Geologic Map of the Nezperce Quadrangle, Lewis and Idaho Counties, Idaho

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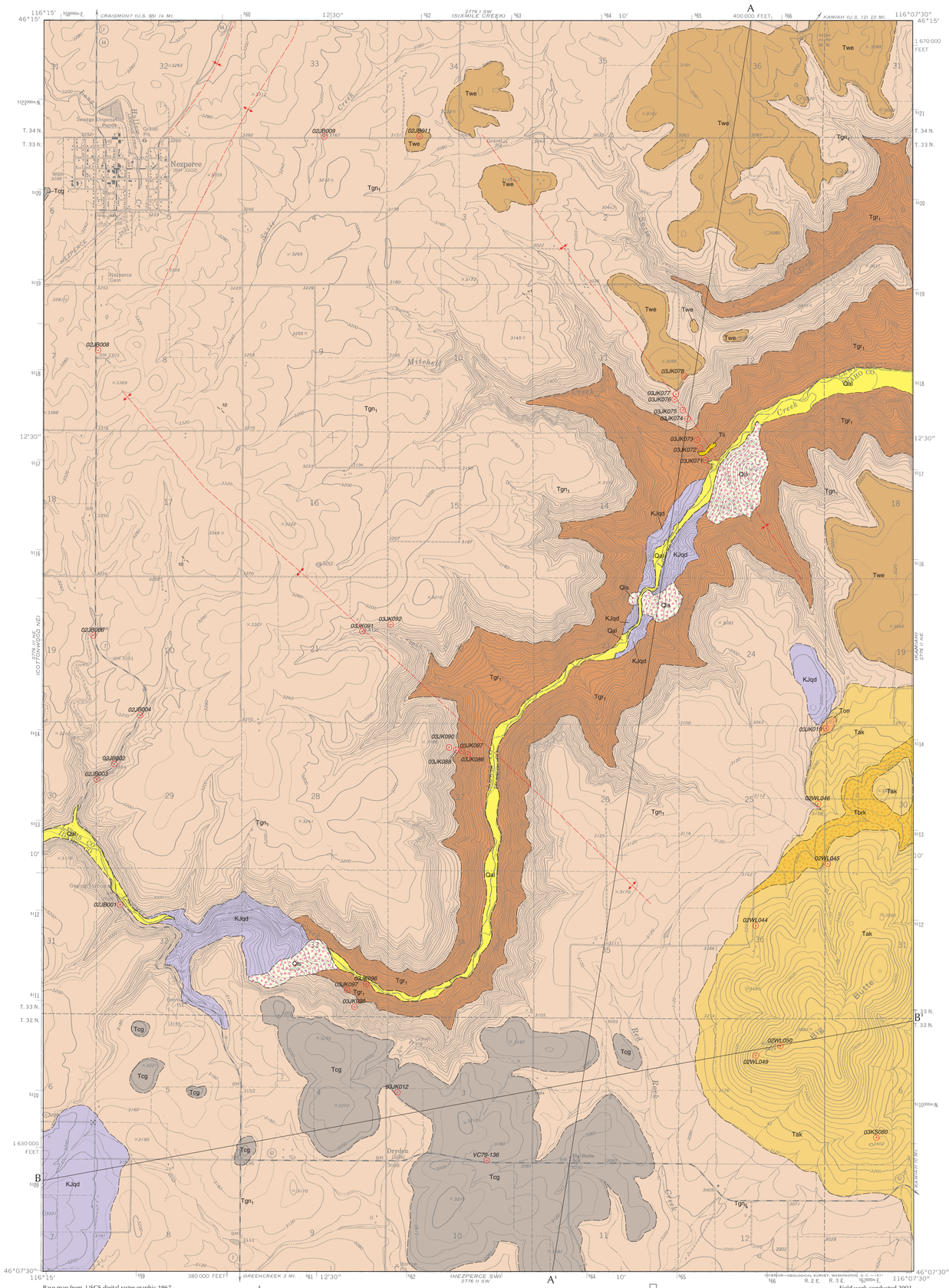
2004



Base map from USGS digital raster graphic 1967.

