

G-probe 16 Summary Report  
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A total of twenty nine labs submitted final results during this stage of the G-probe 16 study. Technique breakdown was, eighteen labs used LA-ICP-MS, four used SEM, and eight used EPMA. Two labs reported results using two techniques. The material BSWIR-1G used in this study was a glass version of a new USGS reference material called BSWIR-1. The material is a Mid-Ocean Ridge Basalt (MORB) collected along the south west Indian ridge which represents a divergent plate boundary marking the separation of the African plate (north) from the Antarctic plate (south).

Conversion of BSWIR-1 to a glass was accomplished at the USGS by melting 300 g of BSWIR-1 in a one liter platinum bowl at 1325° C over a period of six hours. At the end of the melting period the molten material was poured into a platinum boat and rapidly lowered into a water bath for quenching. Twenty grams of random fragments were selected, ground and then split into representative aliquots for bulk analysis testing. Samples were analyzed for their total element content using techniques at the USGS and SGS minerals, Canada. If you have any questions or comments about this study please forward them to me at your earliest convenience.

Below you will find summary results for each element studied in this test. In the element diagrams you will find information for each technique providing a value. Also included is the target value (◆) and calculated precision ( $X \pm Ha$ ) (♦) based on the Horowitz equation. A figure is also presented representing the data compilation for the entire study when more than one technique reported values. The study average is represented by ■, the standard deviation of the average by ■ and the maximum and minimum values by □. This study average is calculated primarily for the analysis of the major elements where multiple techniques provided data. For each technique an average value is presented (ex. LA-ICP-MS, ▲) as well as  $\pm$  one standard deviation (ex. LA-ICP-MS, ▲), and the maximum and minimum values reported (ex. LA-ICP-MS, Δ).

Table 1. Symbols used on figures 1 through 52

<u>Symbol type</u>		<u>Represents</u>
Large solid symbol,	●	Study or method average
Small solid symbol,	●	Study or method one standard deviation
Large open symbol,	○	Study or method Maximum or Minimum

Table 2. Summary results for GP-16, BSWIE-1G

Oxide	Xa %/m	Ha %/m	s.d.m. %/m	GP-16 AVG. %/m	MAX %/m	Min %/m
SiO2	50.16	1.11	1.92	50.10	52.97	42.49
TiO2	1.67	0.06	0.06	1.71	1.89	1.57
Al2O3	15.38	0.41	0.65	15.38	17.20	14.23
Fe2O3	10.52	0.30	0.67	10.27	12.23	9.29
FeO	9.47	0.27	0.85	9.48	11.50	8.73
MnO	0.18	0.01	0.02	0.18	0.23	0.14
MgO	7.90	0.23	0.36	8.03	9.70	7.05
CaO	10.67	0.30	0.28	10.71	11.31	10.06
Na2O	3.20	0.11	0.66	3.09	3.49	0.24
K2O	0.20	0.01	0.04	0.17	0.23	0.04
P2O5	0.17	0.01	0.04	0.17	0.25	0.08

Element	Xa mg/kg	Ha mg/kg	s.d.m. mg/kg	GP-16 AVG. mg/kg	MAX mg/kg	Min mg/kg
Ag	<1	-	0.11	0.39	0.71	0.31
As	<1	-	0.43	0.58	1.26	0.24
Au	<1	-	0.12	0.11	0.29	0.02
B	<10	-	2.93	9.47	12.68	5.31
Ba	38.9	3.6	5.0	33.4	38.4	10.7
Be	<5	-	0.41	0.79	1.89	0.49
Bi	<0.1	-	0.04	0.04	0.14	0.01
Br	<1	-	-	-	-	-
Cd	<0.2	-	0.10	0.20	0.39	0.05
Ce	16.3	1.713	1.13	17.04	18.38	13.29
Cl	0	0.000	4.24	83.09	86.09	80.09
Co	42.7	3.9	3.3	43.6	50.8	37.2
Cr	281	19.2	20.9	299.9	346.7	256.7
Cs	0.13	0.05	0.03	0.12	0.22	0.09
Cu	82.8	11.4	14.1	82.8	120.0	52.2
Dy	5.97	0.730	0.87	5.64	7.04	1.18
Er	3.53	0.47	0.23	3.55	4.31	3.18
Eu	1.56	0.233	0.08	1.45	1.65	1.27
F	<1	-	-	-	-	-
Ga	17	1.8	1.4	16.5	18.9	13.9
Gd	5.48	0.68	0.46	4.99	5.90	3.49
Ge	2	0.288	0.77	1.93	4.05	0.76
Hf	3.33	0.44	0.23	3.05	3.70	2.69
Hg	0	0.000	0.52	1.88	-	-
Ho	1.35	0.21	0.08	1.20	1.49	1.05
I	<1	-	-	-	-	-

