STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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GEOLOGIC MAP OF THE MCKENZIE BRIDGE QUADRANGLE, LANE COUNTY, OREGON

1988

GMS-48

Geologic Map of the McKenzie Bridge Quadrangle, Lane County, Oregon

By G.R. Priest and others

Plate 1

Funded by U.S. Department of Energy
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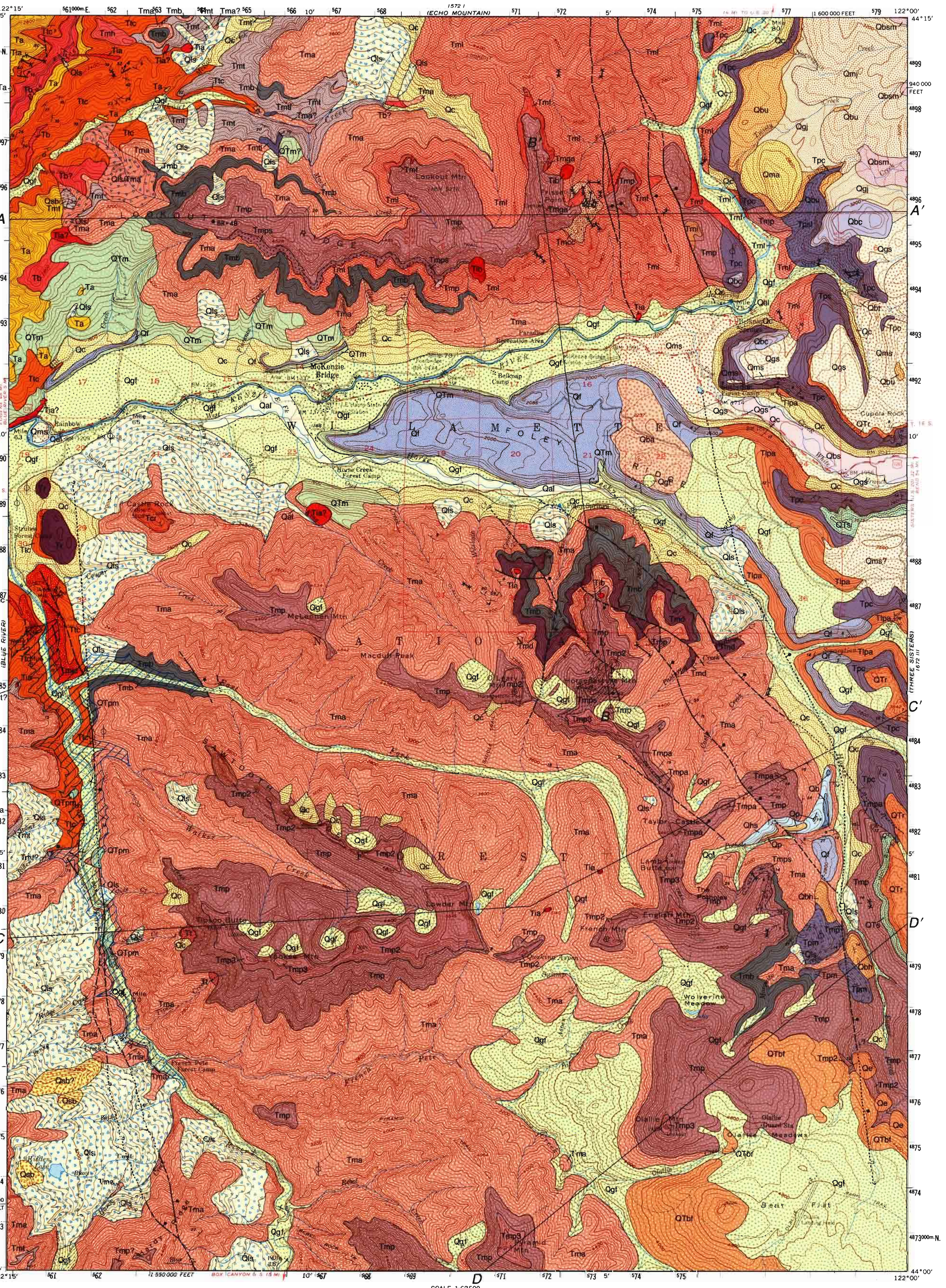


