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CERTIFICATE OF ANALYSIS FOR

MAGMATIC MASSIVE SULPHIDE ORE REFERENCE MATERIAL OREAS 14P

SUMMARY STATISTICS

Recommended value and 95% confidence interval

Constituent	Recommended value	95% Confidence Interval	
		Low	High
Copper, Cu (%)	0.997	0.979	1.015
Gold, Au (ppb)	51	50	52
Nickel, Ni (%)	2.09	2.04	2.14
Palladium, Pd (ppb)	150	147	153
Platinum, Pt (ppb)	99	96	102

Prepared by:
Ore Research & Exploration Pty Ltd
November 2003

INTRODUCTION

OREAS certified reference materials (CRMs) are intended to provide a low cost method of evaluating and improving the quality of precious and base metal analysis of geological samples. To the analyst they provide an effective means of calibrating analytical equipment, assessing new techniques and routinely monitoring in-house procedures. 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.

As a rule only source materials exhibiting a high level of homogeneity of the element(s) of interest are used in the preparation of these materials. This has enabled Ore Research & Exploration to produce a range of CRMs exhibiting homogeneity that matches or exceeds that of currently available international reference materials. In certain instances CRMs produced from a single source are sufficiently homogeneous to produce a relatively coarse-grained form designed to simulate drill chip samples. These have a grain size of minus 3mm and are designated with a "C" suffix to the CRM identification number. These standards are packaged in 1kg units following homogenisation and are intended for submission to analytical laboratories in subsample sizes of as little as 250g. They offer the added advantages of providing a check on both sample preparation and analytical procedures while acting as a blind standard to the assay laboratory. The more conventional pulped standards have a grain size of minus 20 to minus 75 microns and a higher degree of homogeneity. These standards are distinguished by a "P" suffix to the standard identification number. In line with ISO recommendations successive batch numbers are now designated by the lower case suffixes "a", "b", "c", "d", etc.

SOURCE MATERIAL

Reference material OREAS 14P is one of two Ni-Cu-Pt-Pd-Au CRMs prepared from RC drill samples from the West Musgrave region of Western Australia. The samples from which both CRMs were derived were obtained from a mafic magma conduit within granulite country rock south of the Giles Complex in the Musgrave Block. OREAS 14P is a magmatic massive sulphide with ore grade concentrations of nickel and copper while its counterpart, OREAS 13P, is a mineralised leuco gabbronorite containing disseminated Fe-Ni-Cu sulphides.

COMMINUTION AND HOMOGENISATION PROCEDURES

The material constituting OREAS 14P was prepared in the following manner:

a) drying to constant mass at 65^0 C;
b) crushing;
c) milling to minus 25 microns;
d) homogenisation;
e) packaging into 100g lots sealed under N_2 in laminated foil pouches.

ANALYSIS OF OREAS 14P

Fifteen analytical laboratories participated in the analytical program. Their results together with uncorrected means, medians, one sigma standard deviations, relative standard deviations and percent deviation of lab means from the corrected mean of means (PDM^3) are presented in an appendix (Tables A2 to A30). The analytical methods employed by each laboratory are indicated as codes at the head of each laboratory data set and explained in Table A1 (Appendix).

The intent of the certification program was to obtain total concentration values for the elements of interest hence four acid (including HF) digest, borate or alkali fusion methods were employed for the lithophile elements and base metals in combination with an ICP-OES, ICP-MS or AAS reading method. Chromium and zirconium were both under-reported by 4 acid digest compared to fusion methods, presumably due to the presence of refractory host phases and/or volatilisation during digestion, and method dependent values are therefore provided for these elements. Sulphur was determined by 4 acid digest / ICP-OES (22.6% S) and Leco furnace (23.8% S) and although agreement between the two methods is reasonable the Leco value is considered more reliable at these concentrations as corroborated by the narrower confidence interval (Table 1).
For gold and the platinum group elements (PGEs) lead fire assay was used for gold, platinum and palladium and nickel sulphide fire assay for the six PGEs and gold with ICP-MS as the reading method. No statistical bias was observed between either method for platinum and palladium and results were therefore combined for treatment, while for gold under-reporting was evident to varying degrees for nickel sulphide collection and these results have been discarded. Gold, together with Ca, Cr, Co, Fe, Sc and Na, have been determined by instrumental neutron activation analysis (INAA) on a reduced analytical subsample of 0.5g to confirm homogeneity.

Samples used for the round robin evaluation were taken at regular intervals throughout the packaging of the standard and then laboratory sample sets were taken from these in a sequence designed to maximise their representation. The twenty INAA subsamples, on which much of the homogeneity evaluation is based, were also taken at regular intervals during packaging and are considered representative of the entire batch.

STATISTICAL EVALUATION OF ANALYTICAL DATA FOR OREAS 14P

Recommended Value and Confidence Limits

The certified value is the mean of means of accepted replicate values of accepted participating laboratories computed according to the formulae

$$\bar{x}_i = \frac{1}{n_i} \sum_{j=1}^{n_i} x_{ij}$$

$$\ddot{x} = \frac{1}{p} \sum_{i=1}^{p} \bar{x}_i$$

where

x_{ij} *is the jth result reported by laboratory i;*
p is the number of participating laboratories;
n_i *is the number of results reported by laboratory i;*
$\bar{x}_i$ *is the mean for laboratory i;*
$\ddot{x}$ *is the mean of means.*

The confidence limits were obtained by calculation of the variance of the consensus value (mean of means) and reference to Student's-*t* distribution with degrees of freedom (*p*-1).

$$\hat{V}(\ddot{x}) = \frac{1}{p(p-1)} \sum_{i=1}^{p} (\bar{x}_i - \ddot{x})^2$$

$$\text{Confidence limits} = \ddot{x} \pm t_{1-x/2}(p-1)(\hat{V}(\ddot{x}))^{1/2}$$

where $t_{1-x/2}(p-1)$ *is the 1-x/2 fractile of the t-distribution with (p-1) degrees of freedom.*

The distribution of the values are assumed to be symmetrical about the mean in the calculation of the confidence limits.

The test for rejection of individual outliers from each laboratory data set was based on *z* scores (rejected if $|z_i| > 2.5$) computed from the robust estimators of location and scale, *T* and *S*, respectively, according to the formulae

$$S = 1.483 \underset{j=1.....n}{\text{median}} / x_j - \underset{i=1.....n}{\text{median}} (x_i) /$$

$$z_i = \frac{x_i - T}{S}$$

where

T is the median value in a data set;
S is the median of all absolute deviations from the sample median multiplied by 1.483, a correction factor to make the estimator consistent with the usual parameter of a normal distribution.

Individual outliers and, more rarely, laboratory means deemed to be outlying are shown in bold in the tabulated results (Appendix) and have been omitted in the determination of recommended values.

The magnitude of the confidence interval is inversely proportional to the number of participating laboratories and interlaboratory agreement. It is a measure of the reliability of the recommended value, i.e. the narrower the confidence interval the greater the certainty in the recommended value.

Table 1. Recommended values and 95% confidence intervals for OREAS 14P

Constituent	Recommended value	95% Confidence Interval	
		Low	High
Aluminium, Al (percent)	2.26	2.15	2.37
Arsenic, As (ppm)	<5	IND	IND
Barium, Ba (ppm)	343	322	364
Calcium, Ca (percent)	0.99	0.95	1.03
Chromium, Cr (ppm)*	52	46	59
Chromium, Cr (ppm)**	45	43	46
Cobalt, Co (ppm)	754	739	769
Copper, Cu (percent)	0.997	0.979	1.015
Gold, Au (ppb)	51	50	52
Iridium, Ir (ppb)	46	44	48
Iron, Fe (percent)	37.1	36.1	38.1
Lead, Pb (ppm)	<20	IND	IND
Magnesium, Mg (percent)	0.28	0.26	0.30
Manganese, Mn (ppm)	595	569	620
Nickel, Ni (percent)	2.09	2.04	2.14
Osmium, Os (ppb)	70	54	86
Palladium, Pd (ppb)	150	147	153
Phosphorus, P (ppm)	550	510	580
Platinum, Pt (ppb)	99	96	102
Potassium, K (percent)	0.87	0.84	0.90
Rhodium, Rh (ppb)	60	53	67
Ruthenium, Ru (ppb)	108	102	114
Scandium, Sc (ppm)	5.5	4.6	6.5
Sodium, Na (percent)	0.58	0.55	0.61
Strontium, Sr (ppm)	87	83	91
Sulphur, S (percent): ICP	22.8	21.7	23.9
Sulphur, S (percent): Leco	23.8	23.5	24.2
Titanium, Ti (ppm)	2473	2401	2545
Vanadium, V (ppm)	67	65	69
Zinc, Zn (ppm)	81	74	88
Zirconium, Zr (ppm)*	189	174	204
Zirconium, Zr (ppm)**	44	31	57