Topography by photogrammetric methods from aerial photographs taken 1966. Field checked 1967.

Polyconic projection. 1927 North American Datum.

10,000-food grid ticks based on Idaho coordinate system, west zone.

1000-meter Universal Transverse Mercator grid ticks, zone 11.

UTM Grid and 1971 Magnetic North Declination at Center of Map

SCALE 1:24,000

Contour interval 40 feet.
Dotted lines represent 20-foot contours.

QUADRANGLE LOCATION

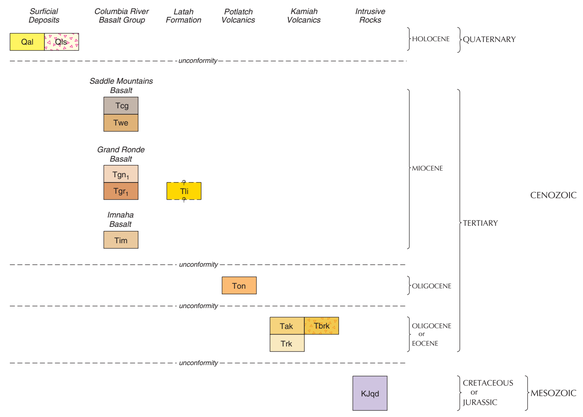
Field work conducted 2003.

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program.

Digital cartography by Jesse S. Bird and Jane S. Freed at the Idaho Geological Survey's Digital Mapping Lab.
Map version 11-03-2005.

Disclaimer: This Digital Web Map is an informal report and may be revised and formally published at a later time. Its content and format may not conform to agency standards.

CORRELATION OF MAP UNITS



INTRODUCTION

The geologic map of the Nezperce quadrangle depicts rock units exposed at the surface or underlying thin surficial cover of soil and colluvium. Thicker surficial deposits of alluvium and landslide debris are also depicted where they mask the underlying rock units. The map is the result of field work conducted in 2002 and 2003 by the authors. Basalt mapping relied considerably on reconnaissance mapping and sampling in the area from 1978 to 1980 (Camp, 1981; and Swanson and others, 1979a).

Most of the quadrangle is underlain by Miocene basalt flows of the Columbia River Basalt Group. The basalt flows filled ancestral drainages and flooded the preexisting topography. Structural warping of the basalt occurred both during and after emplacement, in part controlling the distribution of younger basalt units and postbasalt development of major streams. Basalt units were identified using hand sample characteristics, paleomagnetic signature, geochemical signature, and data from previous work. In the southwestern corner of the area, Jurassic or Cretaceous(?) intrusive rocks are exposed, and Eocene or Oligocene extrusive flows of the Kamiah volcanics are exposed along the southeastern edge of the quadrangle on Big Butte. An outcrop of possible Oligocene Onaway Member basalt occurs on the north flank of Big Butte.

Representative samples of most Columbia River basalt and older volcanic units were collected for analysis. These samples supplemented a previous sample set collected by V.E. Camp (written commun., 2002). Our sample locations and those of Camp are identified on the map. Analytical results of all samples are included in Table 1. Analyses were performed at Washington State University's GeoAnalytical Laboratory.

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

Qal **Alluvial deposits (Holocene)**–Mostly stream alluvium but may include some slope-wash and fan deposits. Primarily coarse channel gravels deposited during high-energy stream flow. Subrounded to rounded pebbles, cobbles, and boulders in a sand matrix. Moderately stratified and sorted. May include intercalated colluvium and debris-flow deposits from steep side slopes.

Qls **Landslide and slump deposits (Pleistocene-Holocene)**–Poorly sorted and poorly stratified angular basalt fragments mixed with silt and clay. Landslide deposits include debris slides as well as blocks of basalt and sedimentary interbeds that have been rotated and moved downslope. Probably form as a result of slumping of Latah Formation sediments at or near the basement rock-basalt contact.

