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GEOLOGICAL SURVEY

MAJOR-ELEMENT ANALYSES OF LATEST PLEISTOCENE-HOLOCENE LAVA FIELDS OF THE SNAKE RIVER PLAIN, IDAHO

by

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INTRODUCTION

This report is a compilation of major-element analyses of latest Pleistocene-Holocene lava fields of the eastern and central Snake River Plain, Idaho. Of the 188 analyses in this compilation, 134 are new analyses by the Branch of Analytical Chemistry of the U.S. Geological Survey. These analyses were made to augment studies of the basaltic volcanic rocks of the eastern and central Snake River Plain by the U.S. Geological Survey. Original references to previously published analyses are included in this report.

Most of the USGS analyses were performed by X-ray fluorescence spectroscopy (XRF) for major elements (Matocha, 1974a, 1974b, 1975; Elsheimer and Fabbi, U.S. Geological Survey, written communication, 1982; and Taggart and others, 1981) and by chemical methods for H_2O^+, H_2O^-, CO_2, and FeO (Cremer and others, 1981; Engleman and others, 1985; Jackson and others, 1985; and Peck, 1964). A few of the USGS analyses were performed by the "rapid rock" method (Shapiro, 1975). These methods and all USGS analysts are listed in the Sample Data section of this report. The previously published analyses were performed by various analysts in various laboratories, and by various methods; these details can be found in the references cited for each of these analyses.

Absolute abundances of the different oxidation states of iron were not determined for some of the previously published analyses performed by the XRF method. For these analyses, iron is listed as FeO and the value is enclosed within parentheses. H_2O^+, H_2O^-, and CO_2 were not determined in some of the previously published analyses.

Significant figures in each analysis are those reported in the references to the older analyses or those reported by the Branch of Analytical Chemistry for the new analyses. Locations of samples are given chiefly by quarter-quarter section, township, range, and U. S. Geological Survey 7 1/2-minute quadrangle. Some sample locations are given by latitude and longitude where section-township-range boundaries have not been established or if reported as such in the original reference.

Stratigraphic terminology for flows and eruptive periods for the Craters of the Moon lava field follows Kuntz and others (1982).

SAMPLE DATA

[See key to abbreviations, p. 17-18]

Sample Number	Method	Analyst	Quad.	1/4 Sec	1/4 Sec	Sec.	T.	R. (east)	Ref.
CRATERS OF THE MOON LAVA FIELD									
Eruptive period A									
Broken Top flow									
BT-1	XC	5	IC	SW	SE	12	1N	24	-
BT-2	XC	9	IC	NE	SE	12	1N	24	-
BT-3	-	-	IC	NE	SE	12	1N	24	LVP
BT-4	XC	7	IC	NE	SE	12	1N	24	-
Blue Dragon flows									
BD-1	XC	7	IC	SE	NE	7	1N	25	-
BD-2	-	-	IC	--	--	14	1N	24	WPL
BD-3	XC	9	NR	SW	NW	29	3N	26	-
BD-4	-	1	IC	__	__	14	1N	24	WPL
BD-5	XC	5	IC	SE	SW	12	1N	24	-
BD-6	XC	5	IC	SE	SE	2	1N	24	-
BD-7	XC	5	IC	SE	SE	2	1N	24	-
BD-8	RR	3	IC	__	__	6	2N	25	WPL

Sample Number	Method	Analyst	Quad.	1/4 Sec	1/4 Sec	Sec.	T.	R. (east)	Ref.
Trench Mortar Flat flow									
TM-1	-	-	WM	NE	NE	29	1N	25	WPL
TM-2	XC	8	IC	SW	SE	18	1N	25	-
TM-3	XC	9	WM	SW	NW	28	1N	25	-
TM-4	XC	8	WM	NW	SW	28	1N	25	-
TM-5	XC	8	WM	SE	SW	28	1N	25	-
TM-6	-	-	WM	SE	SW	20	1N	25	WPL
North Crater flow									
NC-1	-	-	IC			35	2N	24	WPL
NC-2	RR	3	IC			35	2N	24	-
NC-3	-	-	IC	SE	SW	35	2N	24	WPL
Big Craters flows									
BC-1	XC	5	IC	SE	SE	25	2N	24	-
BC-2	-	-	IC	NW	NE	11	1N	24	WPL
BC-3	-	-	IC	SE	SE	2	1N	24	WPL
BC-4	XC	8	IC	SE	SE	2	1N	24	-
BC-5	XC	9	IC	NW	SE	2	1N	24	-
BC-6	-	-	IC			2	1N	24	WPL
BC-7	XC	8	IC	NW	SE	2	1N	24	-
BC-8	XC	9	IC	SW	NE	31	2N	25	-
BC-9	XC	9	IC	SW	NW	31	2N	25	-
BC-10	-	-	IC	NE	SE	4	1N	24	LVP
BC-11	XC	8	IC	NW	NW	1	1N	24	-

Sample Number	Method	Analyst	Quad.	1/4 Sec	1/4 Sec	Sec.	T.	R. (east)	Ref.
Big Craters flows (cont.)									
BC-12	XC	7	IC	NW	NW	1	1N	24	-
BC-13	XC	7	IC	SE	SE	19	2N	25	-
Serrate flow									
SE-1	XC	8	IC	NW	SW	20	2N	25	-
SE-2	XC	9	IC	SW	NE	31	2N	25	-
SE-3	XC	9	IC	SE	NW	35	2N	24	-
SE-4	XC	8	NR	NW	NE	15	2N	25	-
SE-5	XC	5	IC	SW	NE	30	2N	25	-
SE-6	XC	5	IC	SW	NE	35	2N	24	-
Devils Orchard flow									
DO-1	RR	3	IC	SW	SW	31	2N	25	LVP
DO-2	-	-	IC	SW	SW	31	2N	25	LVP
DO-3	-	-	IC	SW	SW	31	2N	25	LVP
DO-4	-	-	IC	-	-	31	2N	25	WPL
DO-5	-	-	IC	SW	SW	31	2N	25	WPL
DO-6	-	-	IC	NE	SW	31	2N	25	WPL
DO-7	-	-	IC	SW	SW	31	2N	25	LVP

Sample Number	Method	Analyst	Quad.	1/4 Sec	1/4 Sec	Sec.	T.	R. (east)	Ref.
Highway flow									
HW-1	-	-	IC	SE	NW	35	2N	24	WPL
HW-2	XC	8	IC	SW	NW	36	2N	24	-
HW-3	-	-	IC	SE	NW	35	2N	24	LVP
HW-4	-	-	IC	SE	NW	35	2N	24	WPL
HW-5	XC	10	IC	NE	SW	35	2N	24	-
Eruptive period B									
Vermillion Chasm flow									
VC-1	XC	8	FB	SW	NE	14	1S	25	-
VC-2	XC	8	FB	SW	SW	13	1S	25	-
Deadhorse flows									
DH-1	-	-	PrB			16	2S	27	LVP
DH-2	XC	9	FB	(43°18′N., 113°23′30"W.)					-
DH-3	XC	8	PrB	NW	NE	15	2S	27	-
Devils Cauldron flow									
DC-1	XC	9	PrB	(43°18′N., 113°21′W.)					-
DC-2	XC	8	PrB	(43°18′N., 113°21′W.)					-
DC-3	XC	9	BPE	SW	SW	14	2S	27	-

Sample Number	Method	Analyst	Quad.	1/4 Sec	1/4 Sec	Sec.	T.	R. (east)	Ref.
Minidoka flow									
MN-1	XC	9	BPE	(43°12′N., 113°18′W)					-
MN-2	XC	5	BP	SE	NE	5	6S	25	-
MN-3	XC	8	BPE	NE	SW	35	2S	27	-
MN-4	RR	4	BP	NW	NW	4	6S	25	-
MN-5	XC	9	BPE	(43°12′N., 113°18W.)					-
Larkspur Park flow									
LP-1	XC	9	CL	SE	SE	10	5S	23	-
Rangefire flow									
RF-1	-	-	PrB	-	-	10	2S	27	LVP
RF-2	XC	8	PrB	SE	SW	10	2S	27	-
Black Top flow									
BL-1	XC	8	PrB	(43°29′N., 113°22′30"W.)					-
BL-2	XC	9	PrB	(43°29′N., 113°22′30"W.)					-
Eruptive period C									
Indian Wells North flow									
IN-1	XC	10	NLB	SE	SE	2	1S	24	-
Indian Wells South flow									
IS-1	XC	10	NLB	NE	NE	10	1S	24	-

