Columbia River Basalt: 1980-1981

sample data and chemical analyses

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By Thomas L. Wright, Kevin N. Black, Donald A. Swanson, and Tim O'Hearn*

Introduction

In this report, we are making available all chemical analyses of whole rocks and selected glasses for samples of Columbia River basalt collected in 1980 and 1981, as well as information for 1971-1977 samples that were not analyzed at the time of our other open-file reports (Wright and others, 1979, 1980). The introductory information that follows is modified from those reports. Samples were analyzed in the laboratories of the U.S. Geological Survey, Reston, Va. (trace elements), at Washington State University (major oxides for bulk rocks), and at the Smithsonian Institution (major oxides for glass). Sample collection was performed under U.S. Geological Survey - U.S. Department of Energy Interagency Agreement EY-78-1-06-1078; major-element analytical work at Washington State University was done under contract nos. W53176, W98799, and M207625 with Rockwell Hanford Operations. In previous open-file reports we published separate tables for dikes and flows. Only one dike is reported here and this is specifically identified in tables 1a,b, and d.

Chemical classification of the samples tabulated in this report is based on major-oxide analyses, using the methods of Wright and Hamilton (1978). All chemical types have been defined previously (Wright and others, 1979, table 3; 1980, table 3 and 4) using samples restricted to a single mappable stratigraphic unit. The abbreviations for chemical types are listed on p. 1e-1f. Identification of the chemical type of each sample in this report is made with reference to polygonal fields expanded according to the standard error of the data set (see Wright and Hamilton, 1978, fig. 3 and Discussion). Chemical identifications

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enclosed by quotation marks (e.g., 'ROZA') in table 1 mark samples for which the analysis falls outside at least one polygon for the chemical type listed. A notation is made in the comment line as to which oxide(s) is (are) aberrant. The chemical composition of a fresh sample not fitting any defined chemical type is listed as unclassified (UNC) in table 1. These samples form the basis for definition of new chemical types.

Location data for all samples collected by Donald Swanson and Gary Byerly are given in this report as table 1a. Samples beginning with B (e.g. B77009) were collected by Byerly and Swanson in 1976 and 1977 in connection with mapping of the Wenatchee 1:100,000-scale (metric) sheet and were given WEN- field identifiers. These have been changed to B for this report both to conserve space and to separate them from DSTW-samples collected by Don Swanson and Tom Wright in the same years, i.e., sample DSTW 76-81 is reported in Wright and others (1979) as 76-81. Sample WEN 76-81 is reported here as B76081. Samples with no letter designation (e.g. 80-081) were collected by Don Swanson in 1980 and 1981 and have original field identification beginning with DS (i.e. DS 80-081).

Table 1b of this report contains all major oxide analyses of bulk rocks for which sample data are given in table 1a. Table 1c of this report contains all instrumental neutron activation analyses obtained to date and supersedes less complete trace element data given in table 1c of Wright and others (1979, 1980). Samples labeled SW correspond to samples collected by Swanson and Wright whose locations are available from previous reports (Wright and others, 1979, 1980). Duplicate analyses of each sample are listed here for all accurately determined elements instead of the previously published average analyses of selected trace elements. Thus, in table 1c of this report, analyses SW 74296a and SW 74296b replace the previously reported analysis labeled 74-296 R in table 1c of Wright and others, 1979. Samples labeled PH,

RB, VC, and WT correspond, respectively, to samples collected by Peter Hooper, Robert Bentley, Victor Camp, and William Taubeneck under the Interagency agreement mentioned above. Sample locations are available from the senior author.

Table 1d presents analysis of volcanic glass including pillow rinds, and one dike selvage labeled "Dike." Analyses were done by Tim O'Hearn on the electron microprobe at the Smithsonian Institution, Department of Mineral Sciences, using methods given by Byerly and others (1977). For samples in which only glass has been analyzed, the chemical type given in table 1d is based on stratigraphic position and/or comparison with glass analyses from samples of known chemical type.

Explanatory Notes for Abbreviations and Terms given in tables 1a

S A M P L E N U M B E R

Table 1a list samples collected by D.A. Swanson and G.R. Byerly and numbered serially within the year of collection (see above).

L O C A T I O N

State	W = Washington, O = Oregon, I = Idaho
County	As labelled
Quadrangle	U.S. Geological Survey 7 1/2-minute series unless otherwise indicated (e.g., Endicott 15')
Section	Location given to nearest 16th section for most samples (e.g., NW/SW12 = northwest 1/4 of southwest 1/4 of section 12; NW/13 = northwest 1/4 of section 13)
Township (T)	Referred to Willamette Baseline in Washington and Oregon and Boise Baseline in Idaho
Range (R)	Referred to Willamette Meridian in Washington and Oregon and Boise Meridian in Idaho

S T R A T I G R A P H Y

All stratigraphic names were defined by Swanson and others (1979)

Formation	Abbreviations as follows:	SM = Saddle Mountains WP = Wanapum GR = Grande Ronde PG = Picture Gorge
Member	Abbreviations as follows:	El Mt = Elephant Mountain Pomona = Pomona W Rdg = Weissenfels Ridge Asotin = Asotin W Cr = Wilbur Creek Um = Umatilla Pr Rp = Priest Rapids Roza = Roza Fr Sp = Frenchman Springs Eck Mt = Eckler Mountain
Flow	Local name given where appropriate	

C H E M I S T R Y

Method of analysis and chemical type refer to major oxide chemistry reported in table 1b. Abbreviations are as follows:

Method of Analysis (METHOD)

XRF = U.S. Geological Survey rock analysis laboratory, Menlo Park, Calif.; X-ray fluorescence methods under the direction of R.H. Abel (Job KD 17 only) and V.G. Mossotti.

XRF-15	Job KB18	Analyst:	Villareal
XRF-16	Job KB19	Analyst:	McDaniel
XRF-17	Job KB20	Analyst:	Espos
XRF-18	Job KD17	Analyst:	Bristow

WSU = Washington State University rock analysis laboratory. X-ray fluorescence methods under the direction of P.R. Hooper. Numbers are sequential and refer to analyses done in the same period of time.

WSU-28 (1980)	Analyst:	I. Herrick
WSU-29 (1981)		

Chemical Type (CHEM TYPE)

Abbreviations of chemical type are keyed to stratigraphic position as listed in the following unnumbered table. Samples analyzed in U.S. Geological Survey laboratories are identified as chemical types defined previously using USGS analyses (Wright and others, 1979, table 3). Samples analyzed at Washington State University are identified as chemical types defined previously using WSU analyses, (Wright and others, 1980, table 3), and their abbreviations are preceded by the initials of the collector, as follows:

SW = Donald Swanson and Thomas Wright
JG = Jamie Gardner
RB = Robert Bentley
GB = Gardner and Bentley
PH = Peter Hooper
VC = Victor Camp
WT = William Taubeneck

Abbreviations of chemical type, which are keyed to stratigraphic position:

Formation	Member	Flow	Chemical Type
Saddle Mountains	Lower Monumental	---	LM
Saddle Mountains	Ice Harbor	Goose Island	GOOSE
		Indian Memorial	INDIAN
		Martindale	MARTIN
		Basin City	BASIN
Saddle Moutains	Not yet defined (NE Oregon)	Nepheline Basalt	WT NEPH
		Andesites	WT ANDES
		Sugarloaf Mountain	WT SUGMT
		Spring Mountain	WT SPRMT
		Jones Butte	WT JONES
		Wilbur Mountain	WT WBRMT
		Olivine basalt, low Ti, P	WT OBLTI
		Olivine basalt, high Ti, P	WT OBHTI
Saddle Mountains	Buford		BUFORD
			PH BUFRD
Saddle Mountains	Elephant Mountain		ELEPHANT
			SW ELEPH
		Wenaha (NE Oregon)	PH WENHA
Saddle Mountains	Not yet defined (NE Oregon)	Eden	PH EDEN
Saddle Mountains	Craigmont (Camp, 1981)		VC CRAIG
	Icicle Flat (Camp, 1981)		VC IFLAT
	Grangeville (Camp, 1981)		VC GRNGE
Saddle Mountains	Pomona		POMONA
			GB PO
		Weippe (Clearwater embayment, Idaho-Camp (1981)	VC WEIPE
Saddle Moutains	Esquatzel		ESQUAT
			RBESQUAT
Saddle Mountains	Swamp Creek (Camp, 1981)		VC SWAMP
		Feary Creek (Camp, 1981)	VC FEARY
	Onaway	Potlatch (Camp, 1981)	VC POT
Saddle Mountains	Not yet defined (E Washington)	Sprague Lake	SWSPRAGE

Abbreviations of chemical type, which are keyed to stratigraphic position (cont.):

Formation	Member	Flow	Chemical Type
Saddle Mountains	Weissenfels Ridge	Slippery Creek	SLIP
		Lewiston Orchards	LEW ORCH
		Flow and dikes near Anatone, Black Butte	SW NEW
Saddle Mountains	Asotin		ASOTIN
			VC ASOT
		Huntzinger?	SW HUNTZ
Saddle Mountains	Not yet defined (Clearwater embayment, Idaho)	Lapwai flows (Camp, 1981)	VC LAP
Saddle Mountains	Wilbur Creek		WILBUR
			VC WILBR
Saddle Mountains	Umatilla		UMATILLA
			PH UMTIL
		Sopher ridge flows	PH SOPHER
Wanapum	Priest Rapids		LOLO INC
			VC LOLO
			ROSALIA
			SW ROSAL
Wanapum	Roza		ROZA
Wanapum	Not yet defined (NE Oregon)	Powatka	PH POWAT
Wanapum	Frenchman Springs		FS INC
			SW FRSP
Wanapum	Eckler Mountain	Shumaker	SHUMAKER
		"	PH SHUM
		Lookingglass	SW LOOK
		Dodge	DODGE
		"	SW DODGE
		Robinette Mountain	ROBIN
Grande Ronde			GR INC

Type of Analysis (ANAL. TYPE)

This column has been changed from the Glass designation used in previous reports. We now code these columns with information cross-referenced to other tables, i.e.,

G = major-oxide analysis of glass ---------- (Table 1d)
M = major-oxide analysis of bulk rock --------- (Table 1b)
T = trace-element (INAA) analysis ---------- (Table 1c)

Comment

The second line for each sample may contain a brief description of the unit sampled, the altitude, in feet, above mean sea level from which the sample was collected, strike and thickness of dikes, and, as explained above, a notation of which oxide, if any, does not fit the chemical type assigned to that sample.

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Table 1a. Columbia River Basalt flows. Release date February, 1982. Sample information for flows collected by D.A. Swanson and G. Byerly

SAMPLE NUMBER	LOCATION ST	COUNTY	QUADRANGLE	SECTION	T	R	STRATIGRAPHY FM	MEMBER	FLOW	CHEMISTRY METHOD	CHEM TYPE	ANAL. TYPE
B76001	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR		Hammond			G
	Section above Rock Island Dam. Satellite invasive flow associated with the "Hammond Sill", 950'.											
B76003	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR		Hammond			G
	Section above Rock Island Dam. Hyaloclastite associated with the invasive "Hammond Sill".											
B76004	W	Douglas	Rock Island Dam	SW/SW28	22N	22E	GR		Hammond			G
	Rock Island Grade, pillow selvedge associated with the invasive "Hammond Sill", 1510'.											
B76005	W	Douglas	Rock Island Dam	SW/SW28	22N	22E	GR		Hammond			G
	Rock Island Grade, satellite invasive flow associated with the "Hammond Sill", about 30' above main unit.											
B76006	W	Douglas	Rock Island Dam	NW/SE28	22N	22E	GR		Colockum Creek			G
	Rock Island Grade, chilled glassy top of invasive flow, 1790'.											
B76007	W	Douglas	Rock Island Dam	NE/NW34	22N	22E	WP	Fr Sp		XRF-16	FS INC	M
	Poorly exposed GR-WP contact with little or no soil or sedimentary interbed, 2240'.											
B76009	W	Douglas	Rock Island Dam	SW/NW29	22N	22E	GR		Hammond			G
	Keane Ranch, satellite invasive flow associated with "Hammond Sill", 1755'.											
B76010	W	Douglas	Rock Island Dam	SW/NW29	22N	22E	GR		Hammond			G
	Keane Ranch, chilled glassy top of invasive "Hammond Sill", 1750'.											
B76011	W	Douglas	Rock Island Dam	SE/SW29	22N	22E	GR		Colockum Creek			G
	Keane Ranch Section. Chilled glassy top of invasive Colockum Creek Flow, 1630'.											
B76012	W	Douglas	Rock Island Dam	SE/SW29	22N	22E	GR		Hammond			G
	Keane Ranch Section. Below B76011; hyaloclastite associated with invasive "Hammond Sill", 1555'.											
B76013	W	Douglas	Rock Island Dam	SE/SW29	22N	22E	GR		Hammond			G
	Keane Ranch Section. Below B76012, top of satellite invasive flow associated with "Hammond Sill", 1515'.											
B76014	W	Douglas	Rock Island Dam	SE/SW29	22N	22E	GR			XRF-16	GR INC	GM
	Keane Ranch Section. Below B76013, top of main invasive "Hammond Sill", invasive dike connects B76013 to B76014, 1505'.											
B76023	W	Douglas	Rock Island Dam	SE/SW29	22N	22E	GR		Hammond	XRF-16		M
	Keane Ranch Section. Below B76014, massive columns of invasive "Hammond Sill", 1260'.											
B76027	W	Douglas	Rock Island Dam	SE/SW29	22N	22E	GR		Hammond	XRF-16	GR INC	M
	Keane Ranch Section. Below B76023, platy jointing near base of invasive "Hammond Sill", 1140'.											
B76029	W	Douglas	Rock Island Dam	SE/SW29	22N	22E	GR			XRF-16	GR INC	M
	Keane Ranch Section. Below B76027, top of flow below the invasive "Hammond Sill", in places has invasive appearance, 1090'.											
B76030	W	Douglas	Rock Island Dam	SE/SW29	22N	22E	GR			XRF-16	GR INC	GM
	Keane Ranch Section. Below B76029, flow with vesicular top and pillowed base, 800'.											

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SAMPLE	LOCATION						STRATIGRAPHY			CHEMISTRY		
NUMBER	ST	COUNTY	QUADRANGLE	SECTION	T	R	FM	MEMBER	FLOW	METHOD	CHEM TYPE	ANAL. TYPE
B76031	W	Douglas	Rock Island Dam	SE/SW29	22N	22E	GR			XRF-16	GR INC	M
Keane Ranch Section. Below B76030, subaerial flow.												
B76032	W	Douglas	Rock Island Dam	SE/SW29	22N	22E	GR			XRF-16	GR INC	M
Keane Ranch Section. Below B76031, subaerial flow.												
B76033	W	Douglas	Rock Island Dam	SE/SW29	22N	22E	GR			XRF-16	GR INC	M
Keane Ranch Section. Below B76032, subaerial flow.												
B76034	W	Douglas	Rock Island Dam	NE/NW29	22N	22E	GR			XRF-16	GR INC	M
Keane Ranch, 300 m N of and stratigraphically above B76009.												
B76035	W	Douglas	Rock Island Dam	SE/SW29	22N	22E	GR		Hammond			G
Glass only. Keane Ranch, 200 m NW of B76009; chilled glassy top of invasive "Hammond Sill".												
B76036	W	Douglas	Rock Island Dam	NE/SE28	21N	22E	GR			XRF-16	GR INC	GM
Rock Island Grade, above B76006. Very thick, complex flow; top at 2230'. Glass seems altered.												
B76037	W	Douglas	Rock Island Dam	NW/SW27	21N	22E	GR			XRF-16	GR INC	M
Rock Island Grade, above thin claystone and B76036, 2430'.												
B76038	W	Douglas	Palisades	NE/SW10	22N	23E	GR			XRF-16	GR INC	GM
Moses Coulee at Whiskey Dick Creek. Invasive flow below claystone forms waterfall.												
B76040	W	Douglas	Palisades	NE/SW10	22N	23E	GR			XRF-18	"GR INC"	M
Moses Coulee. Pegmatoid in B76038 invasive flow. Low Al_2O_3.												
B76041	W	Douglas	Palisades	NW/SE10	22N	23E	GR			XRF-16	GR INC	M
Moses Coulee, below B76040. Scabland bench in floor of coulee.												
B76042	W	Douglas	Rattlesnake Springs	SW/NW30	23N	24E	GR					G
Glass only. Mouth of Douglas Creek above railroad tunnel. Invasive flow below organic, wood-bearing sandstone.												
B76043	W	Douglas	Rattlesnake Springs	SW/NW30	23N	24E	GR					G
Glass only. Basal glassy selvedge of B76042.												
B76044	W	Douglas	Rattlesnake Springs	SW/NW30	23N	24E	GR					G
Glass only. Peperite below B76043.												
B76045	W	Douglas	Rock Island	NW/SW16	23N	21E	GR					G
Glass only. Badger Mountain Rd. Pillows above sandstone, 3340'.												
B76046	W	Douglas	Rock Island	NW/SW16	23N	21E	GR					G
Glass only. Badger Mountain Rd, below sandstone and B76045. Invasive flow with thick upper glassy selvedge, 3240'.												
B76047	W	Douglas	Rock Island	SW/SE17	23N	21E	GR		Hammond			G
Glass only. Badger Mountain Rd, below sandstone and B76046. Thick upper glassy selvedge of invasive "Hammond Sill", 2640'.												

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SAMPLE NUMBER	LOCATION ST	COUNTY	QUADRANGLE	SECTION	T	R	STRATIGRAPHY FMI	MEMBER	FLOW	CHEMISTRY METHOD	CHEM TYPE	ANAL. TYPE
B76048	W	Douglas	Malaga NE	SW/SE4	22N	22E	GR					G
	Glass only. Keane Ranch. Upper glassy selvedge of invasive flow, 1900'.											
B76049	W	Douglas	Rock Island	SW/NW7	22N	22E	GR					G
	Glass only. Keane Ranch. Upper glassy selvedge of invasive flow, somewhat pillowed.											
B76050	W	Douglas	Malaga NE	NW/NE8	22N	22E	GR					G
	Glass only. Keane Ranch, above B76049. Basal pillows.											
B76051	W	Douglas	Malaga NE	NE/NE20	23N	22E	WP	Fr Sp				G
	Glass only. Beaver Creek Road. Highly phyric flow, 2650'.											
B76052	W	Douglas	Rock Island	SW/NW24	23N	21E	GR					G
	Glass only. Beaver Creek Road. Peperite above invasive flow.											
B76053	W	Douglas	Rock Island	SW/NW24	23N	21E	GR					G
	Glass only. Beaver Creek Road. Basal pillows above sediment and B76052.											
B76054	W	Douglas	Rock Island	NE/SW1	22N	21E	GR					G
	Glass only. Wenatchee Radio Tower Road. Upper glassy selvedge of invasive flow.											
B76055	W	Douglas	Rock Island	NE/SE2	22N	21E	GR					G
	Glass only. Wenatchee Radio Tower Road. Basal pillows, uppermost flow on ridge.											
B76056	W	Douglas	Malaga NE	NW/NE14	23N	22E	GR					G
	Glass only. Below Moses' Stool in roadcut. Basal pillows above claystone.											
B76057	W	Douglas	Palisades	SW/SE7	22N	23E	GR					G
	Glass only. Duffy Creek. Upper glassy selvedge of invasive flow.											
B76058	W	Douglas	Palisades	SW/SE7	22N	23E	GR					G
	Glass only. Duffy Creek, above sediments and above B76057. Basal pillows.											
B76059	W	Chelan	Rock Island Dam	SW/NE17	21N	22E	GR					G
	Glass only. Dry Gulch. Basal selvedge with sediments below.											
B76060	W	Chelan	Rock Island Dam	SW/NE17	21N	22E	GR					G
	Glass only. Dry Gulch. Upper selvedge of invasive flow B76059.											
B76061	W	Chelan	Malaga	NW/NW2	21N	21E	GR					G
	Glass only. Alcoa Point. Upper selvedge of invasive flow, 2715'.											
B76062	W	Chelan	Malaga	NW/NW2	21N	21E	GR					G
	Glass only. Alcoa Point, above B76061 and claystone. Basal pillows.											
B76063	W	Chelan	Wenatchee Heights	SW/NW18	21N	21E	GR					G
	Glass only. Laurel Hill roadcut. Glassy upper selvedge of invasive flow. Altered? Low K2O.											

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SAMPLE NUMBER	LOCATION ST	COUNTY	QUADRANGLE	SECTION	T	R	STRATIGRAPHY FM	MEMBER	FLOW	CHEMISTRY METHOD	CHEM TYPE	ANAL. TYPE
B76064	W	Chelan	Wenatchee Heights	NW/SW34	22N	20E	GR					G
	Glass only. Wenatchee Heights. Hyaloclastite. Altered. Very low K20.											
B76067	W	Chelan	Wenatchee Heights	SW/NE3	20N	20E	GR			XRF-18	GR INC	M
	Jumpoff Ridge near Mission Peak, very thick flow.											
B76068	W	Chelan	Wenatchee Heights	NE/NE34	21N	20E	GR		Hammond			G
	Glass only. Rocky Ridge Road. Glassy upper selvedge of invasive "Hammond Sill".											
B76069	W	Chelan	Wenatchee Heights	SE/SE23	21N	20E	GR		Hammond			G
	Glass only. Upper selvedge of invasive "Hammond Sill".											
B76070	W	Chelan	Rock Island Dam	SE/NE20	21N	22E	GR		Colockum Creek			G
	Glass only. Colockum Creek at Columbia River. Very thick pillowed unit.											
B76071	W	Kittitas	West Bar	NW/NE17	20N	22E	GR		Colockum Creek			G
	Glass only. Tarpiscan Creek Road. Basal pillows.											
B76072	W	Kittitas	West Bar	NW/NE17	20N	22E	GR		Colockum Creek			G
	Glass only. Tarpiscan Creek Road. Glassy upper selvedge, invasive into claystone.											
B76073	W	Kittitas	West Bar	NE/NW17	20N	22E	GR		Colockum Creek			G
	Glass only. Tarpiscan Creek Road. Basal pillows.											
B76074	W	Kittitas	Stray Gulch	NW/SE23	20N	21E	GR					G
	Glass only. Tarpiscan Creek Road. Upper pillows.											
B76075	W	Kittitas	Wenatchee Heights	NE/NE2	20N	20E	GR		Hammond			G
	Glass only. North Fork Colockum Creek. Upper glassy selvedge of invasive "Hammond Sill".											
B76076	W	Kittitas	Colockum Pass SW	NW/SW31	18N	20E	WP	Pr Rp		XRF-16	"ROSALIA"	M
	Roadcut in small hill. This flow is above a vesicular Frenchman Springs Flow. Low FeO.											
B76077	W	Kittitas	Colockum Pass SW	SE/NE36	18N	19E	WP	Pr Rp				G
	Glass only. Same flow as B76076. Basal glassy selvedge against sediments.											
B76078	W	Kittitas	Colockum Pass SE	SE/SE19	19N	20E	GR					G
	Glass only. Cooke Creek Road. Upper glassy selvedge of invasive flow.											
B76079	W	Kittitas	Colockum Pass	NW/NE15	20N	20E	GR					G
	Glass only. Top flow on Ingersol Road. Complex flow with mixed pillows, vesicular flow, and sediments.											
B76080	W	Kittitas	Colockum Pass	SW/SW11	20N	20E	GR					G
	Glass only. Pillowed unit below B76079.											
B76081	W	Kittitas	Naneum Canyon	SE/SE13	19N	19E	GR					G
	Glass only. Coleman Canyon Road. Upper pillowed unit above thick entablature, lowest flow exposed.											

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SAMPLE NUMBER	LOCATION ST	COUNTY	QUADRANGLE	SECTION	T	R	STRATIGRAPHY FM	MEMBER	FLOW	CHEMISTRY METHOD	CHEM TYPE	ANAL. TYPE
B76093	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR		Hammond			G
Glass only. Section above Rock Island Dam. Pillow fragment in peperite above invasive "Hammond Sill", 980'.												
B76094	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR		Hammond			G
Glass only. Section above Rock Island Dam and B76093. Bedded peperite just below sediments, 1015'.												
B76095	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR			XRF-16	GR INC	GM
Section above Rock Island Dam and B76094. Flow with upper pillowed unit; glass has low Na2O, 1030'.												
B76096	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR		Colockum Creek			G
Glass only. Section above Rock Island Dam and B76095. Basal pillowed unit, 1055'.												
B76097	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR		Colockum Creek	XRF-16	GR INC	M
Section above Rock Island Dam and B76096. Massive unit within complex flow, 1060'.												
B76098	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR					G
Glass only. Section above Rock Island Dam and B76097. Large pillows in basal unit of complex flow, 1080'.												
B76099	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR			XRF-16	GR INC	GM
Section above Rock Island Dam and B76098. Thick, most prominent pillowed unit in this section above 10' of sediment, 1140'.												
B76100	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR			XRF-16	GR INC	M
Section above Rock Island Dam and B76099. Colonnade above pillows, part of same flow as B76099.												
B76101	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR					G
Glass only. Section above Rock Island Dam. Upper glassy selvedge, same flow as B76099 and B76100, 1450'.												
B76102	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR			XRF-16	GR INC	M
Section above Rock Island Dam and B76101. Thick entablature, 1510'.												
B76104	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR			XRF-16	GR INC	GM
Section above Rock Island Dam and flow B76102. Pillowed top of flow B76102, 1705'.												
B76105	W	Douglas	Rock Island Dam	SE/SW4	21N	22E	GR			XRF-16	GR INC	GM
Section above Rock Island Dam and B76104. Glassy selvedge of complex flow with mixed peperite, 1770'.												
B76110	W	Grant	Evergreen Ridge	NE/SE17	18N	23E	WP	Roza				G
Glass only. Diatomite quarry. Invasive flow.												
B77001	W	Douglas	Rock Island Dam	SE/NW4	21N	22E	GR		Dry Gulch			G
Glass only. Section above Rock Island Dam. Thin pillowed unit, 1150'.												
B77002	W	Douglas	Rock Island Dam	SE/NW4	21N	22E	GR			XRF-16	GR INC	M
Section above Rock Island Dam and B77001. Massive flow, 1160'.												
B77003	W	Douglas	Rock Island Dam	SE/NW4	21N	22E	GR					G
Glass only. Section above Rock Island Dam and B77002. Pillows with minor mixed sediment.												

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B77004	W	Douglas	Rock Island Dam	NW/SE4	21N	22E	GR					G
Glass only. Section above Rock Island Dam and B77003. Pillows with minor mixed sediment, 1570'.												
B77005	W	Douglas	Rock Island Dam	NW/SE4	21N	22E	GR					G
Glass only. Section above Rock Island Dam and B77004. Pillows above a sediment unit at 1810'.												
B77006	W	Douglas	Rock Island Dam	NW/SE4	21N	22E	GR					G
Glass only. Section above Rock Island Dam and B77005. Pillowed unit, top of flow B77005, 1860'.												
B77007	W	Douglas	Rock Island Dam	NW/SE4	21N	22E	GR					G
Glass only. Section above Rock Island Dam and B77006. Basal glassy selvedge against sediment, 1861'.												
B77009	W	Douglas	Rock Island Dam	SW/SW3	21N	22E	GR					G
Glass only. 500' S of above samples. Hyaloclastite equal to B77006.												
B77010	W	Douglas	Rock Island Dam	SW/SW3	21N	22E	GR					G
Glass only. Above B77009 and siltstone. Pillowed base of flow.												
B77018	W	Douglas	Rock Island Dam	E/NW22	21N	22E	GR					G
Glass only. Rocky Point Section at Moses' Coulee. Vesicular top of lowest flow, altered, 940'.												
B77019	W	Douglas	Rock Island Dam	E/NW22	21N	22E	GR					G
Glass only. Rocky Point Section above B77018. Vesicular top of flow unit at 960', probably equals B77018 but also altered.												
B77020	W	Douglas	Rock Island Dam	E/NW22	21N	22E	GR					G
Glass only. Rocky Point Section above B77020. Basal pillowed unit with 1-2 percent small plagioclase phenocrysts, 970'.												
B77021	W	Douglas	Rock Island Dam	E/NW22	21N	22E	GR					G
Glass only. Rocky Point Section above B77020. Basal selvedge above sediments, sparsely plagioclase phyric, 1080'. Low Na2O.												
B77022	W	Douglas	Rock Island Dam	E/NW22	21N	22E	GR					G
Glass only. Rocky Point Section above B77021. Basal pillowed unit, 1260'.												
B77023	W	Douglas	Rock Island Dam	E/NW22	21N	22E	GR					G
Glass only. Rocky Point Section, flow above B77022. Basal selvedge with thin peperite interbed, 1370'.												
B77024	W	Douglas	Rock Island Dam	E/NW22	21N	22E	GR					G
Glass only. Rocky Point Section, flow above B77023. Basal pillowed unit, 1460'.												
B77025	W	Douglas	Rock Island Dam	E/NW22	21N	22E	GR					G
Glass only. Rocky Point Section. Pillowed unit within thick massive flow, 1180'.												
B77027	W	Douglas	West Bar	NE/SW10	20N	22E	GR		Colockum Creek			G
Glass only. Lowest exposed flow, across from stockyard, in quarry, 1080'.												
B77029	W	Douglas	West Bar	NE/NE9	20N	22E	GR		Rocky Point			G
Glass only. About 500' N of B77027. Selvedge from vesicular flow top with sparse plagioclase phenocrysts, 1130'. Equals B77020.												