TERTIARY SEDIMENTS

Latah Formation

Sediments of the Latah Formation are poorly exposed at isolated locations between Grande Ronde R1 basalt flows and at the basalt-basement rock contact. Commonly indicated by sand in soil cover on slopes. Equivalent to the Ellensburg Formation of central and west-central Washington (Swanson and others, 1979b).

Tll **Latah Formation sedimentary interbeds (Miocene)**–Clay, silt and sand deposits that in places separate basalt flows or occur at the basalt-basement rock contact. One interbed, mapped between Tgr_1 flows near the base of a section at the junction of Mitchell and Lawyer creeks, is about 60 feet thick and consists of coarse to fine sand and silt as indicated by detritus and small exposures in the slope. Other interbeds likely occur within the basalt sequence but no exposures were noted. Minor occurrences of sediment at the basalt-basement rock contact near Highway 7 are too small to show at map scale.

COLUMBIA RIVER BASALT GROUP

The stratigraphic nomenclature for the Columbia River Basalt follows that of Swanson and others (1979b) and used in Reidel and Hooper (1989). In Idaho, the group is divided into four formations. From base upward, these are the Imnaha Basalt, Grande Ronde Basalt, Wanapum Basalt, and Saddle Mountains Basalt. Imnaha Basalt is not exposed on the quadrangle but is inferred to underlie Grande Ronde basalt as shown on cross section A-A'. Grande Ronde Basalt, from base upward, has been subdivided into the informal R1, N1, R2, and N2 magnetostratigraphic units (Swanson and others, 1979b). Of these, only basalt from the R1 and N1 units were identified in the map area, although one upper apparently normal polarity flow has chemistry similar to an R2 unit as noted in the descriptions below. No Wanapum Basalt units were found in the map area. Saddle Mountains Basalt units are restricted to the Craigmont Member and the basalt of Weippe, both named by Camp (1981).

Saddle Mountains Basalt

Tcg **Craigmont Member (Miocene)**–Fine-grained basalt with scattered to common plagioclase phenocrysts typically 2-5 mm but a few as much as 10 mm in length. Remanent magnetic polarity is normal, as determined in the field. Poorly exposed in south part of map area south of Lawyer Creek where one flow forms a thin cap on Grande Ronde basalt. Maximum thickness probably less than 80 feet.

Twe **Basalt of Weippe (Miocene)**–Medium- to coarse-grained basalt with scattered to common plagioclase laths 2-5 mm in length; abundant olivine crystals and clots, generally visible to the naked eye. Remanent magnetic polarity is reverse, although field magnetometer readings are commonly conflicting and weak. Similar chemically to Pomona Member basalt (Swanson and others, 1979a) and included in the Pomona Member by Camp (1981). One flow poorly exposed along the northeast edge of the map area where it forms a thin cap less than 75 feet thick on Grande Ronde basalt. Probably invaded the area from the north and east, pinching out east of Nezperce.

Grande Ronde Basalt

Tgn_1 **Grande Ronde, N1 magnetostratigraphic unit (Miocene)**–Mostly dense, dark gray, fine-grained aphyric to plagioclase-microphyric basalt. A few upper flows commonly have a sugary texture and scattered small plagioclase phenocrysts similar to R2 units. Remanent magnetic polarity is normal. Well exposed in canyon walls of Lawyer Creek where thick entablatures commonly form cliffs 30-100 feet high. Contact with underlying Tgr1 arbitrary because of conflicting fluxgate magnetometer results. Probably consists of five to seven flows with an approximate thickness of 600-700 feet east of Highway 7 in Lawyer Creek canyon in the southwest part of the area, thinning to four to five flows about 400 feet thick in Lawyer Creek and Suzie Creek canyons in the northeast part of the area. Uppermost flow (sample 02JB006) at top of Lawyer Creek section along Highway 7 north of the canyon has chemistry similar to the Wapshilla Ridge unit, Grande Ronde R2 (Reidel and others, 1989), but field magnetometer readings consistently indicate normal polarity.

