Ore Research & Exploration P/L ABN 28 006 859 856
37A Hosie Street, Bayswater North, VIC 3153, Australia
P +61 3 9729 0333 | E info@ore.com.au | oreas.com

CERTIFICATE OF ANALYSIS FOR

CERTIFIED REFERENCE MATERIAL

OREAS 13c

Ni–Cu–PGE Ore

Dishaba (South Africa) & Cosmos Mines (Western Australia)

Table 1. Certified Values, Uncertainty & Tolerance Intervals in OREAS 13c.

Constituent	Certified Value	95% Expanded Uncertainty		95% Tolerance Limits	
		Low	High	Low	High
Pb Fire Assay					
Au, Gold (ppb)	200	195	204	195*	204*
Pd, Palladium (ppb)	162	150	174	156	168
Pt, Platinum (ppb)	219	208	231	213	226
NiS Fire Assay					
Au, Gold (ppb)	189	166	213	182*	196*
Pd, Palladium (ppb)	154	134	174	141	167
Pt, Platinum (ppb)	216	191	241	200	232
Rh, Rhodium (ppb)	29.3	25.7	32.9	27.5	31.1
Ru, Ruthenium (ppb)	52.4	47.4	57.3	48.2	56.5
Infrared Combustion					
S, Sulphur (wt.%)	0.732	0.709	0.755	0.717	0.747
4-Acid Digestion					
Ag, Silver (ppm)	1.01	0.87	1.14	0.91	1.10
Al, Aluminium (wt.%)	8.33	8.01	8.66	8.16	8.51
As, Arsenic (ppm)	17.9	17.0	18.9	16.8	19.1
Ba, Barium (ppm)	624	603	645	611	637
Be, Beryllium (ppm)	1.71	1.61	1.82	1.65	1.78
Bi, Bismuth (ppm)	9.02	8.68	9.36	8.84	9.20
Ca, Calcium (wt.%)	5.75	5.56	5.94	5.67	5.82
Cd, Cadmium (ppm)	0.33	0.28	0.39	0.30	0.37
Ce, Cerium (ppm)	56	53	59	55	57
Co, Cobalt (ppm)	69	66	72	67	71
Cr, Chromium (wt.%)	0.565	0.524	0.607	0.551	0.580
Cs, Caesium (ppm)	7.02	6.61	7.43	6.82	7.22
Cu, Copper (wt.%)	0.234	0.227	0.241	0.229	0.239
Dy, Dysprosium (ppm)	4.18	4.02	4.34	4.09	4.27
Er, Erbium (ppm)	2.33	2.18	2.47	2.24	2.41
Eu, Europium (ppm)	1.61	1.54	1.68	1.56	1.66
Fe, Iron (wt.%)	8.03	7.77	8.29	7.90	8.16
Ga, Gallium (ppm)	20.0	19.1	20.9	19.5	20.6
Gd, Gadolinium (ppm)	5.31	5.05	5.57	5.14	5.47
Hf, Hafnium (ppm)	2.34	2.14	2.55	2.21	2.48
Ho, Holmium (ppm)	0.81	0.77	0.84	0.79	0.83
In, Indium (ppm)	0.21	0.19	0.22	0.20	0.22
K, Potassium (wt.%)	1.98	1.92	2.05	1.94	2.02
La, Lanthanum (ppm)	25.5	24.2	26.9	25.0	26.1
Li, Lithium (ppm)	16.7	15.8	17.5	16.3	17.0
Lu, Lutetium (ppm)	0.32	0.30	0.35	0.30	0.34

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).

*Gold Tolerance Limits for typical 30 g lead fire assay and 10 g nickel sulphide fire assay are determined from 20 x 85 mg INAA results and the Sampling Constant (Ingamells & Switzer, 1973).

Note: intervals may appear asymmetric due to rounding.

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

Table 1 continued.

Constituent	Certified Value	95% Expanded Uncertainty		95% Tolerance Limits	
		Low	High	Low	High
4-Acid Digestion continued					
Mg, Magnesium (wt.%)	3.20	3.09	3.32	3.15	3.26
Mn, Manganese (wt.%)	0.123	0.118	0.128	0.120	0.125
Mo, Molybdenum (ppm)	3.08	2.93	3.23	2.92	3.24
Na, Sodium (wt.%)	1.75	1.68	1.82	1.71	1.79
Nb, Niobium (ppm)	8.95	8.41	9.50	8.69	9.22
Nd, Neodymium (ppm)	29.1	27.2	31.0	28.5	29.8
Ni, Nickel (wt.%)	0.223	0.214	0.233	0.219	0.228
P, Phosphorus (wt.%)	0.178	0.173	0.184	0.175	0.182
Pb, Lead (ppm)	21.8	20.6	23.0	21.1	22.5
Pr, Praseodymium (ppm)	7.02	6.54	7.50	6.86	7.18
Rb, Rubidium (ppm)	128	122	134	125	131
S, Sulphur (wt.%)	0.726	0.698	0.753	0.707	0.744
Sb, Antimony (ppm)	0.56	0.49	0.62	0.51	0.60
Sc, Scandium (ppm)	25.4	24.4	26.4	24.9	25.9
Se, Selenium (ppm)	2.69	2.24	3.13	2.47	2.90
Sm, Samarium (ppm)	5.88	5.49	6.28	5.67	6.10
Sn, Tin (ppm)	4.21	3.94	4.47	4.03	4.38
Sr, Strontium (ppm)	503	485	521	495	510
Ta, Tantalum (ppm)	0.62	0.58	0.66	0.59	0.65
Tb, Terbium (ppm)	0.75	0.70	0.80	0.73	0.77
Te, Tellurium (ppm)	0.21	0.09	0.32	0.14	0.27
Th, Thorium (ppm)	11.4	10.1	12.6	10.7	12.0
Ti, Titanium (wt.%)	0.688	0.665	0.711	0.675	0.701
Tl, Thallium (ppm)	0.34	0.32	0.36	0.33	0.35
Tm, Thulium (ppm)	0.33	0.29	0.37	0.31	0.34
U, Uranium (ppm)	2.38	2.15	2.61	2.21	2.54
V, Vanadium (ppm)	286	274	299	280	293
W, Tungsten (ppm)	9.03	8.59	9.46	8.74	9.31
Y, Yttrium (ppm)	21.5	20.4	22.7	21.1	22.0
Yb, Ytterbium (ppm)	2.13	1.98	2.27	2.04	2.21
Zn, Zinc (ppm)	128	123	133	125	132
Zr, Zirconium (ppm)	78	72	83	75	80
Borate / Peroxide Fusion ICP					
Al_2O_3, Aluminium(III) oxide (wt.%)	15.51	15.18	15.84	15.32	15.69
As, Arsenic (ppm)	18.5	15.0	22.0	10.5	26.6
Ba, Barium (ppm)	630	609	651	618	642
Be, Beryllium (ppm)	2.08	1.37	2.79	1.86	2.30
Bi, Bismuth (ppm)	8.88	7.89	9.86	8.70	9.06
CaO, Calcium oxide (wt.%)	8.02	7.79	8.24	7.89	8.14
Cd, Cadmium (ppm)	< 10	IND	IND	IND	IND