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B77030	W	Douglas	West Bar	NE/NE9	20N	22E	GR					G
	Glass only. Above B77029. Most prominent pillowed unit, 1170'.											
B77031	W	Douglas	West Bar	SE/SE4	20N	22E	GR					G
	Glass only. Pillowed unit above and about 500' N of B77030, 1260'.											
B77032	W	Douglas	West Bar	SE/SE4	20N	22E	GR					G
	Glass only. Above B77031 but probably massive part of same flow, 1270'											
B77033	W	Douglas	Rock Island Dam	NW/SW3	20N	22E	GR					G
	Glass only. Vesicular top of flow above B77032, 1440'.											
B77035	W	Douglas	West Bar	SW/SW3	20N	22E	GR					G
	Glass only. Above petrified wood pit, 1580'.											
B77038	W	Douglas	West Bar	SW/SW3	20N	22E	GR					G
	Glass only. Below petrified wood pit, pillowed unit, 1400'.											
B77039	W	Douglas	West Bar	SE/SE4	20N	22E	GR					G
	Glass only. Below B77038. Pillowed unit, 1340'.											
B77040	W	Douglas	Rock Island Dam	NE/NW9	21N	22E	GR		Hammond	XRF-16	GR INC	M
	Small, down-faulted(?) block W of road, invasive "Hammond Sill".											
B77041	W	Chelan	Malaga	NW/NW36	22N	21E	GR					G
	Glass only. Small hill below Alcoa Point. Hyaloclastite, 870'.											
B77042	W	Chelan	Malaga	SE/SW25	22N	21E	GR					G
	Glass only. Below B77041 at river.											
B77043	W	Chelan	Malaga	SW/SW25	22N	21E	GR					G
	Glass only. About 500' below railroad bridge at river. Highly tilted flow below sedimentary interbed, altered, SiO2 is low.											
B77044	W	Chelan	Malaga	SW/SW25	22N	21E	GR					G
	Glass only. Above B77043 and sedimentary interbed.											
B77045	W	Douglas	Rock Island Dam	1	21N	22E	GR		Rocky Point			G
	Glass only. Second flow from base of Frances Canyon. Plagioclase phyric, 1020'.											
B77046	W	Douglas	Rock Island Dam	1	21N	22E	GR					G
	Glass only. Above B77045 in Frances Canyon. Basal pillowed unit of thick flow, 1380'.											
B77047	W	Douglas	Malaga NE	NE/SW10	23N	22E	GR					G
	Glass only. Quarry above Rock Island Creek. Basal pillows of uppermost flow, 2580', thick sediments below.											
B77049	W	Douglas	Malaga NE	NW/SW10	23N	22E	GR		Colockum Creek			G
	Glass only. Below B77047. Peperite at top of invasive flow, 2180'.											

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SAMPLE NUMBER	LOCATION ST	COUNTY	QUADRANGLE	SECTION	T	R	STRATIGRAPHY FMI	MEMBER	FLOW	CHEMISTRY METHOD	CHEM TYPE	ANAL. TYPE
B77052	W	Douglas	Malaga NE	NW/SE10	23N	22E	GR					G
	Glass only. Above B77047. 2680'.											
B77053	W	Douglas	Malaga	NW/SW25	22N	21E	GR			XRF-16	GR INC	GM
	NE side of railroad bridge, steeply dipping flow.											
B77055	W	Douglas	Palisades	SW/SE7	22N	23E	GR			XRF-16	GR INC	M
	Upper flow at Duffy Creek, 2990'.											
B77056	W	Douglas	Palisades	NW/NE18	22N	23E	GR			XRF-16	GR INC	M
	Below B77055, 2660'.											
B77057	W	Douglas	Palisades	NW/NE18	22N	23E	GR					G
	Glass only. Below B77056. Thick pillowed unit, 2800'.											
B77058	W	Douglas	Palisades	SW/NE16	22N	23E	GR			XRF-16	GR INC	M
	Vesicular top of lowest flow in Duffy Creek, 2540'.											
B77059	W	Douglas	Rock Island Dam	NW/NE32	22N	22E	GR					G
	Glass only. Below the invasive "Hammond Sill" in the Keane Ranch section. Also invasive into sediments.											
B77060	W	Chelan	Malaga	NE/NE3	21N	21E	GR			XRF-16	GR INC	M
	Below Alcoa Point. Prominent colonnade at 2420'.											
B77062	W	Chelan	Malaga	NE/NE3	21N	21E	GR		Colockum Creek			G
	Glass only. Below B77060 and thick sedimentary interbed. Upper glassy selvedge of invasive flow.											
B77063	W	Chelan	Malaga	NE/NE3	21N	21E	GR		Colockum Creek	XRF-16	GR INC	M
	Massive part of flow B77062, 2220'.											
B77064	W	Chelan	Malaga	NW/NE3	21N	21E	GR		Hammond			G
	Glass only. Below B77063 and sedimentary interbed. Invasive dike rooted in top of "Hammond Sill", 1940'.											
B77065	W	Chelan	Malaga	NW/NE3	21N	21E	GR		Hammond	XRF-16	GR INC	M
	Below B77064, massive portion of invasive "Hammond Sill", coarse colonnade, 1820'.											
B77066	W	Chelan	Rock Island Dam	NW/NE6	21N	22E	GR					G
	Glass only. Section about 1 mile S of Alcoa Plant. Lowest exposed flow, vesicular top at 950'.											
B77067	W	Chelan	Rock Island Dam	NW/NE6	21N	22E	GR					G
	Glass only. Above B77066, below sedimentary interbed. Invasive flow at 1090'.											
B77068	W	Chelan	Malaga	NE/NW6	21N	22E	GR		Hammond			G
	Glass only. Above B77067, below sedimentary interbed. Invasive "Hammond Sill", 1500'.											
B77069	W	Chelan	Malaga	NE/NW6	21N	22E	GR		Hammond			G
	Glass only. Above B77068, within sedimentary interbed. Satellite invasive flow of "Hammond Sill", 1570'.											

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B77070	W	Chelan	Malaga	NE/NW6	21N	22E	GR		Colockum Creek			G
Glass only. Above B77069. Pillowed unit.												
B77071	W	Kittitas	West Bar	SW/SW16	20N	22E	GR		Hammond			G
Glass only. Cape Horn Section. Top of invasive "Hammond Sill", 1125'.												
B77072	W	Kittitas	West Bar	SW/SW16	20N	22E	GR			XRF-16	GR INC	GM
Cape Horn Section, above B77071 and sedimentary interbed. Thick pillowed unit, 1140'.												
B77073	W	Kittitas	West Bar	NW/SW16	20N	22E	GR		Dry Gulch	XRF-16	GR INC	GM
Cape Horn Section, above B77072. Mixed pillows and sediments in invasive flow, 1270'.												
B77074	W	Kittitas	West Bar	NE/SW16	20N	22E	GR		Colockum Creek	XRF-16	GR INC	GM
Cape Horn Section, above B77073. Complex contact between basal pillows and thick entablature, marked by petrified wood, 1320'.												
B77075	W	Kittitas	West Bar	SE/SW16	20N	22E	GR		Colockum Creek			G
Glass only. Cape Horn Section, glassy top of flow, vesicular, 1560'.												
B77076	W	Kittitas	West Bar	SE/SW16	20N	22E	GR		Rocky Point	XRF-16	GR INC	GM
Cape Horn Section, above B77075. Vesicular pillows below colonnade of plagioclase phyric flow, 1580'.												
B77077	W	Kittitas	West Bar	SE/SW16	20N	22E	GR			XRF-17	GR INC	GM
Cape Horn Section, above B77076. Basal pillowed unit, 1650'.												
B77078	W	Kittitas	West Bar	SE/SW16	20N	22E	GR			XRF-17	GR INC	M
Cape Horn Section, above B77077 but same flow, 1770'.												
B77079	W	Kittitas	West Bar	SE/SW16	20N	22E	GR			XRF-17	GR INC	GM
Cape Horn Section, above B77078. Basal pillowed unit, 1910'.												
B77080	W	Kittitas	West Bar	SE/SW16	20N	22E	GR			XRF-17	GR INC	GM
Cape Horn Section, above B77079. Pillowed unit within B77079 flow, 2000'.												
B77081	W	Kittitas	West Bar	NE/NW21	20N	22E	GR			XRF-17	GR INC	GM
Cape Horn Section, above B77080. Pillowed unit at base of flow, 2030'.												
B77082	W	Kittitas	West Bar	NE/NW21	20N	22E	WP	Fr Sp		XRF-17	FS INC	M
Cape Horn Section, above B77081 and sedimentary interbed, 2110'.												
B77035	W	Kittitas	Cape Horn SE	SE/SW19	19N	22E	GR			XRF-16	GR INC	M
Brushy Creek Section. Lowest flow defined by thin, vesicular flow units, 1740'.												
B77036	W	Kittitas	Cape Horn SE	SE/SW19	19N	22E	GR			XRF-16	GR INC	M
Brushy Creek Section, above B77035. Probably part of B77035, 1755'.												
B77087	W	Kittitas	Cape Horn SE	SE/SW19	19N	22E	GR		Colockum Creek	XRF-16	GR INC	GM
Brushy Creek Section, above B77036. Basal pillows, 1850'.												

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B77088	W	Kittitas	Cape Horn	SE/SW19	19N	22E	GR		Colockum Creek	XRF-17	GR INC	M
	Brushy Creek Section, above B77087. Massive part of flow, 1950'.											
B77089	W	Kittitas	Cape Horn SE	SE/SW19	19N	22E	GR			XRF-17	GR INC	GM
	Brushy Creek Section, above B77088. Basal pillows, 2130'.											
B77090	W	Kittitas	Cape Horn SE	SE/SW19	19N	22E	GR			XRF-17	GR INC	GM
	Brushy Creek Section, above B77039. Massive part of B77089, 2170'.											
B77091	W	Kittitas	Cape Horn SE	NE/NW30	19N	22E	GR			XRF-15	GR INC	M
	Brushy Creek Section, above B77090, massive part of B77089, 2240'.											
B77092	W	Kittitas	Cape Horn SE	NE/NW30	19N	22E	GR			XRF-17	GR INC	M
	Brushy Creek Section, above B77091, next higher flow, 2310'.											
B77093	W	Kittitas	Cape Horn SE	NE/NW30	19N	22E	GR			XRF-17	GR INC	GM
	Brushy Creek Section, above B77092, pillowed unit within(?) B77092, 2380'.											
B77094	W	Kittitas	Cape Horn SE	NE/NW30	19N	22E	GR			XRF-17	GR INC	M
	Brushy Creek Section, above B77093, massive upper part of flow B77092, 2430'.											
B77095	W	Kittitas	Cape Horn SE	NE/NW30	19N	22E	GR			XRF-17	GR INC	M
	Brushy Creek Section, above B77094 and immediately below Frenchman Springs Flow, 2500'.											
B77096	W	Chelan	Rock Island Dam	SW/NE5	21N	22E	GR			XRF-17	GR INC	M
	Rock Island, in river above dam. Upper flow.											
B77097	W	Chelan	Rock Island Dam	SW/NE5	21N	22E	GR					G
	Glass only. Basal pillows of B77096 flow.											
B77098	W	Chelan	Rock Island Dam	SE/NE5	21N	22E	GR					G
	Glass only. Rock Island Dam, spillway cut for new generators. Complex peperite and flow.											
B77099	W	Chelan	Rock Island Dam	NW/NW28	21N	22E	GR		Dry Gulch	XRF-17	GR INC	GM
	Flow collected from Columbia River bank 1/2 mile S of Colockum Creek.											
B77101	W	Douglas	Rock Island	SE/SE21	23N	21E	GR		Colockum Creek			G
	Glass only. Badger Mountain. Basal pillows from the second of three exposed invasive flows, 2930'.											
B77103	W	Douglas	Rock Island Dam	NE/NE3	22N	21E	GR		Hammond			G
	Glass only. Very large landslide block at base of Badger Mountain. Invasive "Hammond Sill", 2240'.											
B77104	W	Douglas	Rock Island	SE/SW34	23N	21E	GR		Hammond			G
	Glass only. Within same large block but above B77103. Basal pillows, 2700'.											
B77105	W	Chelan	Mission Peak	SW/NE25	21N	19E	GR			XRF-17	GR INC	M
	Naneum Ridge. Selvedge from top of invasive flow, 5880'.											

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B77107	W	Chelan	Mission Peak	NW/SE25	21N	19E	GR		Colockum Creek	XRF-17	GR INC	M
Naneum Ridge. Above B77105, 5920'.												
B77109	W	Chelan	Mission Peak	NW/SE25	21N	19E	GR			XRF-17	GR INC	M
Naneum Ridge. Above B77107, top flow in section, 6300'.												
B77115	W	Kittitas	Stray Gulch	SE/NW13	20N	21E	GR					G
Glass only. Tarpiscan Creek Road. Pillowed unit, 2000'.												
B77117	W	Kittitas	Stray Gulch	SW/SW35	20N	21E	GR			XRF-17	GR INC	M
Stray Gulch Section. Lowest flow units in section, vesicular, 2600'.												
B77118	W	Kittitas	Stray Gulch	SW/SW35	20N	21E	GR		Colockum Creek	XRF-17	GR INC	GM
Stray Gulch Section, above B77117. Very thick pillowed unit, 2680'.												
B77119	W	Kittitas	Stray Gulch	SE/SE34	20N	21E	GR		Colockum Creek	XRF-17	GR INC	M
Stray Gulch Section, above B77118, same flow, 2860'.												
B77120	W	Kittitas	Stray Gulch	SE/SE34	20N	21E	GR		Colockum Creek	XRF-17	GR INC	M
Stray Gulch Section, above B77119, same flow, 2920'.												
B77121	W	Kittitas	Stray Gulch	SE/SE34	20N	21E	GR					G
Glass only. Stray Gulch Section, above B77120. Basal pillow unit, 2985'.												
B77122	W	Kittitas	Stray Gulch	SE/SE34	20N	21E	GR			XRF-17	GR INC	M
Stray Gulch Section, above B77121 but likely part of same flow, 3080'.												
B77123	W	Kittitas	Stray Gulch	NW/NE3	19N	21E	GR			XRF-17	"GR INC"	M
Stray Gulch Section, above B77122. Highest flow in section, 3500'. High FeO.												
B77127	W	Kittitas	Naneum Canyon	SE/SE4	19N	19E	GR			XRF-17	GR INC	GM
Glass only. Naneum Canyon Section. Lowest flow collected in roadcut, flow against sediments, 3010'.												
B77128	W	Kittitas	Naneum Canyon	NE/NE22	20N	19E	GR					G
Glass only. Naneum Canyon Road. Upper selvedge of invasive flow filling channel(?) in Swauk(?) Sandstone, 3580'.												
B77129	W	Kittitas	Naneum Canyon	NW/NW23	20N	19E	GR					G
Glass only. Naneum Canyon Road, above B77128. Invasive flow, 3670'.												
B77131	W	Kittitas	Naneum Canyon	NW/SE22	20N	19E	GR					G
Glass only. Naneum Canyon Road. Invasive flow, 3330'.												
B77132	W	Kittitas	Naneum Canyon	SW/SE22	20N	19E	GR					G
Glass only. Naneum Canyon Road, below but probably equal to B77131, 3300'.												
B77133	W	Kittitas	Naneum Canyon	NW/NE3	19N	19E	GR			XRF-17	GR INC	M
Naneum Canyon Section. Flow above B77140, 3380'.												

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B77134	W	Kittitas	Naneum Canyon	NW/NE3	19N	19E	GR			XRF-17	GR INC	M
Naneum Canyon Section. Flow above B77133, 3400'.												
B77135	W	Kittitas	Naneum Canyon	NW/NE3	19N	19E	GR			XRF-17	GR INC	M
Naneum Canyon Section. Thick flow above B77134, 3550'.												
B77136	W	Kittitas	Naneum Canyon	NE/NE3	19N	19E	GR			XRF-17	GR INC	GM
Naneum Canyon Section. Above B77135, pillowed unit at 3860'.												
B77137	W	Kittitas	Naneum Canyon	NE/NE3	19N	19E	GR			XRF-17	GR INC	M
Naneum Canyon Section. Above B77136, but may be same flow, 4030'.												
B77138	W	Kittitas	Naneum Canyon	NW/NW2	19N	19E	GR			XRF-17	GR INC	GM
Naneum Canyon Section. Above B77137, flow at top of canyon; thick pillowed base and platy colonnade, 4240'.												
B77139	W	Kittitas	Naneum Canyon	NE/NW3	19N	19E	GR			XRF-17	GR INC	M
Naneum Canyon Section. Above B77127 at 3120'.												
B77140	W	Kittitas	Naneum Canyon	NE/SE4	19N	19E	GR			XRF-17	GR INC	M
Naneum Canyon Section. Flow between B77139 and B77133, 3170'.												
B77141	W	Kittitas	Mission Peak	SE/SE31	21N	19E	GR					G
Glass only. Upper Naneum Creek. Top of invasive flow, 4400'.												
B77142	W	Kittitas	Mission Peak	SW/NE36	21N	18E	GR			XRF-17	GR INC	M
Howard Creek. Colonnade of very thick flow, 4750'.												
B77145	W	Kittitas	Mission Peak	NW/NW35	21N	19E	GR					G
Glass only. Mission Peak Ski Lift, highest flow exposed is above a sedimentary interbed, 6730'.												
B77146	W	Kittitas	Mission Peak	NW/SE27	21N	19E	GR					G
Glass only. Mission Peak Ski Lift, pillowed unit below sediments and B77145, 6790'.												
B77147	W	Kittitas	Mission Peak	NE/NE34	21N	19E	GR		Hammond			G
Glass only. Mission Peak Ski Lift, top of invasive "Hammond Sill" below sediments, 6640'.												
B77148	W	Kittitas	Mission Peak	NW/NW27	21N	19E	GR					G
Glass only. Mission Peak Ski Lift, top of invasive flow below sediments, 6640'.												
B77152	W	Kittitas	Liberty 15'	NE/SE33	21N	18E	GR			XRF-17	GR INC	GM
Below Table Mountain Road. Upper glassy selvedge of invasive(?) flow below sediments, 6120'.												
B77153	W	Kittitas	Liberty 15'	NE/SE33	21N	18E	GR			XRF-17	GR INC	GM
Below Table Mountain Road, above sediments and B77152. Pillowed unit grades laterally into massive flow, 6140'.												
B77154	W	Kittitas	Liberty 15'	NE/SW4	20N	18E	GR					G
Glass only. Lion Rock. Thick flow surrounds older Swauk sandstone and tuff, 5880'.												

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SAMPLE NUMBER	LOCATION ST	COUNTY	QUADRANGLE	SECTION	T	R	STRATIGRAPHY FM	MEMBER	FLOW	CHEMISTRY METHOD	CHEM TYPE	ANAL. TYPE
B77155	W	Kittitas	Liberty 15'	NE/SW4	20N	18E	GR		Colockum Creek	XRF-17	GR INC	GM
Lion Rock, above B77154. Invasive flow with sediments above. Glass from 6070', rock from 6000'.												
B77156	W	Kittitas	Liberty 15'	NE/NW3	20N	18E	GR					G
Glass only. Lion Rock, above B77155. Hyaloclastite and pillows, 6240'.												
B77157	W	Kittitas	Liberty 15'	NW/NW2	20N	18N	GR		Colockum Creek	XRF-17	GR INC	GM
Drop Creek. Invasive flow with sediments above. Glass from 5790'(altered), rock from 5690'.												
B77158	W	Kittitas	Liberty 15'	NW/NW2	20N	18E	GR			XRF-17	GR INC	GM
Drop Creek, above B77157. Complex flow with mixed hyaloclastite and sediments, and pillows above, 5810'.												
B77159	W	Kittitas	Liberty 15'	NW/NW2	20N	18E	GR			XRF-17	GR INC	GM
Drop Creek, above B77158. Base of flow unit with sedimentary interbed below, 5840'.												
B77161	W	Kittitas	Thorp 15'	SW/SW33	20N	17E	GR					G
Glass only. Hidden Valley Ranch, basal pillows of lowest flow exposed in creek, above a tuffaceous conglomerate, 2200'.												
B77162	W	Kittitas	Cle Elum 15'	SE/SE35	19N	16E	GR					G
Glass only. Taneum Creek roadcut. Glassy base of flow above tuffaceous conglomerate, 2120'.												
B77163	W	Kittitas	Cle Elum 15'	SW/SW1	18N	16E	GR					G
Glass only. Taneum Creek. Glassy upper selvedge of invasive flow below tuffaceous sediments, 3010'.												
B77164	W	Kittitas	Cle Elum 15'	NW/SW32	19N	16E	GR					G
Glass only. Quartz Mountain Road. Glassy upper selvedge of invasive flow below tuffaceous sediments, 3400'.												
B77166	W	Kittitas	Cle Elum 15'	SW/SW32	19N	16E	GR					G
Glass only. Quartz Mountain Road. Hyaloclastite above thick sedimentary interbed of tuffaceous conglomerate, 3560'.												
B77167	W	Kittitas	Cle Elum 15'	SW/SE6	18N	17E	GR					G
Glass only. Rattlesnake Canyon Road. Invasive flow below tuffaceous siltstone, 2540'.												
B77168	W	Kittitas	Cle Elum 15'	SW/SE6	18N	17E	GR					G
Glass only. Rattlesnake Canyon Road, above B77167. Pillows invading tuffaceous siltstone, 2540'.												
B77169	W	Kittitas	Cle Elum 15'	SE/SE6	18N	17E	GR					G
Glass only. Rattlesnake Canyon Road, above B77168. Complex flow with upper pillowed unit over a tuffaceous conglomerate, 2520'.												
B77170	W	Kittitas	Cle Elum 15'	SW/SW5	18N	17E	GR					G
Glass only. Rattlesnake Canyon Road, above B77169. Upper pillowed unit of flow, 2450'.												
B77171	W	Yakima	Yakima East	SE/SE7	13N	19E	SM	Um		XRF-15	"UMATILLA"	GM
Rest Haven Road 1.4 miles from Selah Gap. Pillowed unit of intracanyon flow between two roadcuts in sediments. High CaO.												
B77176	W	Kittitas	Cape Horn SE	SE/NE26	19N	22E	GR		Colockum Creek	XRF-15	GR INC	GM
Quilomene Bay Section, S side of bay. Complex flow at water level is vesicular, 580'.												

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B77177	W	Kittitas	Cape Horn SE	SE/NE26	19N	22E	GR			XRF-15	GR INC	GM
Quilomene Bay Section, above B77176 and two inches of sediments. Very coarse pillows and vesicular zones, 710'.												
B77178	W	Kittitas	Cape Horn SE	NE/SE26	19N	22E	GR			XRF-15	GR INC	GM
Quilomene Bay Section, above B77177. Basal pillows of flow, 1000'.												
B77179	W	Kittitas	Cape Horn SE	NE/SE26	19N	22E	GR			XRF-15	GR INC	GM
Quilomene Bay Section, above B77178. Basal pillows of flow, 1120'.												
B77180	W	Kittitas	Cape Horn SE	NE/SE26	19N	22E	GR			XRF-15	GR INC	GM
Quilomene Bay Section, above B77179. Basal pillows of flow, 1200'.												
B77181	W	Kittitas	Cape Horn SE	NW/SE26	19N	22E	GR		Museum	XRF-15	GR INC	M
Quilomene Bay Section, above B77180, 1350'.												
B77183	W	Kittitas	Manastash Lake	NE/NW6	17N	16E	GR			XRF-15	GR INC	GM
The Island, S Manastash Creek. Invasive flow is second of three exposed here, 3790'.												
B77184	W	Kittitas	Manastash Lake	NE/NW6	17N	16E	GR					G
Glass only. The Island, above B77183. Hyaloclastite, peperite, and micaceous sediments, Na20 is low, K20 is high, 3760'.												
B77185	W	Kittitas	Manastash Lake	NE/NW6	17N	16E	GR			XRF-15	GR INC	GM
The Island, above B77184. Pillows invasive into sediment are probably basal unit of very thick flow that caps the island, 3765'.												
B77186	W	Kittitas	Manastash Lake	NW/NE6	17N	16E	GR			XRF-18	GR INC	GM
The Island. Pegmatoid in flow B77185.												
B77187	W	Kittitas	Cle Elum 15'	NE/SW26	18N	15E	GR			XRF-15	GR INC	GM
S Manastash Creek about two miles NW of the Island. Lowest of three invasive flows. Micaceous sediments above, 4200'.												
B77188	W	Kittitas	Hudson Creek	SW/NE1	17N	16E	GR			XRF-15	GR INC	GM
N Manastash Creek. Lowest exposed flow N of road. Thick complex hyaloclastite-peperite with sediments above, 3315'.												
B77189	W	Kittitas	Hudson Creek	SW/NE1	17N	16E	GR					G
Glass only. N Manastash Creek. Basal pillows of unit above B77188, 3315'.												
B77190	W	Kittitas	Hudson Creek	SW/NE1	17N	16E	GR			XRF-15	GR INC	GM
N Manastash Creek. Very thick, complex flow composed of mixed sediments, hyaloclastite, and coarse pillows, 3400'.												
B77191	W	Kittitas	Hudson Creek	SW/NE1	17N	16E	GR			XRF-15	GR INC	GM
N Manastash Creek. Thin flow caps canyon top at 3530'.												
B77195	W	Chelan	Malaga	SE/SE26	22N	21E	GR			XRF-15	GR INC	M
Malaga Dump. Thick, platy flow, 675'.												
B77196	W	Chelan	Malaga	SE/SE26	22N	21E	GR			XRF-15	GR INC	M
Malaga Dump. Thick flow above B77195, 675'.												

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B77197	W	Chelan	Malaga	SW/SE26	22N	21E	GR			XRF-15	GR INC	GM
Malaga Dump. Flow above B77196, glass 880', rock 910'.												
B77198	W	Chelan	Malaga	NE/NE35	22N	21E	GR			XRF-15	GR INC	M
Malaga Dump. Flow above B77197, platy in part.												
80-001	O	Morrow	Butte Creek Junction	SE/NE3	1N	27E	WP	Fr Sp		WSU-28	'SW FRSP'	M
Colonnade above saprolite, roadcut opposite house, 1090'. Low TiO2.												
80-002	O	Morrow	Butte Creek Junction	SE/NE3	1N	27E	GR			WSU-28	GR INC	M
Vesicular top beneath saprolite below 80-001, 1085'.												
80-003	O	Umatilla	Vey Ranch	NW/SE27	2N	28E	GR			WSU-28	GR INC	M
Natural outcrop, highest flow stratigraphically in section, 1390'.M												
80-004	O	Umatilla	Vey Ranch	SE/NW27	2N	27E	GR			WSU-28	GR INC	M
One or two flows below 80-003, near ridgecrest, natural outcrop, 1550'.												
80-005	O	Morrow	Vey Ranch	SW/SE14	1N	28E	WP	Fr Sp		WSU-28	'SW FRSP'	M
Highest flow, sparsely phyric, in track road, 2065'. High Al2O3, low TiO2.												
80-006	O	Morrow	Vey Ranch	SW/NW13	1N	28E	GR			WSU-28	GR INC	M
Small outcrop along road to windmill, near road junction, 1915'.												
80-007	O	Morrow	Vey Ranch	SW/SW2	1N	28E	WP	Fr Sp		WSU-28	'SWFRSP'	M
Lowest ledge along gully, natural outcrop, 1600'. Low TiO2.												
80-008	O	Morrow	Butter Creek Junction	SW/SE28	2N	27E	WP	Fr Sp		WSU-28	SW FRSP	M
Roadcut near substation, along Highway 207, 1040'.												
80-009	O	Morrow	Ella	SE/SE20	2N	24E	WP	Fr Sp		WSU-28	'SW FRSP'	M
Oxized flow top material, bottom of gully near Emigrant Road, 820'. Low K2O.												
80-010	O	Morrow	Ione North	NW/SW4	1S	24E	WP	Fr Sp		WSU-28	'SW FRSP'	M
In gully above barn, 1260'. Low TiO2.												
80-011	O	Morrow	Ione North	NW/SW4	1S	24E	GR			WSU-28	GR INC	M
In gully opposite barn, below 80-010, 1220'.												
80-012	O	Morrow	Strawberry Canyon SE	NW/NW36	1N	26E	WP	Fr Sp		WSU-28	'SW FRSP'	M
Ditch along road north of main drainage, 1590'. Low TiO2.												
80-013	O	Morrow	Swaggart Buttes	SW/SE19	1S	26E	GR			WSU-28	'GR INC'	M
Highest flow locally in Pieper Canyon. Natural outcrop on hillslope, 2000'. High Al2O3.												
80-014	O	Umatilla	Service Buttes	NW/NW15	2N	28E	GR			WSU-28	GR INC	M
Crest of Service Buttes, float, 1400'.												

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80-015	0	Umatilla	Service Buttes	NE/SE9	2N	28E	GR			WSU-28	GR INC	M
	NE side of gully 1/4 mi E of Service Springs, 1190'.											
80-016	0	Umatilla	Service Buttes	NE/NE21	2N	28E	GR			WSU-28	GR INC	M
	Ridgecrest 0.2 mi W of Job trig, 1640'.											
80-017	0	Umatilla	Service Buttes	SE/SE21	2N	28E	WP	Fr Sp		WSU-28	SW FRSP	M
	Gully just off road, Service Canyon, 1090'.											
80-018	0	Umatilla	Umatilla	NE/SE28	5N	28E	SM	Um		WSU-28	'PHSOPHER'	M
	North quarry wall below fused tuff, vesicular, rubbly, flow banded, 560'. High SiO2, low FeO.											
80-019	0	Morrow	Crow Butte	SE/NW16	4N	24E	SM	El Mt		WSU-28	'SW ELEPH'	M
	Small tumulus near road along railroad track N of I-84, 315'. High Na2O, low K2O.											
80-020	0	Morrow	Lexington	SE/NE23	2S	25E	GR			WSU-28	GR INC	M
	In shallow gully NW of road, 2040'.											
80-021	0	Morrow	Cecil	SE/SE1	1S	23E	GR			WSU-28	GR INC	GM
	Pillow complex, roadcut 1/4 mi E of McNab, 1000'.											
80-022	0	Morrow	Cecil	NW/NE34	1N	23E	WP	Fr Sp		WSU-28	'SW FRSP'	M
	Roadcut at curve in road, 910'. Low TiO2.											
80-023	0	Morrow	Cecil	SE/NE34	1N	23E	GR			WSU-28	GR INC	M
	Flow under 80-022. Small roadcut 0.1 mi SE of 80-022, 890'.											
80-024	0	Morrow	Cecil	NE/NW11	1S	23E	GR			WSU-28	GR INC	M
	Flow in quarry near power line, 1280'.											
80-025	0	Morrow	Utts Butte	NW/NW1	2S	23E	GR			WSU-28	GR INC	M
	In ditch at road intersection, 1830'.											
80-026	0	Morrow	Utts Butte	NW/SW11	2S	23E	WP	Fr Sp		WSU-28	'SW FRSP'	M
	Small outcrop along road, head of Yarnell Canyon, 1950'. Low TiO2.											
80-027	0	Morrow	Ione South	SW/SW21	1S	24E	GR			WSU-28	GR INC	M
	SE end of Jordan Butte, 100 m W of microwave reflector, 2110'.											
80-029	0	Umatilla	Blalock Mt	NE/SW26	4N	37E	WP	Eck Mt	Lookingglass	WSU-28	SW LOOK	M
	Flow over saprolite along Lincton Mountain Road, 4360'.											
80-030	0	Morrow	Hoodlum Canyon	SE/SE36	3S	29E	GR			WSU-28	GR INC	M
	Platy flow along creek just N of bridge, 3720'.											
80-031	0	Umatilla	Ukiah	NW/SW36	4S	31E	GR			WSU-28	GR INC	M
	Flow overlying at least 20' of clay, roadcut, 3510'. Low Na2O.											