SCALE 1:62500

CONTOUR INTERVAL 80 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Control by USGS and USC&GS

Topography from aerial photographs by multiplex methods
Aerial photographs taken 1954. Advance field check 1955

Polyconic projection. 1927 North American datum
10,000-foot grid based on Oregon coordinate system, south zone
1000-meter Universal Transverse Mercator grid ticks, zone 10, shown in blue

Dashed land lines indicate approximate locations

UTM GRID AND 1955 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

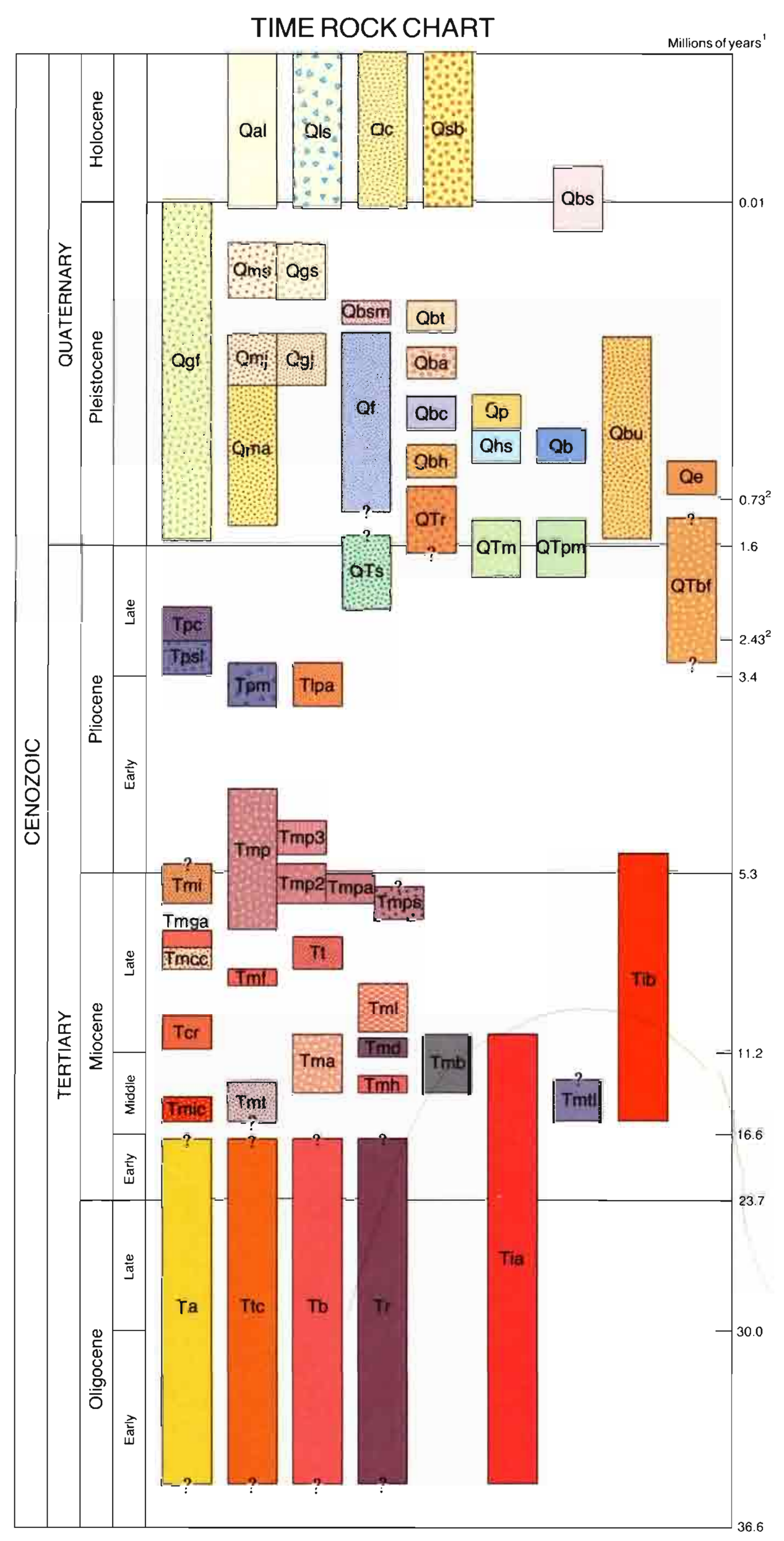
QUADRANGLE LOCATION

Geology by George R. Priest, Gerald L. Black, and Neil M. Woller (Oregon Department of Geology and Mineral Industries) and Edward M. Taylor (Department of Geology, Oregon State University)