Sample Number	Method	Analyst	Quad.	1/4 Sec	1/4 Sec	Sec.	T.	R. (east)	Ref.
Sawtooth flows									
SA-1	XC	9	NLB	SW	NW	32	1S	25	-
SA-2	XC	8	NLB	NE	NW	7	1S	25	-
SA-3	XC	8	NLB	NE	NW	7	1S	25	-
SA-4	XC	5	IC	NW	NW	29	1N	25	-
Big Cinder Butte northwest flow									
BB-1	XC	9	IC	NW	NW	13	1N	24	-
South Echo flow									
SO-1	XC	5	IC	NW	NW	29	1N	25	-
Sheep Trail Butte flow									
ST-1	XC	5		(43°14′N., 113°23′30"W.)					-
ST-2	XC	9	FB	SW	SE	10	1S	25	-
ST-3	XC	8	FB	NW	NW	14	2S	25	-
Fissure Butte flow									
FB-1	XC	9	FB	NW	SW	10	1S	25	-
The Sentinel flow									
SN-1	XC	8	FB	SW	SE	11	1S	25	-
SN-2	XC	7	FB	SE	SE	16	1S	25	-

Sample Number	Method	Analyst	Quad.	1/4 Sec	1/4 Sec	Sec.	T.	R. (east)	Ref.
Eruptive period D									
Silent Cone flow									
SC-1	XC	8	IC	SW	NE	21	1N	24	-
SC-2	XC	8	IC	NW	SE	3	1N	24	-
SC-3	XC	9	IC	SE	SE	16	1N	24	-
Carey Kipuka flow									
CK-1	XC	9	LP	SW	SW	14	1S	23	-
CK-2	XC	9	LP	NE	NW	24	1S	23	-
Little Park flow									
LP-1	XC	9	LP	SW	NE	1	2S	23	-
LP-2	RR	4	LP	SE	SE	1	2S	23	-
Little Laidlaw Park flow									
LL-1	XC	8	NLB	NE	NE	18	1S	25	-
Eruptive period E									
Lava Point flow									
LA-1	XC	9	BDB	NE	NE	27	3S	24	-
LA-2	RR	4	BDB	NE	NW	27	3S	24	-
LA-3	XC	8	FB	NW	NW	3	2S	25	-
LA-4	XC	5	FB	SW	NE	11	2S	25	-

Sample Number	Method	Analyst	Quad.	1/4 Sec	1/4 Sec	Sec.	T.	R. (east)	Ref.
Grassy Cone flow									
GC-1	-	-	(Hwy 20, 27 km east of Carey)						SN
GC-2	-	-	(Hwy 20, 24.4 km east of Carey)						SN
GC-3	-	-	IC	SW	SW	34	2N	24	WPL
GC-4	XC	8	IC	SW	SW	34	2N	24	-
Laidlaw Lake flow									
LL-1	XC	8	LL	SE	NW	31	3S	24	-
LL-2	XC	5	LL	SW	SW	31	3S	24	-
Eruptive period F									
Pronghorn flows									
PH-1	XC	5	BPW	SE	SE	11	3S	25	-
PH-2	XC	9	BL	NW	NW	16	4S	24	-
PH-3	XC	8	BPW	SW	NE	9	3S	25	-
Bottleneck Lake flow									
BN-1	XC	8	BL	SW	NW	16	4S	24	-
Heifer Reservoir flow									
HR-1	RR	4	FB	NW	NE	21	1N	27	-

Sample Number	Method	Analyst	Quad.	1/4 Sec	1/4 Sec	Sec.	T.	R. (east)	Ref.
Eruptive period G									
Sunset Cone flows									
SU-1	-	-	IC	SW	SE	24	2N	24	LVP
SU-2	RR	3	IC			26	2N	24	WPL
SU-3	-	-	IC	SW	SE	24	2N	24	WPL
SU-4	-	-	IC	NW	NW	26	2N	24	WPL
SU-5	XC	9	IC	SE	SW	26	2N	24	-
Carey flow									
CY-1	-	-	LP	-	-	32	1N	23	WPL
CY-2	-	-	LP	-	-	32	1N	23	LVP
CY-3	XC	9	PF	SW	SW	23	1S	22	-
CY-4	RR	4	BMS	SW	SE	27	1N	23	-
CY-5	XC	8	PF	SE	SW	15	1S	22	-
CY-6	XC	9	LP	SW	NE	9	1S	23	-
CY-7	RR	4	BMS	SW	SE	27	1N	23	-
Lava Creek flows									
LC-1	XC	5	NR	NE	NE	5	2N	25	-
LC-2	XC	5	GR	SW	NW	9	2N	24	-
LC-3	XC	5	GR	SW	SE	9	2N	24	-
LC-4	XC	5	GR	NE	NW	8	2N	24	-
LC-5	XC	5	GR	NE	NE	8	2N	24	-
LC-6	-	-	GR	NE	NE	11	2N	24	WPL
LC-7	XC	5	GR	SE	NW	8	2N	24	-

Sample Number	Method	Analyst	Quad.	1/4 Sec	1/4 Sec	Sec.	T.	R. (east)	Ref.
Lava Creek flows (cont.)									
LC-8	-	-	GR	NW	NE	11	2N	24	WPL
LC-9	-	-	GR	NW	NE	11	2N	24	LVP
LC-10	XC	9	GR	NW	NE	11	2N	24	-
LC-11	XC	7	NR	NW	SE	30	3N	26	-
LC-12	XC	9	GR	NE	NE	6	2N	24	-
LC-13	XC	9	GR	NW	SE	32	3N	24	-
LC-14	XC	9	GR	NW	NW	5	2N	24	-
LC-15	XC	8	NR	NW	SW	1	2N	25	-
Eruptive period H									
Kimama flow									
KM-1	XC	5	LL	NE	SE	31	4S	24	-
KM-2	RR	4	CL	SW	NE	13	5S	23	-
Bear Den Lake flow									
BR-1	XC	8	BPW	NE	NE	8	3S	25	-
Little Prairie flow									
LI-1	XC	5	WM	SW	SE	26	1N	25	-

Sample Number	Method	Analyst	Quad.	1/4 Sec	1/4 Sec	Sec.	T.	R. (east)	Ref.
CRATERS OF THE MOON LAVA FIELD									
Cinder cones									
CC-1	XC	8	IC	NW	SE	25	2N	24	-
CC-2	XC	5	IC	SW	NW	36	2N	24	-
CC-3	XC	8	IC	NE	NW	2	1N	24	-
CC-4	XC	9	IC	SW	SW	1	1N	24	-
CC-5	XC	9	IC	SW	NW	12	1N	24	-
CC-6	XC	5	IC	SW	SE	12	1N	24	-
CC-7	XC	9	IC	NW	NE	18	1N	25	-
CC-8	XC	9	IC	SW	SW	12	1N	24	-
CC-9	XC	9	IC	NW	NW	19	1N	25	-
CC-10	XC	9	IC	NW	SE	13	1N	24	-
CC-11	XC	9	IC	NE	SE	18	1N	25	-
CC-12	XC	7	IC	SW	SE	17	1N	25	-
CC-13	XC	9	IC	NE	SE	19	1N	25	-
CC-14	XC	8	IC	NW	NW	29	1N	25	-
CC-15	XC	5	IC	SW	NE	29	1N	25	-
CC-16	XC	7	WM	NW	NW	33	1N	25	-
CC-17	XC	8	FB	NW	SW	3	1S	25	-
CC-18	XC	7	FB	SE	SE	10	1S	25	-
CC-19	XC	9	FB	(43°17′N., 113°22"40"W.)					-
CC-20	XC	9	PrB	(43°17′N., 113°22′30"W.)					-

Sample Number	Method	Analyst	Quad.	1/4 Sec	1/4 Sec	Sec.	T.	R. (east)	Ref.
WAPI LAVA FIELD									
WA-1	XC	10	PiB	-	-	36	5S	27	-
WA-2	XC	6	PiBSE	NW	NE	31	7S	29	-
WA-3	-	-	PiB	-	-	36	5S	27	WPL
KINGS BOWL LAVA FIELD									
KB-1	-	-	PiB	-	-	3	6S	28	WPL
KB-2	XC	10	PiB	NE	NW	32	6S	28	-
KB-3	-	-	PiB	NE	NW	32	5S	28	SN
KB-4	-	-	PiB	NE	NW	32	5S	28	SN
KB-5	-	-	PiB	-	-	3	6S	28	WPL
HELL'S HALF ACRE LAVA FIELD									
HH-1	-	-	-	-	NW	35	3N	34	WPL
HH-2	XC	11	KBSW	SE	SE	27	3N	34	-
HH-3	-	-	-	(43°26'35"N., 112°27'55"W.)					JFK
HH-4	-	-	-	(43°29'24"N., 112°26'46"W.)					JFK
HH-5	-	-	-	(43°29'42"N., 112°13'53"W.)					JFK
HH-6	-	-	-	(11.3 km SW of 20-Mile Rock)					SN
HH-7	-	-	-	(4.8 km NW of windmill along unimproved dirt rd. @ 4750' elevation)					SN
HH-8	RR	2		(43°28'25"N., 112°12'27"W.)					JFK
HH-9	-	-	-	-	-	35	3N	34	WPL