Xa = Target value - USGS bulk analysis of glass fragments  
 Ha = Target precision calculated using modified version of Horowitz equation  
 for data quality 2 ( $Ha = 0.01Xa^{0.8495}$ )  
 s.d.m. = Standard deviation of population mean  
 mean = Mean element concentration for all techniques reporting  
 Max. = Maximum element/oxide concentration reported  
 Min. = Minimum element/oxide concentration reported

Element	Xa mg/kg	Ha mg/kg	s.d.m. mg/kg	GP-16 AVG. mg/kg	MAX mg/kg	Min mg/kg
In	<1	-	0.019	0.071	0.100	0.040
Ir	<1	-	0	0.1	0.1	0.1
La	6.37	0.77	0.34	6.39	7.18	5.77
Li	6.66	0.80	0.49	6.64	7.40	5.60
Lu	0.57	0.10	0.05	0.49	0.65	0.40
Mn	1410	75.73	499	1204	1662	2
Mo	<2	-	0.11	0.52	0.84	0.31
Nb	2.67	0.37	0.32	2.73	4.13	2.36
Nd	13.1	1.4	0.5	12.9	13.7	11.7
Ni	131.7	10.1	15.2	133.5	164.8	87.6
Os	<1	-	-	-	-	-
Pb	<5	-	0.42	1.94	3.87	1.43
Pd	<1	-	-	-	-	-
Pr	2.56	0.36	0.11	2.51	2.74	2.26
Pt	<1	-	-	-	-	-
Rb	3.07	0.41	0.41	2.77	4.14	2.25
Re	<1	-	-	-	-	-
Rh	<1	-	-	-	-	-
Ru	<1	-	-	-	-	-
S	<1	-	-	-	-	-
Sb	0.15	0.03	0.09	0.10	0.25	0.03
Sc	37.3	3.5	3.6	36.9	41.0	25.9
Se	0	0	-	25.92	25.92	25.92
Sm	4.13	0.53	0.21	4.02	4.40	3.46
Sn	3	0.41	1.89	2.16	7.68	0.69
Sr	159	11.9	21.0	151.6	170.2	43.9
Ta	<0.5	-	0.027	0.172	0.242	0.110
Tb	1.01	0.16	0.07	0.87	1.09	0.77
Te	<1	-	-	-	-	-
Th	0.3	0.06	0.03	0.23	0.32	0.16
Tl	<0.5	-	0.06	0.11	0.23	0.05
Tm	0.58	0.10	0.03	0.50	0.62	0.44
U	0.18	0.04	0.02	0.15	0.18	0.10
V	263.3	18.2	21.9	271.6	313.2	211.0
W	<1	-	0.061	0.072	0.200	0.025
Y	34.9	3.3	2.5	32.7	39.1	27.9
Yb	3.4	0.4	0.2	3.3	4.0	2.8
Zn	82.7	6.8	12.8	83.3	103.3	46.3
Zr	118.3	9.2	11.1	121.1	157.4	101.8





Table 3 cont.