Field work conducted in 1986

Cartography by Mark E. Neuhaus

TIME ROCK CHART



[1]Dates taken from Palmer (1983)
[2]Time boundaries of most recent magnetic reversal

MAP SYMBOLS

Contact — Approximately located

Fault — Dashed where inferred; dotted where concealed; queried where doubtful; bar and ball on downthrown side; dip of fault plane in direction of arrow

Strike and dip of beds

Horizontal beds

Dike — Dike with dip close to 90°; all dikes are of basalt or basaltic andesite composition unless otherwise labeled

Thermal spring

Temperature-gradient hole — Only holes with data available to the public are shown. All data are published in DOGAMI open-file reports

Outline of present day Cougar Reservoir

Tables 1, 2, and 3 are printed on a separate sheet accompanying this map.

EXPLANATION

SURFICIAL UNITS

Qal — **Alluvium (Pleistocene and Holocene)** — Fluvial sands and gravels with minor lacustrine deposits of modern stream valleys

Qls — **Landslide deposits (Pleistocene and Holocene)**

Qc — **Colluvium (Pleistocene and Holocene)** — Unconsolidated talus deposits mixed with alluvial fan deposits

Qsb — **Slide block (Pleistocene or Holocene)**

Qgf — **Glacial and glaciofluvial deposits (Pleistocene)** — Undivided till and outwash deposits

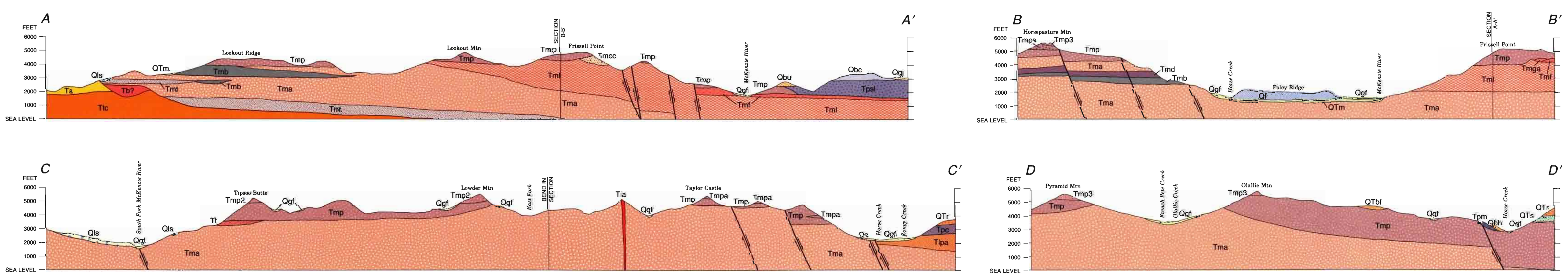
Qms, Qgs — **Youngest till (Qms) and outwash (Qgs) deposits of the most recent glaciation in the area (Pleistocene)** — Till and outwash gravels with relatively fresh clasts. Possibly correlative to deposits of the Suttle Lake glaciation emplaced about 30-12 ka (Shackleton and Opdyke, 1973; Scott, 1977; Bacon, 1983)

Qmj, Qgj — **Till (Qmj) and outwash (Qgj) deposits (Pleistocene)** — Moderately weathered glacial deposits locally overlying unit **Qma** and underlying units **Qms** or **Qgs**. Possibly correlative to Scott's (1977) Jack Creek glaciation that occurred about 80-40 ka or 200-120 ka

