GEOLOGIC MAP OF THE

MOSES LAKE

1:100,000 QUADRANGLE, WASHINGTON

Compiled by

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WASHINGTON DIVISION OF GEOLOGY AND EARTH RESOURCES

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This report has not been edited or reviewed for conformity with Division of Geology and Earth Resources standards and nomenclature

WASHINGTON STATE DEPARTMENT OF
Natural Resources
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CONTENTS

ILLUSTRATIONS

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INTRODUCTION

The Moses Lake quadrangle is one of sixteen 1:100,000-scale quadrangles that cover the northeast quadrant of Washington State (Fig. 1). Geologic maps of these quadrangles have been compiled by Washington Division of Geology and Earth Resources (DGER) geologists and will be the principal data sources for a new 1:250,000-scale geologic map of northeastern Washington. Fourteen of these quadrangles will be released as DGER open-file reports (listed below). The Chelan and Wenatchee quadrangles will not be open-filed because they have been published recently by the U.S. Geological Survey (Tabor and others, 1982, 1987).

Literature review and preliminary compilation of the Moses Lake quadrangle geologic map began in 1985. Sources of geologic data for the Moses Lake quadrangle geologic map are shown in Figure 2.

Units on the Moses Lake quadrangle geologic map are age-lithology units. Upper case letters in the map symbol indicate unit age; lower case letters in the map symbol indicate lithology. Map symbol subscripts identify the formal or informal name of the unit. Thus, the Rosa Member of the Wanapum Basalt, a Miocene basalt, is portrayed with the map symbol Mv_{wr}.

Age assignments of geologic units were made following the flow chart in Figure 3. The geologic time scale devised for the "Correlation of Stratigraphic Units of North America (COSUNA)" project of the American Association of Petroleum Geologists (Salvador, 1985) was used, with slight modifications of the Eocene-Oligocene and Pliocene-Pleistocene boundaries (Armentrout and others, 1983; Prothero and Armentrout, 1985; Montanari and others, 1985; Aguirre and Pasini, 1985).

Volcanic rock names were assigned using whole rock geochemical data and the total alkali-silica (TAS) diagram (Zanettin, 1984).

Structures on the Moses Lake 1:100,000 quadrangle were taken from Swanson and others (1979a), whereas the names of some of these structures were compiled from Grolier and Bingham (1971), Myers, Price, and others (1979), and Drost and Whiteman (1986).

<u>DGER Northeast Quadrant Open-File Reports</u>[1]

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 52 p., 1 pl.

Gulick, C. W., compiler, 1990, Geologic map of the Moses Lake 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-1, 9 p., 1 pl.

Gulick, C. W., compiler, 1990, Geologic map of the Ritzville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-2, 7 p., 1 pl.

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Banks Lake 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-6, 20 p., 1 pl.