Lab identifier		11A	11B		12A	12B		13A	13B		2A	2B		14A	14B
Data Quality		2	2		2	2		2	2		2	2		2	2
Elem/Cmpnd	units	EPMA	EPMA	units	EPMA	EPMA		LAICPMS	LAICPMS		LAICPMS	LAICPMS		LAICPMS	LAICPMS
SiO2	% m/m	49.6	49.4	% m/m	50.34	50.75								45.3	51.6
TiO2	% m/m	1.7	1.69	% m/m	1.71	1.74								1.87	1.89
Al2O3	% m/m	15.4	15.3	% m/m	16.07	16.48								17.2	16.8
Fe2O3T	% m/m	10.2	10.3	% m/m	10.21	10.37								10.3	10.2
Fe(II)O	% m/m			% m/m										11.5	11.4
MnO	% m/m	0.18	0.18	% m/m	0.14	0.23								0.18	0.18
MgO	% m/m	8.05	8.07	% m/m	8.25	8.28								8.2	9.7
CaO	% m/m	10.8	10.8	% m/m	11.16	11.31								10.8	10.8
Na2O	% m/m	3.28	3.29	% m/m	3.15	3.12								3.23	3.21
K2O	% m/m	0.19	0.19	% m/m	0.19	0.2								0.17	0.23
P2O5	% m/m	0.16	0.15	% m/m											
Ag	mg/kg			mg/kg							0.31	0.33		0.38	0.41
As	mg/kg			mg/kg							0.31	0.29			
Au	mg/kg			mg/kg							0.02	0.02			
B	mg/kg			mg/kg							7.11	7.52			
Ba	mg/kg			mg/kg				35.370	38.380		31.48	32.66		34.7	35.1
Be	mg/kg			mg/kg							0.60	0.49			
Bi	mg/kg			mg/kg				0.016	0.019		0.02	0.01		0.02	0.02
Br	mg/kg			mg/kg											
Cd	mg/kg			mg/kg				0.177	0.157		0.09	0.10			
Ce	mg/kg			mg/kg				17.769	18.210		16.16	17.02		17.6	17.4
Cl	mg/kg			mg/kg											
Co	mg/kg			mg/kg				45.890	47.250		39.30	42.51		44.5	44.7
Cr	mg/kg			mg/kg							256.71	279.32		291	294
Cs	mg/kg			mg/kg				0.129	0.134		0.10	0.11		0.12	0.09
Cu	mg/kg			mg/kg				80.530	85.600		72.75	74.99		76.4	77.5
Dy	mg/kg			mg/kg				6.233	6.050		5.58	5.45		6.3	6.0
Er	mg/kg			mg/kg				4.080	3.710		3.48	3.43		3.8	3.6
Eu	mg/kg			mg/kg				1.654	1.564		1.40	1.40		1.50	1.52
F	mg/kg			mg/kg											
Ga	mg/kg			mg/kg							14.11	15.28		18.0	18.1
Gd	mg/kg			mg/kg				5.197	5.102		5.09	4.99		5.3	5.2
Ge	mg/kg			mg/kg							1.34	1.42		2.3	2.2
Hf	mg/kg			mg/kg				3.110	3.020		2.89	2.79		3.3	3.3
Hg	mg/kg			mg/kg											