Tgr_1 **Grande Ronde, R1 magnetostratigraphic unit (Miocene)**–Fine-grained, aphyric to plagioclase-microphyric basalt; rare plagioclase phenocrysts 2-3 mm in length in some flows. Remanent magnetic polarity is reverse, although flows commonly have normal or conflicting fluxgate magnetometer readings, especially in the upper part of the sequence. Consists of at least three thick flows, one or more of which may consist of several flow units as indicated by vesicular float at several intervals on covered slopes. Thickness is 800-1000 feet in Lawyer Creek at the east edge of the map, although the base of the sequence is not exposed. Commonly forms ledges or cliffs on canyon walls.

Imnaha Basalt

Tim **Imnaha basalt (Miocene)**–Not exposed, but inferred to underlie Tgr_1 in part of the quadrangle. Shown only in cross section.

OLDER EXTRUSIVE ROCKS

Potlatch Volcanics(?)

Ton **Onaway Member(?)(Oligocene)**–Dark gray, fine- to medium-grained basalt with scattered, mostly clear plagioclase laths 2-3 mm long. Remanent magnetic polarity not determined. Exposed at only one location along Thorn Springs Road on the northernmost flank of Big Butte. Outcrop consists of columns 6-10 inches in diameter at the entrance to a private driveway. Sample 03JK019 from this outcrop has P_2O_5, Sr, and Nb values and total alkali-silica characteristics of the Onaway Member basalt exposed near Potlatch (Kauffman and others, 2003). These chemical characteristics are different from nearby samples of Kamiah volcanics and Columbia River basalt units (Table 1).

Kamiah Volcanics

Tak **Andesite, basaltic andesite, and basalt of the Kamiah volcanics (Eocene or Oligocene)**–Dark gray, greenish gray, and reddish or purplish gray, generally fine-grained extrusive rocks exposed on Big Butte. Composition varies from basalt to andesite. Jones (1982) reports the andesite units contain 5 to 20 percent plagioclase phenocrysts up to 2 mm in length. He also notes pyroxene phenocrysts up to 1 mm in length in some units. Many units have thin parallel partings that we interpret as internal flow features.

Tbrk **Volcanic breccia of the Kamiah volcanics (Eocene or Oligocene)**–Brecciated zone within Tak unit, exposed at several locations on the north flank of Big Butte and extending east onto the Kamiah quadrangle. Consists of purple, blue, and gray weathering, variably vesiculated, angular andesite clasts up to 50 cm in size in sparse tan weathering, mostly sand-sized lithic and plagioclase crystal matrix. Bedding is mostly massive. May be lahar deposit(s).

Trk **Rhyolite of the Kamiah volcanics (Eocene or Oligocene)**–Not exposed on the Nezperce quadrangle but projected beneath Tak on cross section B-B' because of exposures to the east on the Kamiah quadrangle.

INTRUSIVE ROCKS

KJqd **Biotite-hornblende quartz diorite (Jurassic or Cretaceous?)**–Medium-grained, equigranular, biotite-hornblende quartz diorite. Contains 15-20 percent biotite that occurs in clots up to 8 mm in length, 10-15 percent hornblende that ranges from 1-5 mm in length, and 10-25 percent quartz 2 mm in length. K-feldspar is typically around 2-3 percent, but varies up to 5 percent in some samples. Similar to quartz diorite farther north along the Clearwater River that has been dated by U/Pb SHRIMP zircon means at ~157 Ma

SYMBOLS

Contact: approximately located.

Fold axis: dashed where approximate, dotted where concealed.

Anticline.

Syncline.

Outcrop at which no fabric was observed.

Approximate strike and dip of basalt flow.

L117 Sample location and number.