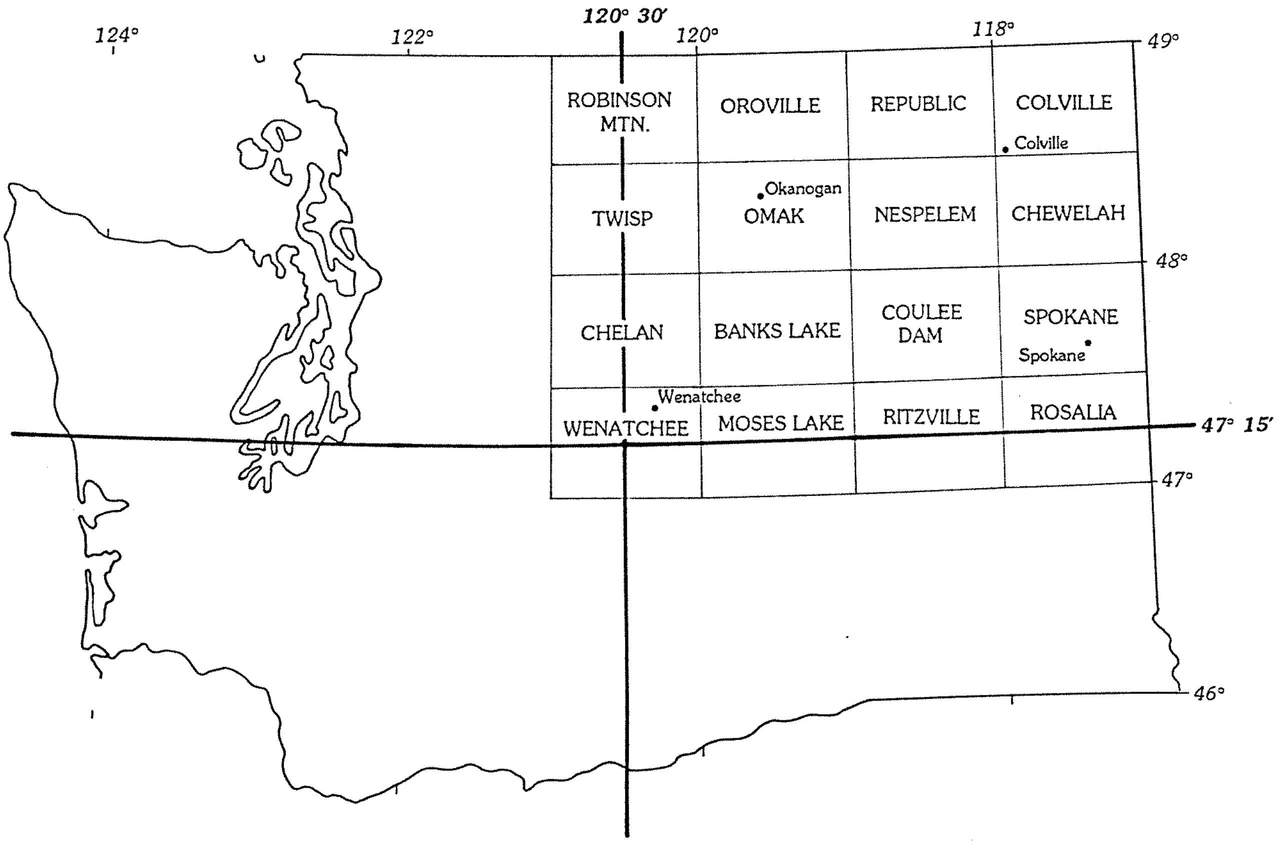

Figure 1. 1:100,000-scale quadrangles in the northeast quadrant of Washington.

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Joseph, N. L., compiler, 1990, Geologic map of the Colville 1:100,000 quadrangle, Washington -Idaho: Washington Division of Geology and Earth Resources Open File Report 90-13, 78 p., 1 pl.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Joseph, N. L., compiler, 1990, Geologic map of the Spokane 1:100,000 quadrangle, Washington-Idaho: Washington Division of Geology and Earth Resources Open File Report 90-17, 29 p., 1 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Republic 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-10, 62 p., 1 pl.