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. 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
Borate / Peroxide Fusion ICP continued					
Ce, Cerium (ppm)	54	52	57	53	55
Co, Cobalt (ppm)	71	69	74	69	74
Cr, Chromium (wt.%)	0.711	0.683	0.738	0.701	0.720
Cs, Caesium (ppm)	6.68	6.14	7.22	6.43	6.93
Cu, Copper (wt.%)	0.237	0.232	0.243	0.230	0.244
Dy, Dysprosium (ppm)	4.08	3.77	4.40	3.93	4.23
Er, Erbium (ppm)	2.25	2.10	2.41	2.16	2.35
Eu, Europium (ppm)	1.59	1.46	1.71	1.50	1.67
Fe_2O_3, Iron(III) oxide (wt.%)	11.70	11.47	11.93	11.56	11.84
Ga, Gallium (ppm)	20.8	19.7	21.8	19.8	21.7
Gd, Gadolinium (ppm)	5.05	4.66	5.43	4.89	5.21
Hf, Hafnium (ppm)	3.06	2.54	3.57	IND	IND
Ho, Holmium (ppm)	0.79	0.74	0.83	0.75	0.82
K_2O, Potassium oxide (wt.%)	2.35	2.24	2.46	2.30	2.40
La, Lanthanum (ppm)	26.8	24.6	28.9	25.9	27.6
Li, Lithium (ppm)	17.6	13.8	21.5	16.3	19.0
Lu, Lutetium (ppm)	0.31	0.27	0.35	0.28	0.33
MgO, Magnesium oxide (wt.%)	5.46	5.32	5.60	5.37	5.55
MnO, Manganese oxide (wt.%)	0.163	0.156	0.169	0.160	0.166
Mo, Molybdenum (ppm)	3.33	2.43	4.22	IND	IND
Nb, Niobium (ppm)	8.67	7.39	9.94	7.80	9.54
Nd, Neodymium (ppm)	28.9	27.3	30.5	28.0	29.7
Ni, Nickel (wt.%)	0.230	0.219	0.240	0.224	0.235
P_2O_5, Phosphorus(V) oxide (wt.%)	0.393	0.354	0.433	0.382	0.405
Pb, Lead (ppm)	23.2	19.7	26.7	21.8	24.6
Pr, Praseodymium (ppm)	7.00	6.65	7.35	6.80	7.20
Rb, Rubidium (ppm)	128	123	134	126	130
S, Sulphur (wt.%)	0.743	0.715	0.770	0.725	0.760
Sb, Antimony (ppm)	0.68	0.51	0.85	IND	IND
Sc, Scandium (ppm)	23.8	22.2	25.5	23.0	24.6
Se, Selenium (ppm)	< 20	IND	IND	IND	IND
SiO_2, Silicon dioxide (wt.%)	50.68	48.67	52.69	49.96	51.40
Sm, Samarium (ppm)	5.82	5.52	6.11	5.64	5.99
Sn, Tin (ppm)	4.73	3.50	5.96	4.34	5.12
Sr, Strontium (ppm)	506	489	523	495	516
Ta, Tantalum (ppm)	0.58	0.41	0.76	0.50	0.66
Tb, Terbium (ppm)	0.73	0.67	0.79	0.68	0.78
Te, Tellurium (ppm)	< 1	IND	IND	IND	IND
Th, Thorium (ppm)	10.9	9.7	12.2	10.2	11.7
TiO_2, Titanium dioxide (wt.%)	1.14	1.11	1.18	1.12	1.16

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. 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
Borate / Peroxide Fusion ICP continued					
Tl, Thallium (ppm)	< 0.5	IND	IND	IND	IND
Tm, Thulium (ppm)	0.32	0.29	0.36	0.30	0.35
U, Uranium (ppm)	2.52	2.11	2.93	2.29	2.76
V, Vanadium (ppm)	290	278	303	283	297
W, Tungsten (ppm)	8.69	7.44	9.94	7.72	9.66
Y, Yttrium (ppm)	22.1	20.9	23.2	21.6	22.6
Yb, Ytterbium (ppm)	2.08	1.86	2.29	1.97	2.19
Zn, Zinc (ppm)	131	120	142	123	139

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. 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 2. Indicative Values for OREAS 13c.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Pb Fire Assay								
Ir	ppb	*55.8*	Rh	ppb	*164*	Ru	ppb	*348*
NiS Fire Assay								
Ir	ppb	*15.1*	Os	ppb	*8.22*			
Infrared Combustion								
C	wt.%	*0.058*						
4-Acid Digestion								
B	ppm	*55*	Hg	ppm	*0.022*			
Ge	ppm	*0.16*	Re	ppm	*0.002*			
Borate / Peroxide Fusion ICP								
Ag	ppm	*0.914*	Hg	ppm	*0.11*	Re	ppm	*< 0.1*
B	ppm	*45.7*	In	ppm	*0.18*			
Ge	ppm	*1.69*	Na_2O	wt.%	*2.38*			
Borate Fusion XRF								
Al_2O_3	wt.%	*15.50*	Fe_2O_3	wt.%	*11.43*	S	wt.%	*0.650*
As	ppm	*< 10*	K_2O	wt.%	*2.32*	SiO_2	wt.%	*50.20*
BaO	ppm	*789*	MgO	wt.%	*5.41*	Sn	ppm	*33.3*
CaO	wt.%	*8.06*	MnO	wt.%	*0.164*	Sr	ppm	*523*
Cl	ppm	*778*	Na_2O	wt.%	*2.35*	TiO_2	wt.%	*1.14*
Co	ppm	*79*	Ni	wt.%	*0.234*	V_2O_5	ppm	*553*
Cr_2O_3	ppm	*9961*	P_2O_5	wt.%	*0.411*	Zn	ppm	*147*
Cu	wt.%	*0.233*	Pb	ppm	*63*	Zr	ppm	*147*
Thermogravimetry								
LOI^{1000}	wt.%	*0.412*						

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: 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 lists indicative physical properties, while Table 4 reports indicative mineralogy determined by semi-quantitative XRD analysis, Gold homogeneity, assessed by INAA, is shown in Table 5 and is further demonstrated through a nested ANOVA (see *Homogeneity Evaluation* section). 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 13c-DataPack.1.0.260730_141251.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.

Results are also presented as scatter plots for Ni and Cu by 4-acid digestion and Au by Pb fire assay in Figures 1–3, respectively. The plots include the certified value (green line), ±3 SD control limits (magenta), and ±5 % control limits (yellow). Accepted individual results are shown in blue, while individual outliers and dataset outliers are highlighted in red and violet, respectively.

INTENDED USE

OREAS 13c 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 13c may be used to calibrate the entire procedure by producing a pure substance CRM transformed into a calibration solution.

OREAS 13c is intended for the following uses:

- 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 Table 1).

SOURCE MATERIAL

OREAS 13c was prepared from a blend of PGE ores, gold ore, high-grade nickel and copper ores, and barren gabbronorite. The principal PGE ores were sourced from the UG2 and Merensky Reefs at the Dishaba Mine within the Bushveld Complex, South Africa, while the gold ore and primary nickel sulphide ore were sourced from Western Australia. The barren gabbronorite diluent was sourced from Black Hill Quarry, South Australia. Minor additions of copper concentrate and high-grade Ni–Cu–PGE ore were incorporated to achieve the targeted Cu and Ni–PGE concentrations, respectively.