Ho	mg/kg			mg/kg				1.287	1.243		1.18	1.13		1.32	1.27
I	mg/kg			mg/kg											
In	mg/kg			mg/kg				0.061	0.078					0.09	0.06
Ir	mg/kg			mg/kg											
La	mg/kg			mg/kg				7.101	7.179		6.20	6.16		6.7	6.0
Li	mg/kg			mg/kg							5.60	6.13			
Lu	mg/kg			mg/kg				0.519	0.516		0.48	0.46		0.52	0.52
Mn	mg/kg			mg/kg							1545.01	1661.57		1423	1386
Mo	mg/kg			mg/kg				0.611	0.564		0.44	0.50		0.5	0.5
Nb	mg/kg			mg/kg				3.001	3.200		2.36	2.40		2.7	2.7
Nd	mg/kg			mg/kg				12.960	13.650		12.59	12.41		13.5	13.0
Ni	mg/kg			mg/kg				138.920	141.600		117.62	127.87		135	133
Os	mg/kg			mg/kg											
Pb	mg/kg			mg/kg				1.929	2.170		1.51	1.59		1.92	1.81
Pd	mg/kg			mg/kg											
Pr	mg/kg			mg/kg				2.607	2.701		2.41	2.44		2.6	2.6
Pt	mg/kg			mg/kg							0.42	0.44		0.51	0.51
Rb	mg/kg			mg/kg				2.822	3.017		2.25	2.45		2.5	2.6
Re	mg/kg			mg/kg											
Rh	mg/kg			mg/kg											
Ru	mg/kg			mg/kg											
S	mg/kg			mg/kg											
Sb	mg/kg			mg/kg				0.033	0.034		0.04	0.04			
Sc	mg/kg			mg/kg							36.55	35.78		41	41
Se	mg/kg			mg/kg											
Sm	mg/kg			mg/kg				4.371	4.187		3.95	3.86		4.2	4.3
Sn	mg/kg			mg/kg				1.999	1.964		7.51	7.68		1.52	1.33
Sr	mg/kg			mg/kg				169.680	170.200		149.52	149.03		163	159
Ta	mg/kg			mg/kg				0.216	0.202		0.15	0.15		0.18	0.17
Tb	mg/kg			mg/kg				0.911	0.895		0.83	0.81		0.94	0.88
Te	mg/kg			mg/kg											
Th	mg/kg			mg/kg				0.233	0.238		0.22	0.21		0.24	0.24
Tl	mg/kg			mg/kg				0.070	0.091		0.05	0.06			
Tm	mg/kg			mg/kg				0.547	0.537		0.48	0.46		0.53	0.51
U	mg/kg			mg/kg				0.158	0.163		0.13	0.14		0.15	0.14
V	mg/kg			mg/kg							257.26	276.12		281	281
W	mg/kg			mg/kg				0.034	0.043		0.03	0.03		0.03	0.03
Y	mg/kg			mg/kg				37.480	37.160		31.90	30.79		34	33
Yb	mg/kg			mg/kg				3.570	3.440		3.22	3.15		3.5	3.5
Zn	mg/kg			mg/kg							72.24	76.53		96	88
Zr	mg/kg			mg/kg				125.500	121.960		116.52	112.84		127	121