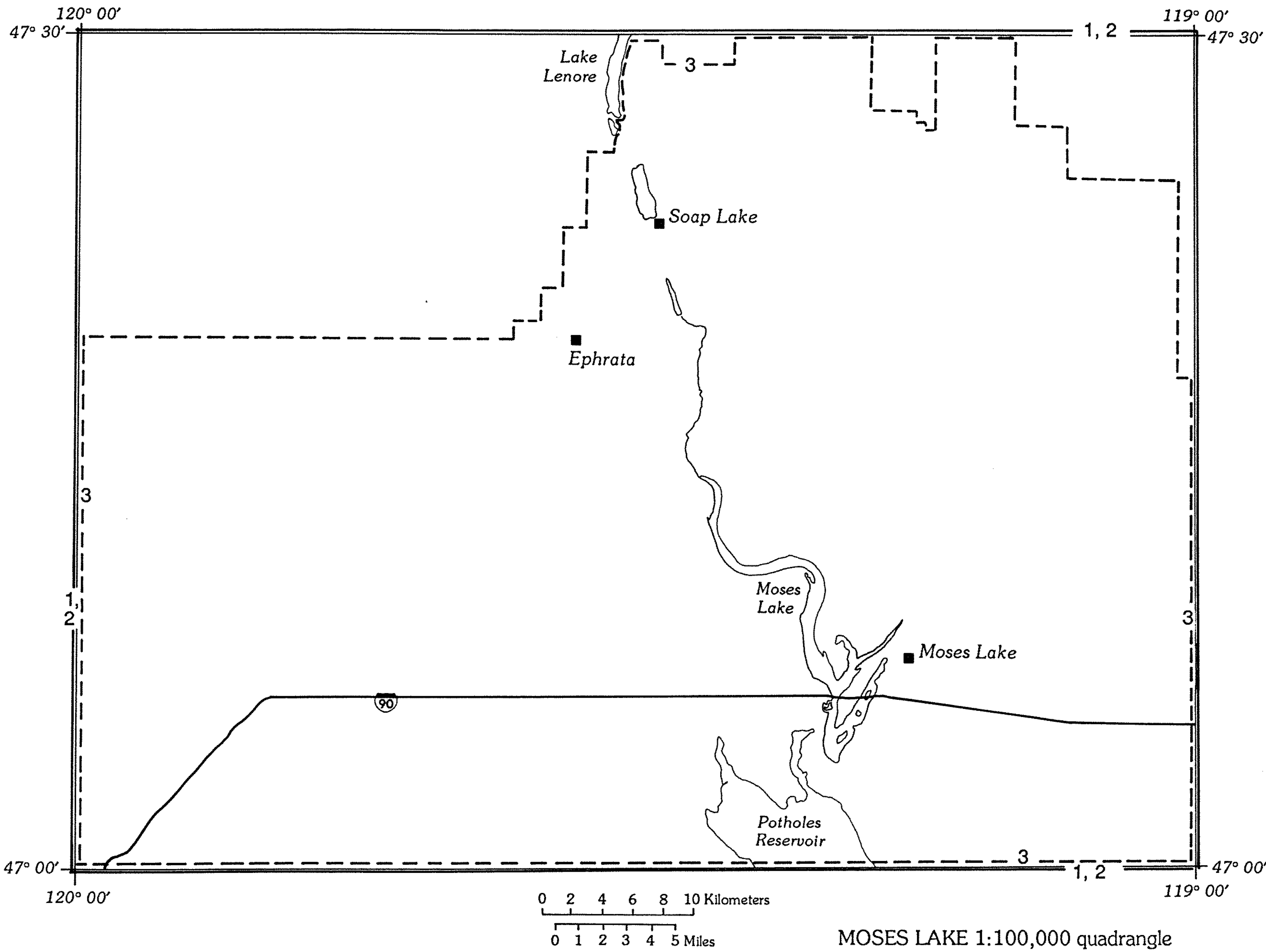

Figure 2. Sources of geologic data for the Moses Lake 1:100,000 quadrangle. 1, Hanson and others, 1979; 2, Swanson and others, 1979a; 3, Grolier and Bingham, 1971.