Sample Number	Method	Analyst	Quad.	1/4 Sec	1/4 Sec	Sec.	T.	R. (east)	Ref.
CERRO GRANDE LAVA FIELD									
CG-1	XC	11	SC	SW	SE	13	1N	30	-
CG-2	-	-	(16.5 km W. of Atomic City, near railroad tracks)						SN
CG-3	RR	12	SC	NW	SW	13	1N	30	-
CG-4	-	-	-	-	-	13	1N	30	DBS
CG-5	-	-	AC	-	SW	15	2N	30	DBS
NORTH ROBBERS LAVA FIELD									
NR-1	XC	11	SC	SE	NE	31	1N	30	-
NR-2	RR	12	SC	SE	SW	30	1N	30	-
NR-3	-	-	SC	-	NE	31	1N	30	DBS
SOUTH ROBBERS LAVA FIELD									
SR-1	XC	11	RB	SE	SE	5	1S	30	-
SHOSHONE LAVA FIELD									
SH-1	XC	10	TU	SW	NW	20	5S	16	-
SH-2	XC	11	SIC	SE	NW	9	3S	18	-
SH-3	XC	11	SIC	SE	NW	9	3S	18	-
SH-4	-	-	(Collapsed lava tube, E. side of road, immediately S of Shoshone Ice Cave)						SN

ABBREVIATIONS USED IN SAMPLE DATA TABLE

Method

XC - Combined X-ray fluorescence and chemical methods (Matocha, 1974a, 1974b 1975; Elsheimer and Fabbi, 1982; Taggart and others, 1981; Cremer and others, 1981; Engleman and others, 1985; Jackson and others, 1985; and Peck, 1964)

RR - Rapid-rock (Shapiro, 1975)

Analysts

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2 - S. Botts, USGS

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4 - H. Smith, USGS

5 - J. Carr and P. Klock, USGS

6 - M. Cremer and L. Espos, USGS

7 - L. Espos and V. McDaniel, USGS

8 - K. Wong and J. Riviello, USGS

9 - L. Espos, N. Elsheimer, and P. Klock, USGS

10 - H. G. Neiman, G. Mason, A. J. Bartel, K. Stewart, and J. Taggart, USGS

11 - G. Mason, L. L. Jackson, C. Stone, A. J. Bartel, K. Stewart, and J. Taggart, USGS

12 - Z. A. Hamlin, USGS

References

JFK -- Karlo (1977)

WPL -- Leeman (1974)

LVP -- Leeman and others (1976)

DBS -- Spear (1979)

SN -- Stout and Nicholls (1977)

Quadrangle

AC - Atomic City

BDB - Bear Den Butte

BL - Bottleneck Lake

BMS - Blizzard Mountain South

BP - Bear Park

BPE - Bear Park East

BPW - Bear Park West

CL - Community Lake

FB - Fissure Butte

GR - Grouse

IC - Inferno Cone

KBSW - Kettle Butte Southwest

LL - Laidlaw Lake

LP - Little Park

NLB - North Laidlaw Butte

NR - Nichols Reservoir

PiB - Pillar Butte

PiBSE - Pillar Butte Southeast

PrB - Pratt Butte

PF - Paddleford Flat

RB - Rock Butte

SC - Scoville

SIC - Shoshone Ice Cave

TU - Tunupa

WM - Watchman

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period A

	Broken Top flow			
Sample no.	BT-1	BT-2	BT-3	BT-4
Field no.	79K89	78K12	69-21	78K13
USGS Lab. no.	M141885	D205454	-------	D205460
SiO_2	47.81	50.49	48.7	50.89
TiO_2	3.20	2.64	3.18	2.67
Al_2O_3	13.59	13.12	12.8	14.22
Fe_2O_3	1.17	1.86	n.d.	3.12
FeO	14.62	13.07	(16.5)	12.05
MnO	0.26	0.24	0.30	0.24
MgO	3.97	2.91	3.74	2.83
CaO	7.31	6.97	7.59	7.03
Na_2O	3.45	3.44	3.19	3.43
K_2O	1.80	2.19	1.94	2.18
P_2O_5	2.36	1.77	2.13	1.60
H_2O^+	0.18	0.13	n.d.	0.03
H_2O^-	0.04	0.10	n.d.	0.04
CO_2	0.11	0.04	n.d.	0.03
Total	99.87	98.97	100.1	100.36

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period A

	Blue Dragon flows			
Sample no.	BD-1	BD-2	BD-3	BD-4
Field no.	78K48	BD-1	78K52	BD-5
USGS Lab. no.	D205462	-------	M141902	-------
SiO_2	48.96	46.59	49.01	49.13
TiO_2	3.17	3.16	2.87	2.36
Al_3O_3	13.83	12.77	13.41	14.79
Fe_2O_3	0.85	2.20	0.77	2.82
FeO	14.70	13.94	14.50	13.83
MnO	0.25	0.27	0.24	0.24
MgO	3.61	3.90	3.34	3.06
CaO	8.03	7.50	6.93	7.08
Na_2O	3.11	3.85	3.61	3.74
K_2O	1.88	1.92	2.03	2.00
P_2O_5	1.90	2.52	1.77	0.90
H_2O^+	0.17	0.67	0.20	0.03
H_2O^-	0.03	0.37	0.14	0.11
CO_2	0.03	n.d.	0.10	0.07
Total	100.52	99.66	98.92	100.16

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period A

	Blue Dragon flows (cont.)			
Sample no.	BD-5	BD-6	BD-7	BD-8
Field no.	79K86	79K106	79K82	CM-3
USGS Lab. no.	M141883	M141894	M141881	D100156
SiO_2	49.28	49.61	49.83	50.07
TiO_2	2.87	2.75	2.64	2.68
Al_3O_3	14.29	13.82	14.11	13.74
Fe_2O_3	2.24	2.32	2.24	2.01
FeO	13.89	12.97	12.77	13.64
MnO	0.26	0.25	0.26	0.28
MgO	3.49	3.25	3.13	3.01
CaO	6.84	6.56	6.48	6.80
Na_2O	3.44	3.47	3.58	3.51
K_2O	1.98	2.05	2.10	2.14
P_2O_5	2.00	1.88	1.81	1.65
H_2O^+	0.25	0.41	0.13	0.21
H_2O^-	0.06	0.10	0.03	0.04
CO_2	0.18	0.11	0.11	0.01
Total	101.07	99.55	99.22	99.79

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period A

	Trench Mortar Flat flow				
Sample no.	TM-1	TM-2	TM-3	TM-4	TM-5
Field no.	69-33	78K46	78K124	78K125	78K126
USGS Lab. no	-------	D205445	M141918	D205455	D205457
SiO_2	49.10	49.79	50.07	50.67	51.08
TiO_2	2.99	2.91	2.76	2.60	2.57
Al_3O_3	13.62	13.65	14.18	13.29	13.29
Fe_2O_3	n.d.	1.15	1.43	1.33	1.72
FeO	(15.79)	13.43	12.97	12.71	12.16
MnO	0.29	0.24	0.24	0.23	0.23
MgO	3.27	3.65	3.80	3.08	3.05
CaO	7.14	7.59	6.73	6.90	6.82
Na_2O	3.72	3.28	3.61	3.47	3.55
K_2O	2.15	2.05	2.12	2.33	2.39
P_2O_5	1.94	1.84	1.88	1.45	1.44
H_2O^+	n.d.	0.27	0.13	0.03	0.13
H_2O^-	n.d.	0.12	0.01	0.06	0.06
CO_2	n.d.	0.05	0.06	0.03	0.02
Total	100.01	100.02	99.98	98.18	98.51

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period A

	Trench Mortar Flat flow (cont.)	North Crater flow		
Sample no.	TM-6	NC-1	NC-2	NC-3
Field no.	69-35	N-CRA	CM-4	TACH
USGS Lab. no.	-------	-------	D100157	-------
SiO_2	56.94	49.6	49.71	51.81
TiO_2	1.30	2.2	2.77	2.50
Al_3O_3	15.34	14.3	13.71	13.95
Fe_2O_3	n.d.	0.97	1.71	n.d.
FeO	(10.74)	14.5	13.99	(15.36)
MnO	0.22	0.34	0.28	0.25
MgO	1.61	3.47	3.13	2.76
CaO	4.92	6.99	6.93	6.38
Na_2O	4.58	3.20	3.52	3.78
K_2O	3.35	2.00	2.08	2.17
P_2O_5	1.00	1.81	1.74	1.04
H_2O^+	n.d.	0.46	0.17	n.d.
H_2O^-	n.d.	0.04	0.03	n.d.
CO_2	n.d.	n.d.	0.04	n.d.
Total	100.00	99.9	99.81	100.00