Table 3 cont.

Lab identifier		15A	15B	16A	16B	17A	17B	18A	18B	19A	19B
Data Quality		2	2	2	2	2	2	2	2	2	2
Elem/Cmpnd	units	LAICPMS	LAICPMS	LAICPMS	LAICPMS	LAICPMS	LAICPMS	LAICPMS	LAICPMS	LAICPMS	LAICPMS
SiO2	% m/m	51.4	51.4	50.63	50.65			50.2	50.3		
TiO2	% m/m	1.68	1.68	1.72	1.72			1.73	1.73		
Al2O3	% m/m	14.6	14.7	15.24	15.25			16.6	16.4		
Fe2O3T	% m/m	9.50	9.59					9.74	9.81		
Fe(II)O	% m/m			9.62	9.61						
MnO	% m/m	0.218	0.220	0.182	0.182			0.182	0.183		
MgO	% m/m	7.68	7.85	8.08	8.10	8.05	8.03	7.5	7.5		
CaO	% m/m			10.45	10.45			10.84	10.82		
Na2O	% m/m			3.49	3.49			3.11	3.14		
K2O	% m/m			0.1809	0.1808			0.178	0.178		
P2O5	% m/m			0.1791	0.1794			0.157	0.158		
Ag	mg/kg							0.379	0.382		
As	mg/kg										
Au	mg/kg			0.033	0.022						
B	mg/kg			12.3	12.0						
Ba	mg/kg	35.4	35.9	34.3	34.4	34.2	33.5	35.2	35.6	36.87	35.53
Be	mg/kg			0.706	0.659						
Bi	mg/kg							0.014	0.021		
Br	mg/kg										
Cd	mg/kg							0.27	0.26		
Ce	mg/kg	17.8	18.1	17.32	17.30	17.1	16.8	16.4	16.6	18.38	17.83
Cl	mg/kg										
Co	mg/kg	43.5	43.6	44.8	44.9	43.4	43.0	43.7	44.7		
Cr	mg/kg	303	307	287.7	288.2	291	288	295.8	298.1		
Cs	mg/kg			0.126	0.124	0.13	0.12				
Cu	mg/kg	77.6	80.6	87.0	83.9	120	110	83.1	91.6		
Dy	mg/kg	5.92	5.85	6.15	6.13	5.86	5.91	5.25	5.16	5.74	5.58
Er	mg/kg	3.57	3.59	3.82	3.81	3.61	3.55	3.21	3.18	3.44	3.37
Eu	mg/kg	1.48	1.50	1.49	1.49	1.49	1.45	1.41	1.41	1.55	1.50
F	mg/kg										
Ga	mg/kg	16.4	16.8	18.07	18.03			17.0	17.3	15.18	14.38
Gd	mg/kg	5.30	5.20	5.49	5.49	5.17	5.17	4.64	4.64	5.08	4.98
Ge	mg/kg									1.23	1.22
Hf	mg/kg	2.97	2.99	3.23	3.23	3.12	3.07	2.73	2.69	2.92	2.83
Hg	mg/kg										
Ho	mg/kg	1.24	1.24	1.27	1.27	1.25	1.24	1.089	1.079	1.15	1.14
I	mg/kg										
In	mg/kg							0.040	0.056		
Ir	mg/kg										
La	mg/kg	6.60	6.59	6.57	6.55	6.57	6.50	5.87	5.90	6.66	6.50
Li	mg/kg			6.54	6.52	6.28	6.35	7.4	7.0		
Lu	mg/kg	0.504	0.501	0.520	0.512	0.51	0.50	0.439	0.438	0.47	0.47
Mn	mg/kg					1398	1385				
Mo	mg/kg			0.528	0.544			0.51	0.52	0.46	0.41
Nb	mg/kg	2.55	2.64	2.73	2.72	2.62	2.56	2.74	2.89	2.67	2.79
Nd	mg/kg	13.4	13.3	13.53	13.51	13.3	13.2	12.6	12.5	13.14	12.71
Ni	mg/kg	144	137	139.9	139.7	138	136	137.3	140.2		
Os	mg/kg										
Pb	mg/kg	1.95	1.92	1.96	1.91	2.20	2.04	1.77	1.75		
Pd	mg/kg										
Pr	mg/kg	2.62	2.65	2.59	2.59	2.55	2.52	2.39	2.42	2.47	2.44
Pt	mg/kg			0.758	0.453						
Rb	mg/kg	2.62	2.68	2.70	2.68	2.73	2.63	3.06	2.92		
Re	mg/kg										
Rh	mg/kg										
Ru	mg/kg										
S	mg/kg										
Sb	mg/kg										
Sc	mg/kg	37.2	35.5	38.62	38.62	37.9	38.0	35.3	34.8		
Se	mg/kg										
Sm	mg/kg	4.13	4.14	4.22	4.22	4.18	4.11	3.86	3.86	3.82	3.76
Sn	mg/kg			1.12	1.09	1.66	1.65				
Sr	mg/kg	156	156	158.1	158.2	160	157	158.0	157.0		
Ta	mg/kg	0.164	0.160	0.175	0.175	0.17	0.17				
Tb	mg/kg	0.867	0.870	0.910	0.910	0.93	0.92	0.780	0.768	0.82	0.81
Te	mg/kg										
Th	mg/kg	0.241	0.240	0.242	0.240	0.23	0.23	0.230	0.228		
Tl	mg/kg							0.061	0.062		
Tm	mg/kg	0.497	0.495	0.522	0.526	0.50	0.49	0.442	0.441	0.50	0.46
U	mg/kg	0.157	0.162	0.147	0.145	0.15	0.14	0.144	0.147		
V	mg/kg	279	282	271.8	271.8	274	271	284.7	286.4		
W	mg/kg										
Y	mg/kg	31.6	31.4	34.84	34.83	33.3	33.2	28.1	27.9	34.06	33.66
Yb	mg/kg	3.30	3.38	3.50	3.52	3.45	3.50	2.99	2.96	3.35	3.28
Zn	mg/kg	89.6	91.6	73.57	73.75	88.0	85.5	83.6	83.9		
Zr	mg/kg	121	121	126.3	126.2	123	121	112.4	110.3	104.06	101.81