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80-032	0	Umatilla	Bridge Creek	NE/NE36	6S	31E	PG			WSU-28	UNC	M
	Highest plagioclase, phyric flow in section. Hillslope E of road block, 3820'.											
80-033	0	Umatilla	Bridge Creek	NE/NE36	6S	31E	GR			WSU-28	GR INC	M
	Flow above 80-032. Hackly, 3900'.											
80-034	0	Umatilla	Ukiah SE	NE/NE16	6S	32E	GR			WSU-28	GR INC	M
	Colonnade in roadcut along road 5209, 4600'.											
80-035	0	Umatilla	Ukiah SE	NE/SE21	6S	32E	PG			WSU-28	UNC	M
	Overtime Spring Partial Section, lowest sampled flow, 3980'.											
80-036	0	Umatilla	Ukiah SE	NE/SE21	6S	32E	PG			WSU-28	UNC	M
	Flow above 80-035, 4040'.											
80-037	0	Umatilla	Ukiah SE	NE/SE21	6S	32E	PG			WSU-28	UNC	M
	Flow above 80-036, 4110'.											
80-038	0	Umatilla	Ukiah SE	NE/SE21	6S	32E	PG			WSU-28	UNC	M
	Flow above 80-037, 4170'.											
80-039	0	Umatilla	Ukiah SE	NE/SE21	6S	32E	GR			WSU-28	GR INC	M
	Flow above 80-038, phyric, 4225'.											
80-040	0	Umatilla	Ukiah SE	NE/SE21	6S	32E	GR			WSU-28	'GR INC'	M
	Flow above 80-039, 4300'. High Al203.											
80-041	0	Umatilla	Ukiah SE	NE/SE21	6S	32E	GR			WSU-28	GR INC	M
	Flow above 80-040, 4350'.											
80-042	0	Umatilla	Ukiah SE	SW/NW22	6S	32E	GR			WSU-28	GR INC	M
	Flow above 80-041, highest in section, 4450'.											
80-043	0	Umatilla	Ukian SE	NW/NW21	6S	33E	GR			WSU-28	"GR INC"	GM
	Roadcut exposing hyaloclastite, 5460'. High Al203, CaO.											
80-044	0	Umatilla	Pearson Ridge	NW/NE28	6S	33E	PG			WSU-28	UNC	M
	Outcrop just S of site of Pearson L.O., 5720'.											
80-045	0	Umatilla	Deerhorn Creek	SW/NE35	5S	30E	GR			WSU-28	'GR INC'	M
	Hillslope N of Fivemile Creek, 4120'. Low SiO2.											
80-046	0	Umatilla	Deerhorn Creek	SW/NE35	5S	30E	GR			WSU-28	GR INC	M
	Flow above 80-045, 4170'.											
80-047	0	Umatilla	Deerhorn Creek	SW/NE35	5S	30E	GR			WSU-28	GR INC	GM
	Flow above 80-046, 4220'.											

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80-048	O	Morrow	Arbuckle Mt	SE/SE5	4S	28E	GR			WSU-28	GR INC	M
	Lowest flow in section. Exposure just NE of road, 3070'.											
80-049	O	Morrow	Arbuckle Mt	SE/SE5	4S	28E	GR			WSU-28	GR INC	M
	Flow above 80-048, hackly. Sampled 100 m NW of 80-048, 3070'.											
80-050	O	Umatilla	Deerhorn Creek	SW/NW34	6S	30E	GR			WSU-28	GR INC	M
	Cliff above John Day River, 4180'.											
80-051	O	Umatilla	Deerhorn Creek	SW/NW34	6S	30E	GR			WSU-28	'GR INC'	M
	Flow above 80-050, 4260'. Low SiO2, high FeO.											
80-052	O	Umatilla	Deerhorn Creek	SW/NW34	6S	30E	GR			WSU-28	GR INC	M
	Flow above 80-051, highest flow in section, 4360'.											
80-053	O	Umatilla	Thompson Flat	NW/SE19	6S	30E	GR			WSU-28	'GR INC'	M
	Ridge between Rush and Stony Creeks, 4250'. Low SiO2, high FeO.											
80-054	O	Umatilla	Thompson Flat	NW/SE19	6S	30E	GR			WSU-28	GR INC	M
	Flow above 80-053, caps ridge, 4310'.											
80-055	O	Morrow	Thompson Flat	NW/SE28	6S	29E	PG			WSU-28	UNC	M
	Highest phyric flow at Potamus Point, 4350'.											
80-056	O	Morrow	Thompson Flat	NW/SE28	6S	29E	PG			WSU-28	UNC	M
	Aphyric flow above 80-055, 4390'.											
80-057	O	Morrow	Thompson Flat	NW/SE28	6S	29E	GR			WSU-28	GR INC	M
	Highest flow in section, flow above 80-056, 4450'.											
80-058	O	Morrow	Thompson Flat	SW/SW34	5S	29E	GR			WSU-28	'GR INC'	M
	Roadcut just above Ellis Creek, overlain by sediment, 4360'. Low SiO2, high FeO.											
80-059	O	Morrow	Lake Penland	NW/SE13	6S	28E	PG			WSU-28	UNC	M
	E side of Mallory Creek, 4220'.											
80-060	O	Morrow	Lake Penland	NW/SE13	6S	28E	GR			WSU-28	'GR INC'	M
	Flow above 80-059, 4260'. Low SiO2, high FeO.											
80-061	O	Umatilla	Owens Butte	SE/SE30	4S	33E	GR			WSU-28	GR INC	M
	Large roadcut, 3840'.											
80-062	O	Morrow	Chapin Creek	SE/SW24	6S	25E	PG			WSU-28	UNC	M
	Roadcut, columnar, plagioclase, phyric, 4330'.											
80-063	O	Morrow	Madison Butte	SW/SW7	6S	28E	GR			WSU-28	'GR INC'	M
	Roadcut, 4150'. Low SiO2, high FeO.											

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	ST	COUNTY	QUADRANGLE	SECTION	T	R	FM	MEMBER	FLOW	METHOD	CHEM TYPE	ANAL. TYPE
80-064	O	Morrow	Madison Butte	SE/NW25	6S	27E	GR			WSU-28	'GR INC'	M
	Slope below end of road, 3770'. Low SiO2, high FeO.											
80-065	O	Morrow	Madison Butte	SE/NE11	6S	27E	PG			WSU-28	UNC	GM
	Phyric flow in roadcut at BM 4072.											
80-066	O	Morrow	Madison Butte	NE/NW27	6S	27E	PG			WSU-28	UNC	M
	Roadcut on road to Moreland Reservoir, 3770'.											
80-067	O	Morrow	Big Rock Flat	SE/NE32	6S	27E	GR			WSU-28	'GR INC'	M
	Flow capping Morphine Ridge at Point 3902. Low SiO2, high FeO.											
80-068	O	Morrow	Chapin Creek	NE/NW30	6S	26E	PG			WSU-28	UNC	M
	Flow capping hill, 4465'.											
80-069	O	Morrow	Chapin Creek	NE/NW34	6S	25E	GR			WSU-28	'GR INC'	M
	Flow capping Hill 4563 S of Camas Prairie. Low SiO2, high FeO.											
80-070	O	Morrow	Lefevre Prairie	SW/SE29	6S	25E	GR			WSU-28	'GR INC'	M
	Roadcut, 4490'. Low SiO2, high FeO.											
80-071	O	Morrow	Lefevre Prairie	SW/SE19	6S	25E	GR			WSU-28	UNC	M
	Welded spatter from Hill 4503. Altered chemistry.											
80-072	O	Morrow	Lefevre Prairie	SE/NE32	6S	25E	GR			WSU-28	'GR INC'	M
	Borrow pit S of road, 4550'. Low SiO2, high FeO.											
80-073	O	Wheeler	Lefevre Prairie	NE/NW23	6S	24E	PG			WSU-28	UNC	M
	Phyric flow, 4230'.											
80-074	O	Wheeler	Lefevre Prairie	NE/NW23	6S	24E	GR			WSU-28	'GR INC'	M
	Microphyric flow above 80-073, 4340'. Low SiO2, high FeO.											
80-075	O	Wheeler	Lefevre Prairie	NE/NE14	6S	24E	GR			WSU-28	'GR INC'	M
	Welded spatter from Hill 4491, 4485'. Low SiO2, high FeO.											
80-076	O	Wheeler	Lefevre Prairie	SW/SW15	6S	24E	PG			WSU-28	UNC	M
	Brown Creek Section, highest exposed flow, 4280'.											
80-077	O	Wheeler	Lefevre Prairie	SW/SW15	6S	24E	PG			WSU-28	UNC	M
	Flow under 30-076, 4220'.											
80-078	O	Wheeler	Lefevre Prairie	SE/SE16	6S	24E	PG			WSU-28	UNC	M
	Flow under 30-077, 4090'.											
80-079	O	Wheeler	Lefevre Prairie	SE/SE16	6S	24E	PG			WSU-28	UNC	M
	Lowest exposed flow in section, flow under 80-078, 3960'.											

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80-080	O	Wheeler	Lefevre Prairie	NW/NW23	6S	24E	PG			WSU-28	UNC	M
	Brown Creek Section offset. Probably flow under 80-079, 3950'.											
80-081	O	Wheeler	Lefevre Prairie	NW/NW23	6S	24E	PG			WSU-28	UNC	M
	Brown Creek Section offset. Flow below 80-080, 3830'.											
80-082	O	Wheeler	Lefevre Prairie	NW/NW23	6S	24E	PG			WSU-28	UNC	GM
	Brown Creek Section offset. Flow below 80-081, 3700'.											
80-083	O	Wheeler	Lefevre Prairie	NW/NW23	6S	24E	PG			WSU-28	UNC	M
	Brown Creek Section offset. Flow under 80-082, lowest exposed flow in section, 3530'.											
80-084	O	Gilliam	Lonerock	NE/NE27	5S	23E	GR			WSU-28	'GR INC'	M
	Craggy outcrops above road, 3480'. Low SiO2, high FeO.											
80-085	O	Gilliam	Buttermilk Canyon	NE/NW17	5S	24E	GR			WSU-28	'GR INC'	M
	Dipping layers along road, 3300'. Low SiO2, K2O, and high FeO.											
80-086	O	Gilliam	Lone Rock Creek	SW/SW3	5S	23E	GR			WSU-28	'GR INC'	GM
	Dike, N35W, 6 m wide, 2400'. Low SiO2, high FeO.											
80-087	O	Gilliam	Lone Rock Creek	SE/SW10	5S	23E	GR			WSU-28	UNC	M
	Welded spatter, ridgecrest, 3380'. Altered chemistry.											
80-088	O	Gilliam	Lone Rock	NW/NW23	5S	23E	GR			WSU-28	'GR INC'	M
	W side of Lone Rock Creek, 3180'. Low SiO2, high FeO.											
80-089	O	Union	Hilgard	NW/NE7	3S	37E	SM	Um		WSU-28	UNC	M
	Outcrop along Whiskey Creek Road,3340'. Fractionated chemistry.											
80-090	O	Union	Hilgard	NE/SE7	3S	37E	SM	Um		WSU-28	UNC	M
	Large blocks above tuffaceous sediments along Whiskey Creek Road, 3470'.Fractionated chemistry.											
80-091	O	Union	Hilgard	NE/SW20	3S	37E	SM	Um		WSU-28	UNC	M
	Flow under 80-092, outcrop in Whiskey Creek Road, 3510'.Fractionated chemistry.											
80-092	O	Union	Hilgard	NW/SE20	3S	37E	SM			WSU-28	"WT OBHTI"	M
	Flow above 80-091, hill E of Whiskey Creek Road, 3620'. High SiO2, low FeO.											
80-093	O	Union	Hilgard	NE/SW20	3S	37E	SM			WSU-28	"WT OBLTI"	M
	Flow under 80-091, outcrop in Whiskey Creek Road, 3420'. Low MgO.											
80-094	O	Union	Hilgard	SE/NE31	3S	37E	GR			WSU-28	GR INC	M
	Poor outcrop along Whiskey Creek Road, 3900'.											
80-095	O	Union	Hilgard	SE/NE30	3S	37E	SM	Um		WSU-28	UNC	M
	Outcrop along western of two parallel roads, 3640'. Fractionated chemistry.											

Table 1a. Columbia River Basalt flows. Release date February, 1982. Sample information for flows collected by D.A. Swanson and G. Byerly

SAMPLE NUMBER	LOCATION ST	COUNTY	QUADRANGLE	SECTION	T	R	STRATIGRAPHY FM	MEMBER	FLOW	CHEMISTRY METHOD	CHEM TYPE	ANAL. TYPE
80-096	O	Union	Hilgard	NW/SE28	3S	37E	SM	Um		WSU-28	UNC	M
Outcrop in road, 3780'. Fractionated chemistry.												
80-097	O	Union	LaGrande Reservoir	NE/SE3	4S	37E	SM	Um		WSU-28	UNC	M
Small borrow pit along unmapped road, 4030'. Fractionated chemistry.												
80-098	O	Union	LaGrande Reservoir	SE/SE9	4S	37E	GR			WSU-28	GR INC	M
Clearing along unmapped road, 4560'.												
80-099	O	Union	LaGrande Reservoir	SW/SW15	4S	37E	SM			WSU-28	WT ANDES	M
Large blocks along road, 5120'.												
80-100	O	Union	LaGrande Reservoir	NW/NW11	4S	37E	SM	Um		WSU-28	UNC	M
Large blocks along unmapped road, 4180'. Fractionated chemistry.												
80-101	O	Union	LaGrande Reservoir	SW/SE11	4S	37E	SM			WSU-28	WT ANDES	M
Cliffs along Little Rock Creek, 4330'.												
80-102	O	Union	LaGrande Reservoir	SE/SW11	4S	37E	SM			WSU-28	UNC	M
Overlies 80-101. Outcrop just below road, 4420'.												
80-103	O	Union	Hilgard	NE/NW1	3S	37E	SM			WSU-28	'WT ANDES'	M
Capping ridge at point 3829. High MgO.												
80-104	O	Union	Glass Hill	SE/NW4	5S	38E	SM			WSU-28	'WT ANDES'	M
Cut along Ladd Canyon Road, 4520'. High TiO2.												
80-105	O	Union	LaGrande Reservoir	SW/SW1	5S	37E	SM			WSU-28	"WT OBHTI"	M
Hillslope above road on Summit Spring Ridge, 5900'. High SiO2, Low FeO and P2O5.												
80-106	O	Union	LaGrande Reservoir	SW/SW32	4S	37E	GR			WSU-28	GR INC	GM
Hillslope above road, 4800'.												
80-107	O	Union	LaGrande Reservoir	SW/SW32	4S	37E	GR			WSU-28	GR INC	M
Flow below 80-106, roadcut, 4750'.												
80-108	O	Union	Tucker Flat	NW/NE28	5S	38E	SM			WSU-28	"WT OBHTI"	M
Low cliff, S end of Mann Ridge above jeep trail, 4600'. Low TiO2 and P2O5.												
80-109	O	Union	Tucker Flat	NE/NE28	5S	38E	SM			WSU-28	WT ANDES	M
Knoll E of jeep trail, 4660'.												
80-110	O	Union	Hilgard	NW/SW34	2S	37E	SM	Um		WSU-28	UNC	M
Cut along jeep road, 3820'. Fractionated chemistry.												
80-111	O	Union	Kamela SE	NE/SW26	2S	36E	GR			WSU-28	'GR INC'	M
Quarry just S of I-84, 3650'. High FeO.												

Table 1a. Columbia River Basalt flows. Release date February, 1982. Sample information for flows collected by D.A. Swanson and G. Byerly

SAMPLE NUMBER	LOCATION ST	COUNTY	QUADRANGLE	SECTION	T	R	STRATIGRAPHY FM	MEMBER	FLOW	CHEMISTRY METHOD	CHEM TYPE	ANAL. TYPE
80-112	O	Union	LaGrande SE	SW/SW18	3S	38E	GR			WSU-28	'GR INC'	M
	Cut along Mill Canyon Road, 3710'. Low SiO2, high FeO.											
80-113	O	Union	LaGrande SE	SE/SE13	3S	37E	SM	Um		WSU-28	UNC	M
	Small borrow pit just S of Mill Canyon Road, 4140'. Fractionated chemistry.											
80-114	O	Union	Hilgard	NE/NW24	3S	37E	SM			WSU-28	"WT ANDES"	M
	Roadcut on ridgecrest, 4280'. High K2O and P2O5, low Na2O.											
80-115	O	Union	LaGrande SE	NW/NW19	3S	38E	SM			WSU-28	"WT ANDES"	M
	Along W side of Glass Hill Road, 3750'. High P2O5, low Na2O.											
80-116	O	Union	LaGrande SE	NW/NW32	3S	38E	SM			WSU-28	"WT ANDES"	M
	Cut along Glass Hill Road, 4780'. High P2O5 and TiO2, low FeO.											
80-117	O	Union	Glass Hill	NW/SW26	4S	38E	SM			WSU-28	WT ANDES	M
	Flow forming Knob 4396, E of Shaw Canyon Road, 4360'.											
80-118	O	Union	Glass Hill	SW/SW1	5S	38E	SM	Um		WSU-28	UNC	M
	Flow capping ridge at elevation point 4909. Fractionated chemistry.											
80-119	O	Union	Tucker Flat	SE/NW23	5S	38E	SM			WSU-28	WT ANDES	M
	Flow over 80-120, ridgecrest S of Shaw Mountain, 4740'.											
80-120	O	Union	Tucker Flat	SE/NW23	5S	38E	SM			WSU-28	"WT OBHTI"	M
	Flow under 80-119, 4710'. High SiO2, low TiO2 and P2O5.											
80-121	O	Union	Glass Hill	SE/SE20	4S	38E	SM			WSU-28	UNC	M
	Ledge just S of road, 5070'. Chemistry most like WT NEPH.											
80-122	O	Union	Glass Hill	SW/NW21	4S	38E	SM			WSU-28	UNC	M
	Cliff at Glass Hill Lookout Tower, 5380'. Chemistry like 80-121.											
80-123	O	Union	Glass Hill	SE/NE20	4S	38E	SM			WSU-28	WT ANDES	M
	Glassy float along spur road to Glass Hill Lookout Tower, 5270'.											
81-001	O	Wasco	Willowdale 15'	NE/NE12	7S	14E	WP	Fr Sp		WSU-29	"SW FRSP"	M
	Very sparsely phyric flow apparently above and abutting seds, quarry, Criterion Summit, 3330'. Low Na2O.											
81-002	O	Wasco	Willowdale 15'	NE/SE19	7S	15E	GR			WSU-29	"GR INC"	M
	Blocks of float above vesicular top, ditch along highway, 3240'. High Al2O3, low Na2O.											
81-003	O	Jefferson	Madras 30'	SW/SW18	10S	13E	GR			WSU-29	UNC	M
	Lowest flow at Pelton Dam, roadcut, 1440'. Similar to PRINEVILLE chemical type(Uppuluri, 1974).											
81-004	O	Jefferson	Madras 30'	NW/NW8	7S	14E	GR			WSU-29	UNC	M
	Flow above interbed over 81-003, roadcut, 1650'. Chemistry like 81-003.											

Table 1a. Columbia River Basalt flows. Release date February, 1982. Sample information for flows collected by D.A. Swanson and G. Byerly

SAMPLE NUMBER	LOCATION ST	COUNTY	QUADRANGLE	SECTION	T	R	STRATIGRAPHY FM	MEMBER	FLOW	CHEMISTRY METHOD	CHEM TYPE	ANAL. TYPE
81-005	O	Jefferson	Madras 30'	NW/NE31	9S	13E	GR			WSU-29	UNC	M
Flow above thick tuff (John Day) in quarry E of highway, 1470'. Chemistry like 81-003.												
81-006	O	Jefferson	Madras 30'	SE/NE27	10S	12E	GR			WSU-29	UNC	M
Flow in erosional contact with overlying gravel. Roadcut, 1850'. Chemistry like 81-003.												
81-007	O	Jefferson	Madras 30'	NE/SE6	11S	12E	GR			WSU-29	"GR INC"	M
Very sparsely olivine-plagioclase platy basalt, top of gorge, W of track road, 2380'. High Al203 and K20.												
81-008	O	Jefferson	Madras 30'	SW/SW34	10S	14E	GR			WSU-29	UNC	M
Roadcut in entablature of dipping flow, 2550'. Chemistry like 81-003.												
81-009	O	Jefferson	Madras 30'	NW/NW35	9S	14E	GR			WSU-29	UNC	M
Entablature in cut along Highway 97, 2060'. Chemistry like 81-003.												
81-010	O	Jefferson	Madras 30'	NE/SE5	9S	14E	GR			WSU-29	UNC	M
Lowest flow above John Day Formation, hillslope near RR trestle, 1420'. Chemistry like 81-003.												
81-011	O	Jefferson	Willowdale 15'	NE/NE25	9S	14E	GR			WSU-29	UNC	GM
Flow with slight pillowed base overlying tuffaceous interbed, roadcut along Highway 97, 2200'. Chemistry like 81-003.												
81-012	O	Wasco	Willowdale 15'	SE/SE28	8S	15E	GR			WSU-29	UNC	M
Lowest flow in Cow Canyon section, 2315'. Chemistry like 81-003.												
81-013	O	Wasco	Willowdale 15'	NW/SE28	8S	15E	GR			WSU-29	UNC	M
Flow above 81-012, 2600'. Chemistry like 81-003.												
81-014	O	Wasco	Willowdale 15'	NW/SE28	8S	15E	GR			WSU-29	"GR INC"	M
Flow above 81-013. Coarse-grained, caps ridge, upper flow in Cow Canyon Section, 2780'. Low Na20.												
81-015	O	Wasco	Willowdale 15'	SE/SE28	8S	15E	GR			WSU-29	UNC	M
Possibly same flow as 81-012, collected in same section, 2440'. Chemistry like 81-003.												
81-016	O	Wasco	Willowdale 15'	SE/NE6	7S	16E	GR			WSU-29	"GR INC"	M
Flow in large quarry S of Highway 97, W of Shaniko Summit, 3430'. High FeO, low Na20.												
81-017	O	Wasco	Willowdale 15'	SE/NW30	7S	16E	GR			WSU-29	"GR INC"	M
Medium-grained flow capping low knoll, possibly above sediments, just SE of track road, 3110'. Low Na20.												
81-018	O	Wasco	Willowdale 15'	NE/SW4	8S	16E				WSU-29	UNC	M
Aerodynamically-shaped bomb in bedded, dipping cinders overlain by white tuff (John Day Formation), hillslope, 2830'.												
81-019	O	Wasco	Willowdale 15'	SE/NW26	8S	15E	GR			WSU-29	UNC	M
Complex entablature at bridge across Antelope Creek, 1980'. Chemistry like 31-003.												
81-020	O	Jefferson	Antelope 15'	SW/NW1	9S	17E	PG			WSU-29	UNC	M
Flow in natural outcrop just above road. Medium-grained, aphyric, 3730'.												

Table 1a. Columbia River Basalt flows. Release date February, 1982. Sample information for flows collected by D.A. Swanson and G. Byerly

SAMPLE NUMBER	LOCATION ST	COUNTY	QUADRANGLE	SECTION	T	R	STRATIGRAPHY FMI	MEMBER	FLOW	CHEMISTRY METHOD	CHEM TYPE	ANAL. TYPE
81-021	O	Wasco	Antelope 15'	SW/SW11	7S	18E	PG			WSU-29	UNC	M
	Black Rock Section, lowest flow, 2850'.											
81-022	O	Wasco	Antelope 15'	SW/SW11	7S	18E	PG			WSU-29	UNC	GM
	Black Rock Section. Flow above 81-021, 2910'.											
81-023	O	Wasco	Antelope 15'	SW/SW11	7S	18E	PG			WSU-29	UNC	GM
	Black Rock Section. Flow above 81-022. Plagioclase, phyric, 2960'.											
81-024	O	Wasco	Antelope 15'	SW/SW11	7S	18E	GR			WSU-29	"GR INC"	M
	Black Rock Section. Flow above 81-023, 3120'. Low Na2O.											
81-025	O	Wasco	Antelope 15'	SW/SW11	7S	18E	GR			WSU-29	"GR INC"	M
	Black Rock Section. Flow above 81-024, 3160'. Low Na2O, high SiO2.											
81-026	O	Wasco	Antelope 15'	SW/SW11	7S	18E	GR			WSU-29	"GR INC"	GM
	Black Rock Section. Flow above 81-025, 3230'. Low Na2O.											
81-027	O	Wasco	Antelope 15'	SE/SE10	7S	18E	GR			WSU-29	UNC	GM
	Black Rock Section. Flow above 81-026, at least two unsampled flows higher, 3400'. Chemistry like 81-003.											
81-028	O	Wheeler	Clarno 15'	SW/SE16	7S	20E	PG			WSU-29	UNC	M
	Ridge-capping flow, highly plagioclase, phyric, 3800'.											
81-029	O	Wheeler	Clarno 15'	SW/NW7	7S	20E	PG			WSU-29	UNC	M
	Clarno Trig Section, lowest flow. Highly plagioclase, phyric, 3580'.											
81-030	O	Wheeler	Clarno 15'	SW/SW7	7S	20E	PG			WSU-29	UNC	M
	Clarno Trig Section. Flow above 81-029, aphyric, 3610'.											
81-031	O	Wheeler	Clarno 15'	SW/SW7	7S	20E	GR			WSU-29	UNC	M
	Clarno Trig Section. Flow above 81-030, aphyric, 3760'. Chemistry like 81-003.											
81-032	O	Wheeler	Clarno 15'	NW/NW7	7S	20E	GR			WSU-29	"GR INC"	M
	Clarno Trig Section. Flow above 81-031, aphyric, 3920'. High Al2O3, low Na2O.											
81-033	O	Wheeler	Clarno 15'	NW/NW7	7S	20E	GR			WSU-29	"GR INC"	M
	Clarno Trig Section. Flow above 81-032. Highest flow in section, forms top of ridge, 4040'. High Al2O3, low Na2O.											
81-034	O	Wasco	Antelope 15'	NW/NE5	8S	18E				WSU-29	UNC	M
	Basalt interbedded with John Day tuff. Bluff N of road, 3880'.											
81-035	O	Wasco	Kaskela	SW/NW1	7S	14E	GR			WSU-29	"GR INC"	M
	Flow capping knoll 3475. Aphyric, collected in road scraping, 3475'. Low Na2O.											

Table 1b. Columbia River Basalt flows. Release date February 1982. Major oxide analyses of bulk rocks. Total iron reported as FE2O3 (U.S.Geological Survey laboratory) or FEO (Washington State University laboratory).

SAMPLE	B76007	B76014	B76023	B76027	B76029	B76030	B76031	B76032	B76033	B76034	B76036	B76037	B76038
SIO2	50.46	53.70	53.61	53.39	53.02	53.46	54.00	53.62	53.17	52.00	52.58	53.55	52.48
AL2O3	13.13	13.51	14.00	13.45	13.57	13.51	13.40	13.41	13.25	13.85	14.02	14.11	13.85
FE2O3	15.14	12.54	12.06	13.09	12.92	13.41	12.99	12.86	13.05	12.58	12.59	11.98	12.48
FEO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MGO	4.43	3.71	4.57	3.84	3.56	3.47	3.46	3.38	3.23	5.21	5.08	4.74	5.12
CAO	8.12	7.57	7.92	7.40	7.49	6.91	6.90	6.87	6.75	8.85	8.77	8.35	8.43
NA2O	2.77	2.99	3.16	3.13	3.03	3.16	3.20	3.22	3.38	2.94	2.83	2.91	2.99
K2O	1.35	1.53	1.33	1.47	1.47	1.64	1.72	1.69	1.59	0.93	1.08	1.43	1.01
H2O	1.09	1.86	1.16	1.69	2.35	1.66	1.55	1.90	2.50	1.20	1.60	0.92	2.09
TIO2	2.79	1.99	1.68	1.97	2.23	2.21	2.17	2.15	2.16	1.69	1.72	1.71	1.66
P2O5	0.51	0.31	0.25	0.30	0.33	0.38	0.36	0.33	0.34	0.22	0.24	0.30	0.23
MNO	0.21	0.18	0.18	0.18	0.27	0.19	0.19	0.19	0.19	0.18	0.19	0.18	0.18
CO2	0.04	0.05	0.02	0.02	0.06	0.02	0.02	0.03	0.03	0.02	0.03	0.02	0.02
TOTAL	100.04	99.94	99.94	99.93	100.30	100.02	99.96	99.65	99.64	99.67	100.73	100.20	100.54

SAMPLE	B76040	B76041	B76067	B76076	B76095	B76097	B76099	B76100	B76102	B76104	B76105	B77002	B77040
SIO2	53.15	54.43	52.70	49.33	52.24	55.16	55.32	54.95	53.64	54.06	52.03	53.92	53.64
AL2O3	11.49	13.54	14.19	12.98	14.26	13.41	13.29	13.18	13.67	13.84	13.78	13.50	13.60
FE2O3	13.48	12.51	12.34	14.83	12.33	12.59	12.27	12.39	11.39	10.25	12.29	12.71	12.44
FEO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MGO	3.44	4.10	4.64	4.01	5.42	3.50	3.49	3.53	4.62	4.45	5.28	3.98	4.04
CAO	7.69	7.35	9.04	8.58	8.77	7.05	7.10	6.79	8.24	8.37	8.68	7.39	7.29
NA2O	3.01	3.16	3.02	2.60	2.94	3.16	3.11	3.15	2.94	2.89	2.81	3.24	3.19
K2O	1.56	1.45	1.10	1.18	1.20	1.67	1.86	1.75	1.31	1.40	0.99	1.46	1.45
H2O	1.44	1.86	0.84	2.74	1.43	1.31	1.28	1.05	1.24	1.30	1.08	2.89	1.59
TIO2	2.21	1.83	1.74	3.47	1.68	1.86	1.89	1.79	1.80	1.86	1.68	1.88	1.83
P2O5	0.47	0.25	0.36	0.72	0.30	0.27	0.29	0.30	0.37	0.40	0.24	0.27	0.27
MNO	0.20	0.17	0.19	0.18	0.19	0.18	0.18	0.17	0.18	0.18	0.18	0.17	0.17
CO2	1.35	0.04	0.04	0.02	0.04	0.03	0.02	0.05	0.03	0.04	0.13	0.02	0.02
TOTAL	99.49	100.69	100.20	100.64	100.80	100.19	100.10	99.10	99.43	99.04	99.17	101.43	99.53

SAMPLE	B77053	B77055	B77056	B77058	B77060	B77063	B77065	B77072	B77073	B77074	B77076	B77077	B77078
SIO2	54.33	52.24	51.53	51.98	55.03	54.84	53.84	54.82	52.00	55.24	54.80	52.15	51.72
AL2O3	13.85	14.24	13.93	14.19	13.68	13.73	13.59	13.78	14.23	13.57	13.51	13.76	13.79
FE2O3	11.94	12.08	11.83	12.38	11.72	12.38	12.63	11.70	11.95	12.14	12.33	12.97	12.72
FEO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MGO	3.94	5.41	5.16	5.57	3.59	3.57	4.00	3.48	4.80	3.49	3.77	4.68	4.97
CAO	7.44	8.91	9.08	9.00	7.06	6.99	7.41	6.96	8.84	7.00	7.44	8.57	8.63
NA2O	3.33	2.99	2.70	2.99	3.24	3.35	3.30	3.02	2.95	3.21	2.89	2.90	2.91
K2O	1.29	1.10	0.98	0.94	1.66	1.61	1.44	1.81	1.12	1.73	1.69	1.17	1.19
H2O	1.55	1.26	2.93	1.60	1.38	1.11	1.57	1.89	2.08	1.47	1.54	1.15	0.99
TIO2	1.87	1.66	1.65	1.63	1.84	1.87	1.85	1.83	1.67	1.89	1.94	1.82	1.73
P2O5	0.23	0.23	0.23	0.22	0.29	0.29	0.27	0.27	0.26	0.29	0.29	0.26	0.28
MNO	0.17	0.18	0.17	0.18	0.16	0.17	0.17	0.18	0.19	0.18	0.20	0.20	0.20
CO2	0.02	0.05	0.03	0.06	0.01	0.03	0.01	0.00	0.03	0.00	0.03	0.09	0.02
TOTAL	99.96	100.35	100.22	100.74	99.66	99.94	100.08	99.74	100.12	100.21	100.43	99.72	99.15

Table 1b. Columbia River Basalt flows. Release date February 1982. Major oxide analyses of bulk rocks. Total iron reported as FE2O3 (U.S.Geological Survey laboratory) or FEO (Washington State University laboratory).

