ORE RESEARCH & EXPLORATION

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CERTIFICATE OF ANALYSIS FOR

HIGH GRADE COPPER ORE REFERENCE MATERIAL

OREAS 933

Table 1. Certified Values, SDs, 95% Confidence and Tolerance Limits for OREAS 933

Constituent	Certified Value	95% Confidence Limits		95% Tolerance Limits	
		Low	High	Low	High
4-Acid Digestion					
Ag, Silver (ppm)	31.0	29.2	32.8	28.3	33.8
Al, Aluminium (wt.%)	4.79	4.53	5.04	4.51	5.06
As, Arsenic (ppm)	9.61	9.15	10.06	8.34	10.88
Be, Beryllium (ppm)	< 2	IND	IND	IND	IND
Bi, Bismuth (ppm)	451	438	464	433	468
Ca, Calcium (wt.%)	0.361	0.331	0.391	0.344	0.378
Co, Cobalt (ppm)	60	59	62	59	62
Cr, Chromium (ppm)	45.6	41.7	49.5	43.1	48.2
Cu, Copper (wt.%)	8.37	8.30	8.43	8.06	8.67
Fe, Iron (wt.%)	17.72	17.09	18.36	17.43	18.02
K, Potassium (wt.%)	1.49	1.36	1.62	1.42	1.57
La, Lanthanum (ppm)	27.5	23.7	31.2	26.0	28.9
Li, Lithium (ppm)	18.2	14.9	21.6	16.6	19.8
Mg, Magnesium (wt.%)	1.13	1.05	1.21	1.08	1.19
Mn, Manganese (wt.%)	0.083	0.079	0.086	0.080	0.085
Mo, Molybdenum (ppm)	< 2	IND	IND	IND	IND
Na, Sodium (wt.%)	0.151	0.142	0.161	IND	IND
Nb, Niobium (ppm)	8.10	7.19	9.01	7.63	8.58
Ni, Nickel (ppm)	28.1	25.4	30.7	26.6	29.5
P, Phosphorus (wt.%)	0.042	0.038	0.046	0.037	0.047
Pb, Lead (ppm)	189	183	195	184	193
S, Sulphur (wt.%)	8.43	7.71	9.15	8.16	8.70
Sb, Antimony (ppm)	2.23	2.15	2.30	2.10	2.35
Se, Selenium (ppm)	68	65	70	65	71
Sn, Tin (ppm)	73	69	78	71	76
Sr, Strontium (ppm)	28.2	24.2	32.2	26.9	29.5
Ti, Titanium (wt.%)	0.223	0.202	0.245	0.209	0.237
V, Vanadium (ppm)	64	55	72	62	65
W, Tungsten (ppm)	26.4	24.7	28.2	23.8	29.1
Y, Yttrium (ppm)	15.1	13.4	16.7	14.1	16.1

Table 1 continued.