*Analysis by fusion; **analysis by 4-acid digest; IND - indeterminate

Statement of Homogeneity

The standard deviation of each laboratory data set includes error due to both the imprecision of the analytical method employed and to possible inhomogeneity of the material analysed. The standard deviation of the pooled individual analyses of all participating laboratories includes error due to the imprecision of each analytical method, to possible inhomogeneity of the material analysed and, in particular, to deficiencies in accuracy of each analytical method. In determining tolerance intervals for elements other than gold that component of error attributable to measurement inaccuracy was eliminated by transformation of the individual results of each data set to a common mean (the uncorrected grand mean) according to the formula

$$x'_{ij} = x_{ij} - \bar{x}_i + \frac{\sum_{i=1}^{p}\sum_{j=1}^{n_i} x_{ij}}{\sum_{i=1}^{p} n_i}$$

where

x_{ij} *is the jth raw result reported by laboratory i*;

x'_{ij} *is the jth transformed result reported by laboratory i*;

n_i *is the number of results reported by laboratory i*;

p *is the number of participating laboratories*;

$\bar{x}_i$ *is the raw mean for laboratory i.*

Table 2. Recommended values and tolerance limits for OREAS 14P.

Constituent	Recommended value	Tolerance limits 1-α= 0.99, ρ= 0.95	
		Low	High
Aluminium, Al (percent)	2.26	2.23	2.29
Arsenic, As (ppm)	<5	IND	IND
Barium, Ba (ppm)	343	335	351
Calcium, Ca (percent)	0.99	0.97	1.01
Chromium, Cr (ppm)*	52	49	55
Chromium, Cr (ppm)**	45	42	48
Cobalt, Co (ppm)	754	742	766
Copper, Cu (percent)	0.997	0.990	1.004
Gold, Au (ppb)	51	48	54
Iridium, Ir (ppb)	46	IND	IND
Iron, Fe (percent)	37.1	36.8	37.4
Lead, Pb (ppm)	<20	IND	IND
Magnesium, Mg (percent)	0.28	0.27	0.29
Manganese, Mn (ppm)	595	584	605
Nickel, Ni (percent)	2.09	2.07	2.11
Osmium, Os (ppb)	70	IND	IND
Palladium, Pd (ppb)	150	146	154
Phosphorus, P (ppm)	550	530	560
Platinum, Pt (ppb)	99	94	104
Potassium, K (percent)	0.87	0.85	0.89
Rhodium, Rh (ppb)	60	IND	IND
Ruthenium, Ru (ppb)	108	IND	IND
Scandium, Sc (ppm)	5.5	5.4	5.6
Sodium, Na (percent)	0.58	0.57	0.59
Strontium, Sr (ppm)	87	85	88
Sulphur, S (percent): ICP	22.8	22.5	23.1
Sulphur, S (percent): Leco	23.8	23.5	24.1
Titanium, Ti (ppm)	2473	2417	2528
Vanadium, V (ppm)	67	64	69
Zinc, Zn (ppm)	81	78	85
Zirconium, Zr (ppm)*	189	184	194
Zirconium, Zr (ppm)**	44	39	49

*Analysis by fusion; **analysis by 4-acid digest; IND - indeterminate

The homogeneity of each constituent was determined from tables of factors for two-sided tolerance limits for normal distributions (ISO 3207) in which

$$\text{Lower limit is } \ddot{x} - k_2'(n, p, 1-\alpha)s_g''$$
$$\text{Upper limit is } \ddot{x} + k_2'(n, p, 1-\alpha)s_g''$$

where

n *is the number of results*;
$1-\alpha$ *is the confidence level*;
p *is the proportion of results expected within the tolerance limits*;
k_2' *is the factor for two-sided tolerance limits* (m, α *unknown*);
s_g'' *is the corrected grand standard deviation.*

The meaning of these tolerance limits may be illustrated for copper, where 99% of the time at least 95% of subsamples will have concentrations lying between 0.99 and 1.01%. 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 (IS0 Guide 35).

The corrected grand standard deviation, s_g'', used to compute the tolerance intervals is the weighted means of standard deviations of all data sets for a particular constituent according to the formula

$$s_g'' = \frac{\sum_{i=1}^{p}(s_i(1 - \frac{s_i}{s_g'}))}{\sum_{i=1}^{p}(1 - \frac{s_i}{s_g'})}$$

where

$1 - (\frac{s_i}{2s_g'})$ *is the weighting factor for laboratory i ;*

s_g' *is the grand standard deviation computed from the transformed (i.e. means - adjusted) results*

according to the formula

$$s_g' = \left[\frac{\sum_{i=j}^{p}\sum_{j=i}^{n_i}(x_{ij}' - \bar{x}_i')^2}{\sum_{i=1}^{p} n_i - 1}\right]^{1/2}$$

where $\bar{x}_i'$ *is the transformed mean for laboratory i*

The weighting factors were applied to compensate for the considerable variation in analytical precision amongst participating laboratories. Hence, weighting factors for each data set have been constructed so as to be inversely proportional to the standard deviation

of that data set. A weighting factor of zero was applied to those data sets where $s_l / 2s_g' > 1$ (i.e. where the weighting factor 1- $s_l / 2s_g' < 0$). It should be noted that estimates of tolerance by this method are considered conservative as a significant proportion of the observed variance, even in those laboratories exhibiting the best analytical precision, can presumably be attributed to measurement error.

For gold a more simplified procedure was used in the determination of homogeneity. This entailed using the high precision INAA data alone, obtained on an analytical subsample weight of 0.5g (compared to 40-50g for the fire assay method). By employing a sufficiently reduced subsample weight in a series of determinations by the same method, analytical error becomes negligible in comparison to subsampling error. The corresponding standard deviation at a 50g subsample weight can then be determined from the observed standard deviation of the 0.5g data using the known relationship between the two parameters (Kleeman, 1967). The homogeneity of gold was then determined from tables of factors for two-sided tolerance limits for normal distributions. The high level of repeatability indicated by the low standard deviations in the laboratory data sets in Table A9 (particularly the 0.5 g INAA data) is consistent with the narrow calculated tolerance interval and is confirmation of the excellent homogeneity of gold in OREAS 14P.

For elements other than gold, outliers were removed prior to the calculation of tolerance intervals and a weighting factor of zero was applied to those data sets where $s_l / 2s_g' > 1$ (i.e. where the weighting factor 1- $s_l / 2s_g' < 0$).

Performance Gates

Performance gates provide an indication of a level of performance that might reasonably be expected from a routine laboratory being monitored by this standard in a QA/QC program. They incorporate errors attributable to bias, precision and inhomogeneity and are simply calculated from the standard deviation of the pooled individual analyses (fire assay data only) generated from the certification program. All individual and lab dataset (batch) outliers are removed prior to determination of the standard deviation. 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.

Performance gates have been calculated for one, two and three standard deviations of the accepted pool of certification data and are presented in Table 3. As a guide these intervals may be regarded as informational (1σ), warning or rejection for multiple outliers (2σ), or rejection for individual outliers (3σ) in QC monitoring although their precise application should be at the discretion of the QC manager concerned.