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:

- Lead collection fire assay: ≥ 25 g
- Nickel sulphide collection fire assay: ≥ 10 g
- S by infrared combustion furnace / CS analyser: ≥ 0.1 g
- 4-acid digestion with ICP-OES and/or MS finish: ≥ 0.25 g
- Borate fusion /Sodium peroxide with ICP-OES and/or MS finish: ≥ 0.2 g

INSTRUCTIONS FOR HANDLING, STORAGE & 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.

Pre-homogenisation of the CRM prior to subsampling and analysis is not necessary as there is no particle segregation under transport [12].

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

Single-Use Sachets

OREAS 13c is available in single-use, 10 g and 60 g laminated foil sachets. Following analysis, it is the manufacturer's expectation that any remaining material is discarded. It is the user's responsibility to prevent contamination and avoid prolonged exposure of the sample to the atmosphere prior to analysis.

Repeat-Use Packaging (e.g., 500 g Plastic Jars)

After taking a subsample, users should replace the lid of the jar promptly and securely to prevent accidental spills and airborne contamination. OREAS 13c contains a non-hygroscopic* matrix with an indicative value for moisture provided to enable users to check for changes to stored material by determining moisture in the user's laboratory and comparing the result to the value in Table 3 in this certificate.

The risk to stability of the CRM in regard to oxidation from the breakdown of sulphide minerals to sulphates is minimal given its low sulphur concentration (0.73 wt.% S).

*A non-hygroscopic matrix means exposure to atmospheres significantly different, in terms of temperature and humidity, from the climate during manufacturing should have negligible impact on the precision of results. Hygroscopic moisture is the amount of adsorped moisture (weakly held H_2O- molecules on the surface of exposed material) following exposure to the local atmosphere. Usually, equilibration of material to the local atmosphere will only occur if the material is spread into a thin (~2mm thick) layer and left exposed for a period of 2 hours.

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)

When applying SDs to monitor performance, it is important to recognise that laboratories differ in proficiency, and that different methods have differing levels of precision. Each laboratory has its own inherent SD (specific to an analyte–method–concentration combination), which is not directly comparable to SDs derived from a round robin.
As most data in this round robin came from world-class laboratories, the interlaboratory SDs are narrower than would be expected across a broader mix. To provide more realistic benchmarks, this report presents pooled interlaboratory SDs, incorporating both within-lab variation and between-lab bias. These should be treated as a starting point only, with QC managers refining them against their own control charts.

The performance gates shown in Table 5 are intended only to be used as an initial 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, SDs 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 differs from the certified value, the significance of this bias should be assessed against the combined standard uncertainty of the certified value

and the laboratory's own measurement uncertainty. Where the observed difference lies within this combined uncertainty, the bias is generally not considered significant.

PERIOD OF VALIDITY

The certification of OREAS 13c remains valid, within the specified measurement uncertainties, until at least November 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.

COMMINUTION AND HOMOGENISATION PROCEDURES

The materials constituting OREAS 13c was prepared in the following manner:

- Drying of sulphide-rich ores to constant mass at 85 °C
- Drying of low-sulphide ores and barren material to constant mass at 105 °C
- Crushing and multi-stage milling of the barren material to >98 % minus 75 microns
- Crushing and multi-stage milling of the ores to 100 % minus 30 microns
- Blending the ores and barren material in appropriate proportions to achieve desired grades
- Homogenisation using OREAS' novel processing technologies
- Packaging in 10 g and 60 g units in laminated foil pouches and 500 g units in plastic wide-mouth jars

PHYSICAL PROPERTIES

OREAS 13c was tested at ORE Research & Exploration Pty Ltd's onsite facility for various physical properties. Table 3 presents these findings that should be used for informational purposes only.

Table 3. Physical properties of OREAS 13c.

Bulk Density (kg/m^3)	Moisture (wt.%)	Munsell Notation‡	Munsell Color‡
856	0.32	N7	Light 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

Table 4. Indicative mineralogy of OREAS 13c by semi-quantitative XRD analysis.

Mineral / Mineral Group	% (mass ratio)
Chalcopyrite	1
Ilmenite	1
Spinel group	1
Chlorite	1
Annite - biotite - phlogopite	3
Ca amphibole	1
Clinopyroxene	10
Orthopyroxene	20
Talc	< 1
Plagioclase	47
K-feldspar	10
Quartz	4

The semi-quantitative XRD results shown in Table 4 above were undertaken by ALS Metallurgy in Balcatta, Western Australia. The results have been normalised to 100 % and represent the relative proportion of crystalline material. Totals greater or less than 100 % are due to rounding errors.

Some amorphous material may be present. 'Spinel group' appears to include mainly chromite and/or magnetite. A trace of gypsum may be present.

ANALYTICAL PROGRAM

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

- Instrumental neutron activation analysis (INAA) for Au on 20 x 85 mg subsamples to confirm homogeneity (1 laboratory)
- Au, Pd and Pt by Pb collection fire assay (25-50 g charge weight) with ICP-OES (12 laboratories), ICP-MS (5 laboratories) or AAS finish (2 laboratories)
- Au, Pt, Pd, Ir, Os, Rh and Ru by nickel sulphide (NiS) collection fire assay with ICP-OES, ICP-MS or INAA finish (up to 6 laboratories depending on the element)
- Total S by IR combustion furnace (21 laboratories)
- Full ICP-OES and ICP-MS elemental suites by 4-acid (HNO_3-HF-$HClO_4$-HCl) digestion (up to 22 laboratories depending on the element)
- Full ICP-OES and ICP-MS elemental suites by sodium peroxide or lithium borate fusion (up to 21 laboratories depending on the element)

For the round robin program, twelve 2.5 kg test units were collected at predetermined intervals during the bagging stage, immediately after homogenisation. Each participating laboratory received six test portions. The samples received by each laboratory were obtained by taking samples from six different 2.5 kg test units to maximise representation (i.e., from either the odd or even sampling (lot) intervals).

The 20 individual INAA results upon which much of the homogeneity evaluation is based, included paired 10 g samples taken from 10 of the 12 different sampling units. This format enabled a nested ANOVA treatment of the INAA results to evaluate homogeneity (see 'Homogeneity Evaluation' section below).