Constituent	Certified Value	95% Confidence Limits		95% Tolerance Limits	
		Low	High	Low	High
4-Acid Digestion continued					
Zn, Zinc (ppm)	602	585	619	585	620
Zr, Zirconium (ppm)	63	54	71	59	67
Aqua Regia Digestion					
Ag, Silver (ppm)	29.6	27.7	31.6	26.9	32.3
Al, Aluminium (wt.%)	2.16	1.93	2.39	2.06	2.26
As, Arsenic (ppm)	9.61	9.08	10.14	7.78	11.45
Ba, Barium (ppm)	32.9	30.2	35.5	29.8	36.0
Bi, Bismuth (ppm)	449	428	471	426	473
Ca, Calcium (wt.%)	0.286	0.277	0.296	0.270	0.302
Co, Cobalt (ppm)	61	57	64	59	63
Cr, Chromium (ppm)	26.0	22.6	29.5	23.9	28.2
Cu, Copper (wt.%)	8.27	8.14	8.40	8.01	8.53
Fe, Iron (wt.%)	17.48	16.75	18.20	16.99	17.96
Ga, Gallium (ppm)	6.87	5.65	8.09	IND	IND
K, Potassium (wt.%)	0.199	0.175	0.222	IND	IND
Mg, Magnesium (wt.%)	1.05	0.92	1.17	0.99	1.10
Mn, Manganese (wt.%)	0.077	0.074	0.080	0.074	0.081
Mo, Molybdenum (ppm)	< 2	IND	IND	IND	IND
Na, Sodium (wt.%)	< 0.03	IND	IND	IND	IND
Ni, Nickel (ppm)	28.1	23.1	33.2	26.9	29.4
Pb, Lead (ppm)	187	179	194	179	194
S, Sulphur (wt.%)	8.34	7.39	9.29	7.96	8.71
Sb, Antimony (ppm)	< 2	IND	IND	IND	IND
Se, Selenium (ppm)	66	61	71	62	70
Sn, Tin (ppm)	66	62	70	63	69
Sr, Strontium (ppm)	15.4	13.7	17.1	IND	IND
Ti, Titanium (wt.%)	0.045	0.034	0.057	0.042	0.049
W, Tungsten (ppm)	22.2	17.5	26.9	IND	IND
Zn, Zinc (ppm)	596	572	619	581	610
Infrared Combustion					
S, Sulphur (wt.%)	9.63	9.51	9.76	9.35	9.92
Borate Fusion XRF					
Co, Cobalt (ppm)	< 100	IND	IND	IND	IND
Cu, Copper (wt.%)	8.38	8.21	8.54	8.18	8.58
Fe_2O_3, Iron(III) oxide (wt.%)	25.61	25.20	26.02	25.15	26.08
Pb, Lead (ppm)	210	174	245	188	231
S, Sulphur (wt.%)	9.79	9.63	9.94	9.65	9.93
SiO_2, Silicon dioxide (wt.%)	42.60	42.28	42.93	42.08	43.12
Zn, Zinc (ppm)	606	584	627	581	631
Peroxide Fusion ICP					
Ag, Silver (ppm)	29.3	24.7	33.9	IND	IND
Bi, Bismuth (ppm)	466	447	485	449	482
Co, Cobalt (ppm)	63	59	67	61	66

Table 1 continued.

Constituent	Certified Value	95% Confidence Limits		95% Tolerance Limits	
		Low	High	Low	High
Peroxide Fusion ICP continued					
Cu, Copper (wt.%)	8.34	8.27	8.41	8.04	8.64
Fe, Iron (wt.%)	18.07	17.66	18.48	17.49	18.65
Pb, Lead (ppm)	197	193	202	185	210
S, Sulphur (wt.%)	9.76	9.59	9.93	9.25	10.27
Sb, Antimony (ppm)	< 2.5	IND	IND	IND	IND
Se, Selenium (ppm)	79	75	83	72	86
Si, Silicon (wt.%)	20.19	20.00	20.38	19.76	20.61
Sn, Tin (ppm)	86	78	94	82	90
Zn, Zinc (ppm)	617	596	637	591	642

Note: intervals may appear asymmetric due to rounding

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.

SOURCE MATERIAL

OREAS 933 is one of a suite of sixteen copper CRMs (OREAS 920 to OREAS 935) prepared from material from the CSA mine located near the town of Cobar in central western New South Wales, Australia. The copper ore body is hosted by the Early Devonian CSA Siltstone, a thinly bedded turbiditic sequence of carbonaceous siltstones and mudstones with minor coarser units. The CSA Siltstone is part of the Cobar Supergroup, consisting of lower syn-rift sediments and upper post-rift sag phase sediments. The mineralisation is structurally controlled and confined to a number of steeply dipping bodies within a major shear zone on the eastern margin of the Early Devonian Cobar Basin. It is characterised by low-grade greenschist alteration and epigenetic low-grade mineralisation enveloping higher-grade shoots of vein complexes or sub-massive to massive sulphides. The sulphides include chalcopyrite, pyrrhotite, pyrite, sphalerite, galena, bornite and cubanite. Iron-rich chlorite and silica are prominent alterations in the siltstone host.

