

Trace Element Analyses
Medicine Lake Strat Test 36-28

Sample	<u>36-28-1</u>	<u>36-28-2</u>	<u>36-28-3</u>	<u>36-28-4</u>	<u>36-28-7</u>	<u>36-28-8</u>	<u>36-28-9</u>
Depth	440'	866'	1,054'	1,502'	1,960'	2,121'	2,145'
Elevation	6,240'	5,814'	5,626'	5,178'	4,720'	4,559'	4,535'
S*	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	0.10
Cl	<50.0	<50.0	139.68	<50.0	<50.0	<50.0	<50.0
V	148.78	211.64	243.07	132.11	<20.0	<20.0	<20.0
Ni	<20.0	34.05	<20.0	38.51	<20.0	<20.0	<20.0
Cu	84.4	63.14	94.94	61.09	<20.0	<20.0	<20.0
Zn	52.46	73.31	68.19	55.65	34.86	28.28	34.78
Rb	33.36	<20.0	<20.0	21.68	84.67	109.4	123.8
Sr	417.44	343.91	477.59	575.45	82.13	99.95	102.77
Zr	135.64	108.88	154.22	130.43	169.58	120.67	132.43
Ba	385.7	220.64	285.84	338.64	1,147.39	940.36	1,031.31
Pb	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0

All trace elements except S are in ppm

*Weight percent

Trace Element Analyses
Medicine Lake Strat Test 36-28

Sample	<u>36-28-1</u>	<u>36-28-2</u>	<u>36-28-3</u>	<u>36-28-4</u>	<u>36-28-7</u>	<u>36-28-8</u>	<u>36-28-9</u>
Depth	440'	866'	1,054'	1,502'	1,960'	2,121'	2,145'
Elevation	6,240'	5,814'	5,626'	5,178'	4,720'	4,559'	4,535'
S*	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	0.10
Cl	<50.0	<50.0	139.68	<50.0	<50.0	<50.0	<50.0
V	148.78	211.64	243.07	132.11	<20.0	<20.0	<20.0
Ni	<20.0	34.05	<20.0	38.51	<20.0	<20.0	<20.0
Cu	84.4	63.14	94.94	61.09	<20.0	<20.0	<20.0
Zn	52.46	73.31	68.19	55.65	34.86	28.28	34.78
Rb	33.36	<20.0	<20.0	21.68	84.67	109.4	123.8
Sr	417.44	343.91	477.59	575.45	82.13	99.95	102.77
Zr	135.64	108.88	154.22	130.43	169.58	120.67	132.43
Ba	385.7	220.64	285.84	338.64	1,147.39	940.36	1,031.31
Pb	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0