Qma — **Oldest till deposits (Pleistocene)** — Moderately to heavily weathered glacial deposits locally overlain by units **Qmj** or **Qgj**. Possibly correlative to Scott's (1977) Jack Creek or Abbott Butte glaciation; the former occurred about 80-40 ka or 200-120 ka; the latter occurred between 900 ka and 200 ka (Scott, 1977)

GEOLOGIC CROSS SECTIONS

Some thin surficial units not shown



VOLCANIC UNITS

Upper Pliocene and Quaternary volcanic and volcaniclastic rocks

Correlative to volcanic rocks of the late High Cascades episode of Priest and others (1983) and to the upper part of the volcanic rocks of the High Cascade Range and Boring Lava of Peck and others (1964)

Qbs — **Basaltic andesite of Sims Butte (upper Pleistocene or Holocene)** — Black to dark-gray, fine-grained basaltic andesite (54.1-55.0 percent SiO_2), with 5-6 percent plagioclase phenocrysts up to 4 mm long with extensively melted and embayed reverse-zoned cores and minor small (1- to 1.5-mm-long) olivine phenocrysts. Unit consists of intracanyon lava that flowed down the valley of the White Branch of the McKenzie River; aa lava flows in the map area, pahoehoe near the vent at Sims Butte. Maximum thickness is 24 m in the map area. Unit was erupted prior to the Mazama ash fall about 7 ka (Bacon, 1983) but after the last glaciation about 12 ka (see unit **Qgs**)

Qbsm — **Basaltic lava flows from Scott Mountain (Pleistocene)** — Dark-gray basaltic lava flows exposed in the headwaters of Boulder Creek. Black vesicular basalt and basaltic andesite (52.0-54.1 percent SiO_2) with 4-8 percent phenocrysts up to 2 mm long of zoned, corroded plagioclase and fresh olivine; some glomerocrysts of the same minerals. Maximum thickness is about 24 m. Older than unit **Qms** but younger than unit **Qmj**

Qbt — **Basalt of Two Butte (Pleistocene)** — Olivine basaltic lava flows similar to unit **Qbsm** but originating from the Two Butte volcanic center. Black to gray, fine- to coarse-grained basalt flows (50.2-51.7 percent SiO_2), with 4-6 percent partially iddingsitized, 2- to 4-mm-long olivine phenocrysts with minor plagioclase phenocrysts. Maximum thickness about 90 m. Unit was erupted before unit **Qms** but after the basalt of Cupola Rock (unit **Tpc**). Distribution controlled by Pleistocene topography

Qba — **Basalt and basaltic andesite (Pleistocene)** — Fresh, dense, medium-gray olivine basalt and basaltic andesite. May have been erupted from a small vent on Foley Ridge, on basis of outcrop pattern in immediate vicinity of vent (SW¼ sec. 22, T. 16 S., R. 6 E.) and absence of these lava flows farther east up the Horse Creek-Separation Creek drainages. Maximum thickness about 98 m. K-Ar age of 0.46 ± 0.06 Ma (Table 1); normally polarized

Qbc — **Clinopyroxene-phyric lava flows (Pleistocene)** — Fine-grained, sparsely clinopyroxene-phyric basaltic andesite intracanyon lava. Maximum thickness about 120 m. Unit has normal magnetic polarity, occurs on a lower intracanyon bench than the basalt of Roney Creek (unit **QTr**), and underlies unit **Qgj**

Qp — **Basalt of Pothole Creek (Pleistocene)** — Light-gray, slightly inflated, platy-jointed, olivine-bearing augite basalt (52.2 percent SiO_2), forming benches on north side of Pothole Creek. Thin section shows phenocrysts of subhedral augite in subtrachytic groundmass of plagioclase, augite, hypersthene, and Fe-Ti oxides. Also present are minor phenocrysts of pale-green iddingsitized olivine and hornblende ghosts (hornblende completely replaced by granular iron oxides and pyroxene). Void space commonly contains vapor-phase biotite. Consists of one lava flow approximately 9 m thick. Normal magnetic polarity. Partly fills channel eroded into poorly indurated debris flows of volcaniclastic rocks of Horse Creek (unit **Qhs**). Pleistocene age inferred from topographic position. Unit **Qp** is a moderately incised intracanyon lava flow that lies 213 m lower than adjacent basalt of Roney Creek (unit **QTr**) with a K-Ar age of 1.71 ± 0.18 Ma