COMMINUTION AND HOMOGENISATION PROCEDURES

The material constituting OREAS 933 was prepared in the following manner:

- drying to constant mass at 105°C;
- preliminary blending of copper ores and barren siltstone materials;
- multi-stage milling to approximately 99% less than 75 microns;

- final homogenisation;
- packaging in 10g units sealed under nitrogen, in laminated foil pouches.

ANALYTICAL PROGRAM

Twenty eight commercial analytical laboratories participated in the program to characterise the analytes reported in Table 1. The following methods were employed for method specific certification:

- Four acid (HCl-HNO_3-HF-$HClO_4$) digestion with ICP-OES, ICP-MS or AAS finish (21 laboratories);
- Aqua regia digestion with ICP-OES, ICP-MS or AAS finish (20 laboratories);
- Infrared combustion furnace for sulphur (19 laboratories);
- Borate or pyro-sulphate fusion with XRF (12 laboratories);
- Peroxide fusion with ICP-OES, ICP-MS or AAS finish (16 laboratories).

For the round robin program ten 300g test units were taken at predetermined intervals during the bagging stage, immediately following final homogenisation, and are considered representative of the entire batch. The six samples received by each laboratory were obtained by taking two 20g scoop splits from each of three separate 300g test units. This format enabled nested ANOVA treatment of the results to evaluate homogeneity, i.e. to ascertain whether between-unit variance is greater than within-unit variance. Table 1 presents the certified values together with their associated 1SD's, 95% confidence and tolerance limits and Table 2 shows indicative values. Table 3 provides performance gate intervals for the certified values of each analytical method group based on their pooled 1SD's. Tabulated results of all elements together with uncorrected means, medians, standard deviations, relative standard deviations and percent deviation of lab means from the corrected mean of means (PDM[3]) are presented in the detailed certification data for this CRM (**OREAS 933-DataPack.1.1.250703_141710.xlsx**).

Table 2. Indicative Values for OREAS 933

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
4-Acid Digestion								
Au	ppm	*< 0.1*	Ge	ppm	*0.33*	Sm	ppm	*4.35*
Ba	ppm	*60*	Hf	ppm	*1.92*	Ta	ppm	*0.73*
Cd	ppm	*1.15*	In	ppm	*8.23*	Tb	ppm	*0.48*
Ce	ppm	*52*	Lu	ppm	*0.22*	Te	ppm	*0.26*
Cs	ppm	*5.62*	Pr	ppm	*6.12*	Th	ppm	*10.0*
Er	ppm	*1.48*	Rb	ppm	*95*	Tl	ppm	*0.56*
Ga	ppm	*14.1*	Re	ppm	*< 0.005*	U	ppm	*2.11*
Gd	ppm	*3.30*	Sc	ppm	*8.12*	Yb	ppm	*1.46*
Aqua Regia Digestion								
Au	ppm	*0.027*	La	ppm	*18.1*	Tb	ppm	*0.32*
B	ppm	*70*	Li	ppm	*16.0*	Te	ppm	*0.25*
Be	ppm	*0.42*	Lu	ppm	*0.12*	Th	ppm	*10.2*
Cd	ppm	*1.21*	Nb	ppm	*0.41*	Tl	ppm	*0.11*
Ce	ppm	*33.1*	P	wt.%	*0.045*	U	ppm	*1.39*
Cs	ppm	*2.34*	Rb	ppm	*12.6*	V	ppm	*22.9*
Ge	ppm	*0.25*	Re	ppm	*0.001*	Y	ppm	*7.62*