All trace elements except S are in ppm

*Weight percent

Chemical Analyses and Norms of
Mt. Shasta Strat Test 36-28 Volcanic Rocks

	<u>36-28-1</u>	<u>36-28-1A</u>	<u>36-28-2</u>	<u>36-28-3</u>	<u>36-28-4</u>	<u>36-28-7</u>	<u>36-28-8</u>	<u>36-28-9</u>
Depth	440'	440'	866'	1,054'	1,502'	1,960'	2,121'	2,145'
Elevation	6,240'	6,240'	5,814'	5,626'	5,178'	4,720'	4,559'	4,535'
SiO ₂	58.76	58.64	49.29	54.98	57.24	72.85	74.27	72.92
TiO ₂	0.83	0.83	1.54	1.31	0.71	0.13	0.14	0.15
Al ₂ O ₃	17.30	17.24	17.01	16.82	17.90	12.68	13.45	14.17
Fe ₂ O ₃	6.90	6.65	10.85	9.13	6.59	1.34	1.84	2.26
FeO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MnO	0.11	0.11	0.18	0.14	0.09	0.04	0.03	0.02
MgO	3.39	3.41	6.00	3.45	3.67	0.14	0.12	0.08
CaO	6.81	6.80	9.69	7.91	6.79	1.01	0.85	0.85
Na ₂ O	3.39	3.27	2.89	3.38	3.20	3.72	4.07	4.18
K ₂ O	1.54	1.54	0.58	1.06	1.28	3.20	3.84	4.26
P ₂ O ₅	0.16	0.16	0.34	0.22	0.17	0.02	0.02	0.01
H ₂ O+	-0.03	-0.03	-0.49	0.57	0.36	2.45	0.50	0.63
H ₂ O-	<u>0.08</u>	<u>0.08</u>	<u>0.08</u>	<u>0.55</u>	<u>0.74</u>	<u>2.04</u>	<u>0.14</u>	<u>0.20</u>
Total	99.24	98.70	97.96	99.52	98.74	99.62	99.27	99.73
q	15.09	15.57	4.56	11.99	14.59	36.64	33.95	30.39
c	0.0	0.0	0.0	0.0	0.0	1.31	1.10	1.16
or	9.10	9.10	3.43	6.26	7.56	18.91	22.69	25.17
ab	28.69	27.67	24.45	28.60	27.08	31.48	34.44	35.37
an	27.44	27.82	31.73	27.59	30.70	4.88	4.09	4.15
di-wo	1.19	1.01	3.95	2.59	0.0	0.0	0.0	0.0
di-en	1.02	0.87	3.42	2.24	0.0	0.0	0.0	0.0
di-fs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hy-en	7.42	7.62	11.53	6.36	9.14	0.35	0.30	0.20
hy-fs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
mt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
il	0.24	0.24	0.39	0.30	0.19	0.09	0.06	0.04
hm	6.90	6.65	10.85	9.13	6.59	1.34	1.84	2.26
tn	1.73	1.73	3.28	2.83	1.32	0.0	0.0	0.0
ru	0.0	0.0	0.0	0.0	0.07	0.08	0.11	0.13
ap	<u>0.38</u>	<u>0.38</u>	<u>0.81</u>	<u>0.52</u>	<u>0.40</u>	<u>0.05</u>	<u>0.05</u>	<u>0.02</u>
Total	99.20	98.66	98.39	98.41	97.65	95.13	98.63	98.90
Femic	18.88	18.50	34.22	23.96	17.72	1.91	2.36	2.65
Salic	80.32	80.16	64.17	74.45	79.93	93.22	96.27	96.24

All values are in weight percent

Chemical Analyses and Norms of
Mt. Shasta Strat Test 36-28 Volcanic Rocks

	<u>36-28-1</u>	<u>36-28-1A</u>	<u>36-28-2</u>	<u>36-28-3</u>	<u>36-28-4</u>	<u>36-28-7</u>	<u>36-28-8</u>	<u>36-28-9</u>
Depth	440'	440'	866'	1,054'	1,502'	1,960'	2,121'	2,145'
Elevation	6,240'	6,240'	5,814'	5,626'	5,178'	4,720'	4,559'	4,535'
SiO ₂	58.76	58.64	49.29	54.98	57.24	72.85	74.27	72.92
TiO ₂	0.83	0.83	1.54	1.31	0.71	0.13	0.14	0.15
Al ₂ O ₃	17.30	17.24	17.01	16.82	17.90	12.68	13.45	14.17
Fe ₂ O ₃	6.90	6.65	10.85	9.13	6.59	1.34	1.84	2.26
FeO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MnO	0.11	0.11	0.18	0.14	0.09	0.04	0.03	0.02
MgO	3.39	3.41	6.00	3.45	3.67	0.14	0.12	0.08
CaO	6.81	6.80	9.69	7.91	6.79	1.01	0.85	0.85
Na ₂ O	3.39	3.27	2.89	3.38	3.20	3.72	4.07	4.18
K ₂ O	1.54	1.54	0.58	1.06	1.28	3.20	3.84	4.26
P ₂ O ₅	0.16	0.16	0.34	0.22	0.17	0.02	0.02	0.01
H ₂ O+	-0.03	-0.03	-0.49	0.57	0.36	2.45	0.50	0.63
H ₂ O-	<u>0.08</u>	<u>0.08</u>	<u>0.08</u>	<u>0.55</u>	<u>0.74</u>	<u>2.04</u>	<u>0.14</u>	<u>0.20</u>
Total	99.24	98.70	97.96	99.52	98.74	99.62	99.27	99.73
q	15.09	15.57	4.56	11.99	14.59	36.64	33.95	30.39
c	0.0	0.0	0.0	0.0	0.0	1.31	1.10	1.16
or	9.10	9.10	3.43	6.26	7.56	18.91	22.69	25.17
ab	28.69	27.67	24.45	28.60	27.08	31.48	34.44	35.37
an	27.44	27.82	31.73	27.59	30.70	4.88	4.09	4.15
di-wo	1.19	1.01	3.95	2.59	0.0	0.0	0.0	0.0
di-en	1.02	0.87	3.42	2.24	0.0	0.0	0.0	0.0
di-fs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hy-en	7.42	7.62	11.53	6.36	9.14	0.35	0.30	0.20
hy-fs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
mt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
il	0.24	0.24	0.39	0.30	0.19	0.09	0.06	0.04
hm	6.90	6.65	10.85	9.13	6.59	1.34	1.84	2.26
tn	1.73	1.73	3.28	2.83	1.32	0.0	0.0	0.0
ru	0.0	0.0	0.0	0.0	0.07	0.08	0.11	0.13
ap	<u>0.38</u>	<u>0.38</u>	<u>0.81</u>	<u>0.52</u>	<u>0.40</u>	<u>0.05</u>	<u>0.05</u>	<u>0.02</u>
Total	99.20	98.66	98.39	98.41	97.65	95.13	98.63	98.90
Femic	18.88	18.50	34.22	23.96	17.72	1.91	2.36	2.65
Salic	80.32	80.16	64.17	74.45	79.93	93.22	96.27	96.24