SAMPLE	B77079	B77080	B77081	B77082	B77085	B77086	B77087	B77088	B77089	B77090	B77091	B77092	B77093
SIO2	52.64	51.81	53.81	51.60	55.22	55.50	55.19	55.48	53.18	53.13	52.06	51.77	52.20
AL2O3	14.18	14.20	14.00	13.69	13.49	13.59	13.65	13.77	13.92	14.04	13.73	13.88	14.07
FE2O3	12.16	12.32	11.89	14.83	12.09	12.05	12.14	12.27	12.97	13.18	12.83	12.70	12.06
FEO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MGO	5.23	5.38	4.56	4.33	3.51	3.55	3.47	3.50	4.70	4.89	4.78	5.21	4.87
CAO	9.02	9.10	8.49	8.12	6.98	6.99	6.89	7.06	8.50	8.43	8.53	8.83	9.06
NA2O	2.76	2.79	2.96	2.79	3.01	3.08	3.22	3.13	2.91	2.92	2.86	2.85	2.68
K2O	1.12	1.07	1.38	1.41	1.88	1.92	1.81	1.75	1.14	1.10	1.15	0.95	1.05
H2O	1.40	1.24	1.37	1.14	1.62	1.29	1.60	1.10	1.33	1.65	1.68	3.00	2.40
TIO2	1.70	1.67	1.72	2.77	1.83	1.85	1.94	1.88	1.87	1.86	1.86	1.73	1.70
P2O5	0.23	0.20	0.29	0.53	0.27	0.27	0.32	0.28	0.25	0.25	0.27	0.22	0.22
MNO	0.19	0.19	0.19	0.21	0.17	0.18	0.18	0.18	0.20	0.20	0.20	0.20	0.19
CO2	0.02	0.05	0.04	0.01	0.00	0.02	0.02	0.01	0.03	0.02	0.03	0.02	0.02
TOTAL	100.65	100.02	100.70	101.43	100.07	100.29	100.43	100.41	101.00	101.67	99.98	101.36	100.52

SAMPLE	B77094	B77095	B77096	B77099	B77105	B77107	B77109	B77117	B77118	B77119	B77120	B77122	B77123
SIO2	52.83	53.42	53.25	52.35	54.77	55.45	52.61	54.95	55.50	55.56	55.61	52.92	55.27
AL2O3	14.19	14.21	13.58	14.16	14.14	13.79	14.13	13.60	13.82	13.79	13.78	13.90	14.49
FE2O3	12.45	12.25	13.34	12.37	12.03	11.98	12.62	12.46	12.07	12.36	12.34	12.49	9.83
FEO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MGO	5.27	4.90	3.67	5.31	3.61	3.55	5.35	3.52	3.47	3.57	3.56	4.90	4.51
CAO	8.91	8.40	7.19	8.75	7.62	7.08	8.98	6.97	6.98	7.00	6.98	8.64	8.69
NA2O	2.74	2.86	3.20	2.89	3.22	3.21	2.81	2.94	3.12	3.30	3.33	3.06	3.16
K2O	1.09	1.34	1.64	1.13	1.66	1.71	0.97	1.87	1.68	1.69	1.73	1.16	1.39
H2O	1.57	1.05	1.91	1.35	0.83	1.44	1.46	1.64	1.83	1.13	1.36	1.02	1.43
TIO2	1.69	1.67	2.20	1.64	2.01	1.85	1.70	1.84	1.90	1.88	1.88	1.77	1.76
P2O5	0.22	0.27	0.36	0.24	0.32	0.30	0.22	0.27	0.29	0.27	0.28	0.29	0.31
MNO	0.19	0.19	0.19	0.19	0.19	0.18	0.19	0.18	0.18	0.18	0.18	0.20	0.18
CO2	0.00	0.01	0.00	0.00	0.03	0.03	0.01	0.03	0.02	0.03	0.04	0.00	0.22
TOTAL	101.15	100.57	100.53	100.38	100.43	100.57	101.05	100.27	100.86	100.76	101.07	100.35	101.24

SAMPLE	B77127	B77133	B77134	B77135	B77136	B77137	B77138	B77139	B77140	B77142	B77152	B77153	B77155
SIO2	53.06	54.12	55.06	54.12	55.61	55.66	52.60	52.99	54.07	54.03	53.36	52.86	55.78
AL2O3	13.42	13.48	13.56	14.11	13.98	13.71	13.92	13.72	13.69	13.78	14.26	14.05	13.99
FE2O3	13.69	12.91	11.89	12.05	11.56	11.50	12.54	13.31	12.95	12.73	12.38	12.32	11.75
FEO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MGO	3.89	3.23	3.29	4.32	3.52	3.49	5.10	3.92	3.59	4.19	5.00	5.21	3.52
CAO	7.42	6.68	6.82	7.90	7.02	7.03	8.65	7.41	6.95	7.55	8.60	8.92	7.04
NA2O	3.42	3.04	3.13	3.12	3.03	3.07	3.04	3.27	3.25	3.22	2.92	2.91	3.14
K2O	1.32	1.82	2.15	1.42	1.69	1.90	0.98	1.39	1.71	1.46	1.18	1.08	1.67
H2O	1.62	2.12	1.49	1.23	1.87	1.15	1.01	1.97	1.20	1.23	0.94	0.93	1.46
TIO2	2.16	2.20	2.19	1.70	1.87	1.84	1.73	2.11	2.20	1.89	1.77	1.72	1.89
P2O5	0.39	0.44	0.43	0.24	0.31	0.29	0.26	0.37	0.38	0.28	0.29	0.23	0.28
MNO	0.20	0.18	0.19	0.18	0.17	0.18	0.19	0.20	0.19	0.18	0.19	0.19	0.18
CO2	0.12	0.03	0.01	0.02	0.04	0.07	0.00	0.03	0.04	0.00	0.02	0.01	0.04
TOTAL	100.71	100.25	100.21	100.41	100.67	99.89	100.02	100.69	100.22	100.54	100.91	100.43	100.74

Table 10. Columbia River Basalt flows. Release date February 1982. Major oxide analyses of bulk rocks. Total iron reported as FE203 (U.S.Geological Survey laboratory) or FEO (Washington State University laboratory).

SAMPLE	B77157	B77158	B77159	B77171	B77176	B77177	B77178	B77179	B77180	B77181	B77183	B77185	B77186
SIO2	53.35	53.15	52.76	52.67	54.94	53.28	54.44	52.32	53.16	53.13	53.57	52.58	55.80
AL203	14.09	14.02	13.78	13.51	13.50	13.75	13.74	13.93	13.88	13.88	13.65	13.70	12.62
FE203	13.09	12.30	12.73	12.72	12.51	13.37	12.58	12.64	12.44	12.52	13.57	12.92	12.58
FEO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MGO	4.82	4.73	4.81	2.68	3.58	4.83	5.19	5.22	4.89	4.64	3.84	4.02	3.10
CAO	8.42	8.64	8.50	6.15	7.03	8.36	8.89	8.90	8.49	8.40	7.26	7.49	6.96
NA20	2.98	2.85	3.02	3.03	3.17	2.91	2.86	2.78	2.92	2.98	3.23	3.06	3.24
K20	1.08	1.23	1.29	2.54	1.82	1.19	1.17	1.07	1.24	1.23	1.61	1.51	1.75
H20	0.88	1.38	0.95	2.00	1.17	1.17	1.03	1.48	1.04	1.26	1.20	1.26	1.07
TIO2	1.87	1.78	1.80	2.61	1.86	1.85	1.72	1.71	1.68	1.74	2.18	1.89	1.96
P205	0.25	0.29	0.31	0.83	0.29	0.26	0.23	0.24	0.27	0.30	0.36	0.28	0.44
MNO	0.20	0.19	0.20	0.21	0.18	0.20	0.20	0.19	0.19	0.19	0.19	0.19	0.18
C02	0.01	0.05	0.03	0.03	0.03	0.00	0.02	0.02	0.02	0.02	0.05	0.03	0.05
TOTAL	101.04	100.61	100.18	98.98	100.08	101.17	102.07	100.50	100.22	100.29	100.71	98.93	99.75

SAMPLE	B77187	B77188	B77190	B77191	B77195	B77196	B77197	B77198	80-001	80-002	80-003	80-004	80-005
SIO2	52.73	50.07	52.49	53.29	53.26	52.52	53.55	53.13	51.34	54.53	54.71	54.07	51.67
AL203	13.70	13.27	14.02	14.01	13.44	13.40	13.44	13.43	14.52	15.21	15.24	15.25	14.64
FE203	13.33	12.41	11.86	12.27	13.43	13.71	13.06	12.41	0.00	0.00	0.00	0.00	0.00
FEO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.04	11.19	10.16	10.78	13.35
MGO	3.93	4.40	5.04	4.91	3.95	3.97	3.48	4.01	4.41	4.33	4.81	4.87	4.39
CAO	7.38	10.47	9.01	8.42	7.38	7.45	6.97	7.41	8.09	8.28	8.46	8.70	8.25
NA20	3.18	2.88	2.76	2.97	3.20	3.26	3.27	3.16	2.71	2.53	2.88	2.55	2.66
K20	1.51	1.15	1.09	1.23	1.43	1.36	1.74	1.44	1.14	1.29	1.31	1.25	1.31
H20	1.63	1.10	1.49	0.90	1.50	2.00	1.60	2.29	n.d.	n.d.	n.d.	n.d.	n.d.
TIO2	2.09	1.74	1.72	1.69	2.04	2.12	2.16	1.83	2.83	1.81	1.70	1.79	2.78
P205	0.35	0.30	0.23	0.29	0.32	0.39	0.40	0.26	0.48	0.33	0.30	0.32	0.48
MNO	0.19	0.22	0.19	0.19	0.20	0.20	0.20	0.17	0.22	0.24	0.18	0.18	0.21
C02	0.03	1.76	0.00	0.01	0.00	0.03	0.00	0.04	n.d.	n.d.	n.d.	n.d.	n.d.
TOTAL	100.05	99.77	99.90	100.18	100.15	100.41	99.87	99.58	99.78	99.74	99.75	99.76	99.74

SAMPLE	80-006	80-007	80-008	80-009	80-010	80-011	80-012	80-013	80-014	80-015	80-016	80-017	80-018
SIO2	53.48	51.28	50.90	51.42	51.51	53.00	51.46	53.42	54.86	54.21	54.71	51.38	55.19
AL203	15.25	14.40	14.26	14.44	14.28	15.46	14.34	15.58	15.36	15.26	15.26	14.24	15.00
FE203	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEO	11.40	13.75	14.54	14.26	13.87	11.62	13.72	10.85	9.55	11.16	10.19	14.18	10.53
MGO	4.89	4.54	4.22	4.05	4.36	4.91	4.44	5.00	4.72	4.57	4.66	4.16	2.88
CAO	8.96	8.28	7.95	8.14	8.10	9.07	8.26	9.01	8.87	8.27	8.54	7.89	6.50
NA20	2.59	2.68	2.81	2.78	2.71	2.62	2.59	2.71	2.75	2.87	2.84	2.84	3.15
K20	0.93	1.29	1.32	0.92	1.40	0.79	1.37	0.92	1.37	1.23	1.29	1.34	2.68
H20	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TIO2	1.81	2.86	2.97	3.06	2.84	1.84	2.87	1.81	1.79	1.70	1.76	3.00	2.90
P205	0.26	0.48	0.53	0.50	0.48	0.26	0.50	0.26	0.32	0.28	0.30	0.52	0.75
MNO	0.18	0.21	0.23	0.18	0.22	0.21	0.22	0.18	0.18	0.16	0.18	0.19	0.19
C02	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TOTAL	99.75	99.77	99.73	99.75	99.77	99.78	99.77	99.74	99.77	99.71	99.73	99.74	99.77

Table 1b. Columbia River basalt flows. Release date February 1982. Major oxide analyses of bulk rocks. Total iron reported as FE2O3 (U.S.Geological Survey laboratory) or FEO (Washington State University laboratory).

SAMPLE	80-019	80-020	80-021	80-022	80-023	80-024	80-025	80-026	80-027	80-028	80-029	80-030	80-031
SIO2	50.44	53.96	54.09	51.38	54.30	53.59	53.57	51.78	55.84	50.05	54.86	55.46	53.80
AL2O3	14.04	15.37	15.13	14.36	15.42	15.13	15.21	14.32	14.83	15.36	14.26	14.67	15.36
FE2O3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEO	14.75	10.47	11.28	13.91	10.44	11.54	11.57	13.63	11.67	11.57	12.67	12.02	11.17
MGO	4.30	4.89	4.24	4.39	4.57	4.89	4.97	4.37	3.41	6.54	3.00	3.71	4.85
CAO	8.50	8.97	8.62	8.15	8.52	8.75	8.75	8.16	6.89	11.57	6.60	6.95	9.08
NA2O	2.68	2.72	2.78	2.81	2.75	2.59	2.61	2.83	2.84	2.22	2.94	2.91	2.34
K2O	0.97	1.06	1.15	1.20	1.32	0.97	0.82	1.20	1.70	0.21	1.87	1.64	0.89
H2O	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TIO2	3.43	1.84	1.95	2.87	1.81	1.82	1.79	2.81	2.08	1.84	2.65	1.90	1.84
P2O5	0.46	0.26	0.30	0.48	0.35	0.26	0.26	0.48	0.32	0.19	0.65	0.30	0.26
MNO	0.21	0.17	0.21	0.22	0.26	0.18	0.17	0.21	0.18	0.19	0.26	0.19	0.19
CO2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TOTAL	99.78	99.71	99.75	99.77	99.74	99.72	99.72	99.79	99.76	99.74	99.76	99.75	99.78

SAMPLE	80-032	80-033	80-034	80-035	80-036	80-037	80-038	80-039	80-040	80-041	80-042	80-043	80-044
SIO2	50.71	54.34	51.78	51.30	51.23	50.69	51.21	52.05	53.50	52.23	53.84	52.42	51.88
AL2O3	16.98	14.92	14.94	15.44	15.82	15.69	15.83	15.37	16.30	15.08	14.58	15.86	15.86
FE2O3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEO	9.67	11.62	12.77	11.21	10.60	11.40	11.08	11.92	9.32	12.38	12.35	10.09	10.69
MGO	6.64	3.61	5.39	6.26	6.86	6.88	6.24	5.26	5.11	4.95	4.43	4.72	5.86
CAO	11.34	8.03	9.27	10.30	10.62	10.00	10.57	10.09	10.53	9.52	8.17	10.94	10.47
NA2O	2.46	2.75	2.65	2.61	2.46	2.25	2.58	2.53	2.62	2.66	2.44	3.00	2.52
K2O	0.32	1.68	0.78	0.64	0.44	0.96	0.39	0.52	0.61	0.68	1.34	0.68	0.60
H2O	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TIO2	1.23	2.21	1.73	1.56	1.34	1.50	1.50	1.60	1.42	1.79	2.05	1.57	1.48
P2O5	0.21	0.39	0.26	0.24	0.19	0.22	0.21	0.23	0.21	0.25	0.33	0.30	0.23
MNO	0.22	0.21	0.19	0.18	0.18	0.19	0.16	0.17	0.14	0.19	0.21	0.18	0.19
CO2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TOTAL	99.78	99.76	99.76	99.74	99.74	99.78	99.77	99.74	99.76	99.73	99.74	99.76	99.78

SAMPLE	80-045	80-046	80-047	80-048	80-049	80-050	80-051	80-052	80-053	80-054	80-055	80-056	80-057
SIO2	51.30	54.86	54.48	53.67	54.13	51.38	50.90	53.15	51.57	54.09	50.61	52.13	53.36
AL2O3	15.01	15.00	14.84	14.65	14.71	15.38	15.13	14.53	14.79	14.52	15.75	14.94	14.74
FE2O3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEO	12.92	10.88	11.37	12.75	12.65	12.15	13.38	12.54	13.89	12.67	12.38	13.33	12.72
MGO	5.37	4.31	4.38	3.88	3.49	5.55	5.14	4.50	4.58	3.68	5.75	4.29	4.12
CAO	9.41	8.24	8.05	7.55	6.98	9.74	9.37	8.13	8.63	7.55	10.03	8.89	8.11
NA2O	2.66	2.55	2.74	2.91	2.94	2.81	2.69	2.87	2.68	2.80	2.49	2.59	2.81
K2O	0.74	1.56	1.54	1.51	1.98	0.67	0.61	1.43	0.96	1.60	0.54	0.97	1.20
H2O	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TIO2	1.82	1.89	1.87	2.21	2.34	1.64	2.00	2.05	2.09	2.21	1.73	2.06	2.16
P2O5	0.30	0.30	0.28	0.39	0.37	0.24	0.30	0.32	0.32	0.39	0.26	0.32	0.33
MNO	0.23	0.19	0.21	0.23	0.19	0.22	0.23	0.22	0.23	0.23	0.22	0.23	0.21
CO2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TOTAL	99.76	99.78	99.76	99.75	99.78	99.78	99.75	99.74	99.74	99.74	99.76	99.75	99.76

Table 1b. Columbia River Basalt flows. Release date February 1982. Major oxide analyses of bulk rocks. Total iron reported as FE2O3 (U.S.Geological Survey laboratory) or FEO (Washington State University laboratory).

SAMPLE	80-058	80-059	80-060	80-061	80-062	80-063	80-064	80-065	80-066	80-067	80-068	80-069	80-070
SIO2	51.69	50.69	51.86	53.40	51.28	52.13	51.92	51.44	51.51	51.46	50.61	51.44	51.53
AL2O3	14.66	15.42	14.83	14.66	15.91	14.75	14.75	15.73	15.86	14.66	17.44	14.53	14.69
FE2O3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEO	13.91	13.24	13.34	12.85	11.39	13.50	13.85	11.45	11.13	14.21	10.81	14.34	14.32
MGO	4.70	5.31	4.56	3.87	5.93	4.50	4.42	5.30	5.89	4.61	5.18	4.62	4.47
CAO	8.67	9.47	8.67	7.51	10.36	8.48	8.55	10.15	9.90	8.59	10.90	8.53	8.62
NA2O	2.63	2.77	2.87	3.25	2.52	2.78	2.72	2.87	2.86	2.75	2.53	2.74	2.62
K2O	0.89	0.54	1.01	1.43	0.52	1.04	0.90	0.84	0.65	0.79	0.39	0.88	0.78
H2O	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TIO2	2.03	1.84	2.06	2.16	1.45	2.03	2.05	1.56	1.51	2.13	1.45	2.12	2.21
P2O5	0.32	0.26	0.32	0.37	0.21	0.32	0.32	0.23	0.26	0.32	0.25	0.32	0.28
MNO	0.24	0.23	0.23	0.22	0.21	0.24	0.26	0.21	0.18	0.23	0.19	0.24	0.23
CO2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TOTAL	99.74	99.77	99.75	99.72	99.78	99.77	99.74	99.78	99.75	99.75	99.75	99.76	99.75

SAMPLE	80-071	80-072	80-073	80-074	80-075	80-076	80-077	80-078	80-079	80-080	80-081	80-082	80-083
SIO2	50.98	51.48	51.03	51.36	51.55	50.92	51.17	51.55	51.21	51.40	50.92	50.78	50.92
AL2O3	14.67	14.64	16.44	14.72	14.58	16.38	15.71	15.83	15.82	16.15	15.87	15.89	15.72
FE2O3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEO	15.34	14.47	10.16	14.30	14.27	10.43	11.10	11.13	10.90	10.46	10.89	11.02	11.19
MGO	4.17	4.50	6.20	4.69	4.55	6.63	6.02	6.00	6.25	6.45	6.47	6.49	6.31
CAO	8.13	8.49	11.14	8.52	8.57	10.84	10.46	9.89	10.22	10.39	10.36	10.41	10.52
NA2O	2.77	2.66	2.65	2.50	2.81	2.53	2.88	2.77	2.90	2.49	2.77	2.77	2.61
K2O	0.89	0.78	0.46	0.95	0.77	0.39	0.53	0.65	0.63	0.64	0.61	0.52	0.59
H2O	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TIO2	2.25	2.15	1.29	2.19	2.13	1.26	1.45	1.50	1.43	1.37	1.46	1.45	1.48
P2O5	0.30	0.33	0.19	0.30	0.32	0.17	0.23	0.25	0.22	0.22	0.22	0.23	0.22
MNO	0.25	0.24	0.17	0.24	0.24	0.18	0.21	0.19	0.19	0.19	0.19	0.21	0.21
CO2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TOTAL	99.75	99.74	99.73	99.77	99.79	99.73	99.76	99.76	99.77	99.76	99.76	99.77	99.77

SAMPLE	80-084	80-085	Dike 80-086	80-087	80-088	80-089	80-090	80-091	80-092	80-093	80-094	80-095	80-096
SIO2	51.59	52.67	51.78	51.23	51.67	58.09	58.23	56.46	52.00	52.42	53.53	58.98	58.96
AL2O3	14.67	14.90	14.75	15.01	14.50	14.53	14.51	14.63	16.44	17.03	14.57	14.94	15.07
FE2O3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEO	13.97	13.26	13.69	15.57	14.41	11.50	10.87	12.01	9.11	8.90	12.95	10.72	10.03
MGO	4.70	4.08	4.49	3.66	4.30	1.87	1.93	2.52	8.07	6.10	4.06	1.68	1.79
CAO	8.46	8.61	8.79	8.27	8.45	5.10	5.33	5.99	9.33	10.25	7.75	4.68	5.08
NA2O	2.84	2.75	2.59	2.38	2.81	3.21	3.15	3.03	2.52	2.65	2.93	3.00	3.13
K2O	0.92	0.71	0.96	0.77	0.69	2.62	2.65	2.08	0.63	0.42	1.31	2.81	2.65
H2O	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TIO2	2.03	2.19	2.13	2.24	2.18	1.96	2.00	2.21	1.18	1.40	2.08	2.02	2.06
P2O5	0.32	0.37	0.33	0.35	0.33	0.67	0.64	0.60	0.32	0.32	0.35	0.70	0.67
MNO	0.23	0.21	0.22	0.25	0.22	0.23	0.42	0.25	0.17	0.26	0.25	0.25	0.32
CO2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TOTAL	99.73	99.75	99.73	99.73	99.76	99.78	99.73	99.78	99.77	99.75	99.78	99.78	99.76

Table 1b. Columbia River basalt flows. Release date February 1982. Major oxide analyses of bulk rocks. Total iron reported as FE203 (U.S.Geological Survey laboratory) or FEO (Washington State University laboratory).

SAMPLE	80-097	80-098	80-099	80-100	80-101	80-102	80-103	80-104	80-105	80-106	80-107	80-108	80-109
SI02	56.51	53.76	64.27	58.46	64.30	53.15	57.59	63.00	51.44	52.13	52.53	51.48	64.48
AL203	14.55	14.97	17.58	14.66	17.81	14.76	17.48	17.73	16.38	15.48	15.10	16.10	17.47
FE203	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEO	10.85	11.96	3.61	10.64	3.48	13.72	7.13	4.67	9.23	11.50	11.70	10.74	3.67
MGO	1.93	4.26	2.31	1.95	2.15	3.93	3.47	1.82	7.47	5.00	4.75	7.00	2.15
CAO	5.31	7.89	5.26	5.27	5.18	7.56	6.55	5.49	9.99	9.24	8.90	9.20	5.14
NA20	2.90	2.53	3.71	2.96	3.44	2.65	3.43	4.00	2.46	2.71	2.66	2.46	3.75
K20	2.87	1.78	1.98	2.96	2.41	1.29	2.05	1.81	0.86	1.12	1.35	0.71	2.00
H20	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TI02	1.95	2.05	0.64	1.95	0.61	2.08	1.31	0.82	1.40	2.09	2.22	1.53	0.65
P205	0.65	0.32	0.30	0.67	0.28	0.35	0.54	0.33	0.35	0.28	0.32	0.37	0.30
MNO	0.23	0.21	0.09	0.24	0.08	0.22	0.19	0.08	0.16	0.21	0.22	0.16	0.14
C02	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TOTAL	99.75	99.73	99.75	99.76	99.74	99.71	99.74	99.75	99.74	99.76	99.75	99.75	99.75

SAMPLE	80-110	80-111	80-112	80-113	80-114	80-115	80-116	80-117	80-118	80-119	80-120	80-121	80-122
SI02	59.86	53.36	52.92	60.55	58.23	58.38	59.53	60.05	58.57	64.65	51.82	46.63	46.57
AL203	15.28	14.52	14.47	15.55	17.27	17.42	16.95	18.48	14.57	17.24	16.55	15.78	15.72
FE203	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEO	11.18	13.50	14.27	10.07	7.05	7.10	7.35	5.85	11.85	3.64	10.12	12.85	12.80
MGO	0.85	3.90	3.88	0.71	3.53	3.40	2.78	2.43	1.50	2.31	6.50	7.63	7.31
CAO	3.53	7.72	7.58	3.81	6.36	6.27	5.87	5.92	4.68	5.23	9.51	8.34	8.42
NA20	3.56	2.83	2.75	3.53	3.47	3.36	3.56	4.18	3.31	3.78	2.50	4.08	4.44
K20	2.56	1.23	1.18	2.56	2.08	2.00	1.90	1.40	2.46	1.84	0.75	0.81	0.85
H20	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TI02	2.06	2.09	2.11	2.15	1.07	1.07	1.14	0.89	1.95	0.68	1.48	2.84	2.84
P205	0.71	0.35	0.35	0.72	0.54	0.59	0.56	0.39	0.67	0.32	0.33	0.61	0.63
MNO	0.15	0.26	0.22	0.09	0.16	0.19	0.13	0.16	0.19	0.08	0.17	0.17	0.17
C02	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TOTAL	99.74	99.76	99.73	99.74	99.76	99.78	99.77	99.75	99.75	99.77	99.73	99.74	99.75

SAMPLE	80-123	81-001	81-002	81-003	81-004	81-005	81-006	81-007	81-008	81-009	81-010	81-011	81-012
SI02	63.42	51.71	53.88	51.26	53.26	51.40	54.01	55.65	54.51	54.05	51.82	54.38	51.57
AL203	17.48	14.53	15.71	15.08	15.37	15.20	15.60	17.28	16.01	15.50	15.23	15.60	15.02
FE203	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEO	3.91	14.22	11.69	12.51	10.81	12.55	10.55	9.21	9.61	10.27	12.64	10.29	12.65
MGO	2.96	4.41	5.14	4.54	4.02	4.44	3.71	3.59	3.27	3.55	4.39	3.65	4.45
CAO	5.38	7.98	8.58	8.00	6.83	7.85	6.45	7.12	6.76	6.61	7.79	6.29	7.81
NA20	3.77	1.73	1.54	2.53	2.62	2.59	2.53	3.34	2.37	2.65	2.00	2.52	2.34
K20	1.70	1.45	0.95	1.75	2.68	1.62	2.90	1.04	3.16	3.18	1.76	3.09	1.82
H20	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TI02	0.75	2.99	1.81	2.65	2.63	2.65	2.56	1.90	2.58	2.50	2.68	2.53	2.63
P205	0.32	0.50	0.26	1.20	1.28	1.18	1.23	0.44	1.26	1.21	1.23	1.20	1.20
MNO	0.09	0.22	0.21	0.25	0.24	0.24	0.23	0.16	0.23	0.24	0.24	0.23	0.24
C02	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TOTAL	99.78	99.74	99.77	99.77	99.74	99.72	99.77	99.73	99.76	99.76	99.78	99.78	99.73

Table 1b. Columbia River basalt flows. Release date February 1982. Major oxide analyses of bulk rocks. Total iron reported as FE203 (U.S.Geological Survey laboratory) or FEO (Washington State University laboratory).