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period A

Big Craters flows

Sample no.	BC-1	BC-2	BC-3	BC-4	BC-5
Field no.	79K91	V29	V19	78K167	79K46
USGS Lab. no.	M141886	-------	-------	D205436	M141933
SiO_2	49.90	50.2	50.3	50.57	50.92
TiO_2	2.54	2.55	2.44	2.75	2.58
Al_3O_3	14.39	13.8	14.3	13.51	14.12
Fe_2O_3	1.56	0.56	0.29	4.45	5.50
FeO	13.24	15.00	14.70	10.82	9.67
MnO	0.26	0.31	0.32	0.25	0.25
MgO	3.07	3.25	3.14	3.17	2.90
CaO	6.34	6.87	6.90	7.14	6.40
Na_2O	3.47	3.27	3.29	3.34	3.66
K_2O	2.19	2.30	2.26	2.10	2.10
P_2O_5	1.73	1.55	1.61	1.78	1.74
H_2O^+	0.25	0.22	0.33	0.47	0.16
H_2O^-	0.06	0.06	0.11	0.06	0.05
CO_2	0.09	0.01	0.01	0.03	0.08
Total	99.09	100.0	100.0	100.44	100.13

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period A

	Big Craters flows (cont.)				
Sample no.	BC-6	BC-7	BC-8	BC-9	BC-10
Field no.	RUS	78K166	79K12	78K51A	SBR-5
USGS Lab. no.	-------	D205439	M141929	M141901	-------
SiO_2	51.14	51.19	51.26	51.41	51.5
TiO_2	2.41	2.52	2.51	2.46	2.56
Al_3O_3	13.95	13.03	14.22	14.05	13.5
Fe_2O_3	2.15	2.09	1.35	1.94	n.d.
FeO	12.97	12.48	13.28	12.73	(15.0)
MnO	0.24	0.24	0.25	0.23	0.28
MgO	2.21	2.70	2.90	2.89	2.79
CaO	6.56	6.79	6.37	6.32	6.58
Na_2O	3.59	3.20	3.58	3.80	3.76
K_2O	2.33	2.22	2.18	2.33	2.34
P_2O_5	1.59	1.67	1.63	1.43	1.65
H_2O^+	0.22	0.19	0.33	0.12	n.d.
H_2O^-	0.12	0.04	0.09	0.03	n.d.
CO_2	n.d.	0.03	0.09	0.10	n.d.
Total	99.48	98.39	97.43	99.84	100.0

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period A

	Big Craters flows (cont.)			Serrate flow
Sample no.	BC-11	BC-12	BC-13	SE-1
Field no.	78K17	78K19	78K120	78K121
USGS Lab. no.	D205453	D205467	D205465	D205444
SiO_2	51.28	51.55	52.04	54.51
TiO_2	2.50	2.55	2.54	1.82
Al_3O_3	13.35	14.37	13.91	13.84
Fe_2O_3	1.77	1.96	1.33	1.56
FeO	12.91	12.77	13.40	11.81
MnO	0.24	0.24	0.24	0.21
MgO	2.70	2.82	2.68	1.82
CaO	6.71	6.79	6.76	5.25
Na_2O	3.41	3.52	3.57	3.78
K_2O	2.30	2.26	2.31	2.87
P_2O_5	1.61	1.48	1.47	1.03
H_2O^+	0.22	0.18	0.18	0.28
H_2O^-	0.08	0.12	0.03	0.05
CO_2	0.04	0.04	0.04	0.02
Total	99.12	100.65	99.78	98.85

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period A

	Serrate flow (cont.)				
Sample no.	SE-2	SE-3	SE-4	SE-5	SE-6
Field no.	79K11	78K151	78K99	79K93	79K107
USGS Lab. no.	M141928	M141923	D205429	M141887	M141895
SiO_2	55.27	55.32	59.91	61.55	62.74
TiO_2	1.54	1.66	0.95	0.68	0.63
Al_3O_3	14.31	14.38	13.94	14.42	14.11
Fe_2O_3	1.40	0.94	2.94	0.78	0.96
FeO	11.74	12.28	7.44	7.62	7.24
MnO	0.20	0.20	0.18	0.18	0.18
MgO	1.81	1.72	0.52	0.36	0.37
CaO	4.81	4.90	3.55	3.02	2.93
Na_2O	4.15	4.36	4.00	3.80	4.01
K_2O	3.07	3.01	3.91	4.52	4.59
P_2O_5	0.81	0.87	0.29	0.19	0.16
H_2O^+	0.18	0.45	0.11	0.30	0.09
H_2O^-	<0.01	0.16	<0.01	0.10	0.09
CO_2	0.08	0.07	0.01	0.08	0.08
Total	99.37	100.32	97.75	97.60	98.18

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period A

	Devils Orchard flow				
Sample no.	DO-1	DO-2	DO-3	DO-4	DO-5
Field no.	CM-2	69-19	69-20	V-33	V-30
USGS Lab. no.	D100155	-------	-------	-------	-------
SiO_2	56.75	58.1	62.1	62.2	62.2
TiO_2	1.29	1.30	0.77	0.66	0.69
Al_3O_3	14.51	14.4	14.8	14.6	14.7
Fe_2O_3	2.39	n.d.	n.d.	0.63	0.75
FeO	10.63	(12.3)	(9.28)	8.4	8.4
MnO	0.25	0.24	0.23	0.21	0.21
MgO	1.12	1.02	0.41	0.25	0.41
CaO	4.56	4.38	3.20	3.46	3.37
Na_2O	4.02	3.65	4.55	4.12	3.79
K_2O	3.32	3.63	4.50	4.62	4.50
P_2O_5	0.63	0.62	0.25	0.13	0.13
H_2O^+	0.15	n.d.	n.d.	0.34	0.20
H_2O^-	0.03	n.d.	n.d.	0.10	0.08
CO_2	0.01	n.d.	n.d.	0.01	0.06
Total	99.66	99.6	100.1	99.7	99.5

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period A

	Devils Orchard flow (cont.)	
Sample no.	DO-6	DO-7
Field no.	69-36	V-31
USGS Lab. no.	-------	-------
SiO_2	62.30	62.6
TiO_2	0.68	0.73
Al_3O_3	14.89	14.8
Fe_2O_3	n.d.	1.79
FeO	(9.24)	7.45
MnO	0.18	0.20
MgO	0.25	0.35
CaO	3.20	3.19
Na_2O	4.37	4.05
K_2O	4.62	4.67
P_2O_5	0.27	0.19
H_2O^+	n.d.	0.18
H_2O^-	n.d.	0.01
CO_2	n.d.	0.06
Total	100.00	100.3

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period A

	Highway flow				
Sample no.	HW-1	HW-2	HW-3	HW-4	HW-5
Field no.	62P81	78K152	V-27	V-26	K-HWAY
USGS Lab. no.	-------	D205432	-------	-------	D250515
SiO_2	62.86	62.88	63.5	63.5	62.9
TiO_2	0.59	0.67	0.48	0.56	0.58
Al_3O_3	14.56	14.49	14.4	15.0	14.2
Fe_2O_3	1.23	0.88	1.14	0.80	8.81
FeO	7.28	7.58	7.14	7.07	2.6
MnO	0.19	0.17	0.19	0.20	0.18
MgO	0.21	0.27	0.30	0.21	0.25
CaO	3.05	2.94	2.91	3.00	2.47
Na_2O	4.16	4.20	4.11	4.05	3.76
K_2O	4.72	4.64	4.81	5.02	4.75
P_2O_5	0.15	0.14	0.09	0.08	0.14
H_2O^+	0.40	0.14	0.07	0.28	0.67
H_2O^-	0.06	0.03	0.04	0.08	0.07
CO_2	0.01	0.02	0.01	0.04	0.07
Total	99.50	99.05	99.2	99.9	101.5

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period B

	Vermillion				
	Chasm flow		Deadhorse flows		
Sample no.	VC-1	VC-2	DH-1	DH-2	DH-3
Field no.	78K91	78K95	69-28	78K82	78K145
USGS Lab. no.	D205430	D205435	-------	D141911	D205449
SiO_2	45.75	45.93	45.1	45.13	45.22
TiO_2	3.24	3.20	3.21	3.16	3.13
Al_3O_3	14.25	14.03	14.3	14.73	14.08
Fe_2O_3	3.32	1.27	0.15	1.16	0.93
FeO	11.75	13.41	15.1	13.64	13.61
MnO	0.24	0.24	0.27	0.23	0.24
MgO	6.06	5.91	6.26	6.58	6.14
CaO	10.06	9.77	9.55	9.18	9.94
Na_2O	2.86	2.91	2.55	2.96	2.88
K_2O	1.19	1.28	1.21	1.14	1.15
P_2O_5	2.03	2.09	2.08	1.86	2.09
H_2O^+	0.14	0.23	0.20	0.23	0.15
H_2O^-	0.05	0.08	0.09	0.05	0.06
CO_2	0.02	0.04	0.05	0.07	0.06
Total	100.96	100.39	100.1	100.12	99.68