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ACKNOWLEDGMENTS

We thank the landowners who allowed access on their property. Will Oakley assisted with mapping of the basement-basalt contact. Dean L. Garwood provided helpful discussions regarding structure and basalt stratigraphy. V.E. Camp kindly provided copies of his field maps and notebooks of the area, and gave permission to publish his sample analyses.

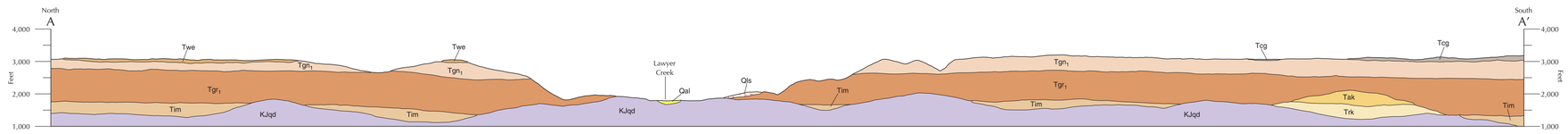
Table 1. Major oxide and trace element chemistry of samples collected on the Nezperce quadrangle.

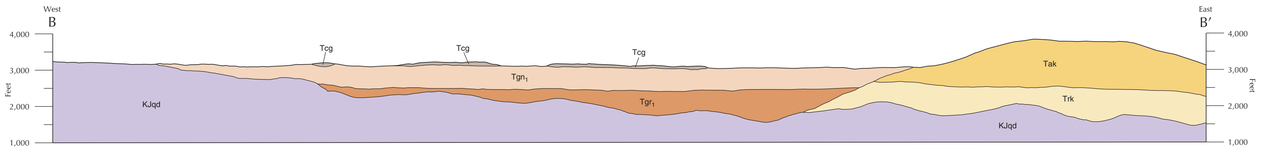
Sample number	Latitude	Longitude	Unit name	Map unit	Normalized major elements in weight percent										Unnormalized trace elements in parts per million																	
					SiO_2	Al_2O_3	TiO_2	FeO*	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	Ni	Cr	Sc	V	Ba	Rb	Sr	Zr	Y	Nb	Ga	Cu	Zn	Pb	La	Ce	Th
03JK012	46.14298	-116.19931	Craigmont Member	Tcg	55.12	14.63	3.233	10.82	0.152	7.46	2.99	1.92	3.10	0.572	15	14	39	326	1156	49	314	277	49	27.8	21	25	152	11	63	84	9
**VC79-136	46.13609	-116.18634	Craigmont Member	Tcg	52.32	14.47	2.93	14.35	0.20	7.41	3.55	1.79	2.32	0.46																		
02JB011	46.23844	-116.19598	basalt of Weippe	Twe	52.24	15.49	1.911	9.78	0.165	11.17	5.85	0.47	2.69	0.237	33	74	39	295	299	9	256	131	31	14.2	19	81	119	2	31	39	3
03JK078	46.21459	-116.15703	basalt of Weippe	Twe	52.29	15.13	1.890	10.20	0.169	11.13	5.96	0.51	2.51	0.217	33	64	35	301	365	7	251	134	31	13.8	19	54	95	1	23	40	0
02JB001	46.16175	-116.23917	Grande Ronde	N_2	Tgn_1	54.92	14.17	1.846	11.18	0.198	8.22	4.55	1.25	3.35	0.317	9	28	41	346	523	30	314	155	35	11.1	20	32	112	3	6	33	4
02JB002	46.17577	-116.23993	Grande Ronde	N_2	Tgn_1	54.40	13.59	2.242	12.75	0.200	7.67	4.00	1.40	3.34	0.395	10	30	28	359	590	33	311	164	37	11.4	20	22	125	2	17	41	4
02JB003	46.17426	-116.24240	Grande Ronde	N_2	Tgn_1	54.85	14.42	1.867	10.88	0.196	8.55	4.39	1.27	3.26	0.316	9	32	34	346	536	32	325	155	37	11.3	20	36	119	4	24	46	4
02JB004	46.18062	-116.23621	Grande Ronde	N_2	Tgn_1	54.34	13.86	2.153	12.26	0.245	8.04	4.16	1.45	3.13	0.364	11	34	42	355	710	32	339	162	37	11.7	23	20	127	4	14	53	4
02JB006	46.18873	-116.24282	Grande Ronde	N_2	Tgn_1	55.45	13.73	2.415	12.05	0.200	7.20	3.52	1.65	3.33	0.454	13	19	38	363	761	40	329	189	39	15.4	20	27	133	9	39	56	6