Table 2 continued.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Aqua Regia Digestion continued								
Hf	ppm	*0.51*	Sc	ppm	*2.45*	Yb	ppm	*0.78*
Hg	ppm	*0.17*	Si	wt.%	*18.48*	Zr	ppm	*16.4*
In	ppm	*7.64*	Ta	ppm	*0.010*			
Infrared Combustion								
C	wt.%	*0.015*						
Borate Fusion XRF								
Al_2O_3	wt.%	*9.28*	MgO	wt.%	*2.01*	Sr	ppm	*12.0*
BaO	ppm	*354*	MnO	wt.%	*0.113*	TiO_2	wt.%	*0.383*
CaO	wt.%	*0.535*	Na_2O	wt.%	*0.197*	V_2O_5	ppm	*127*
Cr_2O_3	ppm	*107*	Ni	ppm	*8.00*	Zr	ppm	*90*
K_2O	wt.%	*1.81*	P_2O_5	wt.%	*0.097*			
LOI^{1000}	wt.%	*6.09*	Sn	ppm	*106*			
Thermogravimetry								
H_2O-	wt.%	*0.062*						
Peroxide Fusion ICP								
Al	wt.%	*5.04*	Ho	ppm	*0.66*	Sm	ppm	*4.70*
As	ppm	*11.8*	In	ppm	*9.79*	Sr	ppm	*27.7*
Ba	ppm	*243*	K	wt.%	*1.65*	Ta	ppm	*0.79*
Be	ppm	*< 5*	La	ppm	*27.3*	Tb	ppm	*0.61*
Ca	wt.%	*0.404*	Li	ppm	*20.6*	Th	ppm	*11.0*
Cd	ppm	*1.11*	Lu	ppm	*0.28*	Ti	wt.%	*0.256*
Ce	ppm	*59*	Mg	wt.%	*1.22*	Tl	ppm	*0.61*
Cr	ppm	*51*	Mn	wt.%	*0.087*	Tm	ppm	*0.29*
Cs	ppm	*5.70*	Mo	ppm	*1.79*	U	ppm	*2.42*
Dy	ppm	*3.55*	Nb	ppm	*9.13*	V	ppm	*60*
Er	ppm	*1.87*	Nd	ppm	*25.4*	W	ppm	*26.6*
Eu	ppm	*1.03*	Ni	ppm	*108*	Y	ppm	*16.2*
Ga	ppm	*15.8*	P	wt.%	*0.331*	Yb	ppm	*1.68*
Gd	ppm	*4.01*	Pr	ppm	*6.94*	Zr	ppm	*101*
Ge	ppm	*2.66*	Rb	ppm	*103*			
Hf	ppm	*3.11*	Sc	ppm	*8.52*			

STATISTICAL ANALYSIS

Certified Values, Standard Deviations, Confidence and Tolerance Limits have been determined for each analytical method following removal of individual and laboratory outliers (Table 1). Certified Values are the mean of means after outlier filtering. The 95% Confidence Limit is a measure of the reliability of the certified value, i.e. the narrower the Confidence Interval the greater the certainty in the Certified Value. It should not be used as a control limit for laboratory performance.

Standard Deviation values (1SDs) are reported in Table 1 and 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.

Performance Gates (Table 3) are 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.

A second method utilises a 5% window calculated directly from the certified value. Standard deviation is also shown in relative per cent 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.

Table 3. Performance Gates for OREAS 933

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											
Ag, ppm	31.0	4.6	21.7	40.3	17.1	44.9	14.95%	29.90%	44.85%	29.5	32.6
Al, wt.%	4.79	0.216	4.35	5.22	4.14	5.44	4.52%	9.03%	13.55%	4.55	5.03
As, ppm	9.61	0.912	7.78	11.43	6.87	12.34	9.50%	18.99%	28.49%	9.13	10.09
Be, ppm	< 2	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Bi, ppm	451	29	392	510	363	539	6.50%	13.00%	19.49%	428	474
Ca, wt.%	0.361	0.023	0.316	0.407	0.293	0.429	6.29%	12.58%	18.88%	0.343	0.379
Co, ppm	60	2.5	55	65	53	68	4.10%	8.21%	12.31%	57	63
Cr, ppm	45.6	3.91	37.8	53.4	33.9	57.4	8.58%	17.16%	25.74%	43.3	47.9
Cu, wt.%	8.37	0.250	7.87	8.87	7.62	9.12	2.98%	5.97%	8.95%	7.95	8.79
Fe, wt.%	17.72	1.217	15.29	20.16	14.08	21.37	6.86%	13.73%	20.59%	16.84	18.61
K, wt.%	1.49	0.101	1.29	1.69	1.19	1.80	6.78%	13.56%	20.34%	1.42	1.57
La, ppm	27.5	2.9	21.7	33.3	18.8	36.2	10.55%	21.10%	31.66%	26.1	28.8
Li, ppm	18.2	2.7	12.9	23.5	10.3	26.2	14.55%	29.11%	43.66%	17.3	19.1
Mg, wt.%	1.13	0.082	0.97	1.29	0.89	1.38	7.22%	14.44%	21.66%	1.07	1.19
Mn, wt.%	0.083	0.004	0.076	0.090	0.072	0.093	4.26%	8.52%	12.78%	0.079	0.087
Mo, ppm	< 2	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Na, wt.%	0.151	0.009	0.133	0.170	0.124	0.179	6.07%	12.13%	18.20%	0.144	0.159
Nb, ppm	8.10	0.695	6.71	9.49	6.02	10.19	8.58%	17.16%	25.75%	7.70	8.51