Qbu — **Undivided basalt and basaltic andesite lava flows (Pleistocene)** — Light-gray intracanyon basalt and basaltic andesite. Maximum thickness about 70 m. Unit overlies the basalt of Roney Creek (unit **QTr**) and underlies unit **Qgj**

Qf — **Basalt of Foley Ridge (Pleistocene)** — Very fresh, gray, open-textured (diktytaxitic) olivine basalt (48.8-50.7 percent SiO_2), with fresh or iddingsitized olivine phenocrysts in a groundmass of plagioclase, ophitic to subophitic augite, and Fe-Ti oxides. All but one analysis of these lava flows had titania contents below 1.6 percent. Rocks are similar to those of basalt of Cupola Rock (unit **Tpc**) and the basalt of Roney Creek (unit **QTr**) but differ because of generally lower titania contents and occurrence on lower intracanyon benches. Unit **Qf** occurs as two intracanyon benches with elevations of 610 and 488 m. Maximum thickness of the older bench is about 200 m; the younger is about 170 m thick. The age of the older bench is constrained by (1) a K-Ar age of 3.96 ± 1.12 Ma (Table 1) near its base, (2) its position filling a canyon cut into unit **Tlpa** with K-Ar age of 3.64 ± 0.22 Ma and the basalt of Roney Creek with a maximum age of about 1.71 Ma (Table 1), and (3) K-Ar age of 0.46 ± 0.06 Ma on capping unit **Qba** (Table 1). A whole-rock age of 5.19 ± 0.06 Ma was reported from the crest of the older bench (Sutter, 1978; Fiebelkorn and others, 1983), but the location of this sample is in doubt (Priest and others, 1983) because no rock crops out at the published location. The age of the younger bench is constrained by (1) K-Ar ages of 2.05 ± 0.52 Ma and 2.23 ± 0.37 Ma from whole-rock samples (Brown and others, 1980; Fiebelkorn and others, 1983), (2) a K-Ar age of 0 ± 0.1 Ma on plagioclase and a whole-rock sample from the outcrop with the 2.05-Ma age (Table 1), (3) normal magnetic polarity, and (4) location in a canyon probably postdating unit **Qba**, which has an age of 0.46 ± 0.06 Ma. Therefore, the age of the older bench is probably between about 1.7 Ma (approximate age of the basalt of Roney Creek) and 0.46 ± 0.06 Ma (age of unit **Qba**). The younger bench is less than 0.46 Ma in age, but the inverted topography of the younger bench argues against its being younger than the last glaciation

Qb — **Basalt (Pleistocene)** — Fresh, slightly diktytaxitic olivine basalt flows (49.9 percent SiO_2), with fresh or iddingsitized olivine phenocrysts in groundmass of plagioclase, ophitic to subophitic augite, and Fe-Ti oxides. Groundmass clinopyroxene is commonly brown. Consists of two or three blocky-jointed flows with total thickness of approximately 150 m. Normal magnetic polarity. Similar chemically and physically to lava flows of basalt of Foley Ridge (unit **Qf**), although those lavas are typically more highly diktytaxitic. Intercalated and in erosional contact with volcaniclastic rocks of Horse Creek (unit **Qhs**) at confluence of Pothole Creek and Horse Creek

Qhs — **Volcaniclastic rocks of Horse Creek (Pleistocene)** — Weakly to moderately well-indurated debris-flow deposits and minor coarse-grained sandstones. Includes poorly sorted, matrix-supported laharic breccias containing angular to rounded clasts of aphyric and porphyritic basalt and basaltic andesite. Occurs at the confluence of Horse Creek and Pothole Creek, where it is approximately 150 m thick. Pleistocene age inferred from topographic position. Unit **Qhs** is intercalated with unit **Qb** and is overlain by the basalt of Pothole Creek (unit **Qp**)