PARTICIPATING LABORATORIES

1. Actlabs, Ancaster, Ontario, Canada
2. AGAT Laboratories, Calgary, Alberta, Canada
3. AGAT Laboratories, Thunder Bay, Ontario, Canada
4. Alex Stewart International, Mendoza, Argentina
5. ALS, Johannesburg, South Africa
6. ALS, Lima, Peru
7. ALS, Loughrea, Galway, Ireland
8. ALS, Malaga, WA, Australia
9. ALS, Vancouver, BC, Canada
10. American Assay Laboratories, Sparks, Nevada, USA
11. ANSTO, Lucas Heights, NSW, Australia
12. Inspectorate (BV), Shanghai, Bao Shan District, China
13. Intertek, Cupang, Muntinlupa, Philippines
14. Intertek, Perth, WA, Australia
15. MINTEK Analytical Services, Randburg, South Africa
16. PT Geoservices Ltd, Cikarang, Jakarta Raya, Indonesia
17. PT Intertek Utama Services, Jakarta Timur, DKI Jakarta, Indonesia
18. Saskatchewan Research Council, Saskatoon, Saskatchewan, Canada
19. SGS, Ankara, Anatolia, Turkey
20. SGS Australia Mineral Services, Perth, WA, Australia
21. SGS Canada Inc., Vancouver, BC, Canada
22. SGS Geosol Laboratorios Ltda, Vespasiano, Minas Gerais, Brazil
23. Shiva Analyticals Ltd, Bangalore North, Karnataka, India
24. Stewart Assay & Environmental Laboratories LLC, Kara-Balta, Chüy, Kyrgyzstan

Please note: To maintain anonymity of participating laboratories, the alphabetical list above does not correspond to the Lab ID numbers shown in the scatter plots 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 17034:2016 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 [6] 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

For analytes other than gold, 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 Ni by 4-acid digestion with ICP-OES/MS finish, where 99 % of the time (1-α=0.99) at least 95 % of subsamples (ρ=0.95) will have concentrations lying between 0.219 and 0.228 wt.%. 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.***

The homogeneity of gold has been determined by INAA at ANSTO using the reduced analytical subsample method which utilises the known relationship between standard deviation and analytical subsample weight (Ingamells and Switzer, 1973 [2]). In this approach the sample aliquot is substantially reduced to a point where most of the variability in replicate assays should be due to inhomogeneity of the reference material and measurement error becomes negligible.

Table 5 below shows the gold INAA data determined on 20 x 85 mg subsamples of OREAS 13c. An equivalent scaled version of the results is also provided to demonstrate an appreciation of what this data means if 30 g fire assays were undertaken without the normal measurement error associated with this methodology. In this instance, the 1RSD of 0.69 % calculated for a 30 g fire assay sample (12.87 % at 85 mg weights) confirms the high level of gold homogeneity in OREAS 13c.

The homogeneity of OREAS 13c has also been evaluated in an Analysis of Variance (**ANOVA**) of the INAA data. The 20 samples were comprised of paired samples from each of 10 sampling lot intervals (representative of the prepared batch) and were randomised prior to assigning sample numbers. The duplicate samples enabled an ANOVA by comparison of within- and between-unit variances across the 10 pairs. The purpose of the ANOVA is to test that no statistically significant difference exists in the variance between

units to that of the variance within units. This allows an assessment of homogeneity across the entire prepared batch of OREAS 13c. The test was performed using the following parameters:

- Gold INAA – 20 results (1 laboratory providing duplicate analyses on 10 samples where each sample can be viewed as a 'unit');
- Null Hypothesis, H_0: Between-unit variance is no greater than within-unit variance (reject H_0 if *p*-value < 0.05);
- Alternative Hypothesis, H_1: Between-unit variance is greater than within-unit variance.

Table 5. Neutron Activation Analysis of Au (in ppb) on 20 x 85 mg subsamples showing the equivalent results scaled to a 30 g sample mass typical of fire assay determination.

Replicate No	Au 85 mg actual	Au 30 g equivalent*
1	216	214
2	182	212
3	202	213
4	183	212
5	196	213
6	212	214
7	222	214
8	217	214
9	230	215
10	193	213
11	199	213
12	227	214
13	220	214
14	204	213
15	225	214
16	199	213
17	312	219
18	196	213
19	231	215
20	204	213
Mean	214	214
Median	208	213
Std Dev.	27.5	1.5
Rel.Std.Dev.	**12.87%**	**0.69%**

*Results calculated for a 30 g equivalent sample mass using the formula: $x^{30g\ Eq} = \frac{(x^{INAA} - \bar{X}) \times RSD@30g}{RSD@85mg} + \bar{X}$

where $x^{30g\ Eq}$ = equivalent result calculated for a 30 g sample mass
(x^{INAA}) = raw INAA result at 85 mg
$\bar{X}$ = mean of 85 mg INAA results

The data were not filtered for outliers before *p*-value calculation, which yielded 0.78 — statistically insignificant, so the Null Hypothesis is accepted. ANOVA does not measure absolute homogeneity; it evaluates whether analytes are similarly distributed across the packaging run and whether variance between subsamples from the same unit differs from that between separate units. A reference material may show poor absolute homogeneity yet still meet a relative homogeneity (ANOVA) criterion if within-unit heterogeneity is substantial

and consistent. Based on ANOVA and interlaboratory certification results, OREAS 13c is fit-for-purpose as a certified reference material (see 'Intended Use' below).

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) or parts per billion (ppb).

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 [5], clause 9.2.5, and ISO 17034:2016 [9], clause 7.12.4b), 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, 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, fulfilling the requirements for metrological traceability as specified in ISO 17034:2016 and ISO 33405:2024 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.

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 13c.