Table 3 cont.

Lab Identifier		20A	20B	22A	22B	23A	23B	24A	24B
Data Quality		2	2	2	2	23A	23B	2	2
Elem/Cmpnd	units	LAICPMS	LAICPMS	LAICPMS	LAICPMS	LAICPMS	LAICPMS	LA-ICP-MS	LA-ICP-MS
SiO2	% m/m	50.6	50.5						
TiO2	% m/m	1.72	1.70						
Al2O3	% m/m	15.3	15.5						
Fe2O3T	% m/m	10.8	10.5						
Fe(II)O	% m/m								
MnO	% m/m	0.18	0.18						
MgO	% m/m	8.05	8.07						
CaO	% m/m	10.6	10.6						
Na2O	% m/m	3.35	3.35						
K2O	% m/m	0.18	0.18						
P2O5	% m/m	0.20	0.20						
Ag	mg/kg	0.35	0.40	0.31	0.34				
As	mg/kg	0.45	0.24	1.23	1.26				
Au	mg/kg			0.15	BDL				
B	mg/kg	9.8	10.3	BDL	BDL				
Ba	mg/kg	34	34	32.3	32.9	36.87	35.53	30.50	29.82
Be	mg/kg	0.59	0.62	BDL	BDL			0.54	0.63
Bi	mg/kg	0.02	0.02	0.092	0.02				
Br	mg/kg								
Cd	mg/kg	0.20	0.23	0.39	0.2			0.31	0.31
Ce	mg/kg	17.4	17.3	16.1	15.9	18.38	17.83	15.50	15.24
Cl	mg/kg								
Co	mg/kg	42.6	42.4	43.8	44.2			39.52	38.85
Cr	mg/kg	315	316	285.2	283.4			307.05	267.23
Cs	mg/kg	0.09	0.11	0.1	0.09			0.12	0.11
Cu	mg/kg	76.9	75.6	89.5	92.9			72.28	76.10
Dy	mg/kg	5.98	6.06	5.89	1.18	5.74	5.58	5.53	5.45
Er	mg/kg	3.47	3.51	3.4	3.5	3.44	3.37	3.43	3.37
Eu	mg/kg	1.44	1.40	1.27	1.3	1.55	1.50	1.37	1.36
F	mg/kg								
Ga	mg/kg	17.4	17.1	17.7	17.6	15.18	14.38	16.15	15.99
Gd	mg/kg	5.04	5.11	5.03	4.9	5.08	4.98	4.61	4.50
Ge	mg/kg	2.26	1.84	4.05	2.95	1.23	1.22		
Hf	mg/kg	3.07	3.21	3.12	3.16	2.92	2.83	3.61	3.39
Hg	mg/kg	2.25	1.52						
Ho	mg/kg	1.26	1.29	1.18	1.19	1.15	1.14	1.15	1.14
I	mg/kg								
In	mg/kg			0.06	0.07				
Ir	mg/kg								
La	mg/kg	6.44	6.42	5.97	6.04	6.66	6.50	5.86	5.77
Li	mg/kg	6.56	6.42	BDL	BDL			6.00	6.15
Lu	mg/kg	0.52	0.51	0.4	0.43	0.47	0.47	0.47	0.46
Mn	mg/kg			1322	1338			1274.07	1275.58
Mo	mg/kg	0.46	0.52	0.47	0.31	0.46	0.41		
Nb	mg/kg	2.73	2.77	2.42	2.41	2.67	2.79	4.13	3.14
Nd	mg/kg	13.4	13.3	11.7	12	13.14	12.71	12.03	11.93
Ni	mg/kg	139	136	138.5	138.9			122.92	124.22
Os	mg/kg								
Pb	mg/kg	1.85	1.88	1.54	1.86			2.46	3.87
Pd	mg/kg			BDL	0.23				
Pr	mg/kg	2.52	2.50	2.35	2.26	2.47	2.44	2.35	2.30
Pt	mg/kg			0.46	0.63				
Rb	mg/kg	2.70	2.74	2.47	2.7			2.53	2.44
Re	mg/kg			0.103	BDL				
Rh	mg/kg			BDL	BDL				
Ru	mg/kg								
S	mg/kg			BDL	BDL				
Sb	mg/kg	0.06	0.04	0.22	0.25				
Sc	mg/kg	39.0	39.4	37.7	36.9				
Se	mg/kg			BDL	BDL				
Sm	mg/kg	3.81	3.94	3.46	3.83	3.82	3.76	3.86	3.81
Sn	mg/kg	1.64	1.50	1.3	1.45				
Sr	mg/kg	151	150	149.6	149.6			154.55	144.61
Ta	mg/kg	0.17	0.19	0.11	0.12			0.19	0.18
Tb	mg/kg	0.90	0.91	0.81	0.8	0.82	0.81	0.89	0.87
Te	mg/kg								
Th	mg/kg	0.24	0.23	0.16	0.18			0.27	0.32
Tl	mg/kg			0.23	0.2				
Tm	mg/kg	0.52	0.54	0.48	0.48	0.50	0.46	0.48	0.49
U	mg/kg	0.14	0.16	0.095	0.096			0.16	0.15
V	mg/kg	260	259	264.7	270.4			298.79	266.13
W	mg/kg	0.04	0.05	BDL	0.2				
Y	mg/kg	33.6	34.2	33.2	33.2	34.06	33.66	30.03	28.89
Yb	mg/kg	3.33	3.43	3.07	3.23	3.35	3.28	3.19	3.19
Zn	mg/kg	84	83	100	103.3			94.58	95.94
Zr	mg/kg	121	125	124.3	124.6	104.06	101.81	131.41	122.37

Table 3 cont.