Qbh — **Basalt of Horse Creek (Pleistocene)** — Zeolitized medium- to dark-gray compact glomeroporphyritic olivine basalt (49.6-51.8 percent SiO_2). Forms intracanyon benches low on the south side of Horse Creek near its confluence with Mosquito and Eugene Creeks. Individual flows are typically blocky to slightly hackly jointed and 3-5 m thick. Total thickness is approximately 140 m. Normal magnetic polarity. One thin section shows plagioclase and iddingsitized olivine phenocrysts in a groundmass of tachylite glass. Pleistocene age inferred from topographic position. Unit **Qbh** is an incised intracanyon sequence of basalt lava flows that lies 183 m lower than the adjacent basalt of Roney Creek (unit **QTr**) that has a maximum K-Ar age of 1.71 ± 0.18 Ma

Qe — **Basaltic andesite of Eugene Creek (Pleistocene)** — Fresh, medium-gray compact olivine basaltic andesite (54.7 percent SiO_2). Forms intracanyon benches high on the south side of Eugene Creek. Individual flows are typically hackly jointed and a meter to several meters thick. Total thickness is approximately 150 m. Normal magnetic polarity. Thin section shows deeply embayed iddingsitized olivine phenocrysts in intergranular groundmass of plagioclase, augite, and Fe-Ti oxides. Pleistocene age inferred from topographic position. Unit **Qe** is an intracanyon lava flow that lies 107 m below the Bear Flat bench

QTpm — **Sedimentary rocks of Cougar Reservoir (upper Pliocene or Pleistocene)** — Subrounded to subangular, cobble- to pebble-sized clasts of andesite of Walker Creek (unit **Tma**) and basalt in a poorly sorted argillaceous sand matrix. Crops out in two places along Cougar Reservoir. Northernmost outcrop has clasts exclusively of andesite of Walker Creek; southernmost outcrop contains a large proportion of basaltic lava clasts. Lithic fragment compositions indicate that at least the northernmost outcrop is entirely from local sources in the Western Cascades. Maximum thickness about 70 m. Probably correlative to the sedimentary rocks of Mill Creek (unit **QTm**)

QTm — **Sedimentary rocks of Mill Creek (upper Pliocene and Pleistocene)** — Not well exposed, but available exposures are composed primarily of poorly indurated debris-flow deposits with subordinate coarse-grained friable sandstones. Debris-flow deposits are poorly sorted with subrounded to subangular pebble- to boulder-sized clasts of andesite of Walker Creek (unit **Tma**) and basalt (basalt of Frissell Point [unit **Tmf**] and others of indeterminate assignment) set in a matrix of sand, silt, and minor clay. Sandstones are coarse grained and poorly sorted. Maximum thickness of about 610 m. Bench of lava of unit **Qf** with K-Ar age of 1.68 ± 0.16 Ma (Table 1) overlies poorly exposed sedimentary rock similar to unit **QTm** about 240 m lower in elevation than the top of unit **QTm**, so part of unit may be older than this. Underlies the basalt of Foley Ridge (unit **Qf**) with K-Ar age of 0 ± 0.1 Ma and unit **Qba** with K-Ar age of 0.46 ± 0.06 Ma (Table 1). Mantles topography that is in part early Pleistocene in age

QTbf — **Basalt and basaltic andesite of Bear Flat (upper Pliocene or Pleistocene)** — Fresh to slightly altered compact olivine basalt and basaltic andesite lava flows (48.3-53.5 percent SiO_2). Basal part of unit exposed in the Eugene Creek drainage has abundant volcaniclastic material, including crudely bedded cinders, agglutinate, surge deposits, and minor conglomerate. Although the lava flow capping unit **QTbf** in the Eugene Creek drainage is a diktytaxitic olivine basalt (48.3 percent SiO_2), most of the lava flows are high-silica (nearly 53 percent SiO_2) basalt. Thin sections typically show sparse, deeply embayed, iddingsitized olivine phenocrysts in an intergranular groundmass of seriate plagioclase, clinopyroxene, glass, and Fe-Ti oxides. Alteration, when present, consists of replacement of olivine by smectite clays. Normal magnetic polarity. Maximum thickness is 460 m at the western margin of Bear Flat. The source of the lava flows of unit **QTbf** is a low, largely intact shield volcano south of Olallie Mountain that may also be the source of the lava flows of the basaltic andesite of Eugene Creek (unit **Qe**). Fills canyons eroded into basalt of Tipsoo Butte (unit **Tmp**) and unit **Tmp3**. Unit **QTbf** is younger than 5.13 ± 0.01 Ma, the average age, weighted for error, of unit **Tmp3** and older than basaltic andesite of Eugene Creek, which occurs in intracanyon benches of lower elevation