Table 3 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											
Ni, ppm	28.1	2.64	22.8	33.3	20.1	36.0	9.41%	18.82%	28.22%	26.7	29.5
P, wt.%	0.042	0.006	0.031	0.053	0.025	0.059	13.30%	26.59%	39.89%	0.040	0.044
Pb, ppm	189	13	164	214	151	226	6.64%	13.29%	19.93%	179	198
S, wt.%	8.43	1.27	5.90	10.96	4.63	12.23	15.02%	30.05%	45.07%	8.01	8.85
Sb, ppm	2.23	0.159	1.91	2.55	1.75	2.70	7.14%	14.28%	21.43%	2.12	2.34
Se, ppm	68	5.0	58	78	53	83	7.44%	14.88%	22.32%	64	71
Sn, ppm	73	9	55	91	46	101	12.49%	24.98%	37.47%	70	77
Sr, ppm	28.2	2.9	22.4	34.0	19.5	36.8	10.22%	20.44%	30.66%	26.8	29.6
Ti, wt.%	0.223	0.020	0.183	0.264	0.163	0.284	9.08%	18.16%	27.24%	0.212	0.235
V, ppm	64	6	51	76	45	83	10.00%	20.01%	30.01%	60	67
W, ppm	26.4	1.76	22.9	30.0	21.1	31.7	6.67%	13.34%	20.01%	25.1	27.8
Y, ppm	15.1	1.7	11.7	18.4	10.1	20.1	11.04%	22.08%	33.13%	14.3	15.8
Zn, ppm	602	36	530	675	494	711	6.00%	12.01%	18.01%	572	633
Zr, ppm	63	7	49	76	43	83	10.66%	21.33%	31.99%	60	66
Aqua Regia Digestion											
Ag, ppm	29.6	5.1	19.5	39.8	14.4	44.8	17.13%	34.26%	51.39%	28.1	31.1
Al, wt.%	2.16	0.176	1.81	2.51	1.63	2.69	8.13%	16.27%	24.40%	2.05	2.27
As, ppm	9.61	1.28	7.06	12.17	5.78	13.45	13.30%	26.60%	39.90%	9.13	10.09
Ba, ppm	32.9	2.11	28.6	37.1	26.5	39.2	6.42%	12.83%	19.25%	31.2	34.5
Bi, ppm	449	42	366	533	324	574	9.28%	18.57%	27.85%	427	472
Ca, wt.%	0.286	0.010	0.266	0.307	0.256	0.317	3.57%	7.15%	10.72%	0.272	0.301
Co, ppm	61	7	46	76	38	83	12.31%	24.63%	36.94%	58	64
Cr, ppm	26.0	3.1	19.8	32.3	16.6	35.4	12.03%	24.06%	36.09%	24.7	27.3
Cu, wt.%	8.27	0.271	7.73	8.81	7.46	9.08	3.27%	6.55%	9.82%	7.86	8.68
Fe, wt.%	17.48	1.270	14.94	20.02	13.67	21.29	7.27%	14.54%	21.80%	16.60	18.35
Ga, ppm	6.87	1.12	4.63	9.11	3.51	10.23	16.31%	32.61%	48.92%	6.53	7.21
K, wt.%	0.199	0.019	0.161	0.236	0.142	0.255	9.44%	18.88%	28.32%	0.189	0.209
Mg, wt.%	1.05	0.12	0.81	1.28	0.69	1.40	11.28%	22.56%	33.85%	0.99	1.10
Mn, wt.%	0.077	0.004	0.069	0.086	0.065	0.090	5.37%	10.74%	16.11%	0.073	0.081
Mo, ppm	< 2	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Na, wt.%	< 0.03	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Ni, ppm	28.1	3.8	20.6	35.7	16.8	39.5	13.43%	26.87%	40.30%	26.7	29.5