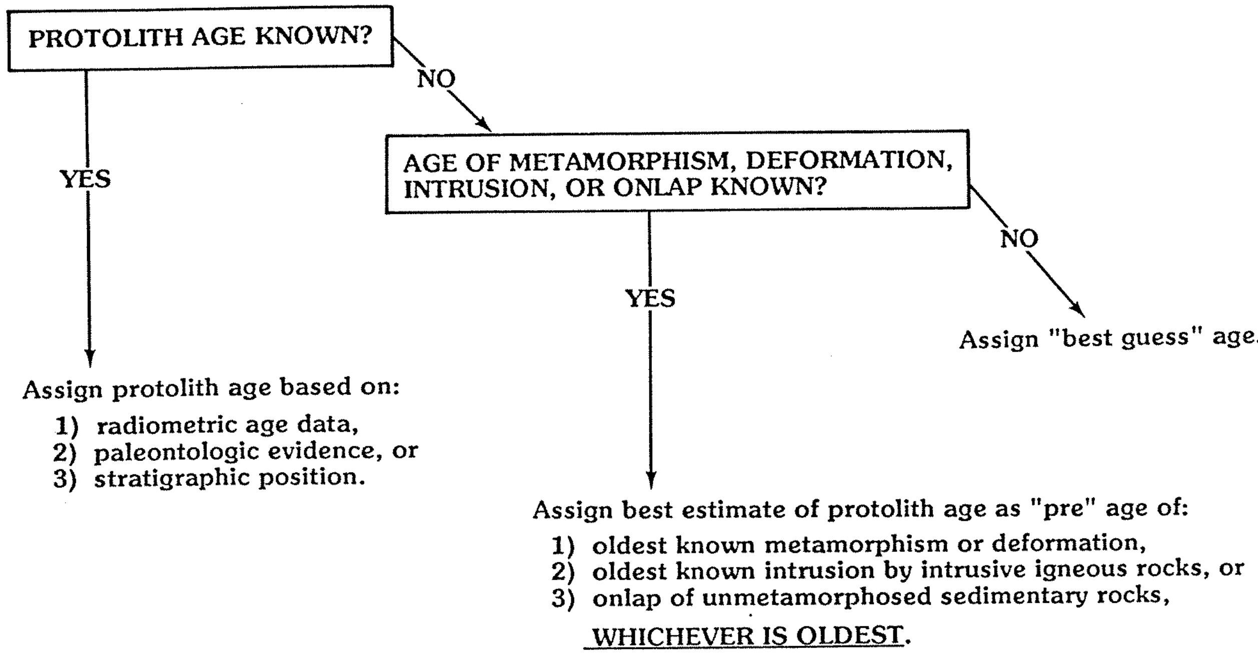

Figure 3. Flow chart for age assignment of geologic units. Protolith age or estimated protolith age may be assigned by correlation with other geologic units. The unit description will include information on how the age of the unit was determined.

Stoffel, K. L.; McGroder, M. F., compilers, 1990, Geologic map of the Robinson Mtn. 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-5, 39 p., 1 pl.

Waggoner, S. Z., compiler, 1990, Geologic map of the Chewelah 1:100,000 quadrangle, Washington-Idaho: Washington Division of Geology and Earth Resources Open File Report 90-14, 63 p., 1 pl.

Waggoner, S. Z., compiler, 1990, Geologic map of the Coulee Dam 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-15, 40 p., 1 pl.

Waggoner, S. Z., compiler, 1990, Geologic map of the Rosalia 1:100,000 quadrangle, Washington-Idaho: Washington Division of Geology and Earth Resources Open File Report 90-7, 20 p., 1 pl.

ACKNOWLEDGMENTS

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DESCRIPTION OF MAP UNITS

Quaternary Sedimentary Deposits

Qa

Alluvium (Holocene to Pleistocene)--Silt, sand, and gravel in stream beds, floodplains, and terraces; includes stratified sand and gravel in alluvial fans and lacustrine silt and silty peat.

Qls

Landslide deposits (Holocene to Pleistocene)--Unstratified and poorly sorted clay, silt, sand, and gravel deposited by rotational and translational landslides and flows (Hanson and others, 1979); includes talus and colluvium. The large outcrop area south of the Beezley Hills is colluvium consisting of silt to boulder-size, mostly subrounded to angular basalt fragments (Grolier and Bingham, 1971).

Qd

Dune sand (Holocene to Pleistocene)--Fine to medium sand, chiefly composed of quartz, feldspar, and basalt grains.

Ql

Loess (Holocene to Pleistocene)--Eolian silt with sand and clay; includes some volcanic ash; locally contains caliche and tephra beds.

Qoa

Older alluvium (Quaternary(?))--Older alluvial-fan deposits composed of semiconsolidated gravel or fanglomerate; fan surfaces dissected and capped by caliche (Hanson and others, 1979).

Deposits of Outburst Floods from Glacial Lake Missoula

Qfg

Gravel (Pleistocene)--Fluvial gravel, ranging from boulders to fine sand, chiefly of rounded basalt fragments but locally containing clasts of granitic and metamorphic rocks, Ringold Formation sediments, and caliche (Grolier and Bingham, 1971). Deposited by glacial outburst floodwaters surging into the Quincy basin from the Grand Coulee and upper Crab Creek channels. Include components of glacial outwash derived from the Okanogan lobe of the Cordilleran ice sheet.

Qfs

Sand and silt (Pleistocene)--Horizontally bedded silt and fine to coarse basaltic sand; includes rhythmically bedded or laminated friable lacustrine fine sand and silt which contain lenses of basaltic sand and gravel and ice-rafted erratic boulders (Grolier and Bingham, 1971). These sediments were deposited in low-energy slackwater environments created by temporary ponding of glacial outburst floodwaters (Hanson and others, 1979).