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	200	8.9	182	218	173	227	4.46%	8.92%	13.38%	190	210
Pd, ppb	162	8	146	178	138	186	4.89%	9.77%	14.66%	154	170
Pt, ppb	219	9	201	237	192	246	4.08%	8.16%	12.25%	208	230
NiS Fire Assay											
Au, ppb	189	18.4	152	226	134	244	9.71%	19.43%	29.14%	180	199
Pd, ppb	154	8	138	170	130	178	5.19%	10.38%	15.56%	147	162
Pt, ppb	216	13	191	241	178	254	5.84%	11.68%	17.52%	205	227
Rh, ppb	29.3	1.6	26.1	32.4	24.6	34.0	5.36%	10.73%	16.09%	27.8	30.7
Ru, ppb	52.4	4.9	42.5	62.2	37.6	67.1	9.39%	18.78%	28.17%	49.8	55.0
Infrared Combustion											
S, wt.%	0.732	0.026	0.679	0.785	0.653	0.811	3.61%	7.23%	10.84%	0.695	0.769
4-Acid Digestion											
Ag, ppm	1.01	0.094	0.82	1.19	0.72	1.29	9.38%	18.76%	28.14%	0.95	1.06
Al, wt.%	8.33	0.368	7.60	9.07	7.23	9.44	4.41%	8.83%	13.24%	7.92	8.75
As, ppm	17.9	0.95	16.0	19.8	15.1	20.8	5.27%	10.55%	15.82%	17.0	18.8
Ba, ppm	624	21	582	666	561	687	3.37%	6.74%	10.12%	593	655
Be, ppm	1.71	0.079	1.56	1.87	1.48	1.95	4.61%	9.22%	13.84%	1.63	1.80
Bi, ppm	9.02	0.449	8.12	9.92	7.67	10.37	4.98%	9.96%	14.95%	8.57	9.47
Ca, wt.%	5.75	0.163	5.42	6.07	5.26	6.24	2.84%	5.68%	8.53%	5.46	6.03
Cd, ppm	0.33	0.026	0.28	0.38	0.26	0.41	7.77%	15.53%	23.30%	0.32	0.35
Ce, ppm	56	3.0	50	62	47	65	5.39%	10.79%	16.18%	53	59
Co, ppm	69	2.6	64	74	61	77	3.81%	7.61%	11.42%	66	72
Cr, wt.%	0.565	0.056	0.454	0.677	0.398	0.733	9.88%	19.75%	29.63%	0.537	0.594
Cs, ppm	7.02	0.490	6.04	8.00	5.55	8.49	6.98%	13.96%	20.93%	6.67	7.37
Cu, wt.%	0.234	0.005	0.224	0.245	0.218	0.250	2.23%	4.47%	6.70%	0.222	0.246
Dy, ppm	4.18	0.128	3.92	4.44	3.80	4.56	3.07%	6.13%	9.20%	3.97	4.39
Er, ppm	2.33	0.072	2.18	2.47	2.11	2.54	3.08%	6.16%	9.24%	2.21	2.44
Eu, ppm	1.61	0.080	1.45	1.77	1.37	1.85	4.96%	9.93%	14.89%	1.53	1.69
Fe, wt.%	8.03	0.257	7.52	8.54	7.26	8.80	3.20%	6.39%	9.59%	7.63	8.43
Ga, ppm	20.0	1.00	18.0	22.0	17.0	23.0	4.98%	9.97%	14.95%	19.0	21.0
Gd, ppm	5.31	0.262	4.78	5.83	4.52	6.09	4.94%	9.87%	14.81%	5.04	5.57
Hf, ppm	2.34	0.193	1.96	2.73	1.76	2.92	8.26%	16.51%	24.77%	2.23	2.46
Ho, ppm	0.81	0.021	0.76	0.85	0.74	0.87	2.63%	5.25%	7.88%	0.77	0.85
In, ppm	0.21	0.013	0.18	0.23	0.17	0.24	6.16%	12.32%	18.48%	0.20	0.22
K, wt.%	1.98	0.076	1.83	2.14	1.76	2.21	3.84%	7.68%	11.52%	1.88	2.08
La, ppm	25.5	1.60	22.3	28.7	20.7	30.3	6.28%	12.56%	18.84%	24.2	26.8
Li, ppm	16.7	0.97	14.7	18.6	13.8	19.6	5.83%	11.66%	17.50%	15.8	17.5
Lu, ppm	0.32	0.020	0.28	0.36	0.26	0.38	6.24%	12.47%	18.71%	0.31	0.34
Mg, wt.%	3.20	0.101	3.00	3.41	2.90	3.51	3.17%	6.34%	9.50%	3.04	3.36
Mn, wt.%	0.123	0.004	0.114	0.132	0.110	0.136	3.59%	7.19%	10.78%	0.117	0.129
Mo, ppm	3.08	0.160	2.76	3.40	2.60	3.56	5.20%	10.40%	15.60%	2.93	3.23
Na, wt.%	1.75	0.082	1.59	1.92	1.51	2.00	4.70%	9.39%	14.09%	1.66	1.84

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 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.

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											
Nb, ppm	8.95	0.589	7.78	10.13	7.19	10.72	6.58%	13.15%	19.73%	8.51	9.40
Nd, ppm	29.1	1.77	25.6	32.7	23.8	34.5	6.08%	12.15%	18.23%	27.7	30.6
Ni, wt.%	0.223	0.007	0.209	0.238	0.202	0.245	3.19%	6.39%	9.58%	0.212	0.235
P, wt.%	0.178	0.006	0.166	0.191	0.160	0.197	3.46%	6.91%	10.37%	0.169	0.187
Pb, ppm	21.8	1.35	19.1	24.5	17.7	25.8	6.18%	12.36%	18.54%	20.7	22.9
Pr, ppm	7.02	0.444	6.13	7.91	5.69	8.35	6.32%	12.65%	18.97%	6.67	7.37
Rb, ppm	128	7	113	143	106	150	5.78%	11.55%	17.33%	122	134
S, wt.%	0.726	0.031	0.663	0.788	0.632	0.819	4.29%	8.57%	12.86%	0.689	0.762
Sb, ppm	0.56	0.08	0.40	0.71	0.32	0.79	13.97%	27.94%	41.91%	0.53	0.58
Sc, ppm	25.4	1.22	23.0	27.8	21.7	29.1	4.81%	9.62%	14.42%	24.1	26.7
Se, ppm	2.69	0.38	1.94	3.44	1.56	3.82	13.99%	27.98%	41.98%	2.55	2.82
Sm, ppm	5.88	0.245	5.39	6.37	5.15	6.62	4.17%	8.33%	12.50%	5.59	6.18
Sn, ppm	4.21	0.295	3.62	4.80	3.32	5.09	7.02%	14.04%	21.07%	4.00	4.42
Sr, ppm	503	20	462	543	442	563	3.99%	7.98%	11.97%	477	528
Ta, ppm	0.62	0.049	0.52	0.71	0.47	0.76	7.86%	15.72%	23.58%	0.59	0.65
Tb, ppm	0.75	0.050	0.65	0.85	0.60	0.90	6.67%	13.33%	20.00%	0.71	0.79
Te, ppm	0.21	0.06	0.10	0.32	0.04	0.37	26.74%	53.47%	80.21%	0.20	0.22
Th, ppm	11.4	0.74	9.9	12.8	9.1	13.6	6.53%	13.05%	19.58%	10.8	11.9
Ti, wt.%	0.688	0.027	0.633	0.742	0.606	0.770	3.97%	7.94%	11.92%	0.653	0.722
Tl, ppm	0.34	0.024	0.29	0.39	0.26	0.41	7.22%	14.44%	21.66%	0.32	0.36
Tm, ppm	0.33	0.03	0.26	0.39	0.22	0.43	10.50%	20.99%	31.49%	0.31	0.34
U, ppm	2.38	0.138	2.10	2.65	1.96	2.79	5.82%	11.64%	17.46%	2.26	2.50
V, ppm	286	12	263	310	251	322	4.14%	8.27%	12.41%	272	300
W, ppm	9.03	0.497	8.03	10.02	7.53	10.52	5.51%	11.02%	16.52%	8.58	9.48
Y, ppm	21.5	1.50	18.5	24.5	17.0	26.0	6.98%	13.97%	20.95%	20.5	22.6
Yb, ppm	2.13	0.137	1.85	2.40	1.71	2.54	6.46%	12.93%	19.39%	2.02	2.23
Zn, ppm	128	5	118	138	114	143	3.81%	7.61%	11.42%	122	135
Zr, ppm	78	4.3	69	86	65	91	5.57%	11.14%	16.72%	74	82
Borate / Peroxide Fusion ICP											
Al_2O_3, wt.%	15.51	0.440	14.63	16.39	14.19	16.83	2.84%	5.68%	8.52%	14.73	16.28
As, ppm	18.5	2.6	13.3	23.7	10.7	26.3	13.99%	27.98%	41.97%	17.6	19.4
Ba, ppm	630	14	602	658	588	673	2.25%	4.50%	6.75%	599	662
Be, ppm	2.08	0.46	1.17	2.99	0.71	3.45	21.96%	43.91%	65.87%	1.97	2.18
Bi, ppm	8.88	0.92	7.03	10.72	6.10	11.65	10.41%	20.82%	31.23%	8.43	9.32
CaO, wt.%	8.02	0.232	7.55	8.48	7.32	8.71	2.89%	5.78%	8.66%	7.62	8.42
Cd, ppm	< 10	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Ce, ppm	54	2.4	49	59	47	62	4.50%	9.00%	13.50%	52	57
Co, ppm	71	2.5	67	76	64	79	3.48%	6.96%	10.45%	68	75
Cr, wt.%	0.711	0.038	0.634	0.787	0.596	0.825	5.37%	10.74%	16.11%	0.675	0.746
Cs, ppm	6.68	0.459	5.76	7.60	5.30	8.06	6.87%	13.74%	20.61%	6.35	7.01
Cu, wt.%	0.237	0.005	0.228	0.246	0.224	0.251	1.90%	3.81%	5.71%	0.225	0.249
Dy, ppm	4.08	0.280	3.52	4.64	3.24	4.92	6.86%	13.71%	20.57%	3.88	4.29
Er, ppm	2.25	0.122	2.01	2.50	1.89	2.62	5.40%	10.80%	16.20%	2.14	2.37

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.