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period B

	Devils Cauldron flow			Minidoka flow	
Sample no.	DC-1	DC-2	DC-3	MN-1	MN-2
Field no.	78K81	78K80	78K56	78K110	79K94
USGS Lab. no.	M141910	D205431	M141903	D141916	M141888
SiO_2	48.73	49.38	50.39	48.14	48.40
TiO_2	2.93	2.98	2.56	3.01	2.96
Al_3O_3	13.62	13.32	13.88	13.68	14.06
Fe_2O_3	1.35	0.65	0.76	1.02	1.09
FeO	13.90	14.53	14.07	14.38	14.44
MnO	0.22	0.25	0.24	0.25	0.26
MgO	3.54	3.60	3.05	4.00	3.83
CaO	7.12	7.89	6.46	7.04	6.92
Na_2O	4.21	3.25	3.92	3.39	3.58
K_2O	2.00	1.97	2.27	1.89	1.96
P_2O_5	1.88	2.06	1.54	2.18	2.12
H_2O^+	0.23	0.17	0.30	0.28	0.26
H_2O^-	0.08	0.02	0.10	0.06	0.06
CO_2	0.11	0.06	0.08	0.10	0.09
Total	99.92	100.13	99.62	99.42	100.03

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period B

	Minidoka flow (cont.)			Larkspur Park flow
Sample no.	MN-3	MN-4	MN-5	LK-1
Field no.	78K57	75L11	78K109	78K76
USGS Lab. no.	D205452	W189536	M141915	M141909
SiO_2	48.86	49.2	49.21	50.94
TiO_2	2.95	2.6	2.94	2.45
Al_3O_3	12.98	14.5	13.82	13.93
Fe_2O_3	0.68	6.3	0.78	0.78
FeO	14.46	9.6	14.46	13.91
MnO	0.25	0.23	0.23	0.22
MgO	3.39	3.3	3.54	2.86
CaO	7.60	6.5	7.21	6.31
Na_2O	3.47	3.6	3.64	4.25
K_2O	2.02	2.2	2.01	2.34
P_2O_5	2.09	1.9	1.86	1.47
H_2O^+	0.25	0.86	0.26	0.26
H_2O^-	0.06	0.31	0.06	0.08
CO_2	0.05	0.00	0.15	0.15
Total	99.11	101.1	100.17	99.95

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period B

	Rangefire flow		Black Top flow	
Sample no.	RF-1	RF-2	BL-1	BL-2
Field no.	69-17	78K144	78K88	78K86
USGS Lab. no.	-------	D205446	D205428	M141913
SiO_2	52.1	53.50	48.54	48.81
TiO_2	2.23	2.00	3.02	2.95
Al_3O_3	14.4	13.83	12.81	13.68
Fe_2O_3	n.d.	1.36	0.69	1.20
FeO	(14.3)	12.13	14.52	14.11
MnO	0.26	0.22	0.24	0.22
MgO	2.33	2.10	3.53	3.57
CaO	5.98	5.59	7.70	7.11
Na_2O	4.29	3.90	3.36	4.25
K_2O	2.70	2.73	1.99	2.01
P_2O_5	1.40	1.05	2.11	1.87
H_2O^+	n.d.	0.53	0.38	0.28
H_2O^-	n.d.	0.08	0.06	0.09
CO_2	n.d.	0.04	0.01	0.06
Total	100.0	99.06	98.96	100.21

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period C

	Indian Wells North flow	Indian Wells South flow
Sample no.	IN-1	IS-1
Field no.	K-IWN	K-IWS
USGS Lab. no.	D250518	D250516
SiO_2	52.9	53.9
TiO_2	2.01	1.85
Al_3O_3	13.9	14.1
Fe_2O_3	2.3	2.6
FeO	11.7	10.9
MnO	0.27	0.26
MgO	2.18	1.93
CaO	5.51	5.23
Na_2O	3.61	3.59
K_2O	2.73	2.90
P_2O_5	1.22	1.09
H_2O^+	0.17	0.27
H_2O^-	0.02	0.03
CO_2	<0.01	<0.01
Total	98.5	98.7

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period C

	Sawtooth flows				Big Cinder Butte NW flow
Sample no.	SA-1	SA-2	SA-3	SA-4	BB-1
Field no.	78K67	78K102	78K103	79K95A	79K23
USGS Lab. no.	M141906	D205425	D205423	M141889	M141931
SiO_2	55.37	57.28	57.61	57.20	54.91
TiO_2	1.70	1.35	1.30	1.29	1.69
Al_3O_3	14.67	14.50	14.53	15.11	14.96
Fe_2O_3	1.55	1.54	1.23	1.04	2.06
FeO	11.21	10.18	10.17	10.23	10.46
MnO	0.20	0.20	0.19	0.21	0.23
MgO	1.94	1.29	1.19	1.45	2.17
CaO	4.95	4.30	4.19	4.12	5.01
Na_2O	4.12	4.08	4.13	3.97	3.94
K_2O	3.04	3.42	3.46	3.40	2.82
P_2O_5	0.87	0.63	0.59	0.62	0.97
H_2O^+	0.16	0.17	0.13	0.43	0.14
H_2O^-	0.04	0.02	<0.01	0.10	0.02
CO_2	0.08	0.03	0.04	0.07	0.07
Total	99.90	99.53	98.76	99.24	99.45

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period C

	South Echo flow	Sheep Trail Butte flow		
Sample no.	SO-1	ST-1	ST-2	ST-3
Field no.	79K96	78C15	78K114	78C5
USGS Lab. no.	M141892	M141898	M141917	D205458
SiO_2	44.27	44.07	44.33	44.95
TiO_2	3.71	3.69	3.65	3.62
Al_3O_3	14.12	13.82	13.77	12.82
Fe_2O_3	2.45	1.44	5.06	1.19
FeO	14.18	14.59	11.31	14.69
MnO	0.27	0.25	0.25	0.25
MgO	5.10	5.17	5.57	4.88
CaO	8.16	8.21	8.33	9.42
Na_2O	3.36	3.32	3.36	3.11
K_2O	1.56	1.47	1.50	1.57
P_2O_5	2.83	2.70	2.77	2.29
H_2O^+	0.19	0.28	0.18	0.16
H_2O^-	0.14	0.07	0.08	0.08
CO_2	0.15	0.23	0.09	0.04
Total	100.49	99.31	100.25	99.07

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period C

	Fissure Butte flow	The Sentinel flow	
Sample no.	FB-1	SN-1	SN-2
Field no.	78K129	78K118	78K113
USGS Lab. no.	M141919	D205447	D205461
SiO_2	49.58	44.65	44.74
TiO_2	2.41	3.70	3.67
Al_3O_3	14.40	12.97	13.90
Fe_2O_3	16.24	1.70	2.23
FeO	0.02	14.55	14.07
MnO	0.25	0.27	0.27
MgO	2.82	4.90	4.73
CaO	6.36	9.60	9.51
Na_2O	3.86	3.04	3.06
K_2O	2.26	1.56	1.60
P_2O_5	1.51	2.87	2.50
H_2O^+	0.32	0.37	0.41
H_2O^-	0.17	0.06	0.12
CO_2	0.09	0.03	0.03
Total	100.29	100.27	100.84

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period D

	Silent Cone flow			Carey Kipuka flow	
Sample no.	SC-1	SC-2	SC-3	CK-1	CK-2
Field no.	78K150	78K177	78K147B	78K147A	78K139
USGS Lab. no.	D205441	D205434	D205464	M141922	M141921
SiO_2	52.78	56.74	57.99	50.54	51.04
TiO_2	1.86	1.67	1.62	2.42	2.35
Al_3O_3	14.06	13.73	14.06	14.16	14.46
Fe_2O_3	0.78	2.91	1.26	1.22	1.45
FeO	11.55	9.43	10.64	13.18	12.84
MnO	0.22	0.20	0.19	0.22	0.22
MgO	1.90	1.55	1.31	2.95	2.94
CaO	5.39	4.82	4.66	6.28	6.14
Na_2O	3.51	3.89	3.71	4.28	4.28
K_2O	2.71	2.95	3.12	2.38	2.43
P_2O_5	1.13	0.83	0.87	1.46	1.39
H_2O^+	0.61	0.19	0.07	0.46	0.54
H_2O^-	0.16	<0.01	0.03	0.15	0.15
CO_2	0.04	0.03	0.02	0.08	0.10
Total	96.70	98.94	99.55	99.78	100.33