SAMPLE	81-013	81-014	81-015	81-016	81-017	81-018	81-019	81-020	81-021	81-022	81-023	81-024	81-025
SIO2	55.05	53.50	51.88	57.21	53.88	49.69	51.65	51.07	51.51	52.50	51.59	52.69	52.21
AL203	15.71	15.37	15.44	15.37	15.39	15.74	15.30	16.21	16.36	16.91	16.24	15.14	15.34
FE203	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEO	9.84	11.92	12.41	10.75	11.94	14.40	12.41	11.29	10.85	10.54	11.62	12.95	12.79
MGO	3.31	5.20	4.38	3.21	5.04	4.83	4.32	6.37	6.33	5.24	5.95	5.23	4.56
CAO	5.92	8.74	7.70	6.77	8.67	8.73	7.81	10.49	10.53	10.07	9.84	8.99	10.01
NA20	2.88	1.71	1.90	1.95	1.51	2.08	2.27	1.96	1.78	2.00	2.13	1.56	1.76
K20	3.27	1.04	1.92	1.81	1.00	0.64	1.84	0.41	0.50	0.65	0.46	0.88	0.75
H20	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TIO2	2.43	1.81	2.68	2.13	1.85	3.00	2.71	1.53	1.46	1.50	1.51	1.79	1.79
P205	1.12	0.26	1.21	0.35	0.26	0.48	1.23	0.24	0.22	0.24	0.21	0.30	0.28
MNO	0.24	0.19	0.24	0.18	0.19	0.18	0.25	0.19	0.22	0.15	0.21	0.23	0.28
CO2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TOTAL	99.77	99.74	99.76	99.73	99.73	99.77	99.79	99.76	99.76	99.80	99.76	99.76	99.77

SAMPLE	81-026	81-027	81-028	81-029	81-030	81-031	81-032	81-033	81-034	81-035
SIO2	56.03	51.53	52.03	51.71	52.42	51.86	56.80	56.78	48.34	54.05
AL203	14.95	15.04	16.51	16.74	16.26	14.88	15.40	15.25	15.67	15.50
FE203	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEO	12.26	12.50	10.99	11.39	10.43	12.43	10.75	11.55	14.30	11.42
MGO	3.43	4.50	6.16	5.32	5.88	4.48	3.53	3.49	5.50	5.02
CAO	6.88	7.81	10.39	10.50	11.35	7.95	6.93	6.95	9.19	9.12
NA20	1.56	2.36	1.48	1.96	1.37	2.06	2.03	1.67	1.93	1.54
K20	2.03	1.89	0.44	0.33	0.37	1.93	1.73	1.67	0.61	0.82
H20	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TIO2	2.09	2.68	1.37	1.43	1.31	2.69	2.06	1.93	3.31	1.81
P205	0.33	1.23	0.19	0.21	0.18	1.23	0.33	0.30	0.50	0.28
MNO	0.19	0.24	0.18	0.18	0.16	0.25	0.17	0.17	0.42	0.19
CO2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TOTAL	99.75	99.78	99.74	99.77	99.73	99.76	99.73	99.76	99.77	99.75

Table 1c. Instrumental Neutron Activation Analyses of all Columbia River Basalt flows. Release date February, 1982. Supersedes data of Wright and others(1979;Table 1c,1980;Tables 1c,2c). Samples were analyzed by L.J. Schwarz under the direction of project leaders J.J. Rowe and P. Baedecker in the U.S. Geological Survey laboratory in Reston,Va. Sample locations for Sw analyses and HUNTZ analysis are given in Wright and others(1979,1980). Sample locations for PH, RB, VC, and WT analyses are obtainable from the senior author. < = below limits of detection. n.d. = not determined.

SAMPLE	C-3 a	C-3 b	HUNTZ a	HUNTZ b	PH78091a	PH78091b	PH78144a	PH78144b	PH78149a	PH78149b	PH78192a	PH78192b	RB78009a
BA	n.d.	140.00	449.00	370.00	988.00	1060.00	964.00	906.00	714.00	843.00	1830.00	1700.00	606.00
CO*	43.40	54.80	45.10	40.30	Contaminated: data rejected								
CR	823.00	900.00	180.00	164.00	4.90	n.d.	7.90	6.90	4.60	n.d.	36.40	35.50	5.80
CS	<	<	<	0.50	0.82	0.90	1.16	1.20	1.33	1.40	0.82	0.70	0.89
HF	1.56	1.90	4.40	4.00	6.25	6.40	4.64	4.40	5.15	5.20	10.70	10.20	5.69
RB	<	<	33.00	20.00	29.90	42.00	34.00	46.00	38.90	55.00	53.00	50.00	34.00
TA*	n.d.	0.26	0.81	0.63	----1.29-----		----0.85-----		----0.95-----		----2.19-----		1.70--
TH	0.28	0.30	4.40	3.40	5.43	5.60	5.37	4.90	5.78	5.50	7.91	7.20	8.80
U	n.d.	n.d.	0.50	n.d.	1.20	1.70	1.51	1.80	1.66	1.60	1.70	n.d.	1.62
ZN	90.00	87.00	103.00	102.00	156.00	150.00	127.00	126.00	138.00	145.00	148.00	142.00	128.00
ZR	<	<	200.00	190.00	219.00	290.00	300.00	160.00	209.00	240.00	506.00	400.00	259.00
SC	25.90	29.90	29.70	27.60	33.80	33.40	31.80	30.30	30.50	29.90	27.50	25.20	27.60
LA	5.20	5.00	28.00	26.00	36.30	35.00	27.00	25.00	28.70	27.00	58.80	56.00	37.60
CE	12.80	13.00	54.00	50.00	78.40	77.00	52.30	47.00	51.80	58.00	119.00	112.00	73.90
ND	10.00	11.00	29.00	26.00	48.90	45.00	27.90	27.00	34.60	31.00	62.00	59.00	39.00
SM	2.90	2.80	6.20	5.60	11.20	11.10	7.70	6.40	7.80	8.10	14.00	15.10	8.10
EU	0.92	0.94	1.63	1.48	3.31	3.25	1.93	1.80	2.05	2.06	4.42	4.20	2.18
GD	2.50	3.20	5.90	5.30	10.60	10.40	7.40	7.10	8.00	7.60	13.00	13.00	7.50
TB	0.31	0.54	0.89	0.74	1.65	1.69	1.09	0.92	1.15	1.13	2.19	2.01	1.00
HO	n.d.	0.60	1.20	n.d.	1.79	1.30	0.88	1.10	0.95	1.60	1.79	2.50	1.20
TM	0.28	0.24	0.53	0.38	0.83	0.81	0.60	0.46	0.60	0.60	0.73	0.80	0.59
YB	1.68	1.70	3.20	2.50	5.62	4.50	3.61	3.60	3.79	4.30	5.67	5.80	3.65
LU	0.26	0.27	0.48	0.62	0.84	0.97	0.53	0.57	0.58	0.62	0.83	0.82	0.51
C.T.		UNC 1/		UNC 2/	PH SHUM			UNC 3/		UNC 3/	PH EDEN		RBESQUAT 4/

SAMPLE	RB78009b	RB78012a	RB78012b	SW71007a	SW71007b	SW71015a	SW71015b	SW71017a	SW71017b	SW71036a	SW71036b	SW71042a	SW71042b
BA	600.00	588.00	650.00	436.00	423.00	300.00	230.00	506.00	541.00	455.00	435.00	479.00	484.00
CO*	Contaminated: data rejected			46.70	44.90	47.10	45.60	44.10	44.80	44.40	44.00	39.10	39.20
CR	7.00	8.20	7.40	18.00	17.60	278.00	268.00	18.50	17.10	257.00	260.00	96.50	96.30
CS	0.90	0.89	0.90	0.79	0.60	<	<	<	0.60	<	<	<	<
HF	5.80	5.84	5.90	5.97	5.80	3.00	2.90	6.40	6.50	4.20	4.40	4.80	4.70
RB	26.00	25.90	42.00	35.90	30.00	<	<	27.00	28.00	<	<	26.00	17.00
TA*	--1.70	----1.65-----		1.78	1.56	0.50	0.63	1.64	1.75	1.41	1.50	1.20	1.10
TH	9.20	8.70	9.00	5.37	5.30	2.20	2.20	6.20	6.10	1.60	1.50	4.00	3.20
U	1.40	1.70	1.70	1.55	1.60	n.d.	n.d.	0.90	1.60	n.d.	0.60	1.10	0.90
ZN	131.00	123.00	124.00	204.00	192.00	108.00	122.00	148.00	179.00	131.00	159.00	165.00	166.00
ZR	230.00	269.00	240.00	250.00	260.00	<	<	200.00	500.00	<	200.00	<	<
SC	29.00	29.00	27.80	33.30	32.00	30.90	30.40	30.20	30.70	39.70	39.50	37.60	37.10
LA	40.00	38.80	38.00	32.20	30.00	16.00	16.00	34.00	36.00	30.00	30.00	26.00	26.00
CE	73.00	76.60	75.00	61.40	56.00	35.00	32.00	78.00	69.00	63.00	63.00	59.00	56.00
ND	37.00	38.00	40.00	35.90	32.00	20.00	17.00	33.00	35.00	34.00	31.00	39.00	37.00
SM	8.60	7.90	8.40	8.50	9.40	4.70	4.50	9.60	9.90	8.40	8.10	7.80	8.30
EU	2.26	2.25	2.26	2.27	2.18	1.38	1.31	2.45	2.53	2.16	2.24	2.52	2.43
GD	8.30	8.40	8.50	8.30	7.20	5.80	4.40	9.90	8.40	7.10	7.90	10.00	8.30
TB	0.97	1.04	0.91	1.53	1.35	0.66	0.93	1.00	1.68	1.25	1.20	1.02	1.40
HO	n.d.	1.40	n.d.	1.40	1.60	1.00	1.30	2.00	1.40	1.40	1.10	2.10	1.20
TM	0.60	0.67	0.48	0.67	0.72	0.49	0.34	0.93	1.05	0.79	0.66	0.67	0.72
YB	3.60	3.68	3.40	4.30	4.10	2.50	2.50	4.60	4.80	3.60	3.80	3.90	4.10
LU	0.58	0.47	0.57	0.85	0.63	0.37	0.37	0.68	0.68	0.57	0.55	0.58	0.56
C.T.	RBESQUAT 4/	RBESQUAT		ELEPHANT		ASOTIN		ELEPHANT		LEW ORCH		LOLO INC	

Table 1c. Instrumental Neutron Activation Analyses of all Columbia River Basalt flows. Release date February, 1982. Supersedes data of Wright and others(1979;Table 1c,1980;Tables 1c,2c). Samples were analyzed by L.J. Schwarz under the direction of project leaders J.J. Rowe and P. Baedecker in the U.S. Geological Survey laboratory in Reston,Va. Sample locations for SW analyses and HUNTZ analysis are given in Wright and others(1979,1980). Sample locations for PH, RB, VC, and WT analyses are obtainable from the senior author. < = below limits of detection. n.d. = not determined.

SAMPLE	SW71066a	SW71066b	SW71073a	SW71073b	SW71084a	SW71084b	SW71090a	SW71090b	SW71104a	SW71104b	SW71105a	SW71105b	SW71106a
BA	284.00	353.00	4350.00	4540.00	858.00	795.00	567.00	641.00	800.00	837.00	522.00	585.00	n.d.
CO	38.20	37.90	15.40	14.90	38.20	38.40	39.40	40.30	37.60	37.60	36.30	36.00	44.90
CR	173.90	163.60	n.d.	n.d.	32.70	35.00	27.70	33.80	47.60	51.40	29.10	28.70	110.00
CS	<	<	0.75	0.80	<	0.70	0.80	1.10	<	<	0.50	0.60	<
HF	2.83	2.80	11.70	12.10	5.90	6.00	5.30	5.80	10.73	10.60	4.62	4.80	3.40
RB	<	<	53.80	57.00	29.00	33.00	43.00	58.00	18.10	25.00	34.90	30.00	<
TA	0.56	0.57	1.54	1.64	1.30	0.90	1.52	1.64	2.90	3.23	0.98	1.22	0.87
TH	1.23	1.20	8.64	8.30	7.00	6.20	8.30	8.40	4.31	4.50	4.14	4.30	2.50
U	n.d.	n.d.	1.59	1.90	1.20	0.50	2.00	2.00	n.d.	n.d.	1.22	1.50	0.80
ZN	131.00	125.00	183.00	181.00	120.00	135.00	116.00	146.00	271.00	390.00	194.00	183.00	108.00
ZR	<	<	591.00	520.00	270.00	360.00	350.00	220.00	573.00	494.00	450.00	50.00	<
SC	41.00	39.60	29.50	29.10	26.40	26.80	26.80	27.70	36.60	36.60	34.80	35.60	35.60
LA	16.90	16.00	51.80	54.00	44.00	44.00	36.00	38.00	78.90	77.00	27.80	26.00	17.00
CE	36.90	36.00	108.00	112.00	81.00	85.00	69.00	74.00	154.50	159.00	53.30	54.00	37.00
ND	31.10	20.00	56.70	58.00	37.00	39.00	37.00	37.00	92.00	76.00	31.60	33.00	18.00
SM	5.20	5.50	11.90	13.00	7.90	8.30	8.10	8.40	21.60	0.40	8.00	8.20	4.50
EU	1.66	1.53	4.74	4.73	1.98	1.95	2.06	2.16	5.69	5.70	2.15	2.23	1.38
GD	n.d.	n.d.	11.40	11.50	6.10	8.10	7.00	8.20	n.d.	n.d.	7.20	8.10	6.40
TB	0.79	1.03	1.81	1.93	1.45	0.98	1.37	1.70	3.34	3.38	1.15	1.50	0.86
HO	n.d.	n.d.	0.90	3.30	1.90	1.10	1.60	1.60	n.d.	n.d.	1.79	1.40	1.30
TM	n.d.	n.d.	0.74	0.78	0.78	0.77	1.00	n.d.	n.d.	n.d.	0.65	0.61	0.55
YB	2.62	2.50	4.94	5.10	4.20	4.40	3.60	3.60	8.49	8.60	4.06	4.10	2.80
LU	0.51	0.52	0.85	0.74	0.62	0.63	0.49	0.52	1.38	1.42	0.80	0.84	0.39
C.T.	DODGE		UNC[5]		WILBUR		ESQUAT		GOOSE		ROZA		POMONA

SAMPLE	SW71106b	SW71107a	SW71107b	SW71114a	SW71114b	SW71125a	SW71125b	SW72031a	SW72031b	SW72073a	SW72073b	SW72104a	SW72104b
BA	220.00	508.00	493.00	505.00	n.d.	3060.00	3030.00	260.00	210.00	626.00	638.00	208.00	157.00
CO	44.90	44.30	45.30	43.90	40.10	28.20	28.50	49.20	48.20	68.80	64.50	47.00	47.80
CR	112.00	21.00	18.80	204.80	181.00	4.30	n.d.	292.00	285.00	29.60	29.50	154.40	157.40
CS	<	<	0.80	<	<	<	<	<	<	0.76	0.80	<	<
HF	3.10	6.70	7.10	5.82	5.80	10.40	10.40	2.90	2.70	5.24	4.90	1.52	1.40
RB	<	22.00	31.00	<	<	28.00	52.00	10.00	<	45.90	34.00	<	<
TA	0.76	1.98	1.72	1.56	1.45	1.60	1.42	n.d.	0.63	1.26	1.33	n.d.	n.d.
TH	2.30	6.50	6.00	2.11	2.20	7.10	6.80	2.00	1.80	5.07	4.40	0.33	0.50
U	0.70	1.40	1.50	n.d.	n.d.	1.30	1.30	n.d.	n.d.	1.59	1.50	n.d.	n.d.
ZN	135.00	163.00	185.00	223.00	154.00	137.00	141.00	98.00	118.00	217.00	196.00	116.00	110.00
ZR	<	<	370.00	354.00	301.00	460.00	420.00	<	<	269.00	100.00	<	<
SC	35.00	31.80	32.30	39.30	36.90	26.80	26.70	31.20	31.20	38.90	38.20	36.80	36.80
LA	17.00	34.00	36.00	41.70	n.d.	45.00	45.00	15.00	15.00	31.10	30.00	7.80	8.00
CE	34.00	74.00	74.00	84.60	75.00	88.00	88.00	30.00	29.00	58.20	57.00	15.70	18.00
ND	21.00	35.00	41.00	55.00	60.00	42.00	50.00	19.00	18.00	33.80	34.00	16.90	10.00
SM	4.60	9.60	9.30	10.80	n.d.	10.10	9.90	4.20	4.30	8.90	8.80	3.00	3.20
EU	1.41	2.47	2.74	3.13	2.93	3.86	3.44	1.26	1.26	2.37	2.32	1.08	1.04
GD	4.30	8.20	10.20	n.d.	n.d.	10.00	9.50	4.90	4.80	8.80	7.90	n.d.	n.d.
TB	0.50	1.25	4.50	1.78	1.71	1.72	2.08	0.66	1.40	1.42	1.37	0.61	0.71
HO	0.70	2.20	1.30	n.d.	n.d.	1.90	1.30	1.30	0.90	1.99	1.70	n.d.	n.d.
TM	0.50	0.69	0.98	n.d.	n.d.	1.00	0.76	0.29	0.43	0.71	0.79	n.d.	n.d.
YB	2.70	4.70	5.00	4.38	3.60	4.50	4.30	2.40	2.30	4.55	4.40	1.72	1.90
LU	0.39	0.66	0.67	0.78	0.67	0.65	0.64	0.36	0.34	0.86	0.64	0.39	0.40
C.T.	POMONA	ELEPHANT		MARTIN		UMATILLA		ASOTIN		UNC[6]		ROBIN	

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SAMPLE	Sw72120a	Sw72120b	Sw72132a	Sw72132b	SW72133a	SW72133b	SW72143a	SW72143b	SW72145a	SW72145b	SW72152a	SW72152b	SW72158a
BA	210.00	210.00	452.00	476.00	526.00	48.00	260.00	250.00	532.00	584.00	985.00	948.00	578.00
CO	43.60	43.80	40.10	39.10	37.40	37.60	42.20	41.90	41.10	42.10	25.40	25.20	45.20
CR	143.00	14.30	97.10	97.00	53.70	55.40	103.00	111.00	23.80	26.00	n.d.	2.50	100.20
CS	<	<	<	0.60	<	1.00	0.90	<	1.00	<	1.23	1.30	0.78
HF	1.50	1.50	4.56	4.30	4.27	4.30	3.20	3.20	4.40	4.80	5.94	6.20	4.69
RB	<	<	31.40	13.00	21.70	28.00	10.00	<	10.00	29.00	35.90	4.30	20.00
TA	n.d.	n.d.	1.23	1.13	1.07	0.91	0.84	0.80	1.75	1.55	1.11	1.16	0.85
TH	0.50	0.50	3.48	3.60	3.87	3.70	2.70	2.70	5.20	4.90	5.02	5.20	3.29
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.80	n.d.	1.50	1.30	1.40	n.d.	n.d.
ZN	132.00	132.00	224.00	20.00	160.00	183.00	107.00	122.00	137.00	156.00	145.00	160.00	168.00
ZR	<	<	<	215.00	227.00	205.00	<	<	<	<	277.00	280.00	241.00
SC	35.70	35.70	36.50	34.50	35.10	35.80	33.30	33.70	22.10	23.10	32.00	32.50	37.40
LA	8.00	8.00	30.50	29.00	26.70	27.00	17.00	17.00	34.00	36.00	33.30	36.00	29.90
CE	15.00	15.00	59.60	59.00	56.80	52.00	35.00	35.00	65.00	70.00	70.00	72.00	60.10
ND	12.00	12.00	35.90	32.00	35.00	39.00	24.00	19.00	29.00	34.00	44.90	43.00	46.50
SM	2.90	2.90	8.90	8.80	7.30	7.80	4.90	4.80	6.30	7.30	10.60	n.d.	9.00
EU	1.02	1.02	2.86	2.50	2.41	2.26	1.39	1.45	2.01	2.17	3.16	3.15	2.70
GD	3.60	3.60	n.d.	n.d.	n.d.	n.d.	4.80	4.30	7.70	7.30	10.30	10.00	n.d.
TB	n.d.	n.d.	1.52	1.25	1.30	1.27	0.60	0.74	1.19	1.50	1.51	1.63	1.36
HO	0.70	0.70	n.d.	n.d.	n.d.	n.d.	1.30	1.00	1.20	1.00	2.21	n.d.	n.d.
TM	0.39	0.39	n.d.	n.d.	n.d.	n.d.	0.56	0.54	0.70	0.80	0.70	0.68	n.d.
YB	2.20	2.20	3.45	3.60	3.37	3.00	2.70	2.70	3.00	3.20	5.12	5.60	3.53
LU	0.34	0.34	0.67	0.64	0.60	0.61	0.39	0.39	0.41	0.48	0.97	0.86	0.64
C.T.	ROBIN		LOLO INC		ROZA		POMONA		LM		SHUMAKER		LOLO INC

SAMPLE	Sw72158b	SW72168a	SW72168b	SW72175a	SW72175b	SW72213a	SW72213b	SW72273a	SW72273b	SW72279a	SW72279b	SW72286a	SW72286b
BA	583.00	976.00	1050.00	3440.00	3360.00	913.00	851.00	998.00	991.00	500.00	501.00	775.00	819.00
CO	43.50	23.50	23.40	28.40	27.50	49.70	50.70	22.90	22.90	38.80	37.10	30.00	28.40
CR	91.60	3.60	n.d.	n.d.	4.90	40.10	40.30	4.20	7.20	106.00	104.00	108.00	102.00
CS	<	0.80	0.90	<	0.50	0.90	0.70	1.00	0.90	<	0.50	0.64	0.60
HF	4.40	6.20	6.10	10.50	10.20	5.70	5.90	6.30	6.20	3.37	3.30	5.32	5.10
RB	17.00	18.00	37.00	34.00	42.00	31.00	48.00	28.00	51.00	8.00	16.00	30.90	29.00
TA	0.99	1.40	1.49	1.52	1.43	0.91	1.10	1.52	1.30	0.48	0.56	1.22	1.14
TH	2.90	5.30	5.20	7.70	7.09	6.80	6.20	5.50	5.40	1.20	1.20	4.12	3.70
U	n.d.	1.80	1.90	1.50	1.10	1.50	1.30	1.40	1.80	0.55	0.50	1.23	1.10
ZN	211.00	164.00	179.00	129.00	143.00	121.00	148.00	157.00	185.00	155.00	160.00	225.00	211.00
ZR	217.00	720.00	240.00	960.00	740.00	<	320.00	310.00	430.00	<	200.00	419.00	140.00
SC	36.00	33.50	34.00	26.70	25.90	26.70	26.90	34.40	34.00	41.40	40.30	40.90	39.40
LA	29.00	37.00	37.00	48.00	47.00	43.00	43.00	37.00	36.00	18.00	17.00	31.70	30.00
CE	60.00	83.00	77.00	91.00	88.00	79.00	80.00	73.00	76.00	36.00	35.00	60.30	62.00
ND	34.00	44.00	44.00	44.00	50.00	40.00	39.00	48.00	44.00	25.00	23.00	38.50	40.00
SM	9.00	11.60	11.60	10.80	10.70	7.80	8.50	10.20	11.30	5.60	5.60	9.70	9.50
EU	2.63	3.32	3.31	4.16	4.00	1.88	1.89	3.28	3.23	1.49	1.51	2.84	2.68
GD	n.d.	11.00	9.80	9.20	10.70	6.80	7.30	9.50	10.20	5.40	4.80	10.10	9.70
TB	1.50	1.44	2.20	1.83	2.21	1.43	1.58	1.59	1.85	0.99	0.83	1.62	1.40
HO	n.d.	2.50	2.10	2.00	1.90	1.80	1.80	2.40	2.50	1.20	1.00	1.49	1.30
TM	n.d.	1.20	0.96	0.91	0.80	n.d.	0.58	1.10	0.96	0.50	0.57	0.66	0.83
YB	3.40	5.70	5.60	4.70	4.59	4.20	4.20	5.60	5.70	3.43	3.40	4.82	4.80
LU	0.68	0.86	0.80	0.69	0.66	0.63	0.62	0.86	0.82	0.98	0.51	0.82	0.69
C.T.	LOLO INC	SHUMAKER		UMATILLA		WILBUR		SHUMAKER		DODGE		UNC [1]	

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SAMPLE	SW72296a	SW72296b	SW72313a	SW72313b	SW72321a	SW72321b	SW73017a	SW73017b	SW73019a	SW73019b	SW73151a	SW73151b	SW73278a
BA	518.00	594.00	521.00	547.00	585.00	559.00	678.00	571.00	580.00	591.00	564.00	610.00	989.00
CO	40.20	40.20	38.20	37.10	38.40	38.50	46.10	45.80	42.80	42.10	40.00	39.40	39.50
CR	22.50	21.30	16.90	14.20	45.40	43.20	22.70	21.00	9.30	7.50	19.90	15.40	18.60
CS	0.93	0.90	1.03	0.90	0.81	1.10	1.70	0.80	1.40	0.90	0.80	0.90	1.05
HF	4.71	4.70	5.54	5.20	3.96	3.90	5.50	5.10	5.90	5.50	5.50	5.40	5.08
RB	30.30	26.00	23.60	32.00	24.50	31.00	23.00	45.00	33.00	53.00	44.00	53.00	38.90
TA	1.17	1.23	1.21	1.02	0.88	0.76	2.00	1.67	1.64	1.75	1.69	1.55	1.07
TH	3.93	4.40	4.25	3.90	3.21	3.10	7.20	7.20	9.30	9.10	8.60	8.30	4.98
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	2.20	1.30	2.30	2.20	1.90	2.10	1.84
ZN	204.00	193.00	227.00	213.00	214.00	191.00	167.00	191.00	134.00	150.00	123.00	136.00	241.00
ZR	259.00	269.00	314.00	302.00	<	201.00	<	250.00	<	150.00	<	<	130.00
SC	34.60	34.00	37.10	36.30	38.70	38.30	29.30	29.40	29.40	29.00	26.50	26.60	38.00
LA	28.50	29.00	33.90	33.00	23.90	24.00	36.00	35.00	41.00	39.00	38.00	37.00	32.40
CE	56.60	59.00	68.00	70.00	48.10	45.00	69.00	68.00	84.00	74.00	70.00	72.00	57.40
ND	33.90	34.00	50.60	39.00	34.60	34.00	33.00	32.00	38.00	34.00	40.00	34.00	38.90
SM	n.d.	n.d.	n.d.	n.d.	7.00	7.30	8.60	7.90	8.40	8.80	8.50	8.30	9.20
EU	2.35	2.31	2.85	2.77	2.29	2.11	2.14	2.15	2.24	2.29	2.19	2.13	2.33
GD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	9.40	7.50	8.40	8.10	8.00	8.10	9.60
TB	1.34	1.37	1.77	1.60	1.33	1.38	1.52	0.93	1.43	1.58	1.39	0.92	1.37
HO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1.80	1.00	2.00	1.80	1.60	1.00	1.70
TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.38	0.70	0.64	0.70	0.78	0.77	0.86
YB	3.57	3.40	4.43	4.10	3.15	3.10	3.80	3.60	3.90	3.60	3.60	3.60	4.77
LU	0.60	0.64	0.74	0.72	0.63	0.65	0.54	0.53	0.54	0.52	0.50	0.51	0.90
C.T.	FS INC		ROSALIA		FS INC		UNC		ESQUAT		ESQUAT		UNC [6]

SAMPLE	SW73278b	SW73349a	SW73349b	SW73355a	SW73355a	SW73355b	SW73355b	SW73356a	SW73356b	SW73358a	SW73358b	SW73359a	SW73359b
BA	694.00	563.00	555.00	397.00	151.00	366.00	150.00	416.00	415.00	749.00	783.00	694.00	756.00
CO	38.90	46.50	46.10	35.20	30.90	35.40	28.00	37.40	38.20	36.70	38.00	38.40	38.60
CR	20.00	21.00	20.70	87.40	18.20	97.30	17.00	117.20	113.80	9.50	16.30	13.20	9.60
CS	1.20	<	0.70	<	0.04	<	0.04	<	<	1.33	1.40	0.93	0.80
HF	5.10	5.50	5.40	2.80	1.35	2.80	1.14	2.88	2.80	4.73	4.90	4.81	5.00
RB	31.00	27.00	46.00	11.60	n.d.	<	n.d.	11.30	13.00	48.20	53.00	63.30	42.00
TA	1.20	1.72	1.77	0.40	1.01	0.48	0.82	0.54	0.66	0.89	1.18	0.87	0.93
TH	5.20	7.50	7.00	1.89	n.d.	2.10	n.d.	2.24	1.90	5.85	6.20	6.65	6.70
U	1.30	2.00	1.70	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	209.00	145.00	152.00	125.00	202.00	113.00	180.00	125.00	135.00	148.00	132.00	153.00	134.00
ZR	310.00	<	<	<	40.00	<	41.00	<	<	<	<	<	<
SC	39.10	29.10	29.40	37.40	n.d.	37.50	n.d.	36.30	35.60	31.80	31.90	32.40	32.50
LA	31.00	36.00	36.00	32.60	16.10	38.00	16.00	17.20	17.00	26.80	26.00	27.00	27.00
CE	58.00	72.00	66.00	32.20	31.50	33.20	33.00	32.90	33.00	52.40	55.00	55.40	54.00
ND	37.00	36.00	36.00	74.60	17.30	78.60	21.00	25.10	19.00	28.40	30.00	28.90	27.00
SM	9.10	8.90	7.80	<	4.30	<	4.50	5.00	5.00	6.70	6.80	6.90	7.00
EU	2.32	2.16	2.14	2.66	1.18	2.80	1.34	1.70	1.47	1.93	1.90	2.07	2.14
GD	9.20	8.30	7.70	19.90	n.d.	20.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	1.39	1.33	1.41	0.45	0.67	0.39	0.82	0.94	0.89	0.90	1.03	1.10	1.07
HO	2.00	1.80	1.10	1.60	n.d.	1.80	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	0.95	1.10	0.61	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	4.80	3.80	3.80	1.24	2.11	1.27	1.80	2.32	2.30	2.96	2.80	3.04	3.10
LU	0.73	0.52	0.51	<	0.39	<	0.43	0.45	0.45	0.54	0.53	0.57	0.56
C.T.	UNC [6]	GR INC	----------										GR INC

Table 1c. Instrumental Neutron Activation Analyses of all Columbia River basalt flows. Release date February, 1982. Supersedes data of Wright and others(1979;Table 1c,1980;Tables 1c,2c). Samples were analyzed by L.J. Schwarz under the direction of project leaders J.J. Rowe and P. Baedecker in the U.S. Geological Survey laboratory in Reston,Va. Sample locations for SW analyses and HUNTZ analysis are given in Wright and others(1979,1980). Sample locations for PH, RB, VC, and WT analyses are obtainable from the senior author. < = below limits of detection. n.d. = not determined.