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Elevation	6,240'	5,814'	5,626'	5,178'	4,720'	4,559'	4,535'
S*	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	0.10
Cl	<50.0	<50.0	139.68	<50.0	<50.0	<50.0	<50.0
V	148.78	211.64	243.07	132.11	<20.0	<20.0	<20.0
Ni	<20.0	34.05	<20.0	38.51	<20.0	<20.0	<20.0
Cu	84.4	63.14	94.94	61.09	<20.0	<20.0	<20.0
Zn	52.46	73.31	68.19	55.65	34.86	28.28	34.78
Rb	33.36	<20.0	<20.0	21.68	84.67	109.4	123.8
Sr	417.44	343.91	477.59	575.45	82.13	99.95	102.77
Zr	135.64	108.88	154.22	130.43	169.58	120.67	132.43
Ba	385.7	220.64	285.84	338.64	1,147.39	940.36	1,031.31
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Elevation	6,240'	6,240'	5,814'	5,626'	5,178'	4,720'	4,559'	4,535'
SiO ₂	58.76	58.64	49.29	54.98	57.24	72.85	74.27	72.92
TiO ₂	0.83	0.83	1.54	1.31	0.71	0.13	0.14	0.15
Al ₂ O ₃	17.30	17.24	17.01	16.82	17.90	12.68	13.45	14.17
Fe ₂ O ₃	6.90	6.65	10.85	9.13	6.59	1.34	1.84	2.26
FeO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MnO	0.11	0.11	0.18	0.14	0.09	0.04	0.03	0.02
MgO	3.39	3.41	6.00	3.45	3.67	0.14	0.12	0.08
CaO	6.81	6.80	9.69	7.91	6.79	1.01	0.85	0.85
Na ₂ O	3.39	3.27	2.89	3.38	3.20	3.72	4.07	4.18
K ₂ O	1.54	1.54	0.58	1.06	1.28	3.20	3.84	4.26
P ₂ O ₅	0.16	0.16	0.34	0.22	0.17	0.02	0.02	0.01
H ₂ O+	-0.03	-0.03	-0.49	0.57	0.36	2.45	0.50	0.63
H ₂ O-	<u>0.08</u>	<u>0.08</u>	<u>0.08</u>	<u>0.55</u>	<u>0.74</u>	<u>2.04</u>	<u>0.14</u>	<u>0.20</u>
Total	99.24	98.70	97.96	99.52	98.74	99.62	99.27	99.73
q	15.09	15.57	4.56	11.99	14.59	36.64	33.95	30.39
c	0.0	0.0	0.0	0.0	0.0	1.31	1.10	1.16
or	9.10	9.10	3.43	6.26	7.56	18.91	22.69	25.17
ab	28.69	27.67	24.45	28.60	27.08	31.48	34.44	35.37
an	27.44	27.82	31.73	27.59	30.70	4.88	4.09	4.15
di-wo	1.19	1.01	3.95	2.59	0.0	0.0	0.0	0.0
di-en	1.02	0.87	3.42	2.24	0.0	0.0	0.0	0.0
di-fs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
hy-en	7.42	7.62	11.53	6.36	9.14	0.35	0.30	0.20
hy-fs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
mt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
il	0.24	0.24	0.39	0.30	0.19	0.09	0.06	0.04
hm	6.90	6.65	10.85	9.13	6.59	1.34	1.84	2.26
tn	1.73	1.73	3.28	2.83	1.32	0.0	0.0	0.0
ru	0.0	0.0	0.0	0.0	0.07	0.08	0.11	0.13
ap	<u>0.38</u>	<u>0.38</u>	<u>0.81</u>	<u>0.52</u>	<u>0.40</u>	<u>0.05</u>	<u>0.05</u>	<u>0.02</u>
Total	99.20	98.66	98.39	98.41	97.65	95.13	98.63	98.90
Femic	18.88	18.50	34.22	23.96	17.72	1.91	2.36	2.65
Salic	80.32	80.16	64.17	74.45	79.93	93.22	96.27	96.24