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
Borate / Peroxide Fusion ICP continued											
Eu, ppm	1.59	0.125	1.33	1.84	1.21	1.96	7.91%	15.82%	23.73%	1.51	1.66
Fe_2O_3, wt.%	11.70	0.229	11.24	12.16	11.01	12.39	1.96%	3.92%	5.88%	11.12	12.29
Ga, ppm	20.8	1.28	18.2	23.3	16.9	24.6	6.16%	12.33%	18.49%	19.7	21.8
Gd, ppm	5.05	0.331	4.39	5.71	4.06	6.04	6.55%	13.10%	19.64%	4.79	5.30
Hf, ppm	3.06	0.203	2.65	3.46	2.45	3.66	6.65%	13.31%	19.96%	2.90	3.21
Ho, ppm	0.79	0.046	0.70	0.88	0.65	0.92	5.78%	11.56%	17.35%	0.75	0.83
K_2O, wt.%	2.35	0.103	2.14	2.56	2.04	2.66	4.40%	8.80%	13.20%	2.23	2.47
La, ppm	26.8	1.93	22.9	30.6	21.0	32.5	7.20%	14.40%	21.60%	25.4	28.1
Li, ppm	17.6	2.4	12.9	22.4	10.5	24.8	13.54%	27.08%	40.62%	16.7	18.5
Lu, ppm	0.31	0.04	0.22	0.40	0.18	0.44	14.26%	28.52%	42.78%	0.29	0.32
MgO, wt.%	5.46	0.120	5.22	5.70	5.10	5.82	2.19%	4.39%	6.58%	5.19	5.73
MnO, wt.%	0.163	0.006	0.151	0.174	0.146	0.179	3.42%	6.84%	10.26%	0.154	0.171
Mo, ppm	3.33	0.65	2.03	4.62	1.39	5.27	19.46%	38.91%	58.37%	3.16	3.49
Nb, ppm	8.67	1.23	6.21	11.13	4.98	12.36	14.20%	28.39%	42.59%	8.23	9.10
Nd, ppm	28.9	0.94	27.0	30.7	26.0	31.7	3.26%	6.52%	9.79%	27.4	30.3
Ni, wt.%	0.230	0.010	0.210	0.249	0.200	0.259	4.24%	8.48%	12.73%	0.218	0.241
P_2O_5, wt.%	0.393	0.046	0.301	0.486	0.255	0.532	11.75%	23.49%	35.24%	0.374	0.413
Pb, ppm	23.2	3.4	16.5	29.9	13.1	33.3	14.53%	29.06%	43.59%	22.0	24.4
Pr, ppm	7.00	0.372	6.26	7.74	5.89	8.12	5.31%	10.62%	15.93%	6.65	7.35
Rb, ppm	128	3	122	134	119	137	2.37%	4.74%	7.11%	122	135
S, wt.%	0.743	0.026	0.691	0.794	0.665	0.820	3.46%	6.93%	10.39%	0.705	0.780
Sb, ppm	0.68	0.16	0.37	0.99	0.21	1.14	22.94%	45.88%	68.81%	0.64	0.71
Sc, ppm	23.8	1.81	20.2	27.4	18.4	29.2	7.60%	15.19%	22.79%	22.6	25.0
Se, ppm	< 20	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
SiO_2, wt.%	50.68	2.789	45.10	56.26	42.31	59.05	5.50%	11.01%	16.51%	48.15	53.22
Sm, ppm	5.82	0.244	5.33	6.30	5.08	6.55	4.19%	8.39%	12.58%	5.53	6.11
Sn, ppm	4.73	1.06	2.62	6.85	1.56	7.90	22.35%	44.71%	67.06%	4.49	4.97
Sr, ppm	506	11	483	528	472	540	2.24%	4.48%	6.72%	480	531
Ta, ppm	0.58	0.09	0.41	0.76	0.32	0.85	15.13%	30.26%	45.39%	0.55	0.61
Tb, ppm	0.73	0.037	0.66	0.80	0.62	0.84	5.03%	10.05%	15.08%	0.69	0.77
Te, ppm	< 1	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Th, ppm	10.9	0.88	9.2	12.7	8.3	13.6	8.02%	16.05%	24.07%	10.4	11.5
TiO_2, wt.%	1.14	0.040	1.06	1.22	1.02	1.26	3.53%	7.06%	10.59%	1.09	1.20
Tl, ppm	< 0.5	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Tm, ppm	0.32	0.028	0.27	0.38	0.24	0.41	8.65%	17.30%	25.95%	0.31	0.34
U, ppm	2.52	0.215	2.09	2.95	1.88	3.17	8.54%	17.08%	25.62%	2.40	2.65
V, ppm	290	16	258	323	242	339	5.53%	11.07%	16.60%	276	305
W, ppm	8.69	0.95	6.78	10.59	5.83	11.55	10.96%	21.92%	32.89%	8.25	9.12
Y, ppm	22.1	1.12	19.8	24.3	18.7	25.4	5.08%	10.15%	15.23%	21.0	23.2
Yb, ppm	2.08	0.168	1.74	2.41	1.57	2.58	8.11%	16.23%	24.34%	1.97	2.18
Zn, ppm	131	11	109	153	98	164	8.43%	16.87%	25.30%	125	138
Zr, ppm	113	9	96	130	87	139	7.55%	15.09%	22.64%	107	119

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.