SAMPLE	SW73360a	SW73360b	SW73361a	SW73361b	SW74207a	SW74207b	SW74244a	SW74244b	SW74245a	SW74245b	SW74246a	SW74246b	SW74247a
BA	412.00	508.00	488.00	560.00	542.00	627.00	421.00	433.00	576.00	514.00	485.00	496.00	747.00
CO	39.00	39.10	41.60	41.40	37.70	37.50	38.60	40.50	38.60	39.20	41.30	43.00	39.60
CR	95.60	92.10	21.10	25.00	47.60	48.40	24.30	26.70	24.60	26.40	22.30	24.40	17.30
CS	1.11	0.50	1.70	1.00	0.97	0.90	1.00	0.90	<	1.20	<	1.80	0.90
HF	3.47	3.90	4.70	4.60	4.14	4.20	3.59	3.70	4.22	4.30	3.87	4.00	4.63
RB	23.40	24.00	7.00	26.00	30.10	27.00	<	<	40.90	28.00	18.70	39.00	36.40
TA	0.64	0.80	1.85	1.58	0.65	0.83	0.57	0.67	1.06	0.89	0.74	0.62	0.84
TH	3.68	3.70	5.50	4.30	4.10	4.40	3.78	3.90	4.36	4.20	3.68	4.00	6.81
U	n.d.	n.d.	1.40	1.30	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	140.00	121.00	137.00	158.00	152.00	125.00	112.00	132.00	136.00	143.00	128.00	143.00	128.00
ZR	<	<	350.00	<	<	<	<	<	<	<	<	<	<
SC	34.20	33.80	22.60	22.60	35.30	34.60	33.80	34.50	35.10	34.90	34.40	35.50	30.60
LA	17.20	19.00	35.00	36.00	22.30	22.00	15.90	17.00	20.40	21.00	18.20	19.00	26.60
CE	37.60	38.00	67.00	69.00	45.90	45.00	33.40	35.00	41.90	43.00	37.80	40.00	55.50
ND	18.40	21.00	35.00	38.00	25.20	24.00	21.50	21.00	27.90	25.00	22.00	24.00	34.10
SM	5.30	5.30	7.20	7.40	6.10	6.00	5.10	5.60	6.60	6.70	5.90	6.40	7.10
EU	1.60	1.67	2.12	2.10	1.78	1.80	1.69	1.61	1.96	2.03	1.71	1.70	2.11
GD	n.d.	n.d.	3.70	3.90	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	0.86	0.94	1.33	0.84	0.95	1.08	1.18	1.09	1.31	1.18	0.94	1.20	1.11
HO	n.d.	n.d.	1.30	0.90	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	0.64	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	2.60	2.30	3.10	3.20	2.95	2.60	2.58	2.60	3.21	3.00	2.95	2.70	3.10
LU	0.50	0.49	0.47	0.46	0.55	0.52	0.42	0.46	0.56	0.55	0.50	0.52	0.51
C.T.	GR INC		LM		GR INC	----------							GR INC

SAMPLE	SW74247b	SW74248a	SW74248b	SW74249a	SW74249b	SW74250a	SW74250b	SW74251a	SW74251b	SW74252a	SW74252b	SW74253a	SW74253b
BA	697.00	721.00	705.00	824.00	823.00	695.00	767.00	616.00	575.00	692.00	65.00	623.00	69.00
CO	41.80	38.30	39.10	37.90	38.80	42.50	44.70	41.40	41.80	41.00	43.20	38.80	38.90
CR	17.30	14.20	17.40	7.80	11.00	11.50	13.70	20.60	24.60	20.50	23.50	20.60	20.10
CS	1.30	0.84	1.00	1.39	1.70	1.22	1.00	<	<	0.82	<	1.46	1.20
HF	4.90	4.89	5.00	4.81	5.00	4.72	5.10	4.01	4.30	4.25	4.10	4.38	4.30
RB	40.00	34.90	8.00	72.40	66.00	45.40	36.00	34.80	61.00	37.20	32.00	35.50	47.00
TA	1.40	0.96	1.02	0.88	0.93	1.00	0.77	1.34	1.01	0.77	0.69	0.92	0.79
TH	6.60	4.90	5.00	7.47	7.20	4.86	5.30	5.03	4.60	5.14	5.20	4.93	5.30
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	146.00	134.00	149.00	131.00	142.00	133.00	157.00	118.00	135.00	117.00	141.00	132.00	145.00
ZR	<	172.00	<	287.00	<	535.00	485.00	<	394.00	391.00	<	<	<
SC	32.00	31.90	32.60	29.10	29.40	34.60	36.00	32.70	33.70	32.70	33.00	33.70	33.10
LA	28.00	25.20	26.00	28.80	29.00	25.00	27.00	20.80	22.00	21.50	22.00	23.10	23.00
CE	56.00	52.80	52.00	56.90	58.00	51.10	55.00	41.50	41.00	44.00	44.00	45.90	45.00
ND	30.00	32.30	14.00	42.10	32.00	31.10	17.00	24.90	23.00	25.20	14.00	28.20	11.00
SM	7.40	7.30	7.30	7.90	8.10	7.10	7.30	5.80	6.00	5.90	5.80	6.40	5.20
EU	2.13	1.85	1.99	2.11	2.04	2.03	2.26	1.65	1.79	1.80	1.83	1.80	1.99
GD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	1.31	1.27	1.18	1.15	1.28	1.42	1.74	1.21	0.92	1.23	0.80	1.28	1.09
HO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	3.10	3.63	3.50	3.49	3.30	3.52	3.40	2.71	2.90	2.93	2.70	3.07	2.80
LU	0.54	0.59	0.60	0.54	0.55	0.59	0.62	0.49	0.50	0.49	0.50	0.54	0.55
C.T.	GR INC	----------											GR INC

Table 1c. Instrumental Neutron Activation Analyses of all Columbia River Basalt flows. Release date February, 1982. Supersedes data of Wright and others(1979;Table 1c,1980;Tables 1c,2c). Samples were analyzed by L.J. Schwarz under the direction of project leaders J.J. Rowe and P. Baedecker in the U.S. Geological Survey laboratory in Reston,Va. Sample locations for SW analyses and HUNTZ analysis are given in Wright and others(1979,1980). Sample locations for PH, RB, VC, and WT analyses are obtainable from the senior author. < = below limits of detection. n.d. = not determined.

SAMPLE	SW74254a	SW74254b	SW74255a	SW74255b	SW74256a	SW74256b	SW74257a	SW74257b	SW74258a	SW74258b	SW74259a	SW74259b	SW74260a
BA	576.00	49.00	407.00	453.00	559.00	486.00	511.00	515.00	544.00	585.00	856.00	830.00	529.00
CO	40.50	39.70	41.20	41.30	43.60	43.20	40.80	40.00	48.00	47.50	35.30	34.90	19.70
CR	118.90	116.50	141.50	144.70	56.60	58.70	52.70	54.10	58.30	56.50	n.d.	6.10	58.50
CS	<	0.70	<	<	<	<	0.83	<	<	0.90	1.38	1.40	<
HF	3.86	3.80	3.53	3.30	3.90	3.80	3.83	3.80	3.84	3.80	4.89	4.90	3.98
RB	18.90	40.00	17.90	17.00	33.40	18.00	22.30	31.00	38.60	41.00	48.30	64.50	29.30
TA	0.75	0.74	0.55	0.62	0.58	0.90	0.90	0.88	0.82	0.65	0.76	0.52	1.32
TH	4.21	3.60	3.08	3.20	3.81	3.70	3.49	3.40	3.66	3.90	6.01	5.80	3.88
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	121.00	135.00	124.00	140.00	132.00	138.00	106.00	135.00	129.00	137.00	134.00	134.00	129.00
ZR	<	<	<	365.00	<	<	<	<	<	<	<	<	<
SC	36.70	35.90	38.60	38.20	36.60	35.90	36.40	36.10	36.80	36.60	32.40	32.30	18.40
LA	19.10	19.00	16.80	17.00	20.00	19.00	19.80	20.00	19.90	20.00	29.90	30.00	20.00
CE	40.10	37.00	34.40	34.00	41.70	39.00	40.70	41.00	40.70	38.00	60.00	57.00	41.30
ND	16.50	10.00	16.00	18.00	20.50	24.00	24.80	21.00	24.40	23.00	39.70	34.00	25.90
SM	5.60	5.30	5.10	5.10	5.30	5.60	5.80	5.80	5.80	5.70	7.60	7.40	5.80
EU	1.59	1.67	1.58	1.57	1.79	1.74	1.77	1.78	1.78	1.67	2.16	2.23	1.82
GD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	1.02	0.98	0.98	1.01	0.97	0.81	1.17	1.04	1.06	0.87	1.33	1.24	1.02
HO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	2.86	2.40	2.49	2.50	2.70	2.60	2.60	2.80	2.89	2.80	3.86	3.70	3.25
LU	0.51	0.49	0.47	0.47	0.51	0.51	0.52	0.51	0.51	0.51	0.64	0.63	0.53
C.T.	GR INC	----------											GR INC

SAMPLE	SW74260b	SW74261a	SW74261b	SW74271a	SW74271b	SW74272a	SW74272b	SW74273a	SW74273b	SW74274a	SW74274b	SW74275a	SW74275b
BA	449.00	596.00	575.00	520.00	557.00	439.00	528.00	751.00	702.00	722.00	725.00	816.00	815.00
CO	40.00	54.20	53.10	40.20	40.50	40.60	39.10	41.00	41.10	38.40	37.50	35.30	35.10
CR	57.80	63.90	59.70	100.60	96.60	113.10	114.50	10.40	8.00	15.50	14.20	9.60	9.90
CS	<	1.29	0.90	<	0.90	0.90	0.70	0.95	1.20	0.85	1.00	1.75	1.80
HF	3.90	4.00	4.00	3.62	3.80	3.62	3.70	4.67	4.90	4.81	5.10	5.08	5.10
RB	24.00	28.60	38.00	24.90	34.00	27.80	25.00	35.90	43.00	54.50	35.00	44.00	44.00
TA	0.69	0.81	0.77	0.67	0.32	0.78	0.69	0.93	1.04	0.91	0.84	0.83	0.98
TH	3.30	3.96	3.50	3.41	3.40	3.64	3.70	5.15	5.50	5.66	5.00	5.95	5.70
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	144.00	133.00	145.00	151.00	126.00	150.00	131.00	159.00	140.00	161.00	135.00	153.00	141.00
ZR	<	<	<	<	<	<	<	<	<	<	<	<	236.00
SC	36.40	37.10	36.50	38.50	37.30	37.00	36.10	33.60	33.30	33.10	31.70	30.30	29.70
LA	20.00	22.10	21.00	18.30	17.00	19.10	19.00	26.40	26.00	24.30	25.00	28.40	27.00
CE	42.00	45.00	44.00	38.00	36.00	41.10	38.00	52.90	55.00	54.80	53.00	58.50	54.00
ND	20.00	24.90	24.00	22.30	21.00	22.70	21.00	29.60	30.00	29.10	29.00	31.20	32.00
SM	5.60	6.30	6.00	5.70	5.40	5.70	5.40	7.40	7.20	7.40	7.00	7.80	7.50
EU	1.78	1.80	1.84	1.62	1.78	1.65	1.68	2.13	2.13	2.07	2.07	2.23	2.15
GD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	1.05	1.20	1.11	0.87	1.02	0.98	0.98	1.17	0.97	1.26	1.06	1.21	1.11
HO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	3.00	3.22	3.00	2.57	2.60	2.65	2.30	3.43	3.30	3.44	3.00	3.60	3.30
LU	0.54	0.57	0.58	0.54	0.52	0.52	0.51	0.65	0.60	0.65	0.57	0.63	0.59
C.T.	GR INC	----------											GR INC

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SAMPLE	SW74276a	SW74276b	SW74277a	SW74277b	SW74278a	SW74278b	SW74279a	SW74279b	SW74280a	SW74280b	SW74281a	SW74281b	SW74282a
BA	778.00	742.00	775.00	701.00	697.00	701.00	568.00	530.00	605.00	589.00	495.00	524.00	601.00
CO	38.80	38.30	33.80	34.10	36.60	36.70	42.80	42.00	38.40	39.50	38.50	40.00	38.30
CR	12.50	13.10	13.40	15.00	11.00	10.90	21.00	22.70	20.30	19.50	23.60	24.10	14.90
CS	1.41	1.20	1.18	1.30	1.35	1.50	<	<	0.74	1.00	<	<	1.02
HF	5.24	5.30	4.70	4.70	4.64	4.90	3.98	4.30	4.36	4.20	3.51	3.60	4.13
RB	53.00	39.00	51.70	45.00	47.10	29.00	23.50	<	30.80	25.00	22.00	<	32.10
TA	0.95	0.99	0.86	0.96	0.84	0.91	0.79	0.68	0.79	0.74	0.73	0.67	0.67
TH	5.64	5.90	6.20	6.30	6.41	6.30	3.96	3.50	4.06	3.90	3.41	3.50	3.64
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	167.00	149.00	151.00	133.00	147.00	131.00	156.00	133.00	155.00	138.00	138.00	124.00	163.00
ZR	<	462.00	305.00	<	76.00	<	361.00	<	302.00	<	<	<	<
SC	33.10	32.60	31.10	30.70	31.20	31.50	35.60	34.80	35.40	35.60	34.70	35.00	36.30
LA	28.60	28.00	28.50	27.00	27.50	27.00	19.10	19.00	21.40	21.00	15.90	17.00	21.20
CE	61.00	58.00	54.80	54.00	55.40	54.00	40.10	38.00	43.60	43.00	36.40	37.00	45.20
ND	36.70	33.00	30.00	27.00	30.70	32.00	24.40	22.00	26.20	26.00	20.20	22.00	27.50
SM	8.30	7.70	7.50	7.10	7.40	7.20	6.40	5.70	6.80	6.40	5.40	5.40	6.80
EU	2.26	2.24	2.22	2.08	1.97	2.10	1.83	1.67	1.86	1.97	1.56	1.67	1.99
GD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	1.31	1.24	1.06	1.03	1.16	1.07	1.01	0.98	1.11	1.09	0.82	0.85	1.02
HO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	4.08	3.40	3.15	2.80	3.25	3.10	3.17	2.70	3.18	3.40	2.42	2.20	3.51
LU	0.69	0.65	0.54	0.56	0.59	0.56	0.54	0.55	0.58	0.62	0.48	0.49	0.61
C.T.	GR INC	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	GR INC

SAMPLE	SW74282b	SW74283a	SW74283b	SW74284a	SW74234b	SW74285a	SW74285b	SW74286a	SW74286b	SW74287a	SW74287b	SW74288a	SW74288b
BA	547.00	491.00	478.00	580.00	634.00	492.00	409.00	533.00	517.00	552.00	541.00	509.00	577.00
CO	39.00	37.80	36.80	40.00	38.60	41.00	37.50	41.10	38.10	39.90	37.00	40.30	38.70
CR	17.60	21.00	24.00	14.60	14.40	27.30	26.40	41.80	38.70	n.d.	5.30	15.40	12.20
CS	1.00	1.03	0.90	<	0.90	1.23	1.10	<	0.80	<	0.80	1.52	1.30
HF	4.30	3.52	3.40	4.16	4.30	3.90	3.60	3.63	3.90	5.10	4.80	4.20	4.30
RB	28.00	29.10	29.00	56.10	19.00	47.00	44.00	61.00	31.00	58.70	37.00	46.00	35.00
TA	0.80	0.72	0.67	n.d.	0.72	n.d.	0.71	0.65	0.62	0.88	0.76	0.61	0.66
TH	4.00	3.87	3.50	4.53	3.90	3.27	3.30	3.83	3.40	4.01	3.90	3.85	3.70
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	141.00	139.00	125.00	144.00	130.00	134.00	121.00	141.00	126.00	137.00	131.00	130.00	124.00
ZR	<	<	<	<	<	<	<	<	<	<	<	<	<
SC	36.70	35.90	35.00	35.80	35.20	36.10	33.70	35.70	34.40	33.70	31.50	33.30	32.30
LA	21.00	17.80	17.00	20.40	20.00	18.40	17.00	18.60	18.00	22.50	22.00	20.10	20.00
CE	44.00	37.30	34.00	42.30	40.00	36.70	34.00	39.10	37.00	46.80	45.00	44.90	39.00
ND	25.00	20.70	19.00	23.40	19.00	21.80	18.00	21.00	22.00	27.00	25.00	24.30	24.00
SM	6.40	5.50	5.00	5.80	5.80	5.50	5.00	5.40	5.30	6.70	6.20	6.10	5.90
EU	0.01	1.60	1.72	1.91	1.84	1.88	1.58	1.79	1.61	2.03	1.94	1.96	1.86
GD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	1.03	0.96	0.82	0.94	1.09	1.06	0.80	1.06	0.74	1.09	1.07	1.37	1.00
HO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	3.00	2.55	2.10	3.05	3.00	2.54	2.50	2.92	2.40	3.37	3.00	3.33	2.70
LU	0.52	0.48	0.48	0.52	0.66	0.49	0.50	0.48	0.50	0.57	0.56	0.57	0.56
C.T.	GR INC	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	GR INC

Table 1c. Instrumental Neutron Activation Analyses of all Columbia River Basalt flows. Release date February, 1982. Supersedes data of Wright and others(1979;Table 1c,1980;Tables 1c,2c). Samples were analyzed by L.J. Schwarz under the direction of project leaders J.J. Rowe and P. Baedecker in the U.S. Geological Survey laboratory in Reston,Va. Sample locations for SW analyses and HUNTZ analysis are given in Wright and others(1979,1980). Sample locations for PH, RB, VC, and WT analyses are obtainable from the senior author. < = below limits of detection. n.d. = not determined.

SAMPLE	SW74289a	SW74289b	SW74290a	SW74290b	SW74291a	SW74291b	SW74292a	SW74292b	SW74293a	SW74293b	SW74294a	SW74294b	SW74295a
BA	534.00	537.00	597.00	723.00	622.00	698.00	630.00	652.00	555.00	559.00	615.00	673.00	566.00
CO	39.10	36.70	41.40	40.40	37.80	37.30	36.10	36.90	39.20	37.80	39.30	38.30	39.70
CR	10.40	11.40	12.00	9.90	8.10	n.d.	9.70	10.70	15.70	18.70	13.20	15.80	11.10
CS	1.22	1.40	1.16	1.30	1.72	1.50	1.47	1.40	<	0.80	1.44	1.00	1.36
HF	4.49	4.60	4.70	4.50	4.98	5.20	4.99	5.10	5.08	4.80	5.25	5.40	4.93
RB	55.60	60.00	45.10	<	67.10	54.00	49.20	<	36.20	64.00	39.60	<	47.20
TA	0.64	0.74	0.91	0.73	0.91	0.88	0.95	0.85	0.98	0.71	0.95	0.67	0.79
TH	3.80	3.80	4.95	3.90	5.27	5.50	5.57	5.50	4.39	4.20	4.17	4.80	5.12
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	136.00	127.00	124.00	121.00	129.00	139.00	128.00	141.00	136.00	138.00	135.00	150.00	127.00
ZR	<	308.00	<	<	987.00	<	<	<	<	<	<	<	<
SC	33.90	33.50	33.30	33.10	30.20	30.00	30.50	30.60	33.60	32.60	33.40	32.90	31.50
LA	21.10	21.00	21.80	21.00	24.60	24.00	23.50	23.00	22.10	22.00	23.40	24.00	22.30
CE	45.00	44.00	43.40	49.00	53.10	53.00	49.20	48.00	47.80	47.00	52.10	51.00	45.90
ND	26.80	27.00	26.80	31.00	30.00	33.00	29.00	29.00	29.20	32.00	31.40	38.00	26.10
SM	6.40	6.40	6.40	6.40	7.10	6.80	6.70	6.70	7.10	6.70	7.60	7.30	6.50
EU	1.98	1.96	1.87	1.89	2.01	2.06	1.97	2.02	2.11	2.10	2.19	2.33	1.87
GD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	1.05	0.96	1.17	1.20	1.13	0.94	1.17	1.12	1.27	1.15	1.07	1.39	0.98
HO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	3.22	2.90	3.18	3.30	3.45	3.40	3.37	3.00	3.50	3.40	3.78	3.90	3.14
LU	0.56	0.57	0.53	0.49	0.61	0.59	0.55	0.56	0.60	0.53	0.66	0.60	0.53
C.T.	GR INC	----------											GR INC

SAMPLE	SW74295b	SW74296a	SW74296b	SW75001a	SW75001b	SW75009a	SW75009b	SW75011a	SW75011b	SW75012a	SW75012b	SW75013a	SW75013b
BA	582.00	462.00	606.00	428.00	391.00	555.00	559.00	545.00	464.00	498.00	420.00	722.00	667.00
CO	38.20	41.10	39.80	46.00	45.40	29.50	27.40	43.50	42.70	44.00	42.70	40.00	38.90
CR	11.50	38.00	32.60	288.00	291.00	105.00	96.70	68.50	60.90	130.90	125.20	12.50	9.60
CS	1.50	1.54	1.60	<	<	0.63	<	<	<	<	<	0.98	1.40
HF	4.70	4.67	4.60	2.60	2.60	4.95	4.70	3.91	3.80	3.63	3.50	4.74	4.70
RB	<	59.70	21.00	<	<	25.90	27.00	13.30	38.00	35.80	23.00	30.10	41.00
TA	0.95	0.81	0.94	0.72	0.79	1.21	1.15	0.80	0.63	0.55	0.68	0.98	0.91
TH	5.40	4.18	3.40	2.00	2.10	4.14	3.60	3.53	3.20	3.43	3.30	5.08	4.80
U	n.d.	n.d.	n.d.	n.d.	n.d.	1.00	1.10	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	107.00	134.00	115.00	85.00	108.00	206.00	189.00	130.00	137.00	121.00	141.00	132.00	145.00
ZR	<	<	<	<	<	159.00	100.00	<	<	<	<	<	<
SC	30.40	34.50	33.70	30.50	30.60	41.10	38.30	37.80	36.40	38.20	37.10	33.50	32.30
LA	22.00	21.40	21.00	16.00	16.00	30.10	28.00	19.10	19.00	17.80	18.00	26.60	25.00
CE	47.00	47.10	45.00	32.00	31.00	59.30	54.00	40.60	38.00	36.60	35.00	55.50	54.00
ND	27.00	27.30	26.00	16.00	18.00	37.30	34.00	24.10	18.00	22.80	18.00	32.50	28.00
SM	6.30	6.80	6.50	4.00	4.20	9.30	8.90	5.60	5.40	5.30	5.10	7.20	6.90
EU	1.87	1.97	1.94	1.24	1.21	2.71	2.53	1.61	1.90	1.71	1.66	2.15	2.10
GD	n.d.	n.d.	n.d.	4.70	3.80	8.80	8.30	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	1.02	1.38	0.96	0.64	0.79	1.46	1.39	0.97	1.03	1.06	0.96	1.10	0.97
HO	n.d.	n.d.	n.d.	1.10	1.10	1.59	2.10	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	n.d.	0.30	0.70	0.63	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	2.60	3.40	3.40	2.30	2.20	4.44	4.40	2.94	2.70	2.89	2.60	3.63	3.20
LU	0.48	0.55	0.54	0.34	0.30	0.79	0.61	0.52	0.51	0.50	0.48	0.60	0.58
C.T.	GR INC		GR INC		ASOTIN		UNC	GR INC	----------				GR INC

Table 1c. Instrumental Neutron Activation Analyses of all Columbia River Basalt flows. Release date February, 1982. Supersedes data of Wright and others(1979;Table 1c,1980;Tables 1c,2c). Samples were analyzed by L.J. Schwarz under the direction of project leaders J.J. Rowe and P. Baedecker in the U.S. Geological Survey laboratory in Reston,Va. Sample locations for SW analyses and HUNTZ analysis are given in Wright and others(1979,1980). Sample locations for PH, RB, VC, and WT analyses are obtainable from the senior author. < = below limits of detection. n.d. = not determined.

SAMPLE	SW75014a	SW75014b	SW75015a	SW75015b	SW75016a	SW75016b	SW75017a	SW75017b	SW75018a	SW75018b	SW75019a	SW75019b	SW75020a
BA	655.00	803.00	524.00	602.00	485.00	415.00	484.00	420.00	567.00	489.00	573.00	527.00	585.00
CO	37.60	37.60	40.20	39.80	40.20	40.60	39.90	35.70	39.10	36.80	38.70	38.10	40.50
CR	12.80	12.20	24.10	26.70	25.50	23.40	24.50	21.50	18.50	19.00	18.10	14.40	22.90
CS	1.31	1.50	<	1.20	0.97	<	1.18	<	<	1.00	0.81	1.00	1.49
HF	5.40	5.50	4.19	4.10	3.64	3.60	3.64	3.60	4.23	3.90	4.10	3.90	4.30
RB	63.50	48.00	23.30	22.00	31.30	24.00	32.70	19.00	32.10	45.00	31.70	36.00	45.10
TA	1.13	0.84	0.71	0.59	0.91	0.58	0.67	0.59	0.65	0.61	0.97	0.68	0.71
TH	6.44	6.10	3.96	3.90	3.40	3.60	3.52	3.40	3.24	3.70	4.27	4.10	4.87
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	131.00	142.00	141.00	152.00	119.00	135.00	120.00	133.00	125.00	152.00	116.00	151.00	137.00
ZR	<	<	<	<	283.00	<	<	<	<	<	<	<	<
SC	30.80	29.40	36.20	35.80	34.80	34.00	34.90	33.40	36.30	35.70	35.10	34.60	36.40
LA	29.90	30.00	21.60	21.00	16.80	17.00	18.90	17.00	21.40	19.00	21.30	20.00	23.40
CE	61.20	58.00	45.60	43.00	36.70	36.00	39.00	36.00	41.40	40.00	42.90	42.00	48.30
ND	34.10	34.00	28.90	8.00	19.80	20.00	21.50	20.00	25.20	22.00	26.70	23.00	27.90
SM	8.00	7.70	6.60	6.00	5.30	5.00	5.50	5.10	6.00	5.60	6.10	5.70	6.60
EU	2.13	2.13	2.03	2.07	1.66	1.75	1.81	1.62	1.82	1.81	1.92	1.72	2.00
GD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	1.20	1.13	1.21	1.24	0.94	0.79	0.84	0.94	0.88	1.01	1.02	0.91	1.07
HO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	3.91	3.70	3.33	3.30	2.70	2.30	2.75	2.20	3.25	3.10	3.17	2.80	3.20
LU	0.61	0.61	0.59	0.57	0.48	0.46	0.48	0.44	0.55	0.52	0.54	0.49	0.55
C.T.,	GR INC	----------											GR INC

SAMPLE	SW75020b	SW75021a	SW75021b	SW75022a	SW75022b	SW75023a	SW75023b	SW75024a	SW75024b	SW75025a	SW75025b	SW75026a	SW75026b
BA	546.00	660.00	561.00	464.00	461.00	626.00	598.00	573.00	512.00	663.00	583.00	687.00	590.00
CO	36.90	37.60	35.10	38.90	36.90	41.90	39.20	40.90	35.80	39.00	n.d.	39.00	37.50
CR	20.20	24.90	23.10	26.90	22.30	6.90	6.70	15.00	12.00	14.60	12.60	17.30	11.80
CS	1.20	0.90	0.80	1.14	1.10	1.18	1.10	<	0.70	1.22	1.50	1.19	1.20
HF	4.00	3.88	3.90	3.81	3.70	4.96	4.90	4.53	3.90	4.68	4.60	4.46	4.40
RB	28.00	25.20	21.00	32.00	24.00	35.80	27.00	19.70	23.00	59.70	<	27.60	34.00
TA	0.69	0.70	0.72	0.59	0.61	1.11	0.58	0.82	0.74	1.05	3.38	0.93	0.73
TH	4.30	4.09	3.80	3.62	3.50	5.18	4.50	4.14	3.60	5.09	4.90	4.67	4.10
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	151.00	130.00	153.00	127.00	143.00	154.00	163.00	148.00	144.00	140.00	n.d.	137.00	155.00
ZR	<	<	103.00	<	<	673.00	<	<	<	<	<	<	<
SC	34.50	36.30	34.80	34.70	33.60	33.00	32.40	33.90	31.70	31.80	32.40	33.70	34.20
LA	21.00	20.00	18.00	18.60	18.00	22.70	22.00	20.40	18.00	21.80	22.00	20.50	20.00
CE	44.00	41.50	39.00	37.70	36.00	47.20	45.00	40.60	38.00	43.40	46.00	39.70	44.00
ND	23.00	26.10	22.00	24.50	20.00	27.90	26.00	25.10	19.00	25.10	28.00	26.60	24.00
SM	5.80	5.90	5.40	5.50	5.10	7.40	6.40	6.40	5.20	6.90	6.60	6.60	6.20
EU	1.93	1.81	1.66	1.59	1.65	2.00	1.96	1.78	1.71	1.80	1.93	1.94	1.87
GD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	0.97	0.93	1.03	1.05	0.92	1.36	1.00	1.40	1.07	1.11	97.54	1.04	1.01
HO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	2.70	2.98	2.70	2.92	2.50	3.48	3.20	3.04	2.80	2.88	3.00	3.18	3.20
LU	0.51	0.54	0.53	0.50	0.45	0.60	0.54	0.53	0.47	0.52	0.54	0.55	0.58
C.T.	GR INC	----------											GR INC

Table 1c. Instrumental Neutron Activation Analyses of all Columbia River Basalt flows. Release date February, 1982. Supersedes data of Wright and others(1979;Table 1c,1980;Tables 1c,2c). Samples were analyzed by L.J. Schwarz under the direction of project leaders J.J. Rowe and P. Baedecker in the U.S. Geological Survey laboratory in Reston,Va. Sample locations for SW analyses and HUNTZ analysis are given in Wright and others(1979,1980). Sample locations for PH, RB, VC, and WT analyses are obtainable from the senior author. < = below limits of detection. n.d. = not determined.