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period D

	Little Park flow		Little Laidlaw Park flow
Sample no.	LP-1	LP-2	LL-1
Field no.	78K65B	75L19	78K106
USGS Lab. no.	M141905	W189538	D205433
SiO_2	49.46	50.3	51.03
TiO_2	2.55	2.6	2.33
Al_3O_3	14.28	14.4	13.84
Fe_2O_3	1.14	1.9	1.10
FeO	13.55	13.1	13.00
MnO	0.24	0.21	0.24
MgO	3.08	3.2	2.61
CaO	6.49	6.4	6.42
Na_2O	4.28	3.8	3.66
K_2O	2.30	2.2	2.48
P_2O_5	1.60	1.9	1.48
H_2O^+	0.43	0.45	0.28
H_2O^-	0.14	0.12	0.09
CO_2	0.08	0.02	0.03
Total	99.62	100.6	98.59

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period E

	Lava Point flow			
Sample no.	LA-1	LA-2	LA-3	LA-4
Field no.	78K68	75L20	78C6	78C7
USGS Lab. no.	M141907	W189539	D205443	M141897
SiO_2	45.64	46.0	46.61	47.04
TiO_2	3.63	3.7	3.40	3.14
Al_3O_3	13.39	14.0	12.37	13.87
Fe_2O_3	1.79	2.1	0.89	1.58
FeO	14.28	14.2	14.56	14.18
MnO	0.23	0.20	0.25	0.25
MgO	4.67	4.5	3.97	3.87
CaO	8.18	7.9	8.67	7.18
Na_2O	3.55	2.9	2.93	3.42
K_2O	1.65	1.6	1.69	1.82
P_2O_5	2.13	2.6	2.49	2.24
H_2O^+	0.37	0.75	0.29	0.49
H_2O^-	0.11	0.20	0.08	0.12
CO_2	0.14	0.00	0.04	0.16
Total	99.76	100.7	98.24	99.36

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period E

	Grassy Cone flow			
Sample no.	GC-1	GC-2	GC-3	GC-4
Field no.	IV71-16A	IV71-15B	V-28	78K183
USGS Lab. no.	-------	-------	-------	D205438
SiO_2	45.62	45.81	46.60	47.25
TiO_2	3.12	3.00	3.22	3.23
Al_3O_3	12.61	12.93	13.90	12.49
Fe_2O_3	3.28	2.84	0.67	8.62
FeO	15.02	15.08	15.50	7.45
MnO	0.26	0.26	0.31	0.25
MgO	4.24	4.05	4.38	3.82
CaO	7.59	7.47	7.97	8.40
Na_2O	3.48	3.66	3.12	3.07
K_2O	1.84	1.89	1.85	1.82
P_2O_5	2.19	2.21	2.32	2.33
H_2O^+	0.53	0.31	0.33	0.19
H_2O^-	0.17	0.09	0.05	0.05
CO_2	n.d.	n.d.	0.05	0.06
Total	99.95	99.60	100.27	99.03

CRATERS OF THE MOON LAVA FIELD

Lava flows of eruptive period E

Laidlaw Lake flow

Sample no.	LL-1	LL-2
Field no.	78K74	79K104
USGS Lab. no.	D205427	M141893
SiO_2	48.68	47.34
TiO_2	2.82	2.942
Al_3O_3	13.04	14.01
Fe_2O_3	1.16	0.95
FeO	14.03	14.21
MnO	0.25	0.26
MgO	3.27	3.79
CaO	7.41	6.94
Na_2O	3.40	3.42
K_2O	2.13	1.98
P_2O_5	1.92	2.22
H_2O^+	0.31	0.30
H_2O^-	0.09	0.08
CO_2	0.07	0.07
Total	98.58	98.51

CRATERS OF THE MOON LAVA FIELD

Lava flows of eruptive period F

	Pronghorn flows			Bottleneck Lake flow	Heifer Reservoir flow
Sample no.	PH-1	PH-2	PH-3	BN-1	HR-1
Field no.	78C17	78K73	78K70	78K72	75L7
USGS Lab. no.	M141899	M141908	D205424	D205426	W189535
SiO_2	45.51	45.52	47.04	46.58	47.1
TiO_2	3.22	3.20	3.15	3.33	3.5
Al_3O_3	13.99	13.81	13.19	13.42	14.4
Fe_2O_3	1.15	1.20	1.53	1.35	1.6
FeO	14.84	14.96	14.42	14.71	14.4
MnO	0.27	0.24	0.26	0.27	0.21
MgO	4.27	4.10	3.91	4.21	4.4
CaO	7.35	7.48	8.27	8.78	7.8
Na_2O	3.51	4.02	3.29	3.39	3.1
K_2O	1.84	1.92	1.90	1.83	1.6
P_2O_5	2.45	2.18	2.37	2.46	2.6
H_2O^+	0.27	0.32	0.18	0.23	0.57
H_2O^-	0.09	0.09	0.08	0.06	0.20
CO_2	0.08	0.07	0.06	0.60	0.00
Total	98.84	99.11	99.65	101.22	101.5

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive period G

	Sunset Cone flows				
Sample no.	SU-1	SU-2	SU-3	SU-4	SU-5
Field no.	SBR-4	CM-1	72-25	72-27	78K184
USGS Lab. no.	-------	D100154	-------	-------	M141924
SiO_2	45.9	46.04	46.06	46.7	49.65
TiO_2	3.45	3.11	3.35	3.27	2.44
Al_3O_3	13.3	13.91	13.61	13.6	14.50
Fe_2O_3	n.d.	2.76	n.d.	n.d.	4.53
FeO	(17.5)	13.91	(17.61)	(16.3)	10.47
MnO	0.31	0.30	0.28	0.30	0.24
MgO	4.16	3.89	4.04	3.97	3.14
CaO	7.68	7.45	7.59	7.56	6.47
Na_2O	3.52	3.45	3.65	3.39	4.50
K_2O	1.94	1.88	1.84	2.08	2.35
P_2O_5	2.44	2.28	1.96	2.41	1.56
H_2O^+	n.d.	0.74	n.d.	n.d.	0.12
H_2O^-	n.d.	0.13	n.d.	n.d.	0.16
CO_2	n.d.	0.02	n.d.	n.d.	0.11
Total	100.2	99.87	99.99	99.6	100.24

CRATERS OF THE MOON LAVA FIELD

Lava flows of eruptive period G

	Carey flow			
Sample no.	CY-1	CY-2	CY-3	CY-4
Field no.	WPL-86	WPL-87	78K62	75L24.2
USGS Lab. no.	-------	-------	M141904	W189341
SiO_2	45.79	45.7	46.44	46.6
TiO_2	3.38	3.31	3.07	3.1
Al_3O_3	13.50	13.9	13.87	13.9
Fe_2O_3	n.d.	n.d.	0.80	2.1
FeO	(17.18)	(16.9)	15.18	14.2
MnO	0.31	0.31	0.25	0.22
MgO	4.07	4.01	3.98	3.9
CaO	7.67	7.69	7.36	7.3
Na_2O	3.42	3.46	3.85	3.3
K_2O	1.99	2.05	1.98	1.8
P_2O_5	2.50	2.51	2.11	2.4
H_2O^+	n.d.	n.d.	0.26	1.0
H_2O^-	n.d.	n.d.	0.10	0.23
CO_2	n.d.	n.d.	0.10	0.06
Total	99.81	99.84	99.35	100.11

CRATERS OF THE MOON LAVA FIELD

Lava flows of eruptive period G

	Carey flow (cont.)			Lava Creek flows	
Sample no.	CY-5	CY-6	CY-7	LC-1	LC-2
Field no.	78K61	78K132	75L24.1	79K85	79K77
USGS Lab. no.	D205422	M141920	W189540	M141882	M141877
SiO_2	47.22	48.88	49.2	43.50	43.68
TiO_2	3.09	2.62	2.9	3.83	3.89
Al_3O_3	13.46	14.37	13.8	14.20	14.05
Fe_2O_3	0.89	1.39	1.5	2.16	3.47
FeO	14.93	13.84	14.4	14.78	13.42
MnO	0.26	0.25	0.23	0.27	0.27
MgO	3.91	3.19	3.3	5.21	5.20
CaO	8.24	6.37	6.9	8.13	8.24
Na_2O	3.47	3.80	3.3	3.47	3.37
K_2O	1.94	2.26	2.0	1.60	1.46
P_2O_5	2.29	1.72	2.1	2.78	2.52
H_2O^+	0.24	0.47	0.54	0.38	0.17
H_2O^-	0.10	0.08	0.08	0.08	0.10
CO_2	0.10	0.12	0.01	0.10	0.34
Total	100.14	99.36	100.3	100.49	100.18