PARTICIPATING LABORATORIES

Anglo Analytical Research Laboratories, Johannesburg, South Africa
Acme Analytical Laboratories, Vancouver, BC, Canada
Activation Laboratories, Ancaster, ON, Canada
Actlabs Pacific, Redcliffe, WA, Australia
ALS Chemex, Stafford, QLD, Australia
ALS Chemex, Vancouver, BC, Canada
Amdel Laboratories, Thebarton, SA, Australia
Becquerel Laboratories, Lucas Heights, NSW, Australia
Genalysis Laboratory Services, Maddington, WA, Australia
Geolaboratory, Geological Survey of Finland, Espoo, Finland
OMAC Laboratories, Loughrea, Co. Galway, Ireland

SGS Lakefield, Lakefield, ON, Canada
Falconbridge Ltd. (Sudbury Div.), Falconbridge, ON, Canada
Ultra Trace Laboratories, Canning Vale, WA, Australia
XRAL Laboratories, Toronto, ON, Canada

Table 3. Proposed performance gates for OREAS 14P

Constituent	Recommended Value	Performance Gates					
		1σ		2σ		3σ	
		Low	High	Low	High	Low	High
Aluminium, Al (wt. %)	2.26	2.12	2.40	1.97	2.55	1.83	2.69
Arsenic, As (ppm)	<5	IND	IND	IND	IND	IND	IND
Barium, Ba (ppm)	343	304	382	265	421	226	460
Calcium, Ca (wt. %)	0.99	0.92	1.06	0.86	1.12	0.79	1.19
Chromium, Cr (ppm)*	52	47	57	43	61	38	66
Chromium, Cr (ppm)**	45	43	47	40	50	38	52
Cobalt, Co (ppm)	754	735	773	716	792	697	811
Copper, Cu (percent)	0.997	0.97	1.02	0.94	1.05	0.92	1.08
Gold, Au (ppb)	51	45	57	39	63	33	69
Iridium, Ir (ppb)	46	43	49	40	52	38	54
Iron, Fe (wt. %)	37.1	35.5	38.7	34.0	40.2	32.4	41.8
Lead, Pb (ppm)	<20	IND	IND	IND	IND	IND	IND
Magnesium, Mg (wt. %)	0.28	0.25	0.31	0.22	0.34	0.19	0.37
Manganese, Mn (ppm)	595	564	626	533	657	502	688
Nickel, Ni (percent)	2.09	2.02	2.16	1.94	2.24	1.87	2.31
Osmium, Os (ppb)	70	53	87	36	104	19	121
Palladium, Pd (ppb)	150	142	158	134	166	125	175
Phosphorus, P (ppm)	550	493	607	436	664	379	721
Platinum, Pt (ppb)	99	91	107	83	115	75	123
Potassium, K (wt. %)	0.87	0.82	0.92	0.78	0.96	0.73	1.01
Rhodium, Rh (ppb)	60	54	66	47	73	41	79
Ruthenium, Ru (ppb)	108	101	115	94	122	87	129
Scandium, Sc (ppm)	5.5	4.41	6.59	3.32	7.68	2.23	8.77
Sodium, Na (wt. %)	0.58	0.54	0.62	0.49	0.67	0.45	0.71
Strontium, Sr (ppm)	87	82	92	76	98	71	103
Sulphur, S (wt. %): ICP	22.8	22.0	23.6	21.1	24.5	20.3	25.3
Sulphur, S (wt. %): Leco	23.8	23.4	24.2	23.0	24.6	22.5	25.1
Titanium, Ti (ppm)	2473	2365	2581	2258	2688	2150	2796
Vanadium, V (ppm)	67	64	70	62	72	59	75
Zinc, Zn (ppm)	81	75	87	69	93	62	100
Zirconium, Zr (ppm)*	189	183	195	177	201	170	208
Zirconium, Zr (ppm)**	44	25	63	6	82	IND	IND

*Analysis by fusion; **analysis by 4-acid digest; IND – indeterminate

PREPARER AND SUPPLIER OF THE REFERENCE MATERIAL

The magmatic massive sulphide ore reference material, OREAS 14P has been prepared and certified and is supplied by:

Ore Research & Exploration Pty Ltd
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AUSTRALIA

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It is available in unit sizes of 10 and 100g laminated foil packets.

INTENDED USE

OREAS 14P is a reference material intended for the following:

i) for the calibration of instruments used in the determination of the concentration of Ni, Cu, Pt, Pd and Au;
ii) for the verification of analytical methods for Ni, Cu, Pt, Pd and Au;
iii) for the preparation of secondary reference materials of similar composition;
iv) as an arbitration sample for commercial transactions.

STABILITY AND STORAGE INSTRUCTIONS

OREAS 14P has been prepared from a magmatic massive sulphide sample and has been packaged under nitrogen in laminated foil pouches. The packaging film is an effective barrier to oxygen and moisture and the sealed CRM is considered to have long-term stability under normal storage conditions. Once opened the contents should be stored in a desiccator purged with nitrogen to inhibit oxidation.

INSTRUCTIONS FOR THE CORRECT USE OF THE REFERENCE MATERIAL

The recommended values for OREAS 14P refers to the concentration level of the certified element values in the packaged state at hygroscopic equilibrium. An equilibrium hygroscopic moisture content of 1.15% has been established for this material. If the reference material is dried by the user prior to analysis, the drying temperature should not exceed 65^0C and the recommended values should be corrected to the moisture-free basis.

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.

CERTIFYING OFFICER: Dr Paul Hamlyn

ACKNOWLEDGMENTS

The generosity of WMC Resources in providing the source material used to prepare OREAS 14P is gratefully acknowledged.

REFERENCES

ISO Guide 35 (1985), Certification of reference materials - General and statistical principals.
ISO Guide 3207 (1975), Statistical interpretation of data - Determination of a statistical tolerance interval.
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APPENDIX

Analytical Results for OREAS 14P

Table A1. Explanation of abbreviations used in Tables 2 – 30.

Abbreviation	Explanation
Std.Dev.	one sigma standard deviation
Rel.Std.Dev.	percent deviation of lab mean from corrected mean of means
PDM[3]	percent deviation of lab mean from corrected mean of means
-	outlying values shown in bold
AF	alkali fusion
BF	borate fusion
4AD	four acid (HF-HNO3 -HClO4 -HCl) digestion
MAR	modified aqua regia digest
AR	aqua regia digest
FA	lead fire assay
NiS	nickel sulphide fire assay
INAA	instrumental neutron activation analysis
OES	inductively coupled plasma optical emission spectrometry
MS	inductively coupled plasma mass spectrometry
AAS	atomic absorption spectrometry
HGAAS	hydride generation atomic absorption spectrometry
Leco	Leco infrared furnace

Table A2. Analytical results for aluminium in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in weight percent).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C1 4AD*OES	Lab C2 BF*OES	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G AF*OES
1	2.35	2.35	2.16	2.28	2.37	2.46	**1.82**	2.32
2	2.38	2.38	2.13	2.20	2.42	2.53	1.99	2.32
3	2.39	2.33	2.01	2.21	2.39	2.44	2.05	2.35
4	2.37	2.33	2.04	2.18	2.37	2.44	1.99	2.26
5	2.40	**2.44**	1.97	2.20	2.32	2.47	2.03	2.39
Mean	2.38	2.37	2.06	2.21	2.37	2.47	1.98	2.33
Median	2.38	2.35	2.04	2.20	2.37	2.46	1.99	2.32
Std.Dev.	0.02	0.05	0.08	0.04	0.04	0.04	0.09	0.05
Rel.Std.Dev.	0.81%	1.95%	3.90%	1.64%	1.54%	1.45%	4.60%	2.05%
PDM[3]	5.52%	4.99%	-8.50%	-1.76%	5.34%	9.56%	-12.32%	3.30%

Table A2. continued

Sample No.	Lab H AF*OES	Lab I 4AD*OES	Lab J 4AD*OES
1	2.36	1.87	2.28
2	2.38	1.90	2.28
3	2.36	**1.80**	2.28
4	2.35	1.88	2.28
5	2.40	1.87	
Mean	2.37	**1.86**	2.28
Median	2.36	1.87	2.28
Std.Dev.	0.02	0.04	0.00
Rel.Std.Dev.	0.87%	2.03%	0.00%
PDM[3]	5.15%	-17.3%	5.15%

Table A3. Analytical results for arsenic in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppm).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C 4AD*MS	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G AF*HGAAS	Lab H 4AD*OES
1	<5	5	4	<5	2.57	<5	<0.5	<3
2	<5	<5	4	<5	2.47	<5	<0.5	4.7
3	5	5	5	<5	3.14	<5	<0.5	<3
4	<5	5	4	<5	3.11	<5	<0.5	7.5
5	<5	<5	4	<5	2.63	<5	<0.5	<3
Mean	-	-	4	-	2.78	-	-	6.1
Median	-	-	4	-	2.63	-	-	6.1
Std.Dev.	-	-	0	-	0.32	-	-	2.0
Rel.Std.Dev.	-	-	10.65%	-	11.33%	-	-	32.90%
PDM[3]	-	-	-8.87%	-	-39.59%	-	-	31.49%