Lab Identifier		25A	25B	26A	26B	27A	27B	6A	6B
Data Quality		2	2	2	2	2	2	2	2
Elem/Cmpnd	units	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS
SiO2	% m/m	A		42.49		48.59	52.11		
TiO2	% m/m	1.57	1.66	1.66		1.73	1.74		
Al2O3	% m/m	14.51	15.43	int std		14.64	14.76		
Fe2O3T	% m/m	9.29	9.30	9.61		12.23	12.19		
Fe(II)O	% m/m								
MnO	% m/m	0.15	0.15			0.22	0.21		
MgO	% m/m	7.44	7.48	7.05		7.84	7.99		
CaO	% m/m	10.30	10.84	10.42		10.80	10.80		
Na2O	% m/m	3.18	3.07	3.06		0.27	0.24		
K2O	% m/m	0.23	0.21	0.198		n.d.	n.d.		
P2O5	% m/m	0.17	0.16	0.198		n.d.	n.d.		
Ag	mg/kg								
As	mg/kg	0.240	0.28						
Au	mg/kg	0.289	0.28						
B	mg/kg	5.378	5.31						
Ba	mg/kg	35.796	36.34	30.4		35.15	35.51	36.51	37.09
Be	mg/kg	1.352	1.89						
Bi	mg/kg	0.142	0.10						
Br	mg/kg								
Cd	mg/kg	0.058	0.05						
Ce	mg/kg	17.015	18.32	15		17.15	17.46	18.33	18.33
Cl	mg/kg								
Co	mg/kg	39.375	37.24	37.7		50.71	50.79	46.33	46.50
Cr	mg/kg	344.647	346.65	260		314.12	305.91	305.8	308.3
Cs	mg/kg	0.200	0.22			0.12	0.12		
Cu	mg/kg	52.166	54.36	69.5		88.10	89.90	80.13	102.8
Dy	mg/kg	5.301	5.55	7.04		5.49	5.43	6.066	5.378
Er	mg/kg	3.636	3.69	4.31		3.41	3.40	3.793	3.334
Eu	mg/kg	1.325	1.38	1.44		1.45	1.49	1.509	1.468
F	mg/kg								
Ga	mg/kg	16.333	15.82	13.9		17.91	18.88	16.91	17.11
Gd	mg/kg	3.532	3.49	5.9		5.05	5.04	5.396	4.854
Ge	mg/kg	1.674	1.91	0.76				1.715	1.621
Hf	mg/kg	2.985	3.15	3.7		3.00	2.93	3.075	2.761
Hg	mg/kg								
Ho	mg/kg	1.048	1.21	1.49		1.16	1.16	1.215	1.113
I	mg/kg								
In	mg/kg	0.100	0.10						
Ir	mg/kg								
La	mg/kg	6.006	6.81	6.59		6.31	6.51	6.713	6.371
Li	mg/kg	7.342	6.65			7.40	7.08	6.965	6.907
Lu	mg/kg	0.590	0.65	0.62		0.49	0.48	0.4911	0.4315
Mn	mg/kg	1.988	2.11	1263				1397	1393
Mo	mg/kg			0.41		0.62	0.65		
Nb	mg/kg	2.468	2.55	2.6		2.95	2.90	2.763	2.709
Nd	mg/kg	12.454	12.29	13.5		13.29	13.49	13.56	13.20
Ni	mg/kg	106.566	101.17	122		164.24	164.84	140.7	141.9
Os	mg/kg								
Pb	mg/kg	1.582	1.43	1.75		1.82	1.96	1.941	1.958
Pd	mg/kg								
Pr	mg/kg	2.522	2.74	2.49		2.58	2.62	2.652	2.604
Pt	mg/kg								
Rb	mg/kg	4.080	4.14			2.87	2.83	2.762	2.760
Re	mg/kg								
Rh	mg/kg								
Ru	mg/kg								
S	mg/kg			44.4					
Sb	mg/kg	0.230	0.25			0.05	0.04		
Sc	mg/kg	25.938	26.08	38.3		37.29	36.64	40.30	37.47
Se	mg/kg								
Sm	mg/kg	4.037	4.40	4.22		4.07	4.13	4.230	3.948
Sn	mg/kg	0.691	0.69	4.28		1.79	1.80		
Sr	mg/kg	153.474	161.31	150		157.30	157.26	163.4	161.8
Ta	mg/kg	0.174	0.24	0.19		0.18	0.17		
Tb	mg/kg	0.968	1.09	1.02		0.85	0.84	0.8805	0.800
Te	mg/kg								
Th	mg/kg	0.266	0.29	0.24		0.22	0.22	0.2336	0.2116
Tl	mg/kg	0.127	0.16						
Tm	mg/kg	0.500	0.49	0.62		0.49	0.49	0.5203	0.4577
U	mg/kg	0.179	0.18	0.1		0.15	0.16	0.1407	0.1353
V	mg/kg	254.328	260.10	240		313.15	308.07	286.2	286.9
W	mg/kg	0.164	0.13			0.04	0.04		
Y	mg/kg	32.777	35.09	39.1		31.36	30.60	33.63	30.52
Yb	mg/kg	2.829	3.09	4.02		3.23	3.25	3.460	3.240
Zn	mg/kg	48.780	46.30	72.5		87.25	87.68	83.52	82.88
Zr	mg/kg	114.040	119.33	145		122.22	117.89	124.0	113.6



Table 3 cont.