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period G

	Lava Creek flows (cont.)				
Sample no.	LC-3	LC-4	LC-5	LC-6	LC-7
Field no.	79K80	79K79F	79K78	V-32	79K76A
USGS Lab. no.	M141880	M141879	M141878	-------	M141876
SiO_2	43.80	43.84	43.95	44.0	44.05
TiO_2	3.89	3.87	3.88	3.78	3.91
Al_3O_3	13.89	13.99	13.96	13.4	14.20
Fe_2O_3	1.83	3.11	2.44	1.78	2.28
FeO	14.76	13.76	14.35	15.3	14.64
MnO	0.26	0.27	0.27	0.33	0.27
MgO	5.18	5.26	5.25	5.30	5.17
CaO	8.07	8.43	8.24	8.55	8.20
Na_2O	3.33	3.42	3.44	3.10	3.42
K_2O	1.52	1.49	1.50	1.58	1.49
P_2O_5	2.51	2.46	2.54	2.65	2.54
H_2O^+	0.32	0.13	0.22	0.31	0.19
H_2O^-	0.07	0.09	0.04	0.02	0.03
CO_2	0.17	0.13	0.14	0.04	0.06
Total	99.60	100.25	100.22	100.1	100.45

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period G

	Lava Creek flows (cont.)				
Sample no.	LC-8	LC-9	LC-10	LC-11	LC-12
Field no.	70-42	69-22	79K69	78K51B	79K72A
USGS Lab. no.	-------	-------	M141937	D205466	M141939
SiO_2	44.3	44.4	44.50	44.63	44.65
TiO_2	4.16	4.03	3.83	3.75	3.75
Al_3O_3	13.5	13.3	14.00	13.98	14.15
Fe_2O_3	n.d.	n.d.	2.92	1.45	2.36
FeO	(17.04)	(17.12)	13.70	14.95	14.00
MnO	0.29	0.30	0.26	0.27	0.26
MgO	4.84	4.90	5.20	4.67	5.20
CaO	8.53	8.53	8.12	9.08	8.04
Na_2O	3.23	3.34	3.36	3.25	3.30
K_2O	1.55	1.59	1.52	1.64	1.55
P_2O_5	2.58	2.48	2.18	2.30	2.18
H_2O^+	n.d.	n.d.	0.20	0.27	0.23
H_2O^-	n.d.	n.d.	0.14	0.10	0.07
CO_2	n.d.	n.d.	0.07	0.04	0.06
Total	100.0	100.0	100.0	100.38	99.80

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period G

	Lava Creek flows (cont.)		
Sample no.	LC-13	LC-14	LC-15
Field no.	79K72B	79K70	78C8
USGS Lab. no.	M141940	M141938	D205440
SiO_2	44.80	44.88	45.04
TiO_2	3.80	3.84	3.62
Al_3O_3	14.18	13.64	12.60
Fe_2O_3	2.16	2.11	1.15
FeO	14.16	14.50	15.03
MnO	0.25	0.26	0.26
MgO	5.16	5.14	4.43
CaO	7.88	8.12	8.98
Na_2O	3.56	3.36	2.97
K_2O	1.54	1.48	1.65
P_2O_5	2.20	2.14	2.68
H_2O^+	0.20	0.24	0.41
H_2O^-	0.10	0.12	0.07
CO_2	0.07	0.07	0.02
Total	100.06	99.90	98.91

CRATERS OF THE MOON LAVA FIELD

Lava flows of Eruptive Period H

	Kimama flow		Bear Den Lake flow	Little Prairie flow
Sample no.	KM-1	KM-2	BR-1	LI-1
Field no.	79K99	75L12	78K69B	78C26
USGS Lab. no.	M141891	W189537	D205442	M141900
SiO_2	45.24	45.4	44.46	44.69
TiO_2	3.28	3.2	3.39	3.60
Al_3O_3	14.23	14.2	12.80	13.63
Fe_2O_3	1.27	2.3	0.52	1.10
FeO	15.11	14.2	15.43	14.72
MnO	0.28	0.23	0.26	0.25
MgO	4.53	4.0	4.18	4.80
CaO	7.50	7.8	8.98	7.92
Na_2O	3.50	3.2	3.11	3.36
K_2O	1.75	1.7	1.56	1.56
P_2O_5	2.64	2.6	2.76	2.48
H_2O^+	0.33	0.94	0.35	0.39
H_2O^-	0.08	0.40	0.20	0.13
CO_2	0.09	0.10	0.09	0.10
Total	99.83	100.3	98.09	98.73

CRATERS OF THE MOON LAVA FIELD

Cinder cones

	Unnamed cone	Unnamed cone	North Crater	Inferno Cone	Unnamed cone
Sample no.	CC-1	CC-2	CC-3	CC-4	CC-5
Field no.	78K2	79K102	78K154	79KL61	79K33
USGS Lab. no.	D205456	M141892	D205437	D205467	M141936
SiO_2	46.89	44.27	51.70	50.72	50.97
TiO_2	3.12	3.71	2.46	2.66	2.45
Al_3O_3	13.08	14.12	13.68	14.03	14.17
Fe_2O_3	1.17	2.46	2.28	1.23	1.55
FeO	14.69	14.18	12.24	13.77	12.79
MnO	0.26	0.27	0.24	0.25	0.25
MgO	3.90	5.12	2.74	3.03	3.17
CaO	8.15	8.16	6.57	6.56	6.34
Na_2O	3.46	3.36	3.67	3.48	3.60
K_2O	1.98	1.56	2.31	2.09	2.20
P_2O_5	2.03	2.83	1.53	1.78	1.55
H_2O^+	0.40	0.19	0.11	0.36	0.16
H_2O^-	0.09	0.14	<0.01	0.05	0.04
CO_2	0.05	0.15	0.02	0.06	0.05
Total	99.27	100.50	99.55	100.07	99.29

CRATERS OF THE MOON LAVA FIELD

Cinder Cones

	Broken Top	Half Cone	Unnamed cone	Big Cinder Butte	Big Cinder Butte
Sample no.	CC-6	CC-7	CC-8	CC-9	CC-10
Field no.	79K88	79K52	79K13	79K4	79K5
USGS Lab. no.	M141884	M141934	M141930	M141925	M141926
SiO_2	51.66	47.95	45.94	52.64	52.46
TiO_2	2.50	2.85	3.16	2.12	2.22
Al_3O_3	14.47	14.06	13.98	14.30	14.17
Fe_2O_3	2.03	2.44	2.43	2.57	2.34
FeO	12.78	13.82	13.77	11.39	11.88
MnO	0.25	0.28	0.27	0.21	0.22
MgO	3.03	3.64	4.60	2.62	2.34
CaO	6.32	6.98	7.62	5.84	6.09
Na_2O	3.56	3.52	3.41	4.31	4.38
K_2O	2.21	1.86	1.80	2.55	2.49
P_2O_5	1.62	1.90	2.45	1.24	1.33
H_2O^+	0.11	0.16	0.22	0.17	0.13
H_2O^-	0.02	0.12	0.20	<0.01	0.03
CO_2	0.11	0.11	0.09	0.05	0.11
Total	100.67	99.69	99.94	100.01	100.19

CRATERS OF THE MOON LAVA FIELD

Cinder cones (continued)

	Cone 5835	Crescent Butte	Coyote Butte	Echo Crater	Unnamed cone
Sample no.	CC-11	CC-12	CC-13	CC-14	CC-15
Field no.	79K57	78KL44	79K10	78K38	79K97
USGS Lab. no.	M141935	D205468	M141927	D205451	M141890
SiO_2	48.82	45.94	46.34	47.22	47.57
TiO_2	3.19	3.38	3.35	3.25	2.93
Al_3O_3	13.23	14.10	13.51	12.72	13.93
Fe_2O_3	1.31	2.00	1.76	9.67	2.83
FeO	14.67	14.16	13.94	6.86	12.84
MnO	0.26	0.26	0.23	0.25	0.26
MgO	3.46	4.24	4.26	3.83	3.64
CaO	7.34	8.76	8.04	8.31	6.99
Na_2O	3.44	3.34	4.38	3.40	3.49
K_2O	1.81	1.83	1.69	1.81	1.91
P_2O_5	1.95	2.30	2.18	2.39	2.17
H_2O^+	0.24	0.07	0.13	0.03	0.10
H_2O^-	0.04	0.06	<0.01	0.04	0.03
CO_2	0.08	0.12	0.06	0.03	0.13
Total	99.84	100.56	99.87	99.81	99.82

CRATERS OF THE MOON LAVA FIELD

Cinder cones (continued)