Table 3 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
Aqua Regia Digestion continued											
Pb, ppm	187	17	153	220	137	237	8.92%	17.83%	26.75%	177	196
S, wt.%	8.34	1.28	5.78	10.89	4.51	12.16	15.31%	30.61%	45.92%	7.92	8.75
Sb, ppm	< 2	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Se, ppm	66	10	46	87	36	97	15.46%	30.93%	46.39%	63	70
Sn, ppm	66	6.6	53	79	46	86	9.96%	19.93%	29.89%	63	70
Sr, ppm	15.4	1.27	12.8	17.9	11.6	19.2	8.29%	16.58%	24.87%	14.6	16.1
Ti, wt.%	0.045	0.008	0.029	0.062	0.020	0.070	18.45%	36.90%	55.35%	0.043	0.048
W, ppm	22.2	3.7	14.8	29.6	11.2	33.3	16.60%	33.19%	49.79%	21.1	23.3
Zn, ppm	596	47	502	689	456	736	7.84%	15.67%	23.51%	566	625
Infrared Combustion											
S, wt.%	9.63	0.351	8.93	10.34	8.58	10.69	3.65%	7.30%	10.95%	9.15	10.12
Borate Fusion XRF											
Co, ppm	< 100	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Cu, wt.%	8.38	0.272	7.84	8.92	7.56	9.19	3.24%	6.49%	9.73%	7.96	8.80
Fe_2O_3, wt.%	25.61	0.668	24.28	26.95	23.61	27.62	2.61%	5.21%	7.82%	24.33	26.89
Pb, ppm	210	35	140	280	105	315	16.69%	33.37%	50.06%	199	220
S, wt.%	9.79	0.179	9.43	10.15	9.25	10.33	1.83%	3.66%	5.49%	9.30	10.28
SiO_2, wt.%	42.60	0.427	41.75	43.46	41.32	43.88	1.00%	2.00%	3.01%	40.47	44.73
Zn, ppm	606	39	527	684	488	723	6.48%	12.96%	19.44%	575	636
Peroxide Fusion ICP											
Ag, ppm	29.3	4.3	20.6	38.0	16.3	42.3	14.80%	29.59%	44.39%	27.8	30.8
Bi, ppm	466	35	396	535	362	570	7.44%	14.89%	22.33%	442	489
Co, ppm	63	7	48	78	41	86	11.86%	23.72%	35.58%	60	66
Cu, wt.%	8.34	0.203	7.93	8.75	7.73	8.95	2.43%	4.86%	7.29%	7.92	8.76
Fe, wt.%	18.07	0.838	16.39	19.75	15.55	20.58	4.64%	9.28%	13.91%	17.17	18.97
Pb, ppm	197	7	183	212	176	219	3.64%	7.27%	10.91%	187	207
S, wt.%	9.76	0.337	9.09	10.43	8.75	10.77	3.45%	6.90%	10.35%	9.27	10.25
Sb, ppm	< 2.5	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
Se, ppm	79	3.7	72	87	68	90	4.70%	9.40%	14.10%	75	83
Si, wt.%	20.19	0.378	19.43	20.94	19.05	21.32	1.87%	3.74%	5.62%	19.18	21.20
Sn, ppm	86	10	66	105	56	115	11.43%	22.85%	34.28%	81	90
Zn, ppm	617	35	546	687	511	722	5.71%	11.42%	17.13%	586	647

Note: intervals may appear asymmetric due to rounding

Tolerance Limits (ISO Guide 3207) 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 copper 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 between 8.06 and 8.67 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 (ISO Guide 35).