SAMPLE	SW75027a	SW75027b	SW75028a	SW75028b	SW75035a	SW75035b	SW75036a	SW75036b	SW75046a	SW75046b	SW75077a	SW75077b	SW75078a
BA	769.00	752.00	633.00	560.00	809.00	784.00	650.00	681.00	579.00	579.00	522.00	507.00	740.00
CO	36.80	36.10	39.50	37.40	38.00	36.90	41.40	40.10	45.30	44.70	40.70	40.10	35.90
CR	9.20	9.60	16.80	16.60	41.50	38.60	113.90	114.90	150.50	146.10	47.70	49.20	n.d.
CS	2.10	2.10	1.63	1.30	<	<	<	<	<	<	<	0.60	1.25
HF	5.38	5.30	4.70	4.90	10.72	10.20	6.55	6.50	6.65	6.40	3.80	3.60	4.99
RB	48.00	43.00	30.70	39.00	<	26.00	19.60	<	<	<	18.50	55.00	57.00
TA	1.06	0.94	0.73	0.80	3.24	3.00	1.78	2.05	1.65	1.98	0.62	0.69	0.89
TH	6.57	5.90	4.74	5.00	4.19	4.60	3.40	3.50	2.30	2.00	3.40	3.80	5.93
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	149.00	162.00	141.00	152.00	262.00	260.00	225.00	221.00	186.00	226.00	141.00	150.00	135.00
ZR	<	<	<	<	462.00	490.00	297.00	287.00	267.00	245.00	<	<	<
SC	29.80	30.50	31.30	31.60	37.00	35.70	37.60	36.00	38.30	37.60	36.80	37.00	32.20
LA	25.50	25.00	23.10	23.00	78.50	74.00	49.90	48.00	46.40	46.00	19.40	20.00	27.20
CE	50.60	53.00	47.40	50.00	156.00	149.00	99.10	96.00	92.80	89.00	42.60	39.00	55.30
ND	31.40	32.00	26.70	28.00	85.60	84.00	44.80	55.00	55.60	52.00	23.60	24.00	28.80
SM	7.60	7.30	7.30	6.70	21.20	20.80	12.90	12.10	13.00	12.70	5.60	5.70	7.00
EU	1.82	2.03	1.98	1.92	5.80	5.51	3.57	3.21	3.52	3.55	1.70	1.65	2.26
GD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	1.36	1.20	1.21	1.01	3.31	3.45	1.93	1.88	2.00	2.17	0.95	1.18	0.99
HO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	3.41	3.30	3.24	2.90	8.29	8.50	4.79	4.80	5.01	4.80	3.05	3.00	3.28
LU	0.57	0.58	0.52	0.55	1.40	1.38	0.86	0.85	0.85	0.86	0.52	0.49	0.56
C.T.	GR INC		GR INC		GOOSE		INDIAN		BASIN		GR INC		GR INC

SAMPLE	SW75078b	SW75079a	SW75079b	SW75080a	SW75080b	SW75081a	SW75081b	SW75082a	SW75082b	SW75083a	SW75083b	SW75084a	SW75084b
BA	751.00	517.00	443.00	532.00	482.00	609.00	660.00	662.00	644.00	711.00	691.00	718.00	729.00
CO	36.20	42.10	42.40	41.60	42.70	43.40	44.80	43.90	42.50	40.40	40.00	40.40	39.80
CR	n.d.	87.70	83.80	95.00	102.70	17.10	18.40	17.10	13.60	14.70	12.20	14.50	15.20
CS	1.50	<	<	<	0.70	<	1.20	1.26	1.00	1.25	1.30	1.76	1.60
HF	4.60	3.85	3.70	3.82	3.80	4.23	4.30	4.88	4.60	5.07	5.20	5.14	5.10
RB	36.00	<	<	20.20	<	23.60	58.00	31.00	<	66.00	49.00	41.30	<
TA	0.82	0.79	0.26	0.99	0.74	1.10	0.78	0.87	0.74	1.09	0.94	1.03	0.84
TH	5.30	2.93	3.50	2.88	3.60	4.35	4.70	4.36	3.80	5.36	5.30	5.42	5.00
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	130.00	136.00	136.00	134.00	114.00	129.00	159.00	152.00	161.00	139.00	154.00	153.00	164.00
ZR	<	<	<	<	<	<	<	<	<	<	<	<	<
SC	33.30	39.00	38.80	37.10	38.50	34.60	35.20	36.10	36.40	33.40	33.40	33.00	33.10
LA	29.00	17.30	17.00	17.80	18.00	22.30	23.00	24.30	24.00	27.20	28.00	27.40	27.00
CE	55.00	31.80	34.00	39.40	42.00	45.10	43.00	50.90	48.00	59.40	58.00	56.70	58.00
ND	31.00	19.60	20.00	20.60	22.00	25.30	25.00	27.70	32.00	30.40	35.00	34.50	33.00
SM	7.00	5.20	5.20	5.40	5.40	6.10	6.20	7.10	7.00	7.80	7.80	7.70	7.60
EU	2.12	1.58	1.59	1.84	1.69	1.80	2.00	2.04	2.09	2.45	2.22	2.07	2.08
GD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	1.14	0.89	1.20	0.98	0.82	1.13	1.16	1.35	1.15	1.31	1.38	1.28	1.42
HO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	3.80	2.84	2.90	2.67	2.50	3.07	2.90	4.20	3.30	3.60	3.70	3.80	3.50
LU	0.55	0.50	0.47	0.50	0.48	0.54	0.52	0.64	0.61	0.63	0.58	0.60	0.59
C.T.	GR INC												GR INC

Table 1c. Instrumental Neutron Activation Analyses of all Columbia River Basalt flows. Release date February, 1982. Supersedes data of Wright and others(1979;Table 1c,1980;Tables 1c,2c). Samples were analyzed by L.J. Schwarz under the direction of project leaders J.J. Rowe and P. Baedecker in the U.S. Geological Survey laboratory in Reston,Va. Sample locations for SW analyses and HUNTZ analysis are given in Wright and others(1979,1980). Sample locations for PH, RB, VC, and WT analyses are obtainable from the senior author. < = below limits of detection. n.d. = not determined.

SAMPLE	SW75085a	SW75085b	SW75086a	SW75086b	SW75087a	SW75087b	SW75088a	SW75088b	SW75089a	SW75089b	SW75090a	SW75090b	SW75091a
BA	709.00	701.00	764.00	695.00	555.00	482.00	510.00	470.00	574.00	644.00	628.00	543.00	605.00
CO	40.90	38.70	36.40	36.20	44.00	43.20	42.40	41.30	41.90	41.80	41.50	39.80	41.40
CR	14.50	13.70	14.60	8.90	15.60	23.50	18.80	21.10	18.50	20.10	21.40	16.80	21.10
CS	1.43	1.00	1.43	1.30	1.41	1.20	1.02	0.90	1.07	0.80	1.27	1.30	1.37
HF	4.94	4.90	4.86	5.00	4.22	3.80	4.11	3.80	4.16	4.00	4.61	4.20	4.17
RB	53.10	55.00	53.30	29.00	31.20	<	36.30	<	32.70	55.00	45.50	73.00	39.50
TA	0.76	0.58	0.98	0.81	0.85	0.67	0.73	0.68	0.62	0.71	0.87	0.96	1.02
TH	5.10	5.00	6.90	6.70	2.67	4.70	4.31	3.40	3.41	4.50	3.88	3.30	4.26
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	142.00	139.00	139.00	153.00	126.00	135.00	142.00	148.00	143.00	142.00	148.00	151.00	142.00
ZR	<	154.00	<	<	<	<	<	<	<	<	<	<	<
SC	33.00	32.60	32.10	31.60	35.60	35.60	37.10	35.60	36.00	35.40	37.70	36.80	37.00
LA	26.40	26.00	27.40	28.00	18.10	19.00	19.50	18.00	19.20	19.00	22.00	22.00	21.10
CE	56.30	55.00	57.10	59.00	41.50	37.00	40.70	36.00	43.30	40.00	47.70	49.00	41.00
ND	32.90	32.00	30.90	34.00	22.50	25.00	23.90	24.00	24.50	29.00	26.50	26.00	24.50
SM	7.50	7.20	7.80	7.30	6.10	5.90	6.60	5.90	6.20	6.20	7.00	6.80	6.90
EU	2.10	1.99	2.10	2.23	1.82	1.49	1.87	1.90	1.87	1.93	2.09	1.93	1.95
GD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	1.08	1.33	1.19	1.27	1.15	1.05	1.35	1.18	1.03	1.46	1.16	1.21	1.07
HO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	3.44	3.60	3.56	3.60	2.85	3.10	3.13	3.30	3.38	3.20	3.94	3.40	3.83
LU	0.62	0.55	0.56	0.53	0.52	0.54	0.56	0.51	0.56	0.52	0.61	0.56	0.58
C.T.	GR INC	----------											GR INC

SAMPLE	SW75091b	SW75092a	SW75092b	SW75093a	SW75093b	SW75094a	SW75094b	SW75095a	SW75095b	SW75096a	SW75096b	SW75097a	SW75097b
BA	455.00	540.00	571.00	551.00	602.00	541.00	500.00	605.00	563.00	733.00	644.00	656.00	707.00
CO	40.00	42.10	42.30	41.50	41.00	39.70	41.60	40.60	41.80	37.40	38.00	37.70	38.40
CR	24.10	28.50	17.60	13.20	14.60	19.20	18.40	14.60	12.80	n.d.	n.d.	8.60	n.d.
CS	1.00	1.00	0.90	1.09	1.10	1.09	1.10	1.05	0.90	1.48	1.30	1.46	1.10
HF	4.10	3.91	3.60	4.33	4.00	4.01	4.10	4.16	4.20	4.94	4.50	4.92	4.70
RB	<	24.40	<	39.40	<	25.20	<	27.60	<	63.50	78.00	45.40	41.00
TA	0.64	0.68	0.75	0.87	0.64	0.80	0.58	0.76	0.66	1.00	0.82	0.99	0.74
TH	4.40	4.08	3.10	4.23	3.60	3.47	4.10	4.32	4.40	4.65	4.60	4.56	4.30
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ZN	149.00	130.00	147.00	138.00	128.00	127.00	141.00	138.00	140.00	136.00	147.00	136.00	148.00
ZR	<	<	<	<	<	<	<	<	<	<	<	<	<
SC	36.00	35.70	36.30	35.60	35.80	35.10	36.50	35.60	36.60	32.60	33.00	32.50	32.60
LA	20.00	16.90	17.00	19.60	19.00	19.00	19.00	20.30	21.00	21.80	22.00	22.60	19.00
CE	45.00	38.20	36.00	42.30	42.00	39.10	40.00	43.90	43.00	46.40	46.00	48.50	48.00
ND	27.00	19.80	23.00	24.80	26.00	22.60	24.00	24.60	27.00	27.70	28.00	27.70	25.00
SM	6.60	5.60	5.60	6.70	6.30	6.00	6.20	6.60	6.80	7.00	7.00	7.10	6.10
EU	2.03	1.64	1.46	1.87	1.76	1.88	1.87	1.98	2.04	2.08	2.05	2.13	2.09
GD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TB	1.12	1.06	1.13	0.96	0.98	1.13	1.26	1.10	1.14	1.22	1.22	1.14	1.18
HO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
YB	3.20	2.37	3.10	3.57	3.20	2.69	3.10	2.93	3.10	3.26	3.70	3.17	3.50
LU	0.60	0.49	0.50	0.58	0.54	0.53	0.52	0.56	0.61	0.59	0.55	0.59	0.54
C.T.	GR INC	----------											GR INC

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SAMPLE	SW75098a	SW75098b	SW75099a	SW75099b	SW76085a	SW76085b	SW76218a	SW76218b	SW76218c	SW76235a	SW76235b	SW76239a	SW76239b
BA	778.00	689.00	537.00	454.00	509.00	519.00	4560.00	4240.00	4360.00	809.00	725.00	413.00	433.00
CO	39.80	39.70	38.70	40.30	39.50	42.20	11.40	10.70	11.00	47.20	45.10	44.40	43.10
CR	15.30	12.30	13.30	12.60	169.00	194.00	3.00	2.80	3.80	47.70	49.50	37.10	39.50
CS	1.31	1.00	1.14	1.10	<	<	0.70	0.60	0.60	<	<	<	<
HF	4.58	4.40	4.74	4.60	3.90	4.20	13.30	12.50	12.80	6.40	6.30	4.40	4.40
RB	39.10	<	25.50	<	<	<	58.00	64.00	66.00	<	<	10.00	28.00
TA	0.88	0.75	1.07	0.79	0.68	0.73	1.59	1.50	1.65	1.59	1.69	1.25	1.23
TH	4.30	4.30	4.55	4.90	3.22	4.10	9.40	9.00	9.10	3.00	3.00	4.90	4.50
U	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1.60	1.60	2.00	1.60	1.30	1.10	1.10
ZN	158.00	141.00	133.00	141.00	95.00	104.00	209.00	207.00	215.00	147.00	176.00	130.00	139.00
ZR	<	<	<	<	169.00	140.00	752.00	660.00	630.00	310.00	410.00	<	<
SC	34.70	33.90	33.00	33.60	27.70	29.60	31.10	29.90	29.80	38.10	36.70	33.40	33.30
LA	20.70	21.00	21.20	21.00	25.40	25.00	61.00	60.00	58.00	43.00	42.00	28.00	28.00
CE	44.30	42.00	43.90	44.00	46.30	57.00	124.00	117.00	111.00	88.00	86.00	58.00	57.00
ND	22.80	26.00	25.90	27.00	27.00	27.00	61.00	57.00	54.00	52.00	44.00	30.00	32.00
SM	6.70	6.60	6.50	6.80	5.50	5.60	13.00	12.50	12.70	10.30	10.30	7.00	6.90
EU	2.12	2.05	1.92	2.00	1.51	1.61	5.61	5.28	5.39	2.72	1.65	1.88	2.00
GD	n.d.	n.d.	n.d.	n.d.	5.90	5.80	13.00	11.70	12.20	10.00	9.00	7.10	7.80
TB	0.98	1.06	1.04	0.91	0.76	0.81	1.77	1.70	1.51	1.66	1.60	0.86	1.38
HO	n.d.	n.d.	n.d.	n.d.	n.d.	1.00	1.90	1.80	2.10	2.20	1.70	1.70	1.10
TM	n.d.	n.d.	n.d.	n.d.	0.45	0.42	0.65	0.60	0.82	1.02	1.02	0.69	n.d.
YB	2.90	3.10	2.87	3.20	2.88	3.20	4.10	3.90	3.90	4.90	4.70	3.50	3.30
LU	0.58	0.54	0.53	0.59	0.48	0.45 [9]	0.61	0.57	0.55	0.70	0.68	0.48	0.48
C.T.	GR INC		GR INC		UNC			UNC [5]		LOLO INC		SLIP	

SAMPLE	SW76252a	SW76252b	SW76255a	SW76255b	SW76273a	SW76273b	SW77284a	SW77284b	SW77321a	SW77321b	SW78035a	SW78035b	SW78047a
BA	n.d.	320.00	470.00	388.00	400.00	442.00	958.00	1030.00	771.00	740.00	229.00	260.00	389.00
CO*	44.70	45.20	38.30	39.00	39.40	39.90	Contaminated: data rejected						
CR	303.00	298.00	44.00	46.00	43.30	44.50	n.d.	n.d.	n.d.	n.d.	44.90	50.30	8.30
CS	<	<	1.00	<	<	0.70	1.06	1.10	1.31	1.10	1.62	1.80	<
HF	3.00	3.10	5.40	5.00	5.30	5.50	6.36	6.30	5.67	5.50	6.10	6.50	6.99
RB	<	<	24.00	45.00	33.00	40.00	27.00	42.00	27.90	31.00	19.90	45.00	28.90
TA*	1.00	0.91	1.50	1.45	1.55	1.60	----1.23-----		----1.23-----		----1.83-----		3.48--
TH	1.40	1.40	7.00	6.90	7.30	7.20	5.47	5.20	5.64	5.20	4.23	4.90	3.06
U	n.d.	n.d.	1.60	1.80	1.60	1.80	1.75	1.70	1.55	1.80	n.d.	n.d.	1.70
ZN	104.00	127.00	114.00	143.00	124.00	136.00	153.00	151.00	141.00	125.00	133.00	150.00	114.00
ZR	<	<	<	<	<	<	219.00	260.00	269.00	<	279.00	210.00	289.00
SC	34.70	34.40	30.90	13.70	30.70	31.30	31.60	31.00	29.80	28.90	34.40	36.30	18.20
LA	n.d.	20.00	32.00	34.00	n.d.	33.00	37.90	36.00	n.d.	30.00	25.60	25.00	38.10
CE	41.00	41.00	64.00	66.00	61.00	61.00	82.60	79.00	63.30	62.00	54.90	59.00	79.10
ND	25.00	23.00	31.00	34.00	34.00	35.00	50.40	50.00	36.90	40.00	32.20	33.00	43.00
SM	5.00	5.60	7.80	7.10	6.50	7.70	11.70	11.50	8.80	9.10	8.40	8.20	9.20
EU	1.63	1.58	1.79	1.84	1.82	1.86	3.38	3.22	2.52	2.41	2.19	2.35	2.81
GD	3.50	4.90	6.10	6.80	7.10	7.70	11.50	10.20	8.60	9.20	8.30	8.60	7.90
TB	0.78	0.94	1.20	1.70	1.54	1.20	1.98	1.76	1.25	1.18	1.20	1.45	1.04
HO	1.10	0.80	1.60	1.10	1.70	1.40	1.70	1.00	1.29	1.80	n.d.	1.60	1.59
TM	0.51	0.44	0.69	0.50	0.71	0.66	0.87	0.76	0.60	0.64	0.75	0.71	0.34
YB	2.30	2.70	3.70	4.10	3.80	4.00	5.56	5.60	4.80	4.70	3.97	4.80	2.41
LU	0.42	0.38	0.56	0.56	0.56	0.58	0.86	0.79	n.d.	0.80	0.68	0.67 [10]	0.31
C.T.	SW NEW		BUFORD		BUFORD		PH POWAT		H LOOK		UNC		VC POT

Table 1c. Instrumental Neutron Activation Analyses of all Columbia River Basalt flows. Release date February, 1982. Supersedes data of Wright and others(1979;Table 1c,1980;Tables 1c,2c). Samples were analyzed by L.J. Schwarz under the direction of project leaders J.J. Rowe and P. Baedecker in the U.S. Geological Survey laboratory in Reston,Va. Sample locations for SW analyses and HUNTZ analysis are given in Wright and others(1979,1980). Sample locations for PH, RB, VC, and WT analyses are obtainable from the senior author. < = below limits of detection. n.d. = not determined.

SAMPLE	SW78047b	SW78075a	SW78075b	SW78077a	SW78077b	SW78381a	SW78381b	SW78382a	SW78382b	SW78384a	SW78384b	SW78460a	SW78460b
BA	580.00	532.00	730.00	391.00	370.00	750.00	786.00	943.00	1240.00	713.00	825.00	313.00	390.00
CO*	Contaminated: data rejected												
CR	6.00	60.50	57.50	242.00	242.00	3.60	3.80	n.d.	n.d.	6.60	6.90	228.00	216.00
CS	<	<	<	<	<	4.25	4.60	1.15	1.30	1.33	1.10	0.37	0.30
HF	7.10	6.17	6.10	4.26	4.40	3.59	3.50	6.43	6.50	5.66	5.70	3.16	3.30
RB	29.00	4.00	31.00	<	<	122.00	129.00	47.50	39.00	44.90	43.00	19.90	24.00
TA*	--3.46	----1.73-----		----1.25-----		----1.12-----		----1.29-----		----1.35-----		----0.80-----	
TH	3.20	2.79	2.80	1.98	1.80	8.71	8.80	5.68	5.40	5.55	5.50	2.55	2.70
U	1.20	n.d.	n.d.	0.61	n.d.	4.80	4.50	1.63	1.50	1.48	1.40	0.61	n.d.
ZN	120.00	138.00	135.00	116.00	123.00	39.00	40.00	153.00	152.00	153.00	144.00	84.00	89.00
ZR	290.00	329.00	260.00	169.00	260.00	100.00	150.00	319.00	280.00	209.00	240.00	150.00	130.00
SC	18.20	38.30	36.60	38.80	40.20	3.90	4.10	31.60	31.80	32.40	31.40	29.20	29.20
LA	38.00	41.10	39.00	n.d.	24.00	23.70	25.00	37.30	37.00	30.90	29.00	17.40	18.00
CE	79.00	81.80	85.00	65.90	65.00	42.30	46.00	83.20	83.00	67.40	65.00	38.30	34.00
ND	41.00	47.40	47.00	38.00	37.00	20.50	22.00	48.10	51.00	37.50	39.00	19.90	19.00
SM	9.00	10.30	10.10	8.50	8.00	4.70	4.50	11.40	12.30	8.80	9.20	4.40	4.50
EU	2.68	2.62	2.59	2.27	2.27	0.34	0.36	3.29	3.49	2.49	2.49	1.31	1.28
GD	7.70	8.80	8.60	8.10	7.30	2.60	4.90	12.20	12.20	8.70	8.40	4.50	4.30
TB	1.07	1.51	1.43	1.20	1.14	0.98	0.91	1.90	1.83	1.34	1.66	0.71	0.74
HO	1.10	1.40	n.d.	1.49	n.d.	n.d.	1.30	1.59	2.00	1.70	n.d.	0.86	n.d.
TM	0.34	0.66	0.83	0.59	0.61	0.48	0.47	0.76	0.89	0.71	0.73	0.43	0.45
YB	2.20	4.69	4.20	4.08	3.70	3.76	3.70	5.78	5.80	4.80	4.30	2.49	2.10
LU	0.37	0.68	0.82	n.d.	0.76	0.58	0.55	1.01	1.00	0.70	0.84	0.48	0.49
C.T.	VC POT	SW SPRAG		SW SPRAG		UNC[1]		PH POWAT		SW LOOK		SW HUNTZ	

SAMPLE	SW78467a	SW78467b	VC78081a	VC78081b	VC78131a	VC78131b	VC78267a	VC78267b	VC78277a	VC78277b	VC78302a	VC78302b	VC78371a
BA	715.00	737.00	621.00	593.00	345.00	380.00	666.00	680.00	250.00	280.00	347.00	n.d.	704.00
CO*	Contaminated: data rejected												
CR	1.60	1.50	117.00	116.00	10.30	8.60	102.00	102.00	56.50	51.90	49.80	49.10	8.00
CS	4.66	4.30	0.60	0.50	0.37	<	0.60	0.70	<	<	<	<	0.66
HF	3.21	3.20	4.79	4.60	6.91	6.60	5.11	5.20	3.24	3.10	3.26	3.50	6.11
RB	119.00	125.00	29.90	29.00	29.20	30.00	22.90	35.00	9.00	<	<	<	52.90
TA*	----1.45-----		----0.86-----		----3.58-----		----0.92-----		----0.83-----		----0.79-----		1.68--
TH	9.42	9.30	4.85	4.80	3.08	3.20	5.45	5.40	2.40	2.50	2.57	2.40	7.30
U	4.30	4.40	1.01	1.00	1.05	1.00	1.26	1.10	0.44	n.d.	0.50	n.d.	1.44
ZN	34.00	37.00	134.00	128.00	141.00	139.00	109.00	109.00	102.00	100.00	100.00	106.00	148.00
ZR	125.00	117.00	250.00	270.00	239.00	370.00	250.00	250.00	<	150.00	<	190.00	169.00
SC	3.30	3.50	27.40	27.00	20.20	19.80	27.60	27.90	36.50	33.70	36.30	36.80	25.90
LA	26.50	28.00	28.70	32.00	37.90	37.00	34.90	34.00	17.00	16.00	18.20	17.00	43.60
CE	49.60	49.00	58.10	56.00	74.30	71.00	64.80	63.00	34.50	32.00	36.10	39.00	80.20
ND	21.50	19.00	31.50	33.00	43.80	40.00	30.90	32.00	18.90	23.00	20.50	22.00	45.80
SM	4.50	4.40	6.50	6.60	8.90	10.30	7.10	7.30	4.90	4.90	5.10	5.10	8.80
EU	0.24	0.24	1.63	1.60	2.72	2.68	1.73	1.75	1.48	1.39	1.51	1.51	2.41
GD	2.20	4.90	5.90	5.40	8.20	8.10	6.80	7.20	5.30	4.60	5.20	5.10	9.30
TB	0.91	0.78	1.00	0.91	1.43	1.13	0.86	0.99	0.89	0.76	0.73	0.88	1.27
HO	n.d.	1.30	1.20	1.10	1.09	1.20	1.00	1.30	0.93	n.d.	0.81	n.d.	1.70
TM	0.53	0.48	0.49	0.50	0.35	n.d.	0.59	0.57	0.41	0.40	0.45	0.36	0.72
YB	3.21	3.60	3.48	3.50	2.42	2.30	3.70	3.50	2.66	2.60	2.87	2.50	4.02
LU	0.54	0.50	0.64	0.48	0.57	0.31	0.53	0.72	0.38	0.40	0.39	0.58	0.85
C.T.	UNC[1]		VC LAP		VC POT		VC LAP		VC WEIPE		VC WEIPE		VC CRAIG

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SAMPLE	VC78371b	VC79003a	VC79003b	VC79136a	VC79136b	VC79190a	VC79190b	VC79257a	VC79257b	VC79282a	VC79282b	VC79317a	VC79317b
BA	730.00	338.00	370.00	735.00	690.00	292.00	291.00	355.00	388.00	479.00	434.00	498.00	483.00
CO*	Contaminated: data rejected												
CR	7.50	9.90	9.50	7.40	6.60	133.00	133.00	80.60	87.50	78.90	81.80	38.50	39.70
CS	0.70	<	<	<	<	<	<	<	<	<	<	0.70	<
HF	6.10	6.72	6.70	6.30	5.80	3.27	3.20	2.55	2.50	2.63	2.70	5.43	5.20
RB	42.00	23.90	37.00	29.90	42.00	<	24.00	<	<	<	<	27.00	27.00
TA*	--1.68	----3.77-----		----1.65-----		----0.99-----		----0.64-----		----0.40-----		----1.51-----	
TH	6.90	3.16	3.10	7.20	7.20	2.84	2.90	1.00	1.00	1.09	1.10	3.25	3.10
U	1.50	1.22	1.10	1.55	1.40	0.81	0.60	0.62	n.d.	0.46	0.40	1.16	1.20
ZN	150.00	131.00	131.00	145.00	151.00	127.00	118.00	155.00	151.00	164.00	152.00	167.00	153.00
ZR	320.00	259.00	240.00	239.00	<	119.00	170.00	<	<	<	160.00	419.00	390.00
SC	25.70	19.20	18.90	26.70	26.00	33.40	32.70	38.80	39.10	39.90	40.00	34.40	32.60
LA	42.00	37.10	36.00	43.80	42.00	19.50	19.00	13.50	13.00	13.60	13.00	30.90	29.00
CE	79.00	75.30	70.00	83.80	83.00	35.50	37.00	26.60	27.00	27.00	26.00	56.30	54.00
ND	44.00	39.80	40.00	45.80	44.00	18.00	18.00	18.90	19.30	22.90	17.00	33.10	34.00
SM	9.00	8.70	9.00	8.80	8.60	4.70	4.40	4.40	4.40	4.70	4.40	7.50	7.50
EU	2.41	2.64	2.60	2.45	2.37	1.21	1.19	1.31	1.32	1.34	1.29	2.21	2.14
GD	8.30	7.10	7.80	9.20	n.d.	4.70	4.50	4.70	4.30	5.00	4.80	8.40	7.50
TB	1.54	1.31	1.15	1.14	1.05	0.70	0.71	0.86	0.84	0.92	0.74	1.32	1.28
HO	1.30	0.84	0.80	1.70	2.00	1.10	0.80	1.09	0.80	1.20	1.30	1.89	1.20
TM	0.60	0.40	0.45	0.67	n.d.	0.50	0.37	0.53	0.47	0.50	0.50	0.61	0.61
YB	4.10	2.18	2.20	4.03	3.80	2.59	2.30	3.28	3.30	3.38	3.40	4.28	3.90
LU	0.57	0.45	0.30	0.68	0.57	0.50	0.37	0.95	0.52	0.70	0.51	0.94	0.57
C.T.	VC CRAIG	VC POT		VC CRAIG		VC GRNGE		VC IFLAT		VC IFLAT		VC SWAMP	

SAMPLE	VC79319a	VC79319b	VC79347a	VC79347b	VC79349a	VC79349b	VC79385a	VC79385b	WT78005a	WT78005b	WT78006a	WT78006b	WT78011a
BA	610.00	606.00	534.00	516.00	564.00	584.00	347.00	315.00	596.00	627.00	280.00	323.00	91.00
CO*	Contaminated: data rejected												
CR	36.50	37.80	19.90	21.10	20.70	21.20	134.00	132.00	63.00	62.80	88.00	91.80	466.00
CS	0.63	<	0.56	<	0.92	1.00	<	<	0.40	0.30	<	<	<
HF	5.49	5.50	5.43	5.30	5.30	5.50	3.27	3.10	2.66	2.60	1.65	1.80	1.40
RB	27.90	13.00	45.90	41.00	46.90	34.00	<	<	<	<	<	<	<
TA*	----1.54-----		----1.73-----		----1.67-----		----0.95-----		----0.52-----		----0.45-----		0.39--
TH	3.13	3.10	6.98	6.80	7.23	7.40	2.86	2.80	1.60	1.50	n.d.	n.d.	n.d.
U	1.07	0.70	1.59	1.70	1.96	1.80	0.99	0.90	0.74	n.d.	n.d.	n.d.	n.d.
ZN	159.00	159.00	152.00	150.00	152.00	152.00	127.00	121.00	100.00	100.00	120.00	130.00	81.00
ZR	439.00	430.00	180.00	360.00	159.00	250.00	139.00	160.00	119.00	130.00	<	<	<
SC	34.40	33.70	29.00	29.00	28.90	29.50	33.40	32.40	16.90	16.80	24.70	25.40	28.10
LA	35.30	34.00	36.00	35.00	36.40	36.00	21.10	20.00	26.20	26.00	14.70	15.00	7.20
CE	60.10	55.00	62.10	62.00	66.70	66.00	37.30	37.00	47.10	45.00	39.20	39.00	16.60
ND	34.00	37.00	36.30	34.00	37.50	37.00	20.90	20.00	28.90	30.00	29.10	27.00	10.50
SM	8.10	8.20	7.30	7.40	7.50	7.80	5.10	4.50	5.70	5.10	6.00	6.00	2.80
EU	2.30	2.32	2.11	2.09	2.11	2.14	1.29	1.29	1.70	1.66	1.89	2.00	0.89
GD	8.80	7.10	8.30	7.70	8.00	9.00	4.50	5.10	4.90	4.40	4.00	4.70	2.80
TB	1.42	1.43	1.01	1.09	1.11	1.13	0.75	0.71	0.68	0.68	0.81	0.73	0.62
HO	1.59	1.70	1.40	1.50	1.20	1.50	0.97	1.10	0.73	0.60	0.37	n.d.	0.46
TM	0.67	0.62	0.58	0.55	0.56	0.81	0.46	0.52	0.25	n.d.	0.22	0.24	0.34
YB	4.41	4.00	3.79	3.60	3.84	3.70	2.49	2.60	1.84	1.80	1.12	1.20	1.95
LU	0.87	0.56	0.69	0.53	0.89	0.53	0.58	0.38	0.24	0.27	0.14	0.15	0.29
C.T.	VC SWAMP		VC FEARY		VC FEARY		VC GRNGE		WT ANDES		WT NEPH		WT OBHTI