Table A3. continued

Sample No.	Lab I 4AD*OES
1	<5
2	<5
3	<5
4	<5
5	<5
Mean	-
Median	-
Std.Dev.	-
Rel.Std.Dev.	-
PDM[3]	-

Table A4. Analytical results for barium in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppm).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C1 4AD*MS	Lab C2 BF*OES	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G BF*OES
1	341	338	14	**316**	35	366	**60**	371
2	344	334	16	306	32	372	120	358
3	342	338	15	308	29	366	150	345
4	340	334	15	304	40	359	120	337
5	345	338	18	310	33	359	130	346
Mean	342	336	**16**	309	**34**	364	**116**	351
Median	342	338	15	308	33	366	120	346
Std.Dev.	2	2	2	5	4	5	34	13
Rel.Std.Dev.	0.61%	0.65%	9.72%	1.49%	12.1%	1.50%	29.0%	3.78%
PDM[3]	-0.20%	-1.95%	-95.5%	-10.00%	-90.1%	6.2%	-66.2%	2.42%

Table A4. continued

Sample No.	Lab H AF*ICP	Lab I 4AD*OES
1	358	**211**
2	363	246
3	358	244
4	352	239
5	354	229
Mean	357	234
Median	358	239
Std.Dev.	4	14
Rel.Std.Dev.	1.19%	6.13%
PDM[3]	4.05%	-31.9%

Table A5. Analytical results for calcium in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in weight percent).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C1 4AD*MS	Lab C2 BF*OES	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G AF*OES
1	0.99	1.05	**0.98**	0.96	1.01	1.16	0.90	1.03
2	1.01	1.06	0.93	0.93	1.03	1.11	0.88	1.01
3	1.01	1.04	0.91	0.94	1.02	1.10	0.89	0.99
4	1.00	1.04	0.92	0.92	1.01	1.06	0.88	0.98
5	1.01	**1.09**	0.94	0.93	0.99	1.06	0.87	1.00
Mean	1.00	1.06	0.94	0.93	1.01	1.10	0.88	1.00
Median	1.01	1.05	0.93	0.93	1.01	1.10	0.88	1.00
Std.Dev.	0.01	0.02	0.03	0.01	0.01	0.04	0.01	0.02
Rel.Std.Dev.	0.89%	1.96%	2.89%	1.47%	1.47%	3.96%	1.29%	1.92%
PDM[3]	2.14%	7.43%	-4.78%	-4.89%	2.95%	11.61%	-10.07%	1.94%

Table A5. continued

Sample No.	Lab H AF*OES	Lab I 4AD*OES	Lab J 4AD*OES
1	1.014	0.91	1.02
2	1.032	0.91	1.01
3	1.021	0.87	1.01
4	1.004	0.91	1.01
5	1.045	0.90	
Mean	1.02	0.90	1.01
Median	1.02	0.91	1.01
Std.Dev.	0.02	0.02	0.01
Rel.Std.Dev.	1.55%	1.92%	0.49%
PDM[3]	4.09%	-8.44%	2.72%

Table A6. Analytical results for chromium in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppm).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C 4AD*MS	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G AF*OES	Lab H AF*OES
1	44	50	48	46	**50**	43	54	49
2	**40**	50	46	45	**45**	43	57	51
3	44	45	44	43	47	44	51	46
4	44	45	44	47	47	43	52	51
5	44	45	43	44	47	45	56	48
Mean	43	47	45	45	47	44	54	49
Median	44	45	44	45	47	43	54	49
Std.Dev.	2	3	2	2	2	1	3	2
Rel.Std.Dev.	4.14%	5.83%	4.19%	3.51%	3.95%	2.05%	4.72%	4.36%
PDM[3]	-8.14%	-0.06%	-4.39%	-4.31%	0.25%	-7.29%	14.8%	4.75%

Table A6. continued

Sample No.	Lab I 4AD*OES	Lab K INAA
1	45	56
2	41	59
3	40	60
4	42	44
5	42	49
6		54
7		53
8		54
9		51
10		49
11		56
12		48
13		60
14		56
15		61
16		43
17		55
18		52
19		51
20		59
Mean	42	53
Median	42	54
Std.Dev.	2	5
Rel.Std.Dev.	4.45%	9.53%
PDM[3]	-10.7%	13.7%

Table A7. Analytical results for cobalt in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppm).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C 4AD*MS	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G AF*OES	Lab H MAR*OES
1	**728**	772	773	780	671	770	714	736
2	733	766	773	784	668	754	739	734
3	732	766	723	776	659	766	724	733
4	734	766	778	767	644	759	712	725
5	736	752	725	776	663	751	737	726
Mean	733	764	754	777	**661**	760	725	731
Median	733	766	773	776	663	759	724	733
Std.Dev.	3	7	28	6	10	8	13	5
Rel.Std.Dev.	0.40%	0.97%	3.69%	0.81%	1.58%	1.05%	1.73%	0.68%
PDM[3]	-2.42%	1.82%	0.49%	3.44%	-12.0%	1.23%	-3.40%	-2.66%

Table A7. continued

Sample No.	Lab I 4AD*OES	Lab J 4AD*OES	Lab K INAA
1	601	780	759.1
2	608	780	769.5
3	**581**	780	763.3
4	603	770	759.2
5	600		755.8
6			751.4
7			742.9
8			**734.7**
9			760.4
10			753.8
11			764.0
12			758.1
13			771.2
14			768.5
15			762.5
16			755.6
17			766.3
18			772.0
19			765.0
20			755.6
Mean	**599**	778	759.4
Median	601	780	759.8
Std.Dev.	10	5	9.3
Rel.Std.Dev.	1.72%	0.64%	1.22%
PDM[3]	-20.3%	3.16%	1.16%

Table A8. Analytical results for copper in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in weight percent).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C 4AD*OES	Lab D 4AD*AAS	Lab E 4AD*OES	Lab F1 4AD*OES	Lab F2 4AD*AAS	Lab G AR*OES
1	0.990	1.01	1.005	1.003	0.901	0.967	0.96	1.00
2	1.007	1.02	1.012	1.003	0.909	0.947	0.95	0.97
3	1.013	1.00	1.011	1.007	0.908	0.956	0.97	0.98
4	0.999	1.00	1.012	1.005	0.908	0.949	0.95	0.97
5	1.014	**1.05**	1.000	1.001	0.902	0.942	0.93	1.00
Mean	1.005	1.016	1.008	1.004	**0.906**	0.952	0.952	0.984
Median	1.007	1.010	1.011	1.003	0.908	0.949	0.950	0.980
Std.Dev.	0.010	0.021	0.005	0.002	0.004	0.010	0.015	0.015
Rel.Std.Dev.	1.01%	2.04%	0.53%	0.23%	0.42%	1.02%	1.56%	1.54%
PDM[3]	0.72%	1.86%	-5.26%	0.63%	-9.22%	-4.54%	-4.56%	-1.35%

Table A8. continued

Sample No.	Lab H MAR*OES	Lab I AR*AAS	Lab J 4AD*OES	Lab L 4AD*OES	Lab M AR*OES
1	1.020	1.02	1.00	1.03	0.988
2	1.018	1.01	0.99	1.03	0.994
3	1.027	1.04	1.00		0.990
4	1.030	1.04	0.99		
5	1.025	1.02			
Mean	1.024	1.026	0.995	1.030	0.991
Median	1.025	1.020	0.995	1.030	0.990
Std.Dev.	0.005	0.013	0.006	0.000	0.003
Rel.Std.Dev.	0.48%	1.31%	0.58%	0.00%	0.31%
PDM[3]	2.66%	2.86%	-0.23%	3.26%	-0.68%

Table A9. Analytical results for gold in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppb).

