1).

MINIMUM SAMPLE SIZE

To relate analytical determinations to the values in this certificate, the minimum mass of sample used should match the typical mass that the laboratories used in the interlaboratory (round robin) certification program. This means that different minimum sample masses should be used depending on the operationally defined methodology as follows:

- Au by lead collection fire assay: ≥ 25 g;
- 4-acid digestion with ICP-OES and/or MS finish: ≥ 0.25 g.

PERIOD OF VALIDITY & STORAGE INSTRUCTIONS

The certification of OREAS C26f remains valid, within the specified measurement uncertainties, until at least July 2040, provided the CRM is handled and stored in accordance with the instructions given below. This certification is nullified if the CRM is any way changed or contaminated.

Store in a clean and cool dry place away from direct sunlight.

Long-term stability will be monitored at appropriate intervals and purchasers notified if any changes are observed. The period of validity may well be indefinite and will be reassessed prior to expiry with the aim of extending the validity if possible.

INSTRUCTIONS FOR HANDLING & CORRECT USE

Fine powders pose a risk to eyes and lungs and therefore standard precautions including the use of safety glasses and dust masks are advised.

All certified values contained within this report refer to the concentration levels in the packaged state. There is no need for drying prior to weighing and analysis.

Single-use 500g bags

The entire 500g bag of OREAS C26f should be submitted to the laboratory for preparation (to a minimum specification of 85% passing 75 microns), subsampling and analysis. It is the user's responsibility to prevent contamination and avoid prolonged exposure of the sample to the atmosphere prior to analysis.

Authoritative Source of Information

This Certificate of Analysis constitutes the primary and authoritative document for the certified values, associated expanded uncertainties, and their correct use. While the accompanying DataPack provides supporting information, including raw data and uncertainty estimates with additional significant figures, these extended figures are provided solely for transparency, convenience and statistical reference. Users must rely exclusively on the values stated in this Certificate, rounded to an appropriate number of significant figures, for all metrological and analytical purposes. Any discrepancy between values presented in the DataPack and those in this Certificate shall be resolved in favour of the information provided herein.

Notice on Certificate Updates

The version of the Certificate of Analysis (COA) available on the OREAS website is considered the official and most current version. As COAs may be revised following periodic reviews, re-evaluation of data, or the availability of new information, users are strongly advised to refer to the latest online version prior to each use.

It is the user's responsibility to ensure that the most recent and applicable certificate is used to support the traceability, validity, and fitness-for-purpose of the certified reference material (CRM).

Any significant changes to the sections of this certificate will be clearly documented in the revised certificate.

QC monitoring using multiples of the Standard Deviation (SD)

In the application of SD's in monitoring performance it is important to note that not all laboratories function at the same level of proficiency and that different methods in use at a particular laboratory have differing levels of precision. Each laboratory has its own inherent SD (for a specific concentration level and analyte-method pair) based on the analytical process and this SD is not directly related to the round robin program.

The majority of data generated in the round robin program was produced by a selection of world class laboratories. The SD's thus generated are more constrained than those that would be produced across a randomly selected group of laboratories. To produce more generally achievable SD's the 'pooled' SD's provided in this report include interlaboratory bias. This 'one size fits all' approach may require revision at the discretion of the QC manager concerned following careful scrutiny of QC control charts.

The performance gates shown in Table 6 are intended only to be used as a preliminary guide as to what a laboratory may be able to achieve. Over a period of time monitoring your own laboratory's data for this CRM, SD's should be calculated directly from your own laboratory's process. This will enable you to establish more specific performance gates that are fit for purpose for your application as well as the ability to monitor bias. If your long-term trend analysis shows an average value that is within the 95 % expanded uncertainty then generally there is no cause for concern in regard to bias.

LEGAL NOTICE

Ore Research & Exploration Pty Ltd has prepared and statistically evaluated the property values of this reference material to the best of its ability. The Purchaser by receipt hereof releases and indemnifies Ore Research & Exploration Pty Ltd from and against all liability and costs arising from the use of this material and information.

DOCUMENT HISTORY

Revision No.	Date	Changes applied
0	5th February 2026	First publication.

CERTIFYING OFFICER

Craig Hamlyn (B.Sc. Hons - Geology), Technical Manager - ORE P/L

QMS CERTIFICATION

ORE Pty Ltd is accredited for compliance with ISO 17034:2016 (Accreditation number 20483).

ORE Pty Ltd is ISO 9001:2015 certified by Lloyd’s Register Quality Assurance Ltd for its quality management system including development, manufacturing, certification and supply of CRMs.

REFERENCES

[1] Govett, G.J.S. (1983). Handbook of Exploration Geochemistry, Volume 2: Statistics and Data Analysis in Geochemical Prospecting (Variations of accuracy and precision).

[2] Ingamells, C. O. and Switzer, P. (1973). A Proposed Sampling Constant for Use in Geochemical Analysis, Talanta 20, 547-568.

[3] ISO Guide 30:2015. Terms and definitions used in connection with reference materials.

[4] ISO 33401:2024-01. Reference materials – Contents of certificates, labels and accompanying documentation.

[5] ISO 33405:2024-05. Reference materials – Approaches for characterization and assessment of homogeneity and stability.

[6] ISO Guide 98-3:2008. Guide to the expression of uncertainty in measurement (GUM:1995).

[7] ISO 16269:2014. Statistical interpretation of data – Part 6: Determination of statistical tolerance intervals.

[8] ISO 17025:2017, General requirements for the competence of testing and calibration laboratories.

[9] ISO 17034:2016. General requirements for the competence of reference material producers.

[10] Munsell Rock Color Book (2014). Rock-Color Chart Committee, Geological Society of America (GSA), Minnesota (USA).

[11] OREAS-BUP-70-09-11: Statistical Analysis - OREAS Evaluation Method.

[12] OREAS-TN-04-1498: Stability under transport; an experimental study of OREAS CRMs.

[13] OREAS-TN-05-1674: Long-term storage stability; an experimental study of OREAS CRMs.

[14] Thompson, A.; Taylor, B.N. (2008); Guide for the Use of the International System of Units (SI); NIST Special Publication 811; U.S. Government Printing Office: Washington, DC; available at: https://physics.nist.gov/cuu/pdf/sp811.pdf (accessed Nov 2021).

[15] Van der Veen A.M.H. et al. (2001). Uncertainty calculations in the certification of reference materials, Accred Qual Assur 6: 290-294.