Quaternary-Tertiary Sedimentary Deposits

QR cg, QR c

Ringold Formation (Pleistocene to Pliocene)--Interbedded tuffaceous sand and silt, buff clay to silt and fine sand, and basaltic fanglomerate, punctuated by numerous thin caliche layers. Pleistocene glacial meltwater streams dissected the surface of the Ringold Formation prior to deposition of late Pleistocene and Holocene sediments, producing an unconformity between Ringold and post-Ringold sediments. The Ringold Formation was named by Merriam and Buwalda (1917) for strata in the White Bluffs on the Priest Rapids 1:100,000 quadrangle to the south. Pleistocene mammalian fossils (Merriam and Buwalda, 1917; Strand and Hough, 1952) and Pliocene to late Pleistocene mollusks and ostracods (Grolier and Bingham, 1978, p. 38) have been collected from various Ringold lithofacies. The Ringold Formation can be subdivided into the following map units:

QR cg

Basaltic fanglomerate--"Angular to subangular, poorly sorted pebbles, cobbles, and boulders of basalt in a matrix of brown tuffaceous sand and silt" (Grolier and Bingham, 1978, p. 49).

QR c

Tuffaceous sand and silt--Dominantly reddish-brown to light-gray, loosely consolidated tuffaceous sand to silt that is typically massive but commonly contains thin-bedded layers; includes subordinate grayish-yellow to brown, well-sorted, laminated, lacustrine clays that locally contain thin layers of quartzose and micaceous sand and silt (Grolier and Bingham 1971, 1978). Grolier and Bingham (1978) suggested that massive bedding and vertical prismatic partings in the sand and silt are indicative of primary eolian deposition.

Tertiary Volcanic Rocks

Yakima Basalt Subgroup of Columbia River Basalt Group

Mv_{wpr}

Wanapum Basalt, Priest Rapids Member (middle Miocene)--Four flows of grayish-black (fresh) to red-brown (weathered), medium- to coarse-grained, slightly diktytaxitic basalt with reversed magnetic polarity. Large columns as much as 3 m (10 ft) in diameter are common, as are platy partings in the basal flow. In the western part of the Quincy basin, the Priest Rapids Member overlies the Quincy diatomite, which attains a maximum thickness of 6 m (20 ft). Where the underlying diatomite is absent, a pillow-palagonite bed, as much as 3 m (10 ft) thick, characterizes the base of the Priest Rapids (Mackin, 1961; Grolier and Bingham, 1971, 1978). The Priest Rapids is the uppermost member of the Wanapum Basalt, which erupted between 15.5 and 14.5 m.y. ago (Long and Duncan, 1983).

Mv_{wr}

Wanapum Basalt, Roza Member (middle Miocene)--Dark bluish-gray, medium- to coarse-grained, porphyritic basalt containing uniformly distributed, lath-shaped transparent plagioclase phenocrysts averaging 1 cm in length. The Roza contains one or two flows that average 30 m (100 ft) in thickness and have a transitional magnetic polarity. The Roza Member overlies the Frenchman Springs Member and the Squaw Creek Member of the Ellensburg Formation, and in places it intrudes the Squaw Creek diatomite. Locally, as in the extreme southwest part of the quadrangle, invaded Squaw Creek rests on the quenched top of the Roza and is overlain depositionally by tuffaceous siltstone and the Priest Rapids Member (Swanson and others, 1979b).

Mv_{wfs}

Wanapum Basalt, Frenchman Springs Member (middle Miocene)--Dark gray to black, medium-grained to aphanitic, sparsely porphyritic basalt that contains "large, internally shattered plagioclase phenocrysts that are partly resorbed or weakly zoned" (Grolier and Bingham, 1978, p. 24). The Frenchman Springs typically overlies medium-grained, friable, quartz-feldspar-mica sand and weakly cemented, tuffaceous sand, silt, and clay of the Vantage Sandstone (Ellensburg Formation). Outcrops of Vantage Sandstone are of limited extent and are not shown on the map. Where the Vantage is absent, the Frenchman Springs rests directly on the weathered surface of the Grande Ronde Basalt. The Frenchman Springs is overlain by the Roza Member or Squaw Creek diatomite (Grolier and Bingham, 1978).

Mv_{gN2}, Mv_{gR2}

Grande Ronde Basalt (middle Miocene)--Dark gray to black, fine-grained to aphanitic basalt commonly cut by columnar or fan joints. Grande Ronde basalts erupted between 17 and 15.5 m.y. ago. The formation is subdivided into four magnetostratigraphic units (Swanson and others, 1979b), two of which are present in the map area (Swanson and others, 1979a):

Mv_{gN2}

Magnetostratigraphic unit N_2; upper flows of normal magnetic polarity.

Mv_{gR2}

Magnetostratigraphic unit R_2; upper flows of reversed magnetic polarity.

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