Sample No.	Lab A1 FA*MS (50g)	Lab A2 NiS*MS (50g)	Lab B1 FA*MS (40g)	Lab B2 NiS*MS (40g)	Lab C1 FA*MS (50g)	Lab C2 FA*MS (50g)	Lab D FA*MS (50g)	Lab F1 FA*MS (50g)
1	75	36	51	14	49	49	49	53
2	68	38	47	19	51	50	49	50
3	69		55	35	49		50	51
4	74		44		52		50	53
5	67		51		49		50	53
Mean	**70.6**	**37.0**	49.5	**17.0**	50.0	49.5	49.6	52.0
Median	69.0	37.0	50.5	19.0	49.0	49.5	50.0	53.0
Std.Dev.	3.6	1.4	4.1	11.0	1.4	0.7	0.5	1.4
Rel.Std.Dev.	5.17%	3.82%	8.31%	64.5%	2.83%	1.43%	1.10%	2.72%
PDM[3]	38.9%	-27.2%	-2.58%	-66.6%	-1.63%	-2.61%	-2.42%	2.31%

Table A9. continued

Sample No.	Lab F2 FA*MS (50g)	Lab G1 FA*AAS (50g)	Lab G2 FA*MS (50g)	Lab H FA*MS (50g)	Lab I FA*MS (50g)	Lab K INAA (0.5g)
1	54	53	52	55.0	63	55.2
2	50	53	55	53.4	68	39.5
3		50		51.1	60	49.6
4		47		**59.0**	62	47.9
5		50		54.0	**111**	49.7
6						57.5
7						49.4
8						56.3
9						45.4
10						30.9
11						50.5
12						66.2
13						33.1
14						48.9
15						41.1
16						52.8
17						36.1
18						51.6
19						40.4
20						61.7
Mean	52.0	50.6	53.5	54.5	**72.8**	48.2
Median	52.0	50.0	53.5	54.0	63.0	49.5
Std.Dev.	2.8	2.5	2.1	2.9	21.6	9.2
Rel.Std.Dev.	5.44%	4.96%	3.97%	5.31%	29.6%	19.2%
PDM[3]	2.31%	-0.45%	5.26%	7.22%	43.2%	-5.19%

Table A10. Analytical results for iridium via NiS*MS in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppb).

Sample No.	Lab A NiS*MS	Lab B NiS*MS	Lab E NiS*MS	Lab F NiS*MS	Lab G NiS*MS	Lab L NiS*MS	Lab M NiS*MS
1	48	45	45	46	45.4	40	49.0
2	48	48	42	45	**22.2**	40	50.9
3		52					44.8
Mean	48.0	48.3	43.5	45.5	33.8	**40.0**	48.2
Median	48.0	48.0	43.5	45.5	33.8	40.0	49.0
Std.Dev.	0.0	3.5	2.1	0.7	16.4	0.0	3.1
Rel.Std.Dev.	0.00%	7.27%	4.88%	1.55%	48.5%	0.00%	6.47%
PDM[3]	1.07%	1.77%	-6.44%	-2.14%	-28.8%	-15.8%	1.56%

Table A11. Analytical results for iron in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in weight percent).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C1 4AD*MS	Lab C2 BF*OES	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G AF*OES
1	36.90	39.3	**37.63**	38.27	36.45	37.3	>25.00	37.1
2	37.92	**39.9**	35.96	39.01	36.79	37.8	>25.00	37.2
3	**36.41**	39.2	34.60	38.63	36.27	37.5	>25.00	37.2
4	37.73	39.1	35.21	39.03	36.43	36.7	>25.00	37.4
5	38.04	39.3	34.61	38.85	36.30	36.2	>25.00	37.3
Mean	37.40	39.36	35.60	38.76	36.45	37.09	-	37.24
Median	37.73	39.30	35.21	38.85	36.43	37.25	-	37.20
Std.Dev.	0.71	0.31	1.26	0.32	0.21	0.64	-	0.11
Rel.Std.Dev.	1.90%	0.80%	3.55%	0.82%	0.57%	1.73%	-	0.31%
PDM[3]	0.42%	5.68%	-4.41%	4.07%	-2.13%	-0.42%	-	-0.01%

Table A11. continued

Sample No.	Lab H AF*OES	Lab I 4AD*OES	Lab J 4AD*OES	Lab K INAA
1	36.38	35.36	35.6	39.43
2	36.15	35.78	35.8	39.75
3	36.24	**33.86**	35.6	39.55
4	36.35	35.41	35.6	39.33
5	36.22	35.11		39.25
6				38.88
7				38.61
8				**38.13**
9				38.87
10				39.12
11				39.07
12				39.22
13				39.34
14				39.47
15				39.28
16				39.04
17				39.41
18				39.71
19				39.09
20				39.30
Mean	36.27	35.10	35.65	39.19
Median	36.24	35.36	35.60	39.27
Std.Dev.	0.10	0.74	0.10	0.38
Rel.Std.Dev.	0.26%	2.10%	0.28%	0.96%
PDM[3]	-2.62%	-5.74%	-3.90%	5.23%

Table A12. Analytical results for lead in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppm).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C 4AD*MS	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G 4AD*OES	Lab H 4AD*OES
1	<5	<5	16.8	13	18.3	<2	<20	11.4
2	<5	<5	16.8	11	18.5	<2	<20	11.1
3	<5	<5	16.5	15	18.9	<2	<20	10.1
4	<5	<5	16.4	11	18.1	<2	<20	**14.6**
5	<5	5	15.8	13	18.8	<2	<20	11.0
Mean	-	-	16.5	12.6	18.5	-	-	11.6
Median	-	-	16.5	13.0	18.5	-	-	11.1
Std.Dev.	-	-	0.4	1.7	0.3	-	-	1.7
Rel.Std.Dev.	-	-	2.49%	13.3%	1.80%	-	-	14.8%
PDM[3]	-	-	16.1%	-11.1%	31%	-	-	-17.9%

Table A12. continued

Sample No.	Lab I 4AD*OES
1	13
2	12
3	11
4	14
5	12
Mean	12.4
Median	12.0
Std.Dev.	1.1
Rel.Std.Dev.	9.19%
PDM[3]	-12.5%

Table A13. Analytical results for magnesium in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in weight percent).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C1 4AD*MS	Lab C2 BF*OES	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G AF*OES
1	0.32	0.30	0.25	0.25	0.30	0.287	0.24	0.30
2	0.32	0.30	0.24	0.25	0.30	0.304	0.24	0.30
3	0.32	0.30	0.22	0.25	0.30	0.300	0.25	0.28
4	0.32	0.30	0.24	0.24	0.30	0.289	0.24	0.28
5	0.31	0.31	0.22	0.24	0.29	0.299	0.25	0.30
Mean	0.318	0.302	0.234	0.245	0.298	0.296	0.244	0.292
Median	0.320	0.300	0.240	0.247	0.300	0.299	0.240	0.300
Std.Dev.	0.004	0.004	0.013	0.007	0.004	0.008	0.005	0.011
Rel.Std.Dev.	1.41%	1.48%	5.73%	2.81%	1.50%	2.54%	2.24%	3.75%
PDM[3]	14.8%	9.05%	-15.5%	-11.6%	7.61%	6.79%	-11.9%	5.44%

Table A13. continued

Sample No.	Lab H AF*OES	Lab I 4AD*OES	Lab J 4AD*OES
1	0.285	0.26	0.29
2	0.287	0.26	0.29
3	0.283	0.25	0.29
4	0.284	0.26	0.30
5	**0.302**	0.25	
Mean	0.288	0.256	0.293
Median	0.285	0.260	0.290
Std.Dev.	0.008	0.005	0.005
Rel.Std.Dev.	2.73%	2.14%	1.71%
PDM[3]	4.07%	-7.56%	5.08%

Table A14. Analytical results for manganese in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppm).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C 4AD*MS	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G 4AD*OES	Lab H AF*OES
1	568	605	625	608	**589**	550	639	610
2	578	615	613	605	568	535	663	610
3	579	605	588	606	574	545	625	610
4	575	620	610	605	566	540	607	610
5	581	628	580	**594**	563	535	645	620
Mean	576	615	603	604	572	541	636	612
Median	578	615	610	605	568	540	639	610
Std.Dev.	5	10	19	6	10	7	21	4
Rel.Std.Dev.	0.88%	1.61%	3.09%	0.91%	1.79%	1.21%	3.32%	0.73%
PDM[3]	-3.09%	3.37%	1.45%	1.52%	-3.79%	-9.01%	6.93%	2.93%