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SAMPLE	WT78011b	WT78016a	WT78016b	WT78020a	WT78020b	WT78024a	WT78024b	WT78029a	WT78029b	WT78047a	WT78047b	WT79004a	WT79004b
BA	n.d.	291.00	280.00	344.00	322.00	1110.00	1060.00	486.00	427.00	200.00	280.00	750.00	756.00
CO*	Contaminated: data rejected												
CR	490.00	79.60	80.80	244.00	239.00	29.90	31.30	170.00	165.00	138.00	135.00	46.90	46.50
CS	<	<	<	<	<	0.48	0.50	<	<	<	<	<	0.50
HF	1.30	1.75	1.70	1.81	1.70	3.52	3.40	3.29	3.00	1.60	1.50	2.78	2.90
RB	<	<	<	<	<	11.90	20.00	5.00	<	23.90	<	<	<
TA*	--0.39	----0.44-----		----0.32-----		----0.61-----		----0.72-----		----0.45-----		---------0.50--	
TH	0.40	n.d.	n.d.	0.44	0.50	2.08	1.80	1.32	1.00	n.d.	0.60	1.49	1.60
U	n.d.	n.d.	n.d.	n.d.	n.d.	0.75	n.d.	0.30	n.d.	n.d.	n.d.	0.74	0.60
ZN	77.00	139.00	142.00	89.00	79.00	71.00	72.00	109.00	112.00	87.00	88.00	136.00	144.00
ZR	<	<	<	<	<	177.00	140.00	<	100.00	<	<	86.00	200.00
SC	29.10	27.00	25.90	34.00	31.60	10.20	10.20	28.30	26.30	35.10	33.60	15.70	15.90
LA	8.00	19.00	18.00	10.10	9.00	34.60	35.00	21.50	20.00	7.00	6.00	40.00	40.00
CE	15.00	50.80	48.00	22.90	21.00	56.40	56.00	45.80	40.00	13.70	14.00	89.90	91.00
ND	8.00	42.50	31.00	13.90	12.00	26.40	28.00	27.90	24.00	10.00	9.00	50.80	46.00
SM	2.50	7.50	7.90	3.70	3.10	4.90	5.30	6.30	5.60	2.70	2.40	8.30	8.50
EU	0.85	2.27	2.27	1.07	1.00	1.35	1.37	1.92	1.78	0.89	0.84	2.13	2.12
GD	1.90	4.60	4.50	3.80	2.70	4.20	4.30	5.50	5.10	2.70	2.10	5.30	5.20
TB	0.50	0.90	0.89	0.56	0.57	0.51	0.53	1.01	0.92	0.65	0.54	0.75	0.70
HO	0.50	0.64	n.d.	0.71	0.80	0.49	0.60	0.78	1.00	0.77	0.80	0.18	0.80
TM	0.23	0.20	0.22	0.23	0.33	0.32	0.30	0.49	0.53	0.34	0.27	n.d.	n.d.
YB	2.10	0.96	1.20	2.11	2.10	1.70	1.70	2.88	2.80	2.08	1.80	1.05	1.00
LU	0.32	0.14	0.14	0.31	0.32	0.23	0.24	0.43	0.44	0.33	0.40	0.18	0.21
C.T.	WT OBHTI		WT NEPH		WT OBLTI		WT ANDES		WT OBHTI		WT OBLTI		WT SPRMT

SAMPLE	WT79004c	WT79020a	WT79020b	WT79020c	WT79027a	WT79027b	WT79028a	WT79028b
BA	689.00	1490.00	1480.00	1630.00	914.00	876.00	657.00	658.00
CO*	Contaminated: data rejected							
CR	46.40	72.80	69.40	67.50	111.00	109.00	99.40	98.20
CS	<	<	<	<	0.70	0.60	0.42	0.60
HF	1.90	3.29	3.40	3.30	3.40	3.30	2.61	2.70
RB	<	<	17.00	10.00	18.00	10.00	<	<
TA*	--0.50	---------0.57---------			----0.53-----		----0.36-----	
TH	1.50	2.00	2.00	2.20	2.84	2.80	2.37	2.30
U	0.60	0.59	0.40	0.90	0.93	0.80	0.48	0.40
ZN	144.00	128.00	133.00	132.00	113.00	123.00	102.00	100.00
ZR	140.00	109.00	80.00	140.00	159.00	50.00	<	310.00
SC	15.70	16.20	16.20	16.00	17.20	16.90	16.00	16.30
LA	36.00	57.10	56.00	56.00	44.60	43.00	32.10	32.00
CE	88.00	125.00	129.00	120.00	96.30	94.00	66.40	65.00
ND	47.00	65.80	73.00	75.00	44.90	51.00	39.00	38.00
SM	8.10	10.20	10.80	11.30	8.60	8.10	5.50	5.70
EU	2.10	2.59	2.64	2.58	2.11	2.13	1.57	1.61
GD	4.80	6.60	6.30	6.60	5.90	6.50	4.40	4.40
TB	0.59	0.80	0.61	0.77	0.67	0.67	0.45	0.54
HO	0.60	0.49	0.60	0.70	0.76	0.70	0.54	0.60
TM	n.d.	0.32	n.d.	n.d.	0.26	0.30	0.29	0.34
YB	1.00	1.11	1.20	1.20	1.33	1.30	1.15	1.10
LU	0.14	0.25	0.15	0.16	0.21	0.16	0.24	0.16
C.T.	WT SPRMT		WT SPRMT		WT WBRMT		WT WBRMT	

Footnotes identifying samples for which chemical types have not been defined:

1/ Imnaha basalt

2/ Huntzinger flow. Fractionated ASOTIN chemical type.

3/ Joseph volcanics. Similar to GR INC chemical type but probably younger than Grande Ronde Basalt.

4/ Equivalent to Esquatzel member and ESQUAT chemical type.

5/ Fractionated UMATILLA chemical type.

6/ Frenchman Springs member; high TiO2, low FeO chemical variant.

7/ Priest Rapids member, Palouse vent.

8/ Oldest intracanyon flow. Saddle Mountains Basalt, possibly Esquatzel member. Major oxides similar to FS INC chemical type.

9/ Eagle Lake flow, probably in Asotin member.

10/ Amphibolitized dike, probably not Columbia River Basalt.

11/ High-silica rhyolite pumice and obsidian, interbedded with Saddle Mountains Basalt.

* Samples were ground at Washington State University in Tungsten Carbide mortars from which TA and CO were introduced as contaminants. CO values are all too high and cannot be corrected. TA values have been corrected empirically by comparison with flows of known TA content using the relative intensity of the Tungsten peak on the INAA pattern. Corrected average TA values are bracketed by dashes, e.g. ----0.91-----.

Table 1d. Columbia River basalt flows. Release date February 1982. Major oxide analyses of glasses. Analyses done by Tim O'Hearn at the Smithsonian Institution, Washington, D.C.

SAMPLE	B75001	B76003	B76004	B76005	B76006	B76009	B76010	B76011	B76012	B76013	B76014	B76030	B76035
SIO2	56.25	55.88	55.90	56.95	56.52	55.75	55.29	56.95	56.35	56.00	55.41	55.27	55.09
AL2O3	12.80	13.02	13.19	12.37	12.97	12.61	12.69	13.90	13.24	12.83	12.39	12.16	12.80
FEO	13.05	12.77	13.26	13.54	12.53	13.28	13.27	12.39	13.03	13.30	13.06	12.88	12.91
MGO	2.90	3.10	2.85	2.71	2.74	2.74	2.91	3.19	3.13	2.91	2.92	2.62	3.06
CAO	6.66	7.03	6.89	6.71	6.75	6.78	6.67	7.05	6.98	6.82	6.83	6.23	6.88
NA2O	3.19	3.25	3.03	3.16	3.20	3.31	3.10	3.09	3.25	3.21	2.95	2.42	3.04
K2O	1.65	1.62	1.78	1.60	1.85	1.71	1.56	1.61	1.66	1.68	1.60	1.77	1.68
TIO2	2.40	2.40	2.35	2.46	2.19	2.49	2.37	2.08	2.32	2.41	2.31	2.69	2.39
P2O5	0.31	0.35	0.35	0.30	0.35	0.36	0.33	0.35	0.37	0.35	0.33	0.37	0.36
TOTAL	99.23	99.42	99.60	99.80	99.10	99.03	98.19	100.61	100.33	99.51	97.80	96.41	98.21
C.T.	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC

SAMPLE	B76036	B76038	B76042	B76043	B76044	B76045	B76046	B76047	B76048	B76049	B76050	B76051	B76052
SIO2	55.52	54.68	54.33	55.08	56.90	56.11	55.05	55.23	55.51	54.39	56.06	52.28	53.94
AL2O3	14.51	13.45	13.24	13.17	13.17	13.64	13.45	12.78	12.44	13.56	13.95	11.84	14.10
FEO	11.68	13.04	13.24	13.36	12.17	12.10	12.51	12.92	13.12	12.06	12.07	15.07	11.99
MGO	3.80	3.64	3.78	3.67	3.37	4.04	4.21	2.94	3.00	4.46	3.94	3.55	4.39
CAO	8.58	7.73	7.77	7.78	7.39	8.26	8.33	7.05	6.87	8.72	8.09	8.10	8.84
NA2O	2.83	2.81	3.17	3.16	3.29	2.79	2.73	3.21	2.78	2.76	2.83	2.61	2.89
K2O	1.09	1.27	1.20	1.25	1.47	1.24	1.08	1.62	1.56	0.96	1.31	1.31	1.05
TIO2	1.95	2.31	2.37	2.30	2.07	1.98	1.98	2.40	2.25	1.87	2.06	3.41	1.95
P2O5	0.29	0.38	0.38	0.29	0.30	0.30	0.27	0.38	0.31	0.22	0.31	0.49	0.23
TOTAL	100.25	99.31	99.48	100.06	100.13	100.46	99.61	98.53	97.84	99.00	100.62	98.66	99.38
C.T.	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC.	GR INC	FS INC	GR INC

SAMPLE	B76053	B76054	B76055	B76056	B76057	B76058	B76059	B76060	B76061	B76062	B76063	B76064	B76068
SIO2	55.28	54.61	55.63	55.82	54.70	55.95	54.67	55.48	54.82	55.28	56.21	54.80	55.96
AL2O3	13.40	13.32	13.56	14.14	12.87	13.58	13.50	13.61	12.70	13.75	12.71	13.30	12.74
FEO	12.12	12.60	12.40	11.73	13.55	11.93	12.81	12.70	13.53	12.36	13.42	12.82	13.05
MGO	3.97	4.07	3.82	3.72	3.46	4.08	3.92	3.78	3.39	3.63	2.86	4.03	3.00
CAO	8.07	8.18	7.95	8.05	7.67	8.21	8.25	8.09	7.73	7.79	7.06	8.37	6.86
NA2O	2.32	2.60	2.49	3.10	2.93	2.46	3.14	3.14	2.54	2.63	2.54	3.05	2.98
K2O	1.24	1.06	1.29	1.23	1.33	1.16	1.21	1.26	1.27	1.41	0.70	0.10	1.60
TIO2	2.06	2.04	2.02	1.99	2.38	1.96	2.12	2.15	2.46	2.07	2.36	2.09	2.37
P2O5	0.34	0.29	0.32	0.30	0.40	0.28	0.33	0.31	0.43	0.33	0.32	0.27	0.30
TOTAL	98.80	98.77	99.45	100.08	99.29	99.61	99.95	100.52	98.87	99.25	98.18	98.83	98.86
C.T.	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC

SAMPLE	B76069	B76070	B76071	B76072	B76073	B76074	B76075	B76077	B76078	B76079	B76080	B76081	B76093
SIO2	56.70	57.20	58.06	57.19	57.21	56.80	56.25	49.86	57.57	54.93	55.00	56.71	56.56
AL2O3	12.71	13.39	13.06	13.05	12.97	13.36	12.92	11.27	13.17	13.29	13.00	13.57	12.76
FEO	13.32	12.25	12.34	12.27	12.57	11.71	13.38	16.23	12.19	12.61	13.06	12.18	13.39
MGO	3.07	3.07	2.73	2.69	2.96	3.49	2.89	3.73	2.83	4.04	4.29	3.54	3.06
CAO	6.79	6.89	6.56	6.46	6.80	7.45	6.78	8.40	6.71	8.27	8.44	7.34	6.93
NA2O	2.65	3.24	3.27	2.70	2.79	3.34	3.37	2.32	2.88	2.63	3.10	3.01	3.24
K2O	1.56	1.60	1.85	1.75	1.60	1.35	1.64	1.28	1.68	1.04	1.04	1.45	1.61
TIO2	2.46	1.99	2.20	2.19	2.04	1.96	2.51	4.27	2.19	2.02	2.15	1.98	2.43
P2O5	0.32	0.27	0.26	0.24	0.26	0.25	0.35	0.81	0.23	0.27	0.28	0.28	0.36
TOTAL	99.73	99.90	100.35	98.54	99.20	99.71	100.09	98.17	99.45	99.10	100.36	100.06	100.34
C.T.	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	ROSALIA	GR INC	GR INC	GR INC	GR INC	GR INC

Table 1d. Columbia River basalt flows. Release date February 1982. Major oxide analyses of glasses. Analyses done by Tim O'Hearn at the Smithsonian Institution, Washington, D.C.

SAMPLE	B76074	B76095	B76096	B76098	B76099	B76101	B76104	B76105	B76110	B77001	B77003	B77004	B77005
SIO2	56.03	56.07	57.95	54.44	56.67	56.53	55.05	55.26	51.52	54.80	56.23	54.36	54.37
AL2O3	13.08	12.56	13.66	13.04	13.05	13.29	13.21	14.02	11.84	13.44	13.51	13.27	13.80
FEO	13.10	12.37	12.65	12.41	12.36	12.36	12.29	11.60	15.61	12.58	12.30	13.39	12.03
MGO	2.23	3.01	3.17	4.13	3.04	3.08	4.28	4.59	3.64	3.90	3.16	3.53	4.62
CAO	6.74	6.69	6.99	8.44	6.79	6.92	8.51	8.92	8.24	7.94	6.92	7.70	8.81
NA2O	3.20	2.01	2.60	2.67	3.21	2.96	3.01	2.97	2.39	3.21	3.04	2.69	2.96
K2O	1.59	1.60	1.77	1.13	1.62	1.45	0.99	0.92	1.25	1.17	1.51	1.29	0.94
TIO2	2.41	2.05	2.13	1.99	2.16	2.06	1.98	1.91	3.85	2.15	1.99	2.35	1.92
P2O5	0.35	0.26	0.27	0.30	0.34	0.27	0.29	0.21	0.63	0.31	0.29	0.45	0.27
TOTAL	99.43	96.62	101.19	98.55	99.24	98.92	99.61	100.40	98.97	99.50	98.95	99.03	99.72
C.T.	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	ROZA	GR INC	GR INC	GR INC	GR INC

SAMPLE	B77006	B77007	B77009	B77010	B77018	B77019	B77020	B77021	B77022	B77023	B77024	B77025	B77027
SIO2	54.73	55.92	54.79	55.77	54.88	55.90	56.19	55.12	55.21	55.08	56.92	54.84	57.55
AL2O3	13.89	13.87	13.97	13.68	13.33	13.40	12.73	12.64	13.48	13.45	13.52	13.40	13.27
FEO	12.12	12.45	12.35	12.38	12.21	12.23	12.98	13.01	12.31	12.11	11.92	12.66	12.16
MGO	4.44	4.00	4.41	3.94	5.11	3.09	3.37	3.35	4.27	4.46	3.94	4.02	3.10
CAO	8.62	7.96	8.71	7.93	6.92	6.88	7.34	7.16	8.34	8.53	7.94	8.29	6.77
NA2O	2.43	2.78	2.49	2.41	2.44	2.04	3.18	1.71	2.53	2.72	2.52	2.73	2.97
K2O	1.01	1.24	1.01	1.23	1.60	1.65	1.49	1.91	1.20	1.16	1.44	1.26	1.90
TIO2	1.98	2.02	1.97	1.99	1.98	1.94	2.20	2.32	2.05	1.98	2.05	2.16	2.07
P2O5	0.29	0.33	0.28	0.33	0.26	0.29	0.30	0.40	0.29	0.27	0.35	0.34	0.32
TOTAL	99.51	100.57	99.96	99.66	96.73	97.42	99.78	97.62	99.68	99.76	100.60	99.70	100.11
C.T.	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC

SAMPLE	B77029	B77030	B77031	B77032	B77033	B77035	B77038	B77039	B77041	B77042	B77043	B77044	B77045
SIO2	56.92	55.66	55.40	55.69	53.98	55.66	55.93	55.03	55.52	57.02	53.97	55.35	56.21
AL2O3	12.92	13.55	13.42	13.40	13.53	13.39	13.20	13.42	12.43	13.24	12.89	12.93	12.87
FEO	13.30	12.86	12.05	12.20	11.53	11.91	12.63	12.15	12.95	11.74	11.36	11.63	13.13
MGO	3.23	4.11	4.28	4.20	4.54	3.90	3.74	4.17	2.64	3.03	2.95	3.40	3.10
CAO	7.13	8.20	8.07	8.33	8.88	8.03	8.06	8.51	6.53	7.11	6.84	7.39	7.33
NA2O	2.85	3.01	3.02	2.95	3.02	2.55	2.82	2.36	2.80	2.85	3.09	2.69	2.84
K2O	1.63	1.20	1.25	1.22	0.95	1.29	1.20	1.03	1.77	1.50	1.52	1.16	1.37
TIO2	2.23	2.12	2.02	1.97	1.86	1.99	2.27	2.01	2.69	2.14	2.20	2.05	2.23
P2O5	0.30	0.27	0.30	0.30	0.24	0.30	0.33	0.29	0.43	0.28	0.25	0.24	0.29
TOTAL	100.51	100.78	99.81	100.26	98.53	99.02	100.18	98.97	97.76	98.91	95.07	96.84	99.37
C.T.	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC

SAMPLE	B77046	B77047	B77049	B77052	B77053	B77057	B77059	B77062	B77064	B77066	B77067	B77068	B77069
SIO2	55.03	56.59	57.76	56.07	56.40	54.57	56.20	56.68	56.03	56.27	55.77	55.65	55.60
AL2O3	13.37	13.48	13.25	13.54	13.20	13.35	12.50	13.25	12.69	12.43	12.30	12.74	12.62
FEO	11.92	12.42	12.26	11.98	11.89	11.92	13.28	12.20	13.19	13.38	13.51	13.12	13.31
MGO	4.04	3.93	3.09	4.01	3.25	4.36	2.68	3.05	2.78	2.60	2.55	2.93	2.86
CAO	8.46	8.04	6.89	8.09	6.85	8.78	6.56	6.38	6.51	6.20	6.16	7.07	6.69
NA2O	2.97	2.91	2.96	2.60	3.04	2.77	2.68	2.95	3.15	2.47	2.90	2.58	2.91
K2O	1.05	1.58	1.94	1.51	1.78	1.20	2.15	2.29	2.03	3.10	2.46	1.59	1.50
TIO2	2.02	2.10	2.10	2.09	2.26	2.04	2.81	2.19	2.64	2.77	2.89	2.42	2.57
P2O5	0.32	0.36	0.27	0.35	0.30	0.26	0.40	0.35	0.41	0.48	0.44	0.36	0.46
TOTAL	99.13	101.41	100.52	100.24	98.97	99.25	99.26	99.34	99.43	99.70	98.98	98.46	98.52
C.T.	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC

Table 1d. Columbia River Basalt flows. Release date February 1982. Major oxide analyses of glasses. Analyses done by Tim O'Hearn at the Smithsonian Institution, Washington, D.C.

SAMPLE	B77070	B77071	B77072	B77073	B77074	B77075	B77076	B77077	B77079	B77080	B77081	B77087	B77089
SIO2	57.14	55.30	56.77	54.73	57.14	57.05	55.53	54.87	54.79	54.31	55.47	56.08	54.25
AL203	13.16	12.46	12.93	13.15	13.18	13.42	12.74	13.03	13.62	13.54	13.52	13.07	13.36
FEO	12.39	13.33	12.29	12.93	12.45	12.61	13.56	13.59	12.28	12.21	12.28	12.47	13.06
MGO	3.25	2.87	2.85	3.88	3.09	3.16	3.19	3.87	4.50	4.52	3.89	2.91	4.05
CAO	6.93	6.64	6.49	7.98	6.82	6.87	7.06	8.11	8.79	8.81	8.03	6.77	8.34
NA20	2.88	2.95	3.04	3.10	2.79	2.71	2.69	2.32	2.56	2.53	2.83	2.84	2.87
K20	1.47	1.54	1.58	1.11	1.45	1.41	1.35	1.08	1.03	1.07	1.33	1.77	1.10
TIO2	2.13	2.55	2.17	2.28	2.10	2.17	2.41	2.30	1.94	2.01	2.05	2.17	2.15
P205	0.36	0.36	0.34	0.33	0.32	0.32	0.36	0.30	0.25	0.26	0.30	0.29	0.27
TOTAL	99.69	98.00	98.46	99.49	99.34	99.72	98.89	99.47	99.76	99.26	99.70	98.37	99.45
C.T.	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC

SAMPLE	B77093	B77097	B77098	B77099	B77101	B77103	B77104	B77115	B77118	B77121	B77127	B77128	B77129
SIO2	54.30	54.52	54.93	54.29	56.46	55.67	55.50	56.84	57.32	54.98	54.72	54.79	54.81
AL203	13.44	12.59	12.41	13.41	13.30	12.72	13.59	13.29	13.45	13.39	12.57	13.36	12.75
FEO	12.27	13.30	13.41	12.55	12.21	12.97	11.93	12.32	12.37	12.90	13.76	12.17	13.42
MGO	4.36	2.84	2.61	4.05	3.19	2.91	4.21	3.31	3.16	4.09	3.09	3.90	3.04
CAO	8.75	6.83	6.53	8.31	7.11	6.85	8.44	6.90	6.96	8.36	7.18	7.84	7.08
NA20	2.84	3.01	3.08	3.13	3.18	2.95	2.84	2.90	2.63	2.54	2.66	3.12	3.24
K20	1.06	1.76	1.87	1.18	1.60	1.89	1.35	1.87	1.82	1.26	1.72	1.46	1.64
TIO2	2.02	2.59	2.75	2.09	2.04	2.42	1.93	2.09	2.09	2.17	2.68	2.03	2.66
P205	0.25	0.36	0.37	0.30	0.29	0.38	0.31	0.34	0.32	0.31	0.50	0.29	0.45
TOTAL	99.29	97.80	97.96	99.31	99.38	98.76	100.10	99.86	100.12	100.00	98.88	98.96	99.09
C.T.	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC

SAMPLE	B77131	B77132	B77136	B77138	B77141	B77145	B77146	B77147	B77148	B77152	B77153	B77154	B77155
SIO2	55.12	55.27	57.49	55.03	55.36	54.90	54.56	55.84	55.81	55.24	54.78	56.65	57.48
AL203	13.15	13.07	13.17	13.28	12.63	13.46	13.42	12.87	12.90	13.42	13.57	13.63	13.52
FEO	11.90	12.12	12.09	12.82	13.14	12.32	12.57	12.99	12.42	12.29	12.45	12.35	12.46
MGO	3.73	3.69	2.78	4.04	2.85	4.08	4.09	2.85	3.05	4.11	4.21	3.45	2.98
CAO	7.87	7.87	6.83	8.65	6.51	8.48	8.45	7.04	7.19	8.67	8.50	7.40	6.86
NA20	2.86	3.07	3.01	2.50	2.88	2.93	2.99	3.05	2.60	2.70	2.73	3.17	2.80
K20	1.13	1.15	1.62	0.97	1.68	1.06	0.99	1.50	1.73	1.06	1.13	1.54	2.47
TIO2	2.04	2.13	2.24	2.16	2.76	2.13	2.20	2.48	2.31	2.16	1.91	2.06	2.04
P205	0.31	0.33	0.31	0.28	0.38	0.35	0.25	0.36	0.34	0.29	0.32	0.31	0.31
TOTAL	98.13	98.70	99.54	99.73	98.19	99.71	99.52	98.98	98.35	99.94	99.60	100.56	100.92
C.T.	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC

SAMPLE	B77156	B77157	B77158	B77159	B77161	B77162	B77163	B77164	B77166	B77167	B77168	B77169	B77170
SIO2	54.69	54.92	55.28	55.48	54.98	55.38	55.04	55.82	55.66	54.43	56.62	53.94	54.21
AL203	13.63	13.23	13.46	13.67	12.88	13.15	13.55	13.62	13.64	13.58	13.26	13.53	13.72
FEO	12.55	13.01	12.95	13.16	13.28	13.35	13.19	12.51	12.32	13.02	12.61	12.72	12.59
MGO	4.07	4.03	4.13	4.18	3.18	3.09	4.19	3.41	3.44	4.15	2.99	3.99	4.19
CAO	8.31	8.17	8.14	8.23	6.92	6.98	8.29	7.31	7.42	8.35	6.85	8.25	8.55
NA20	2.94	2.83	2.71	2.60	2.95	2.93	2.85	2.94	2.80	2.92	3.06	2.77	2.44
K20	1.14	1.11	1.27	1.23	1.66	1.67	1.19	1.59	1.50	1.09	1.74	1.20	1.12
TIO2	1.96	2.04	2.00	2.03	2.32	2.32	2.02	2.16	2.11	2.15	2.17	2.08	2.07
P205	0.31	0.28	0.36	0.37	0.39	0.46	0.32	0.31	0.31	0.27	0.34	0.35	0.33
TOTAL	99.60	99.67	100.30	101.00	98.54	99.33	100.64	99.67	99.20	99.96	99.64	98.83	99.22
C.T.	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC

Table 1d. Columbia River basalt flows. Release date February 1982. Major oxide analyses of glasses. Analyses done by Tim O'Hearn at the Smithsonian Institution, Washington, D.C.

SAMPLE	B77171	B77176	B77177	B77178	B77179	B77180	B77183	B77184	B77185	B77186	B77187	B77188	B77189
SIO2	54.37	56.48	54.09	54.08	54.17	54.68	54.87	55.23	55.61	68.51	54.78	54.50	54.75
AL2O3	12.90	13.37	13.44	13.40	13.63	13.61	12.71	13.05	13.11	13.03	12.65	13.47	13.82
FEO	11.82	12.41	12.92	13.03	12.37	12.64	13.11	13.21	13.23	5.06	13.58	12.63	12.39
MGO	2.14	3.04	4.10	4.00	4.26	4.20	2.94	3.16	2.86	0.08	2.84	4.08	4.03
CAO	5.62	6.94	8.25	8.16	8.58	8.41	6.67	7.15	6.76	1.44	6.47	8.39	8.40
NA2O	2.99	3.14	2.94	2.80	2.77	2.25	1.79	3.01	3.24	3.52	2.82	2.76	2.50
K2O	2.81	1.67	1.11	1.12	1.13	1.19	3.17	1.76	1.81	4.62	1.92	1.11	1.16
TIO2	2.50	2.09	2.17	2.21	2.08	2.11	2.55	2.57	2.50	0.73	2.61	2.08	2.08
P2O5	0.91	0.28	0.29	0.33	0.29	0.31	0.38	0.36	0.35	0.12	0.40	0.27	0.31
TOTAL	96.06	99.42	99.30	99.13	99.28	99.40	98.19	99.50	99.47	97.11	98.07	99.29	99.44
C.T.	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC	GR INC

SAMPLE	B77190	B77191	B77192	B77197	79-006	80-043	80-047	80-065	80-082	Dike 80-086	80-106	81-011	81-022
SIO2	54.16	56.11	56.14	54.53	49.79	51.48	55.28	52.07	51.09	53.18	53.24	55.03	51.04
AL2O3	13.57	13.16	12.87	12.47	11.62	13.36	13.05	12.97	13.47	12.92	12.88	13.90	13.29
FEO	12.42	12.87	13.24	13.02	15.83	13.29	12.26	13.74	13.33	14.98	13.50	9.19	13.14
MGO	4.41	3.27	2.66	2.71	3.70	4.84	3.76	4.58	5.21	3.97	3.87	2.55	4.84
CAO	8.64	7.34	6.77	6.53	8.52	9.34	7.65	8.84	9.83	8.19	8.03	5.46	9.23
NA2O	2.49	2.68	3.22	2.78	2.41	3.22	2.97	2.97	3.07	2.85	2.94	3.42	3.38
K2O	1.09	1.51	1.74	1.83	1.33	0.94	1.45	0.96	0.82	1.09	1.47	3.86	1.05
TIO2	2.01	2.27	2.50	2.59	4.15	2.04	2.15	2.17	2.18	2.39	2.98	2.61	2.21
P2O5	0.27	0.36	0.47	0.43	0.74	0.27	0.33	0.27	0.29	0.40	0.39	1.08	0.30
TOTAL	99.06	99.57	99.61	96.89	98.09	98.78	98.90	98.57 1/	99.29 1/	99.97	99.30	97.10 2/	98.48 1/
C.T.	GR INC	GR INC	GR INC	GR INC	ROSALIA	GR INC	GR INC	UNC	UNC	'GR INC'	GR INC	UNC	UNC

SAMPLE	81-023	81-026	81-027
SIO2	50.78	55.43	50.85
AL2O3	13.12	12.60	12.63
FEO	14.34	13.12	13.01
MGO	4.94	2.75	3.71
CAO	9.36	6.37	7.65
NA2O	3.06	3.03	3.12
K2O	0.92	2.01	2.24
TIO2	2.14	2.53	3.09
P2O5	0.27	0.39	1.49
TOTAL	98.83 1/	98.23	97.79 2/
C.T.	UNC	GR INC	UNC

Footnotes:

1/ Picture Gorge Basalt

2/ Grande Ronde basalt, similar to PRINEVILLE chemical type (Uppuluri, 1974)