QTr — **Basalt of Roney Creek (upper Pliocene or Pleistocene)** — Very fresh, gray, medium-grained diktytaxitic olivine basalt (48.1-50.9 percent SiO_2) containing fresh or iddingsitized olivine phenocrysts in groundmass of plagioclase, ophitic to subophitic augite, and Fe-Ti oxides. Groundmass augite is brown in transmitted light. Rocks are very mafic (usually <50 percent SiO_2). Titania values are variable, ranging from <1.4 percent to >2 percent. Forms thick (up to 18 m) blocky to crudely columnar lava flows that cap ridges east of Horse Creek and west of Mill Creek. Includes both reversely and normally magnetized flows. The maximum thickness is approximately 150 m. Flaherty (1981) obtained dates of 3.5 ± 1.1 Ma and 4.8 ± 1.4 Ma on one sample from the base of the unit opposite Mosquito Creek. Priest and Vogt (1983) published a date of 6.8 ± 1.18 Ma from a lava flow higher in the section. An age of 1.71 ± 0.18 Ma was obtained on plagioclase from a lava flow with reversed magnetic polarity intercalated in volcaniclastic rocks of unit **QTs** immediately below the base of unit **QTr**. An age of 1.68 ± 0.16 Ma was obtained on plagioclase from a diktytaxitic lava flow about 0.25 km west of the map boundary (see location of sample BR-37 on Figure 1). This flow is similar in stratigraphic position and composition to unit **QTr**. The 1.71-Ma and 1.68-Ma ages are considered to be more reliable than the older ages because of stratigraphic relationships and lower statistical errors. The mean age of these two samples is 1.70 ± 0.02 Ma. Both the 1.68-Ma and 1.71-Ma ages fall within a normal polarity interval of the Matuyama reversed epoch (LaBrecque and others, 1977), but both analyzed rocks have reversed magnetic polarity. The two lava flows were therefore probably erupted during reversed polarity intervals at 1.62-0.95 Ma or 2.41-1.83 Ma (intervals of LaBrecque and others, 1977). At one standard deviation, the mean age overlaps these reversed polarity intervals at ages of 1.62-1.50 Ma and 1.90-1.83 Ma

QTs — **Volcaniclastic rocks (upper Pliocene or Pleistocene)** — Debris flows and coarse sandstones with abundant clasts of diktytaxitic and dense basalt; includes occasional thin basaltic lava flows. Maximum thickness of about 90 m in the Horse Creek area. The unit overlies basalt of Cupola Rock (unit **Tpc**) with probable basal age of 2.7-2.41 Ma. A reversely polarized lava flow in the uppermost part of unit **QTs** near Horse Creek yielded a K-Ar age of 1.71 ± 0.18 Ma. The reversed polarity is consistent with eruption during reversed polarity intervals at 1.62-0.95 Ma or 2.41-1.83 Ma (intervals of LaBrecque and others, 1977). At one standard deviation, the K-Ar age overlaps these reversed polarity intervals at 1.89-1.83 Ma and 1.62-1.53 Ma