Table A14. continued

Sample No.	Lab I 4AD*OES
1	496
2	500
3	**480**
4	498
5	494
Mean	**494**
Median	496
Std.Dev.	8
Rel.Std.Dev.	1.61%
PDM[3]	-16.98%

Table A15. Analytical results for nickel in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in weight percent).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C1 4AD*MS	Lab C2 BF*OES	Lab D 4AD*AAS	Lab E 4AD*OES	Lab F 4AD*AAS	Lab G AR*OES
1	2.13	2.14	2.04	2.11	2.08	1.91	**2.08**	2.20
2	2.16	2.21	2.09	2.11	2.08	1.93	1.97	2.12
3	2.17	2.18	2.03	2.11	2.08	1.91	1.98	2.14
4	2.15	2.19	2.01	2.10	2.07	1.91	1.95	2.14
5	2.18	2.22	2.05	2.09	2.08	1.90	1.95	2.18
Mean	2.16	2.19	2.04	2.10	2.08	**1.91**	1.98	2.16
Median	2.16	2.19	2.04	2.11	2.08	1.91	1.97	2.14
Std.Dev.	0.02	0.03	0.03	0.01	0.00	0.01	0.06	0.03
Rel.Std.Dev.	0.84%	1.42%	1.45%	0.42%	0.20%	0.63%	2.79%	1.52%
PDM[3]	2.99%	4.37%	-2.48%	0.38%	-0.83%	-8.75%	-5.36%	2.84%

Table A15. continued

Sample No.	Lab H MAR*OES	Lab I 4AD*AAS	Lab J 4AD*OES	Lab L 4AD*OES	Lab M AR*OES
1	2.12	1.98	2.06	2.17	2.10
2	2.13	1.98	2.06	2.16	2.09
3	2.15	1.96	2.06		2.11
4	2.13	1.98	2.06		
5	2.11	1.99			
Mean	2.13	1.98	2.06	2.17	2.10
Median	2.13	1.98	2.06	2.17	2.10
Std.Dev.	0.02	0.01	0.00	0.01	0.01
Rel.Std.Dev.	0.76%	0.55%	0.00%	0.33%	0.48%
PDM[3]	1.43%	-5.65%	-1.59%	3.27%	0.17%

Table A16. Analytical results for osmium in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppb).

Sample No.	Lab A NiS*MS	Lab B NiS*MS	Lab C NiS*MS	Lab E NiS*MS	Lab F NiS*MS	Lab G NiS*MS
1	84	59	74	49.0	80	18
2	81	52	67	46.0	72	16
3		58				
Mean	82.5	56.3	70.5	47.5	76.0	**17.0**
Median	82.5	58.0	70.5	47.5	76.0	17.0
Std.Dev.	2.1	3.8	4.9	2.1	5.7	1.4
Rel.Std.Dev.	2.57%	6.72%	7.02%	4.47%	7.44%	8.32%
PDM[3]	11.16%	-24.10%	-5.01%	-32.20%	8.48%	-77.09%

Table A17. Analytical results for palladium in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppb).

Sample No.	Lab A1 FA*MS	Lab A2 NiS*MS	Lab B1 FA*MS	Lab B2 NiS*MS	Lab C1 FA*MS	Lab C2 FA*MS
1	146	154	130	135	149.1	147.3
2	151	153	128	144	159.2	144.2
3	148		150	151	153.7	
4	156		122		162.3	
5	154		141		154.1	
Mean	151	154	134	143	156	146
Median	151	154	130	144	154	146
Std.Dev.	4	1	11	8	5	2
Rel.Std.Dev.	2.73%	0.46%	8.29%	5.60%	3.31%	1.50%
PDM[3]	1.48%	3.16%	-9.73%	-3.67%	4.62%	-2.05%

Table A17. continued

Sample No.	Lab D FA*MS	Lab F1 FA*MS	Lab F2 FA*MS	Lab F3 NiS*MS	Lab G1 FA*AAS	Lab G2 NiS*MS	Lab G3 FA*AAS	Lab H FA*AAS
1	146	150	155	152	141	128	145	134
2	147	155	150	151	147	**70**	147	134
3	150	150			137			128
4	147	155			139			137
5	144	155			131			128
Mean	147	153	153	152	139	**99**	146	**132**
Median	147	155	153	152	139	99	146	134
Std.Dev.	2	3	4	1	6	41	1	4
Rel.Std.Dev.	1.48%	1.79%	2.32%	0.47%	4.19%	41.4%	0.97%	3.04%
PDM[3]	-1.34%	2.82%	2.49%	1.02%	-6.59%	-33.5%	-2.64%	-11.2%

Table A17. continued

Sample No.	Lab I FA*MS	Lab L NiS*MS	Lab M FA*OES	Lab N1 FA*MS	Lab N2 NiS*MS	Lab O FA*MS
1	142	160	148	151	185	159
2	159	160	157	153	175	107
3	143		146			
4	147					
5	155					
Mean	149	160	150	152	**180**	**133**
Median	147	160	148	152	180	133
Std.Dev.	7	0	6	1	7	37
Rel.Std.Dev.	5.02%	0.00%	3.90%	0.68%	3.93%	27.7%
PDM[3]	0.27%	7.53%	1.03%	1.28%	20.0%	-11.3%

Table A18. Analytical results for phosphorous in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppm).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C1 4AD*MS	Lab C2 BF*OES	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G 4AD*OES
1	0.06	0.056	0.055	0.052	0.061	0.049	0.061	0.05
2	0.06	0.054	0.054	0.052	0.063	0.050	0.059	0.05
3	0.06	0.052	0.050	**0.074**	0.062	0.048	0.059	0.05
4	0.06	0.056	0.050	0.052	0.062	**0.055**	0.060	0.05
5	0.06	0.060	0.050	0.052	**0.057**	0.048	0.059	0.04
Mean	0.060	0.056	0.052	0.057	0.061	0.050	0.060	0.048
Median	0.060	0.056	0.050	0.052	0.062	0.049	0.059	0.050
Std.Dev.	0.000	0.003	0.002	0.010	0.002	0.003	0.001	0.004
Rel.Std.Dev.	0.00%	5.34%	4.81%	17.20%	3.84%	5.85%	1.50%	9.32%
PDM[3]	9.77%	1.72%	-5.23%	3.81%	11.60%	-8.45%	9.04%	-12.18%

Table A18. continued

Sample No.	Lab H AF*OES	Lab I 4AD*OES
1	0.059	0.051
2	0.044	0.052
3	0.064	0.050
4	0.053	0.051
5	0.067	0.051
Mean	0.057	0.051
Median	0.059	0.051
Std.Dev.	0.009	0.001
Rel.Std.Dev.	16.00%	1.42%
PDM[3]	5.01%	-6.66%

Table A19. Analytical results for platinum in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppb).

Sample No.	Lab A1 FA*MS	Lab A2 NiS*MS	Lab B1 FA*MS	Lab B2 NiS*MS	Lab C1 FA*MS	Lab C2 FA*MS	Lab D FA*MS
1	98	96	90	87	97.1	100.1	102
2	98	92	90	94	101.4	96.9	102
3	101		97	97	98.0		104
4	96		85		101.1		103
5	101		97		100.7		101
Mean	98.8	94.0	91.8	92.7	99.7	98.5	102.4
Median	98.0	94.0	90.3	94.0	100.7	98.5	102.0
Std.Dev.	2.2	2.8	5.3	5.1	2.0	2.3	1.1
Rel.Std.Dev.	2.19%	3.01%	5.73%	5.54%	1.97%	2.30%	1.11%
PDM[3]	1.83%	-3.12%	-5.40%	-4.49%	2.72%	1.52%	5.54%

Table A19. continued

Sample No.	Lab F2 FA*MS	Lab F3 NiS*MS	Lab G1 FA*AAS	Lab G2 FA*MS	Lab G3 NiS*MS	Lab H FA*AAS	Lab I FA*MS	Lab L NiS*MS
1	103.5	106	101	97.4	95	93.0	95.3	90
2	99.5	102	112	100.0	**48**	101.0	106.6	90
3			106			93.2	96.9	
4			97			101.0	98.0	
5			98			96.3	104.4	
Mean	101.5	104.0	102.8	98.7	71.5	96.9	100.2	90.0
Median	101.5	104.0	101.0	98.7	71.5	96.3	98.0	90.0
Std.Dev.	2.8	2.8	6.2	1.8	33.2	4.0	5.0	0.0
Rel.Std.Dev.	2.79%	2.72%	6.05%	1.86%	46.5%	4.09%	4.95%	0.00%
PDM[3]	4.61%	5.48%	5.95%	1.73%	-26.3%	-0.13%	3.31%	-7.24%