All values are in weight percent



February 6, 1984

INTER-OFFICE CORRESPONDENCE / SUBJECT:

Whole Rock Major and Trace
Element Analyses of Samples from
Medicine Lake, California

FILE RKC-4-84

TO: Kent Smith
Geothermal Operations
Salt Lake City, UT

FROM: R. K. Churchill *RKC*
241 GB, Ext. 9666

Attached are the whole rock chemical analyses for the Medicine Lake rock samples that you requested. The major elements, H₂O and S are in weight percent, and the remaining trace element values are in ppm. LOI is weight loss on ignition (sample fusion) and H₂O is weight loss during sample drying. Note that duplicate analyses have been run on samples 52-4-1, and 52-4-5, 52-4-11, 36-28-1 and 88-12-1.

The thin sections that you requested have been completed and are being sent separately.

RKC/laf

Attachments

cc: R&D Files (RC)
D. Reese (r) R. C. Lenzer
N. L. Burnett
M. N. McElroy (r) D. W. Rhett

SIMULTANEOUS X-RAY FLUORESCENCE ANALYSIS

SUMMARY REPORT

RESULTS AS WT % OXIDES

OXIDE FORMULA	LAB STD	52-4-1	52-4-1	52-4-2	52-4-3	52-4-4
SI O2	60.06	74.39	75.05	75.42	58.68	60.91
AL2O3	12.14	12.93	12.97	13.13	18.15	18.19
NA2O	4.57	3.55	3.54	3.54	3.64	4.04
K2O	4.51	4.53	4.55	4.59	1.58	1.42
FE2O3	5.96	1.48	1.32	1.68	4.76	5.66
CA O	7.96	0.86	0.87	0.84	6.21	6.19
MG O	2.66	0.17	0.18	0.07	2.94	2.93
TI O2	0.13	0.21	0.22	0.22	0.61	0.61
MN O	0.32	0.03	0.03	0.02	0.09	0.09
P2O5	0.42	0.02	0.02	0.02	0.14	0.14
LOI	0.94	0.24	0.24	0.24	0.63	-0.09
TOTALS	99.67	98.40	98.98	99.77	97.44	100.08
H2O	0.23	< 0.034	< 0.034	0.09	0.19	0.06

OXIDE FORMULA	52-4-5	52-4-5	52-4-6	52-4-8	52-4-9	52-4-10
SI O2	56.23	56.06	64.47	52.45	56.44	51.36
AL2O3	18.81	18.73	16.01	17.50	17.43	20.69
NA2O	3.23	3.29	3.70	3.52	3.68	3.07
K2O	0.86	0.85	2.61	1.12	1.24	0.58
FE2O3	5.73	6.56	5.28	8.61	8.65	6.99
CA O	7.59	7.56	4.37	8.41	6.98	9.44
MG O	4.50	4.43	1.53	5.65	3.53	1.91
TI O2	0.61	0.61	0.88	1.49	1.20	1.09
MN O	0.10	0.10	0.08	0.14	0.13	0.11
P2O5	0.13	0.13	0.22	0.41	0.37	0.22
LOI	0.06	0.06	0.08	-0.23	0.14	1.17
TOTALS	97.84	98.38	99.23	99.27	99.79	96.63
H2O	0.17	0.17	0.33	0.04	0.14	2.44