Lab identifier Data Quality Elem/Cmpnd	units	28A	28B	29A	29B
		2 LAICPMS	2 LAICPMS	2 LAICPMS	2 LAICPMS
SiO2	% m/m	50.72	50.76	50.51	
TiO2	% m/m	1.68	1.64	1.68	
Al2O3	% m/m	14.28	14.23	15.01	
Fe2O3T	% m/m	10.65	10.63	10.43	
Fe(II)O	% m/m				
MnO	% m/m	0.183	0.184	0.18	
MgO	% m/m	8.08	7.99	7.84	
CaO	% m/m	10.59	10.63		
Na2O	% m/m	3.40	3.36	3.12	
K2O	% m/m	0.183	0.184	0.17	
P2O5	% m/m	0.250	0.254	0.18	
Ag	mg/kg			0.71	
As	mg/kg			0.93	
Au	mg/kg			0.05	
B	mg/kg	12.35	12.68		
Ba	mg/kg	34.45	34.35	33.5	
Be	mg/kg	0.75	0.71		
Bi	mg/kg			0.03	
Br	mg/kg				
Cd	mg/kg			0.28	
Ce	mg/kg	16.79	16.4	13.29	
Cl	mg/kg				
Co	mg/kg	44.04	43.88		
Cr	mg/kg	308.2	305.9	301.56	
Cs	mg/kg	0.14	0.12	0.12	
Cu	mg/kg	79.02	79.70	104.31	
Dy	mg/kg	5.64	5.66	5.81	
Er	mg/kg	3.46	3.39	3.43	
Eu	mg/kg	1.43	1.44		
F	mg/kg				
Ga	mg/kg			14.95	
Gd	mg/kg	4.96	4.97	5.22	
Ge	mg/kg	2.37	2.44	2.88	
Hf	mg/kg	2.88	2.81	3.06	
Hg	mg/kg				
Ho	mg/kg	1.15	1.14	1.19	
I	mg/kg				
In	mg/kg			0.07	
Ir	mg/kg			0.1	
La	mg/kg	6.19	6.15	6.22	
Li	mg/kg	6.83	6.67		
Lu	mg/kg	0.46	0.44	0.48	
Mn	mg/kg				
Mo	mg/kg	0.62	0.63	0.84	
Nb	mg/kg	2.46	2.48	2.54	
Nd	mg/kg	12.96	12.98	13.01	
Ni	mg/kg	141.7	139.3	87.59	
Os	mg/kg				
Pb	mg/kg	2.01	1.97	1.91	
Pd	mg/kg				
Pr	mg/kg	2.42	2.46	2.41	
Pt	mg/kg			2.5	
Rb	mg/kg	2.66	2.69	2.41	
Re	mg/kg			0.03	
Rh	mg/kg				
Ru	mg/kg				
S	mg/kg				
Sb	mg/kg			0.05	
Sc	mg/kg	37.22	37.20	39.77	
Se	mg/kg			25.92	
Sm	mg/kg	4.06	4.13	4.13	
Sn	mg/kg	1.80	1.81	1.22	
Sr	mg/kg	151.3	150.0	43.93	
Ta	mg/kg	0.16	0.14	0.16	
Tb	mg/kg	0.82	0.80	0.83	
Te	mg/kg				
Th	mg/kg	0.23	0.22	0.24	
Tl	mg/kg			0.13	
Tm	mg/kg	0.46	0.47	0.48	
U	mg/kg	0.16	0.16	0.15	
V	mg/kg	279.6	276.9	281.6	
W	mg/kg			0.15	
Y	mg/kg	30.03	29.86	31.4	
Yb	mg/kg	3.23	3.18	3.39	
Zn	mg/kg	88.05	87.85	84.36	
Zr	mg/kg	116.4	115.9	124.29	