Table A19. continued

Sample No.	Lab M NiS*MS	Lab N1 FA*MS	Lab N2 NiS*MS	Lab O FA*MS
1	92.8	103	138	143
2	100.0	109	155	78
3	86.0			
4				
5				
Mean	92.9	106.4	**146.5**	110.5
Median	92.8	106.4	146.5	110.5
Std.Dev.	7.0	4.2	12.0	46.0
Rel.Std.Dev.	7.53%	3.97%	8.21%	41.6%
PDM[3]	-4.22%	7.90%	48.6%	12.1%

Table A20. Analytical results for potassium in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in weight percent).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C1 4AD*MS	Lab C2 BF*OES	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G AF*OES
1	0.90	0.903	0.88	0.80	0.88	0.698	0.83	**0.87**
2	0.91	0.933	0.86	0.84	0.90	0.712	0.82	0.92
3	0.92	0.918	0.81	0.82	0.89	0.718	0.83	0.92
4	0.90	0.918	0.82	0.79	0.88	0.700	0.82	0.95
5	0.92	0.929	0.81	0.80	0.86	0.727	0.82	0.91
Mean	0.910	0.920	0.836	0.812	0.882	**0.711**	0.824	0.914
Median	0.910	0.918	0.820	0.805	0.880	0.712	0.820	0.920
Std.Dev.	0.010	0.012	0.032	0.019	0.015	0.012	0.005	0.029
Rel.Std.Dev.	1.10%	1.27%	3.84%	2.33%	1.68%	1.72%	0.66%	3.15%
PDM[3]	4.58%	5.75%	-3.92%	-6.73%	1.36%	-18.3%	-5.30%	5.04%

Table A20. continued

Sample No.	Lab H AF*OES	Lab I 4AD*OES	Lab J 4AD*OES
1	0.90	0.82	0.92
2	0.90	0.83	0.91
3	0.90	**0.78**	0.93
4	0.90	0.82	0.90
5	0.90	0.82	-
Mean	0.900	0.814	0.915
Median	0.900	0.820	0.915
Std.Dev.	0.000	0.019	0.013
Rel.Std.Dev.	0.00%	2.39%	1.41%
PDM[3]	3.43%	-6.45%	4.62%

Table A21. Analytical results for rhodium in West Musgrave standard OREAS 14P (abbreviations as in Table A1;outliers in bold; values in ppb).

Sample No.	Lab A NiS*MS	Lab B NiS*MS	Lab C FA*MS	Lab E NiS*MS	Lab F NiS*MS	Lab G NiS*MS	Lab L NiS*MS	Lab M NiS*MS
1	66	53	**13.6**	64.9	66	49	70	56.7
2	65	57	19.2	59.8	62	**28**	70	58.7
3		59	17.3					52.0
4			20.6					
5			19.5					
Mean	65.5	56.3	**18.0**	62.4	64.0	38.5	70.0	55.8
Median	65.5	57.0	19.2	62.4	64.0	38.5	70.0	56.7
Std.Dev.	0.7	3.1	2.7	3.6	2.8	14.8	0.0	3.4
Rel.Std.Dev.	1.08%	5.42%	15.2%	5.78%	4.42%	38.6%	0.00%	6.16%
PDM[3]	10.4%	-5.05%	-69.6%	3.2%	5.9%	-35.1%	18.0%	-5.94%

Table A22. Analytical results for ruthenium via NiS*MS in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppb).

Sample No.	Lab A NiS*MS	Lab B NiS*MS	Lab E NiS*MS	Lab F NiS*MS	Lab G NiS*MS	Lab L NiS*MS	Lab M NiS*MS
1	114	107	120.0	114	98	100	106.0
2	113	108	105.0	115	**55**	100	109.0
3		116					97.1
Mean	113.5	110.3	112.5	114.5	76.5	100.0	104.0
Median	113.5	108.0	112.5	114.5	76.5	100.0	106.0
Std.Dev.	0.7	4.9	10.6	0.7	30.4	0.0	6.2
Rel.Std.Dev.	0.62%	4.47%	9.43%	0.62%	39.7%	0.00%	5.95%
PDM[3]	7.92%	4.91%	4.60%	6.46%	-27.3%	-4.92%	-1.08%

Table A23. Analytical results for scandium in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppm).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C 4AD*MS	Lab D 4AD*OES	Lab E 4AD*OES	Lab G AF*OES	Lab H AF*OES	Lab I 4AD*MS
1	5	6.2	4	7	6.12	<5	<5	4
2	5	6.2	4	7	5.92	6	<5	4
3	5	6.2	4	7	5.47	5	<5	4
4	5	6.2	4	7	5.60	6	<5	4
5	5	6.4	4	7	5.44	<5	<5	4
Mean	5.0	6.2	4.0	7.0	5.7	5.7	-	4.0
Median	5.0	6.2	4.0	7.0	5.6	6.0	-	4.0
Std.Dev.	0.0	0.1	0.0	0.0	0.3	0.6	-	0.0
Rel.Std.Dev.	0.00%	1.43%	0.00%	0.00%	5.26%	10.2%	-	0.00%
PDM[3]	-9.75%	12.6%	-27.8%	26.4%	3.03%	2.28%	-	-27.8%

Table A23. continued

Sample No.	Lab K INAA
1	6.71
2	6.40
3	6.62
4	6.45
5	6.85
6	6.93
7	6.94
8	6.68
9	6.72
10	6.84
11	6.70
12	6.92
13	6.31
14	6.64
15	6.74
16	6.77
17	6.60
18	6.95
19	6.61
20	6.75
Mean	6.7
Median	6.7
Std.Dev.	0.2
Rel.Std.Dev.	2.66%
PDM[3]	21.1%

Table A24. Analytical results for sodium in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in weight percent).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C1 4AD*MS	Lab C2 BF*OES	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G 4AD*OES
1	0.57	0.65	0.562	0.53	0.61	0.547	0.57	0.60
2	0.58	0.65	0.550	0.50	0.62	0.565	0.55	0.63
3	0.59	0.64	0.521	0.52	0.61	0.565	0.56	0.61
4	0.58	0.64	0.544	0.51	0.60	0.553	0.55	0.60
5	0.59	0.67	0.521	0.52	0.59	0.574	0.55	0.62
Mean	0.582	0.650	0.540	0.516	0.606	0.561	0.556	0.612
Median	0.580	0.650	0.544	0.519	0.610	0.565	0.550	0.610
Std.Dev.	0.008	0.012	0.018	0.008	0.011	0.011	0.009	0.013
Rel.Std.Dev.	1.44%	1.88%	3.37%	1.64%	1.88%	1.88%	1.61%	2.13%
PDM[3]	0.92%	12.7%	-6.43%	-10.5%	5.08%	-2.76%	-3.59%	6.12%

Table A24. continued

Sample No.	Lab H AF*OES	Lab I 4AD*OES	Lab J 4AD*OES	Lab K INAA
1	0.61	0.50	0.63	0.618
2	0.61	0.51	0.63	0.603
3	0.61	0.48	0.63	0.599
4	0.61	0.50	0.64	0.611
5	0.62	0.50		0.606
6				0.614
7				0.604
8				0.622
9				0.617
10				0.611
11				0.620
12				0.617
13				0.595
14				0.616
15				0.598
16				0.614
17				0.611
18				0.624
19				0.601
20				0.621
Mean	0.612	0.498	0.633	0.611
Median	0.610	0.500	0.630	0.613
Std.Dev.	0.004	0.011	0.005	0.009
Rel.Std.Dev.	0.73%	2.20%	0.79%	1.43%
PDM[3]	6.12%	-13.6%	8.80%	5.96%