02JB008	46.21688	-116.24233	Grande Ronde	N_2	Tgn_1	55.24	14.10	2.205	10.88	0.226	8.08	4.25	1.32	3.34	0.366	11	31	39	374	837	32	336	164	39	12.4	22	19	126	8	30	36	5
02JB009	46.23844	-116.21004	Grande Ronde	N_2	Tgn_1	54.70	13.94	2.194	11.71	0.199	8.06	4.16	1.36	3.31	0.377	10	31	36	367	579	33	329	164	37	11.5	23	22	124	8	19	30	6
03JK076	46.21213	-116.15905	Grande Ronde	N_2	Tgn_1	54.97	14.04	2.223	11.26	0.226	8.14	4.05	1.56	3.12	0.407	9	22	36	387	672	34	335	164	38	11.4	22	19	129	5	31	54	2
03JK077	46.21236	-116.15874	Grande Ronde	N_2	Tgn_1	55.69	14.43	2.250	10.06	0.184	8.08	4.03	1.61	3.29	0.380	9	18	35	389	646	37	340	170	38	11.4	21	22	135	10	26	37	4
03JK088	46.17709	-116.19044	Grande Ronde	N_2	Tgn_1	56.06	14.08	1.884	10.95	0.188	7.68	4.04	1.73	3.11	0.280	5	16	38	311	574	39	329	169	34	11.0	18	19	109	9	28	36	4
03JK090	46.17751	-116.19193	Grande Ronde	N_2	Tgn_1	55.05	14.36	1.826	10.50	0.194	8.62	4.58	1.43	3.12	0.314	13	23	42	345	530	30	324	152	35	10.6	22	44	116	3	19	32	4
03JK091	46.18909	-116.20432	Grande Ronde	N_2	Tgn_1	54.61	14.01	2.138	12.10	0.198	7.93	4.13	1.38	3.13	0.376	10	26	40	367	576	32	326	162	35	11.0	22	19	118	5	21	25	4
03JK092	46.18988	-116.20020	Grande Ronde	N_2	Tgn_1	54.96	13.96	2.192	11.63	0.203	8.00	4.03	1.45	3.20	0.372	10	22	34	382	622	34	330	166	37	11.3	23	19	125	6	33	46	4
03JK097	46.15440	-116.20780	Grande Ronde	N_2	Tgn_1?	57.14	13.55	2.251	11.62	0.189	6.69	3.04	1.99	3.21	0.327	4	17	34	360	752	53	315	204	40	13.3	22	17	127	13	22	51	6
03JK098	46.15183	-116.20559	Grande Ronde	N_2	Tgn_1	55.79	14.35	1.786	10.70	0.193	8.06	4.26	1.44	3.16	0.258	7	17	34	321	545	38	318	155	33	11.1	23	11	108	3	46	52	4
03JK071	46.20614	-116.15413	Grande Ronde	R_2	Tgr_1	54.16	14.05	2.156	11.60	0.200	8.30	4.63	1.41	3.15	0.332	17	45	38	332	500	37	333	181	36	12.6	21	72	110	7	22	53	6
03JK072	46.20738	-116.15544	Grande Ronde	R_2	Tgr_1	54.92	14.42	2.207	10.71	0.211	8.56	4.05	1.53	3.06	0.330	16	39	34	397	539	37	351	186	36	12.4	23	65	115	6	31	48	2
03JK073	46.20816	-116.15612	Grande Ronde	R_2	Tgr_1	56.98	13.41	2.262	12.06	0.188	6.62	2.94	1.98	3.23	0.331	4	14	31	365	707	56	319	203	39	13.7	23	21	125	9	25	51	8