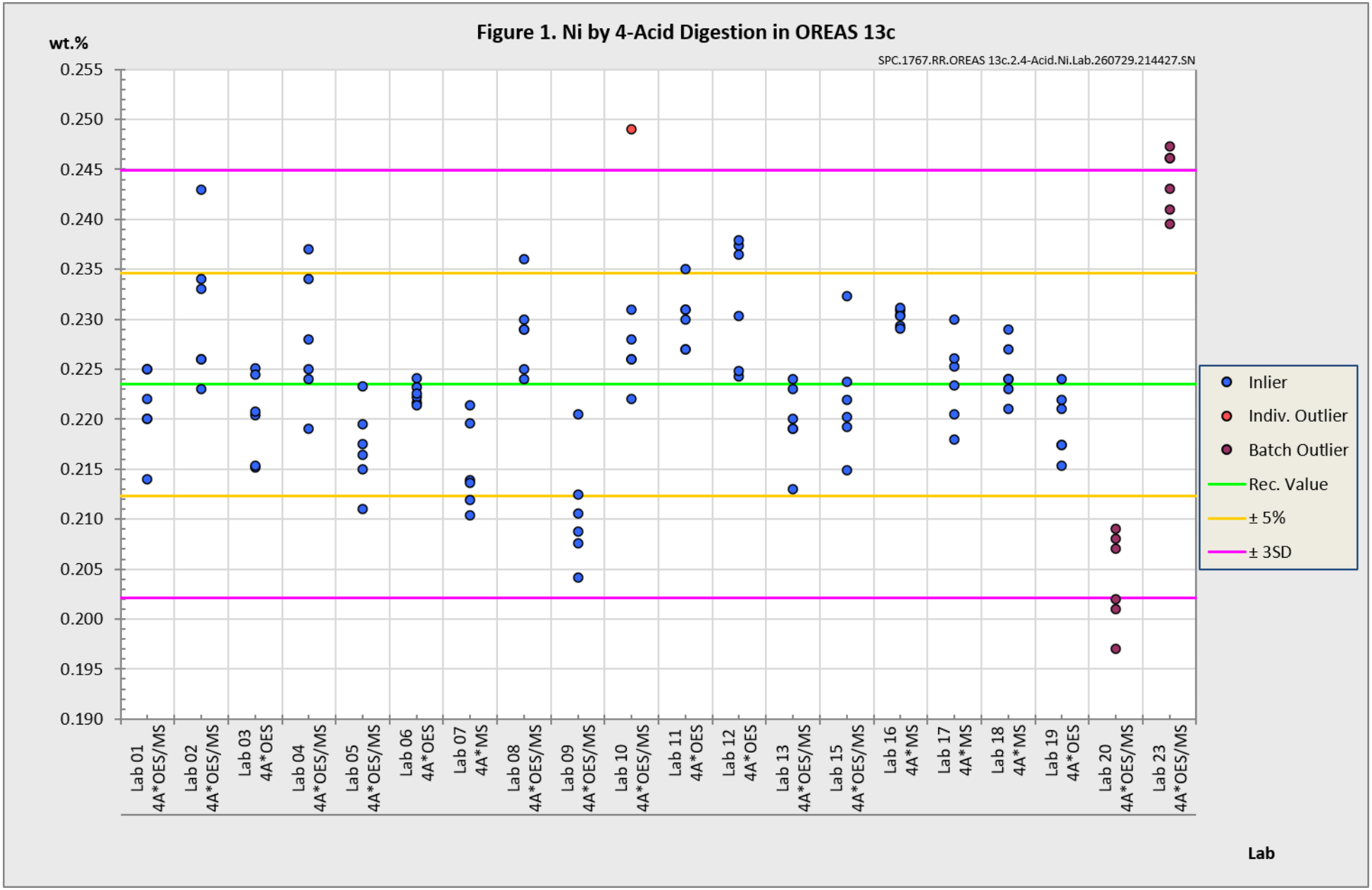
Figure 1. Ni by 4-Acid Digestion in OREAS 13c
wt.%
SPC.1767.RR.OREAS 13c.2.4-Acid.Ni.Lab.260729.214427.SN
0.255
0.250
0.245
0.240
0.235
0.230
0.225
0.220
0.215
0.210
0.205
0.200
0.195
0.190
Lab 01 4A*OES/MS
Lab 02 4A*OES/MS
Lab 03 4A*OES
Lab 04 4A*OES/MS
Lab 05 4A*OES/MS
Lab 06 4A*OES
Lab 07 4A*MS
Lab 08 4A*OES/MS
Lab 09 4A*OES/MS
Lab 10 4A*OES/MS
Lab 11 4A*OES
Lab 12 4A*OES
Lab 13 4A*OES/MS
Lab 15 4A*OES/MS
Lab 16 4A*MS
Lab 17 4A*MS
Lab 18 4A*MS
Lab 19 4A*OES
Lab 20 4A*OES/MS
Lab 23 4A*OES/MS
Lab
Inlier
Indiv. Outlier
Batch Outlier
Rec. Value
± 5%
± 3SD

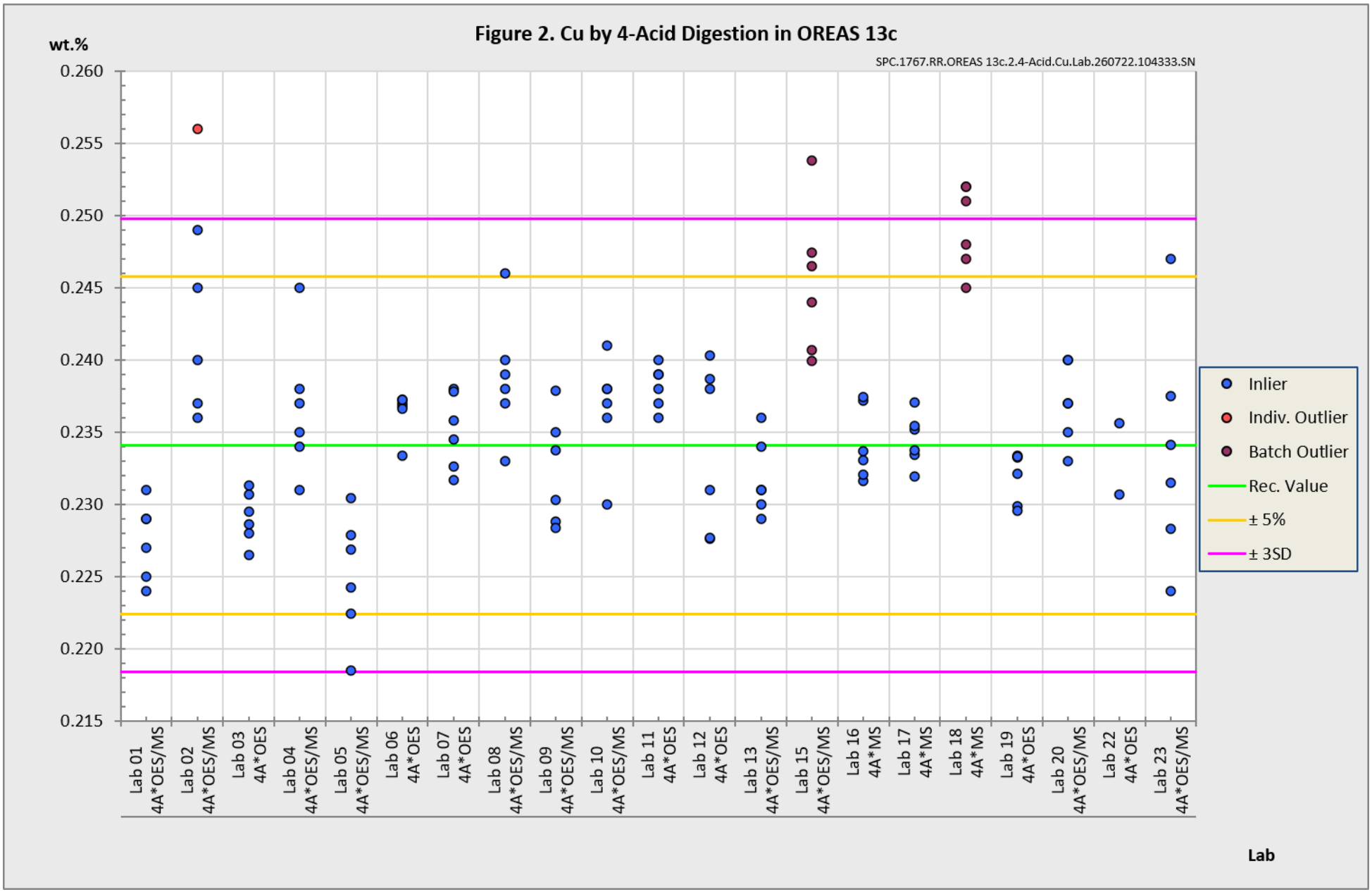
Figure 2. Cu by 4-Acid Digestion in OREAS 13c
wt.%
SPC.1767.RR.OREAS 13c.2.4-Acid.Cu.Lab.260722.104333.SN
0.260
0.255
0.250
0.245
0.240
0.235
0.230
0.225
0.220
0.215
Lab 01 4A*OES/MS
Lab 02 4A*OES/MS
Lab 03 4A*OES
Lab 04 4A*OES/MS
Lab 05 4A*OES/MS
Lab 06 4A*OES
Lab 07 4A*OES
Lab 08 4A*OES/MS
Lab 09 4A*OES/MS
Lab 10 4A*OES/MS
Lab 11 4A*OES
Lab 12 4A*OES
Lab 13 4A*OES/MS
Lab 15 4A*OES/MS
Lab 16 4A*MS
Lab 17 4A*MS
Lab 18 4A*MS
Lab 19 4A*OES
Lab 20 4A*OES/MS
Lab 22 4A*OES
Lab 23 4A*OES/MS
Lab
Inlier
Indiv. Outlier
Batch Outlier
Rec. Value
± 5%
± 3SD