Table A25. Analytical results for strontium in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppm).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C1 4AD*MS	Lab C2 BF*MS	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G BF*MS
1	84	91	81	80.8	89	91.2	93	94.6
2	86	91	80	82.7	89	92.5	92	93.3
3	86	90	74	85.1	89	90.1	94	93.6
4	85	89	78	78.3	88	86.6	91	90.8
5	86	90	76	81.3	86	89.6	91	**98.5**
Mean	85.4	90.1	77.8	81.6	88.2	90.0	92.2	94.2
Median	86.0	90.0	78.0	81.3	89.0	90.1	92.0	93.6
Std.Dev.	0.9	0.7	2.9	2.5	1.3	2.2	1.3	2.8
Rel.Std.Dev.	1.05%	0.82%	3.68%	3.07%	1.48%	2.45%	1.41%	2.97%
PDM[3]	-1.49%	3.93%	-10.3%	-5.83%	1.73%	3.80%	6.35%	8.61%

Table A25. continued

Sample No.	Lab H AF*OES	Lab I 4AD*OES
1	81.8	72
2	81.6	74
3	82.2	70
4	81.7	73
5	82.0	73
Mean	81.9	**72.4**
Median	81.8	73.0
Std.Dev.	0.2	1.5
Rel.Std.Dev.	0.29%	2.09%
PDM[3]	-5.58%	-16.5%

Table A26A. Analytical results for acid digest sulphur in West Musgrave standard OREAS 14P (abbreviations as in Table A1; outliers in bold; values in weight percent).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C 4AD*MS	Lab D 4AD*OES	Lab H MAR*OES	Lab I 4AD*OES	Lab J 4AD*OES
1	21.50	21.9	14.51	22.88	23.62	**17.61**	**22.80**
2	21.43	21.8	17.27	23.16	23.52	16.40	23.30
3	**22.38**	22.2	16.93	23.10	23.73	16.03	23.50
4	21.55	22.2	16.14	23.24	23.82	16.18	23.50
5	21.59	22.4	14.47	23.03	23.78	**15.09**	
Mean	21.69	22.10	**15.86**	23.08	23.69	**16.26**	23.28
Median	21.55	22.20	16.14	23.10	23.73	16.18	23.40
Std.Dev.	0.39	0.24	1.32	0.14	0.12	0.90	0.33
Rel.Std.Dev.	1.80%	1.11%	8.32%	0.59%	0.52%	5.56%	1.42%
PDM[3]	-4.02%	-2.21%	-29.8%	2.14%	4.85%	-28.0%	2.24%

Table A26B. Analytical results for Leco sulphur in West Musgrave standard OREAS 14P (abbreviations as in Table A1; outliers in bold; values in weight percent).

Sample No.	Lab A Leco	Lab B Leco	Lab C Leco	Lab F Leco	Lab G Leco	Lab H Leco	Lab I Leco
1	23.9	24.3	23.70	24.1	24.1	20.99	**24.46**
2	24.0	23.7	23.90	23.3	23.5	21.20	24.68
3	24.1	24.4	24.10	23.7	22.7	**21.99**	24.79
4	24.1	23.6	24.05	24.3	23.2	21.41	24.84
5	24.1	23.4	23.90	23.9	23.1	21.34	24.84
Mean	24.04	23.88	23.93	23.86	23.32	**21.39**	**24.72**
Median	24.10	23.70	23.90	23.90	23.20	21.34	24.79
Std.Dev.	0.09	0.44	0.16	0.38	0.52	0.37	0.16
Rel.Std.Dev.	0.37%	1.86%	0.65%	1.61%	2.24%	1.75%	0.65%
PDM[3]	0.98%	0.31%	0.52%	0.23%	-2.04%	-10.2%	3.85%

Table A27. Analytical results for titanium in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppm).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C1 BF*OES	Lab C2 4AD*MS	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G AF*OES
1	2456	2600	2500	2520	2647	2476	2500	2400
2	2513	2600	2400	2500	2681	2414	2500	2500
3	2517	2600	2400	2320	2649	2385	2600	2400
4	2490	2600	2400	2470	2621	2385	2500	2400
5	2540	2700	2400	2330	2564	2356	2500	2500
Mean	2503	2620	2420	2428	2632	2403	2520	2440
Median	2513	2600	2400	2470	2647	2385	2500	2400
Std.Dev.	32	45	45	96	44	46	45	55
Rel.Std.Dev.	1.27%	1.71%	1.85%	3.94%	1.66%	1.90%	1.77%	2.24%
PDM[3]	1.24%	5.96%	-2.13%	-1.81%	6.46%	-2.82%	1.91%	-1.32%

Table A27. continued

Sample No.	Lab H AF*OES	Lab I 4AD*OES
1	2460	2300
2	2450	2400
3	2460	2200
4	2460	2300
5	2470	2300
Mean	2460	2300
Median	2460	2300
Std.Dev.	7	71
Rel.Std.Dev.	0.29%	3.07%
PDM[3]	-0.51%	-6.98%

Table A28. Analytical results for vanadium in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppm).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C1 4AD*MS	Lab C2 BF*MS	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G 4AD*MS
1	67	72	67	65	69	115	66	69
2	65	72	67	67	68	106	64	67
3	63	70	67	68	69	109	66	67
4	67	70	66	66	69	119	64	64
5	67	72	**63**	68	66	119	67	69
Mean	65.8	71.2	66.0	66.8	68.2	**113.5**	65.4	67.2
Median	67.0	72.0	67.0	67.0	69.0	115.0	66.0	67.0
Std.Dev.	1.8	1.1	1.7	1.3	1.3	5.9	1.3	2.0
Rel.Std.Dev.	2.72%	1.54%	2.62%	1.95%	1.91%	5.17%	2.05%	3.05%
PDM[3]	-1.36%	6.74%	-1.06%	0.14%	2.24%	70.1%	-1.96%	0.74%

Table A28. continued

Sample No.	Lab H AF*OES	Lab I 4AD*OES
1	62.1	56
2	62.1	57
3	62.1	54
4	62.2	57
5	63.0	56
Mean	62.3	**56.0**
Median	62.1	56.0
Std.Dev.	0.4	1.2
Rel.Std.Dev.	0.63%	2.19%
PDM[3]	-6.61%	-16.0%

Table A29. Analytical results for zinc in West Musgrave standard OREAS 14P (abbreviations as in Table 1; values in ppm).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C 4AD*MS	Lab D 4AD*OES	Lab E 4AD*OES	Lab F 4AD*OES	Lab G 4AD*OES	Lab H 4AD*OES	Lab I 4AD*OES
1	86	100	82	83	294	84	68.1	115	83
2	92	100	82	82	275	84	69.6	119	84
3	88	98	80	84	281	82	70.3	116	80
4	89	100	81	83	273	84	68.1	120	83
5	90	98	78	83	261	84	70.2	117	83
Mean	89.0	**99.2**	80.6	83.0	**276.7**	83.6	69.3	**117.4**	82.6
Median	89.0	100.0	81.0	83.0	274.8	84.0	69.6	117.0	83.0
Std.Dev.	2.2	1.1	1.7	0.7	12.0	0.9	1.1	2.1	1.5
Rel.Std.Dev.	2.51%	1.10%	2.08%	0.85%	4.34%	1.07%	1.58%	1.77%	1.84%
PDM[3]	9.41%	21.95%	-0.91%	2.04%	240%	2.77%	-14.9%	44.3%	1.54%

Table A30. Analytical results for zirconium in West Musgrave standard OREAS 14P (note: fusion methods report total Zr, acid digest methods are partial; abbreviations as in Table 1; values in ppm).

Sample No.	Lab A 4AD*OES	Lab B 4AD*OES	Lab C1 4AD*MS	Lab C2 BF*MS	Lab D 4AD*ICP	Lab E 4AD*ICP	Lab G BF*MS	Lab H AF*ICP	Lab I 4AD*MS
1	33	47	36	180	46	58	192	195	**88**
2	42	41	33	186	45	62	193	195	97
3	39	47	31	189	46	60	184	196	**122**
4	39	42	35	180	46	59	182	195	95
5	36	44	31	180	46	64	190	195	98
Mean	38	44	33	183	46	61	188	195	100
Median	39	44	33	180	46	60	190	195	97
Std.Dev.	3	3	2	4	0	3	5	0	13
Rel.Std.Dev.	9.05%	6.28%	7.11%	2.19%	0.98%	4.16%	2.61%	0.23%	12.9%
PDM[3]	-28.8%	-16.7%	-37.6%	244%	-13. 7%	14.5%	255%	268%	88.5%