The homogeneity of OREAS 933 has also been evaluated in an ANOVA study for all certified analytes. This study tests the null hypothesis that no statistically significant difference exists between the *between-unit variance* and the *within-unit variance* (i.e. p-values <0.05 indicate rejection of the null hypothesis). Of the 78 certified values, no failures were observed indicating no evidence to reject the null hypothesis.

Based on the statistical analysis of the results of the inter-laboratory certification program it can be concluded that OREAS 933 is fit-for-purpose as a certified reference material (see 'Intended Use' below).

PREPARER AND SUPPLIER OF THE REFERENCE MATERIAL

Reference material OREAS 933 has been prepared and certified by:

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

Tel: +613-9729 0333
Fax: +613-9729 8338
Web: www.ore.com.au
Email: info@ore.com.au

It has been packaged in 10g units sealed under nitrogen in laminated foil pouches.

PARTICIPATING LABORATORIES

1. Accurassay, Thunder Bay, Ontario, Canada
2. Acme (BV), Santiago, Chile
3. Acme (BV), Vancouver, BC, Canada
4. Actlabs, Ancaster, Ontario, Canada
5. Actlabs, Kamloops, BC, Canada
6. Actlabs, Thunder Bay, Ontario, Canada
7. ALS, Brisbane, QLD, Australia
8. ALS, Burnie, TAS, Australia
9. ALS, Vancouver, BC, Canada
10. Amdel (BV), Cardiff, NSW, Australia
11. Intertek Genalysis, Adelaide, SA, Australia
12. Intertek Genalysis, Johannesburg, South Africa
13. Intertek Genalysis, Perth, WA, Australia
14. Intertek Testing Services, Cupang, Muntinlupa, Philippines
15. Intertek Testing Services, Jakarta, Indonesia
16. Intertek Testing Services, Shunyi, Beijing, China
17. Labtium Oy, Saarenkylä, Rovaniemi, Finland
18. MINTEK Analytical Services, Randburg, South Africa
19. OMAC, Loughrea, Galway, Ireland
20. PT Geoservices Ltd, Cikarang, Jakarta Raya, Indonesia
21. SGS Canada Inc., Vancouver, BC, Canada
22. SGS Didipio , Makati City, Quirino, Philippines
23. SGS Geosol Laboratorios Ltda, Vespasiano, Minas Gerais, Brazil
24. SGS Lakefield Research Ltd, Lakefield, Ontario, Canada
25. SGS Nui Phao, Ba Dinh District, Ha Noi, Vietnam
26. SGS South Africa Pty Ltd, Booysens, Gauteng, South Africa
27. Shiva Analyticals Ltd, Bangalore North, Karnataka, India
28. Ultra Trace Pty Ltd (BV), Perth, WA, Australia

INTENDED USE

OREAS 933 is intended for the following uses:

- for the monitoring of laboratory performance in the analysis of geological samples for the analytes reported in Table 1;
- for the verification 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.

STABILITY AND STORAGE INSTRUCTIONS

OREAS 933 has been prepared from mineralised and altered carbonaceous siltstones and mudstones from the CSA mine located near the town of Cobar in central western New South Wales, Australia. To prolong its shelf life it has been packaged under nitrogen in robust foil laminate pouches. Under normal storage conditions it is considered to have long-term stability beyond 10 years.

INSTRUCTIONS FOR THE CORRECT USE OF THE REFERENCE MATERIAL

The certified values for OREAS 933 refer to the concentration level in its packaged state. It should not be dried prior to weighing and analysis.

HANDLING INSTRUCTIONS

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

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
1	4th July, 2025	Revision of selected certified values for silver and some trace elements.
0	8th April, 2014	First publication.

CERTIFYING OFFICER

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

REFERENCES

ISO Guide 3207 (1975), Statistical interpretation of data - Determination of a statistical tolerance interval.

ISO Guide 35 (2006), Certification of reference materials - General and statistical principals.