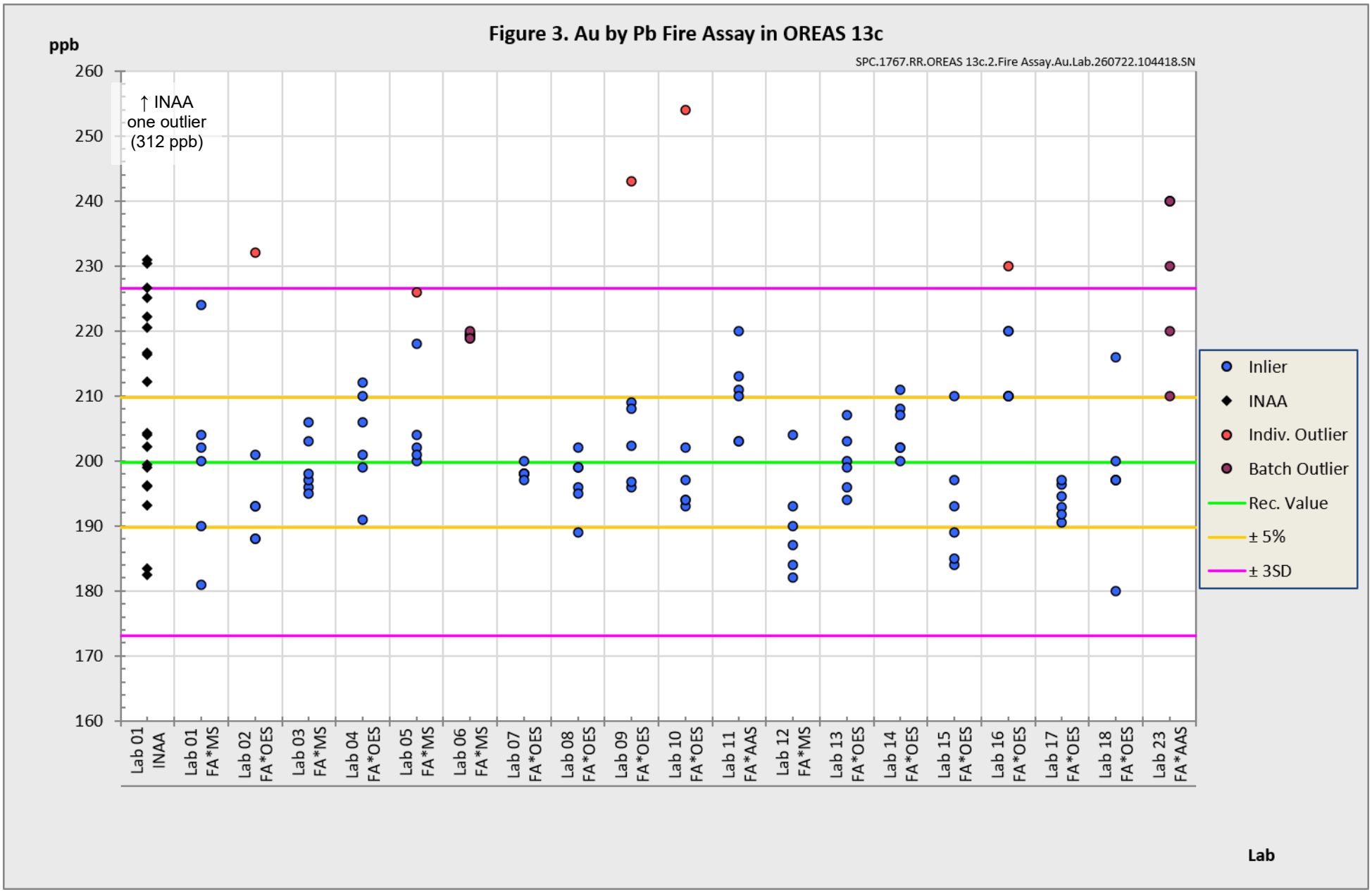
Figure 3. Au by Pb Fire Assay in OREAS 13c
ppb
SPC.1767.RR.OREAS 13c.2.Fire Assay.Au.Lab.260722.104418.SN
↑ INAA
one outlier
(312 ppb)
260
250
240
230
220
210
200
190
180
170
160
Lab 01 INAA
Lab 01 FA*MS
Lab 02 FA*OES
Lab 03 FA*MS
Lab 04 FA*OES
Lab 05 FA*MS
Lab 06 FA*MS
Lab 07 FA*OES
Lab 08 FA*OES
Lab 09 FA*OES
Lab 10 FA*OES
Lab 11 FA*AAS
Lab 12 FA*MS
Lab 13 FA*OES
Lab 14 FA*OES
Lab 15 FA*OES
Lab 16 FA*OES
Lab 17 FA*OES
Lab 18 FA*OES
Lab 23 FA*AAS
Inlier
INAA
Indiv. Outlier
Batch Outlier
Rec. Value
± 5%
± 3SD
Lab

PREPARER AND SUPPLIER

Certified reference material OREAS 13c is prepared, certified and supplied by:

ORE Research & Exploration Pty Ltd
37A Hosie Street
Bayswater North VIC 3153
AUSTRALIA

Tel: +613-9729 0333
Web: www.oreas.com
Email: info@ore.com.au

CERTIFYING OFFICER

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

ACCREDITATION

ORE Pty Ltd is ISO 9001:2015 certified by Lloyd's Register Quality Assurance Ltd (LRQA) for its quality management system (QMS) encompassing the development, manufacturing, certification and supply of CRMs.

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0	3rd August 2026	First publication.

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