	Sentinel Butte	Split Butte	Sheep Trail Butte	Black Top Butte	Black Top Butte
Sample no.	CC-16	CC-17	CC-18	CC-19	CC-20
Field no.	78K123	78K128	78K115	78K85	78K87
USGS Lab. no.	D205459	D205448	D205463	M141912	M141914
SiO_2	44.58	46.25	44.83	52.61	53.06
TiO_2	3.69	3.27	3.63	2.16	2.13
Al_3O_3	13.76	13.20	13.84	14.36	14.35
Fe_2O_3	2.57	1.99	10.07	1.96	2.71
FeO	14.56	14.04	6.66	12.15	11.35
MnO	0.26	0.26	0.26	0.22	0.21
MgO	4.77	4.04	4.86	2.52	2.25
CaO	9.53	8.44	9.45	5.79	5.83
Na_2O	3.01	3.44	3.05	4.05	4.13
K_2O	1.56	1.84	1.56	2.58	2.57
P_2O_5	2.50	2.57	2.30	1.21	1.22
H_2O^+	0.17	0.19	0.25	0.14	0.12
H_2O^-	0.09	0.05	0.05	0.03	<0.01
CO_2	0.04	0.04	0.04	0.05	0.10
Total	101.09	99.62	100.85	99.82	100.03

WAPI LAVA FIELD

Sample no.	WA-1	WA-2	WA-3
Field no.	K-WAPI	P46	69-14
USGS Lab. no.	D250513	M133509	_____
SiO_2	46.2	46.39	45.50
TiO_2	2.36	2.17	2.86
Al_3O_3	15.0	15.43	16.10
Fe_2O_3	1.6	1.05	n.d.
FeO	11.0	11.03	(13.10)
MnO	0.20	0.19	0.21
MgO	8.98	8.34	7.79
CaO	10.6	10.77	10.30
Na_2O	2.30	2.65	2.69
K_2O	0.50	0.61	0.67
P_2O_5	0.60	0.67	0.78
H_2O^+	0.20	0.14	n.d.
H_2O^-	<0.01	0.06	n.d.
CO_2	0.03	0.04	n.d.
Total	99.6	99.54	100.00

KINGS BOWL LAVA FIELD

Sample no.	KB-1	KB-2	KB-3	KB-4	KB-5
Field no.	SRU-7	K-KB	IV71-14	IV71-13	SRU-6
USGS Lab. no.	-------	D250517	_____	_____	_____
SiO_2	44.51	45.8	45.70	45.86	46.00
TiO_2	3.01	2.48	2.29	2.29	2.23
Al_3O_3	16.21	14.7	14.76	14.66	15.40
Fe_2O_3	2.09	1.5	1.78	4.25	1.53
FeO	11.62	11.6	11.03	8.78	11.20
MnO	0.20	0.21	0.18	0.17	0.22
MgO	6.37	9.48	9.86	10.04	9.95
CaO	10.80	10.4	10.13	10.18	10.30
Na_2O	2.70	2.31	2.56	2.56	2.47
K_2O	0.66	0.45	0.41	0.42	0.52
P_2O_5	0.69	0.60	0.55	0.60	0.55
H_2O^+	0.56	0.12	0.10	0.14	0.08
H_2O^-	n.d.	<0.01	0.06	0.10	n.d.
CO_2	0.13	<0.01	n.d.	n.d.	0.07
Total	99.95	99.4	99.41	100.05	100.52

HELL'S HALF ACRE LAVA FIELD

Sample no.	HH-1	HH-2	HH-3	HH-4	HH-5
Field no.	SRU-13	84KS4	6-24-4B	HHA-8D	HHA-W
USGS Lab. no.	-------	D260164	-------	-------	-------
SiO_2	46.5	47.1	46.27	45.72	46.77
TiO_2	3.31	3.42	3.02	3.37	3.22
Al_3O_3	14.6	14.6	14.99	14.87	13.94
Fe_2O_3	3.1	1.9	1.06	1.99	1.67
FeO	10.9	12.8	12.66	13.82	12.48
MnO	0.22	0.22	0.20	0.16	0.18
MgO	6.44	6.47	6.54	5.84	7.10
CaO	9.78	9.30	9.12	9.28	9.40
Na_2O	2.63	2.60	2.57	2.56	2.40
K_2O	0.83	0.82	0.83	0.83	0.84
P_2O_5	0.55	0.57	0.68	0.99	0.82
H_2O^+	n.d.	0.19	0.17	0.18	0.30
H_2O^-	n.d.	0.02	n.d.	n.d.	n.d.
CO_2	n.d.	<0.01	0.32	0.36	0.34
Total	98.9	100.0	98.93	99.97	99.46

HELL'S HALF ACRE LAVA FIELD (cont.)

Sample no.	HH-6	HH-7	HH-8	HH-9
Field no.	SRV72-2	SRV72-4	6-16-6	SRU-12
USGS Lab. no.	-------	-------	W190343	-------
SiO_2	47.21	47.44	48.4	46.60
TiO_2	3.44	2.65	2.9	3.66
Al_3O_3	14.14	14.58	15.3	14.40
Fe_2O_3	4.12	3.70	2.9	n.d.
FeO	10.53	9.12	12.6	(15.10)
MnO	0.22	0.18	0.22	0.23
MgO	6.40	8.33	6.5	6.52
CaO	9.60	9.37	8.5	9.16
Na_2O	2.84	2.83	2.5	2.70
K_2O	0.87	0.77	0.82	0.98
P_2O_5	0.11	0.39	0.54	0.65
H_2O^+	0.10	0.23	0.25	n.d.
H_2O^-	0.12	0.11	0.03	n.d.
CO_2	n.d.	n.d.	0.07	n.d.
Total	99.70	99.70	101.5	100.00

CERRO GRANDE LAVA FIELD

Sample no.	CG-1	CG-2	CG-3	CG-4	CG-5
Field no.	84KS3	SRV72-21	75K166A	76SCG5	76SMF21
USGS Lab. no.	D260163	-------	W192043	-------	-------
SiO_2	45.2	45.37	46.5	44.82	46.3
TiO_2	3.49	3.32	3.2	3.11	2.75
Al_3O_3	14.7	14.57	14.5	14.76	15.4
Fe_2O_3	2.0	2.01	2.4	2.03	n.d
FeO	12.5	12.35	11.6	12.58	(13.60)
MnO	0.23	0.19	0.17	0.22	0.21
MgO	6.32	7.25	6.8	6.91	7.10
CaO	9.60	9.23	8.9	9.43	10.03
Na_2O	2.88	2.92	2.8	2.95	2.72
K_2O	0.89	0.88	0.89	0.85	0.63
P_2O_5	1.29	1.03	1.4	1.18	0.57
H_2O^+	0.20	0.16	0.45	0.38	n.d
H_2O^-	0.03	0.19	0.13	n.d.	n.d.
CO_2	<0.01	n.d.	0.02	0.04	n.d.
Total	99.3	99.5	99.8	99.26	99.4

	NORTH ROBBERS LAVA FIELD			SOUTH ROBBERS LAVA FIELD
Sample no.	NR-1	NR-2	NR-3	SR-1
Field no.	84KS2	75K173	77SMF43	84KS1
USGS Lab. no.	D260161	W192044	-------	D260162
SiO_2	46.4	47.0	45.30	44.6
TiO_2	2.10	2.3	3.41	3.10
Al_3O_3	15.4	15.5	15.70	14.9
Fe_2O_3	1.2	3.7	2.12	9.1
FeO	11.2	9.2	12.73	6.26
MnO	0.20	0.16	0.25	0.23
MgO	9.27	8.8	7.04	7.17
CaO	10.8	10.1	9.85	9.71
Na_2O	2.48	2.6	2.52	2.93
K_2O	0.40	0.43	0.68	0.66
P_2O_5	0.56	0.67	1.03	1.00
H_2O^+	0.14	0.23	0.26	0.25
H_2O^-	0.02	0.06	n.d.	0.04
CO_2	0.01	0.00	0.00	<0.01
Total	100.2	100.8	100.89	100.0

SHOSHONE LAVA FIELD

Sample no.	SH-1	SH-2	SH-3	SH-4
Field no.	KSHOS	84KS5	84KS6	SRV72-9
USGS Lab. no.	D250514	D260165	D260166	-------
SiO_2	46.1	46.4	46.4	46.26
TiO_2	2.84	2.68	2.54	2.66
Al_3O_3	14.4	14.8	15.0	14.36
Fe_2O_3	1.5	1.7	1.9	1.52
FeO	11.7	11.7	11.3	11.51
MnO	0.21	0.21	0.21	0.18
MgO	7.72	8.14	8.27	8.52
CaO	9.85	10.1	10.0	9.84
Na_2O	2.52	2.59	2.57	2.88
K_2O	0.85	0.69	0.68	0.78
P_2O_5	1.21	0.95	0.90	0.91
H_2O^+	0.32	0.25	0.19	0.19
H_2O^-	<0.01	0.03	0.03	0.23
CO_2	<0.01	<0.01	<0.01	n.d.
Total	99.2	100.2	100.0	99.82

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