03JK074	46.21029	-116.15741	Grande Ronde	R_2	Tgr_1?	55.62	14.11	1.786	11.14	0.200	7.95	4.22	1.64	3.08	0.253	4	15	37	328	531	40	315	155	33	11.2	21	17	111	6	27	42	7
03JK075	4.63006	-116.41440	Grande Ronde	R_2	Tgr_1?	54.46	14.02	1.843	11.86	0.207	8.39	4.49	1.30	3.11	0.313	5	23	38	348	563	29	321	154	35	11.3	22	38	109	4	17	48	4
03JK086	46.17659	-116.18920	Grande Ronde	R_2	Tgr_1?	56.85	13.46	2.245	12.18	0.186	6.64	3.00	1.93	3.18	0.332	5	16	36	357	751	54	318	204	40	14.6	24	14	125	10	21	57	5
03JK087	46.17689	-116.19013	Grande Ronde	R_2	Tgr_1	57.16	13.67	2.245	11.43	0.180	6.66	3.04	2.13	3.15	0.335	3	16	34	354	714	51	323	205	40	14.3	23	15	125	12	38	55	6
03JK096	46.15425	-116.20358	Grande Ronde	R_2	Tgr_1	56.87	13.41	2.240	12.14	0.194	6.63	2.98	1.90	3.31	0.327	8	16	30	356	700	51	311	203	39	14.3	23	21	125	7	35	49	5
03JK019	46.17910	-116.13739	Onaway basalt	?	Ton?	52.71	16.99	1.874	10.57	0.222	6.03	3.22	1.78	5.34	1.261	20	36	14	88	458	14	1305	444	49	42.7	22	33	141	5	48	116	3
02WL044	46.15969	-116.14752	Kamiah volcanics	Tak		52.88	18.31	1.441	8.35	0.141	9.11	4.60	0.88	3.94	0.343	60	36	23	212	442	11	588	139	24	12.8	19	54	87	4	5	37	2
02WL045	46.16585	-116.13725	Kamiah volcanics	Tak		52.23	18.21	1.522	9.47	0.138	8.22	4.76	0.87	4.21	0.377	46	26	16	227	477	6	632	143	24	11.6	18	44	90	2	19	46	2
02WL046	46.17171	-116.13852	Kamiah volcanics	Tak		50.67	17.71	1.629	10.47	0.159	8.84	5.49	0.77	3.89	0.373	59	32	28	249	377	8	579	144	28	10.7	19	59	94	3	20	31	2
02WL049	46.14664	-116.14752	Kamiah volcanics	Tak		56.35	17.19	1.229	8.43	0.142	7.31	3.69	1.36	3.97	0.336	44	24	24	194	590	16	513	170	31	13.3	15	55	84	3	34	56	2
02WL050	46.14763	-116.14393	Kamiah volcanics	Tak		56.50	18.48	1.004	6.82	0.124	7.48	4.19	1.25	3.90	0.260	52	31	22	156	497	17	530	146	24	10.3	19	38	70	5	19	25	2
03KS080	46.13838	-116.13000	Kamiah volcanics	Tak		58.57	16.78	0.886	6.08	0.116	6.97	4.91	1.53	3.91	0.252	89	114	20	150	544	26	463	139	24	13.1	18	81	80	9	14	36	4

* Major elements are normalized on a volatile-free basis, with total Fe expressed as FeO.

** Samples collected by V. Camp, 1978. Analytical results used with permission (Camp, written communication 2002).

Analyses performed at Washington State University GeoAnalytical Laboratory, Pullman, WA.





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