SIMULTANEOUS X-RAY FLUORESCENCE ANALYSIS

SUMMARY REPORT

RESULTS AS WT % OXIDES

OXIDE FORMULA	52-4-11	52-4-11	52-4-12	52-4-13	52-4-14	52-4-15
SI O2	52.82	53.00	50.15	49.35	55.29	53.99
AL2O3	19.56	19.60	16.58	17.44	17.33	17.16
NA2O	2.29	2.33	3.47	3.76	3.35	3.18
K2O	0.61	0.62	0.83	0.78	1.17	0.60
FE2O3	8.09	8.61	11.52	12.92	7.13	7.62
CA O	6.13	6.14	8.33	7.70	6.77	7.46
MG O	3.11	3.12	5.16	4.02	5.27	5.20
TI O2	1.03	1.03	1.75	1.76	0.93	0.91
MN O	0.14	0.14	0.18	0.18	0.11	0.13
P2O5	0.11	0.11	0.45	0.34	0.22	0.22
LOI	4.03	4.03	0.48	0.83	1.12	1.58
TOTALS	97.93	98.70	98.90	99.09	98.69	98.04
H2O	8.72	8.72	1.23	0.90	2.41	2.83

OXIDE FORMULA	LAB STD	36-28-1	36-28-1	36-28-2	36-28-3	36-28-4
SI O2	59.52	58.76	58.64	49.29	54.98	57.24
AL2O3	12.13	17.30	17.24	17.01	16.82	17.90
NA2O	4.67	3.39	3.27	2.89	3.38	3.20
K2O	4.51	1.54	1.54	0.58	1.06	1.28
FE2O3	5.99	6.90	6.65	10.85	9.13	6.59
CA O	7.97	6.81	6.80	9.69	7.91	6.79
MG O	2.69	3.39	3.41	6.00	3.45	3.67
TI O2	0.13	0.83	0.83	1.54	1.31	0.71
MN O	0.32	0.11	0.11	0.18	0.14	0.09
P2O5	0.42	0.16	0.16	0.34	0.22	0.17
LOI	0.94	-0.03	-0.03	-0.49	0.57	0.36
TOTALS	99.29	99.16	98.63	97.88	98.97	98.01
H2O	0.23	0.08	0.08	0.08	0.55	0.74

SIMULTANEOUS X-RAY FLUORESCENCE ANALYSIS

SUMMARY REPORT

RESULTS AS WT % OXIDES

OXIDE FORMULA	36-28-7	36-29-8	36-28-9	88-12-1	88-12-1
SI O2	72.85	74.27	72.92	65.77	65.53
AL2O3	12.68	13.45	14.17	16.42	16.41
NA2O	3.72	4.07	4.18	3.33	3.31
K2O	3.20	3.84	4.26	2.02	2.02
FE2O3	1.34	1.84	2.26	4.16	4.01
CA O	1.01	0.85	0.85	4.33	4.32
MG O	0.14	0.12	0.08	2.12	2.12
TI O2	0.13	0.14	0.15	0.45	0.46
MN O	0.04	0.03	0.02	0.06	0.06
F2O5	0.02	0.02	0.01	0.10	0.10
LOI	2.45	0.50	0.63	0.65	0.65
TOTALS	97.58	99.11	99.53	99.42	99.00
H2O	2.04	0.14	0.20	0.51	0.51

	36-28-7	36-28-8	36-28-9	88-12-1
SECOND 10 ELEMENTS ARE PPM				
CL	< 50.000	< 50.000	< 50.000	< 50.000
V	< 20.000	< 20.000	< 20.000	63.41
NI	< 20.000	< 20.000	< 20.000	< 20.000
CU	< 20.000	< 20.000	< 20.000	< 20.000
ZN	34.86	28.28	34.78	28.92
RB	84.67	109.40	123.80	47.29
SR	82.13	99.95	102.77	506.15
ZR	169.58	120.67	132.43	127.35
BA	1147.39	940.36	1031.31	443.61
PB	< 40.000	< 40.000	< 40.000	< 40.000
S	< 0.050	0.12	0.10	< 0.050