Tpc — **Basalt of Cupola Rock (upper Pliocene)** — Fresh, diktytaxitic basalt (47.1-52.2 percent SiO_2) similar in mineralogy and texture to the basalt of Foley Ridge (unit **Qf**) and basalt of Roney Creek (unit **QTr**). Titania values are generally about 1.7-2.5 percent. Most typical rock type is holocrystalline, with intersertal to subophitic brownish clinopyroxene between a network of plagioclase, olivine, and acicular Fe-Ti oxides. Generally has minor fresh or slightly iddingsitized olivine phenocrysts. Somewhat finer grained and with higher titania values than the basalt of Foley Ridge. Partially fills a canyon cut in the basalt of Foley Ridge and the basalt of Roney Creek. Maximum thickness of unit **Tpc** is about 400 m near Scott Creek. K-Ar ages are 2.6 ± 0.2 Ma and 2.2 ± 0.1 Ma at base (Armstrong and others, 1975; Fiebelkorn and others, 1983) and 0.88 ± 0.33 Ma in upper part (Table 1). Underlies basalt of Roney Creek with K-Ar age of about 1.7 Ma and overlies basalt of Scott Creek (unit **Tpsl**) with K-Ar age of 2.35 ± 0.14 Ma (Table 1). The 0.88-Ma age is probably not accurate because of the high analytical error and position below basalt of Roney Creek. Average age of the basal rocks, weighted for error, is 2.28 ± 0.09 Ma. Mean age of basal rocks is 2.4 ± 0.3 Ma. The two basal samples have normal magnetic polarity, suggesting an age in the 2.84- to 2.41-Ma normal polarity interval of the Gauss magnetic normal polarity epoch (magnetic polarity time scale of LaBrecque and others [1977]). At one standard deviation, the mean age overlaps the age of this polarity interval at 2.7-2.41 Ma. K-Ar age of unit and chemical composition are essentially the same as the basalt of Scott Creek, so the two units may be part of the same eruptive episode

Tpsl — **Basalt of Scott Creek (upper Pliocene)** — Fine-grained lava flows with interbedded pillows and palagonitic sedimentary rocks and minor diatomite. Lava flows are dense basalt similar in chemical composition (48.4-50.9 percent SiO_2 and 1.70-2.26 percent titania) to the basalt of Cupola Rock (unit **Tpc**). Maximum thickness is about 200 m. K-Ar age of 2.35 ± 0.14 Ma (Table 1). Overlain by basalt of Cupola Rock with basal age of approximately 2.7-2.41 Ma. Similarity of age and composition to the basalt of Cupola Rock suggests that the two units may be part of the same eruptive episode. Dikes occurring geographically within unit **Tpsl** are of same composition as unit **Tpsl**, suggesting that it was erupted from local vents

Tpm — **Basalt of Mosquito Creek (lower and upper Pliocene)** — Medium-gray, compact, fine-grained olivine basalt (49.6-51.8 percent SiO_2) in a flow-on-flow sequence in which individual lava flows are typically 3 to 6 m thick. Most are blocky jointed. Some flows are >15 m thick and have crudely columnar-jointed bases. Forms intracanyon benches at the confluence of Horse Creek and Mosquito Creek. Thin section shows deeply embayed, iddingsitized olivine phenocrysts in an intergranular groundmass of plagioclase, augite, olivine, and Fe-Ti oxides. Titania values are low, ranging from 0.97 to 1.27 percent. Maximum thickness is 400 m. Normal magnetic polarity. The absolute age of unit is uncertain. Weak evidence indicates that unit probably does not represent intracanyon flows in the modern Horse Creek drainage. Rocks of the unit are not fresh in hand sample or in thin section. The thickness of the lavas and their exposure nearly to the bottom of the Horse Creek drainage also argue against a young age. They probably occupy a canyon of ancestral Horse Creek. Physically they most resemble rocks of unit **Tlpa**, although generally they are more mafic and are interpreted to reflect the first episode of volcanism after downfaulting along Horse Creek. Unit **Tcm** thus considered equivalent in time to unit **Tlpa**. A K-Ar date from near the base of unit **Tlpa** is 3.64 ± 0.22 Ma

Tlpa — **Basaltic andesite and andesite (lower and upper Pliocene)** — Gray to black, dense basaltic andesite interbedded with subordinate andesite, conglomerate, and sandstone; contains very minor, thin ash-flow tuff. Andesite, tuff, and sedimentary rocks are confined to upper part of the unit. Basaltic andesite lava flows are generally fine grained with microphenocrysts of olivine with or without orthopyroxene in a pilotaxitic groundmass. One distinctive flow has phenocrysts of plagioclase and clinopyroxene and is altered to a green color. Andesite is similar to basaltic andesite but has more orthopyroxene phenocrysts. A distinctive ash-flow tuff interbed is brown and densely welded to nonwelded. In the nonwelded zone, tuff is rich in 0.5- to 10-cm-long obsidian lithic fragments that are flattened in the welded zone. Orange cinderlike clasts are also characteristic of the welded tuff. The matrix is composed of fine ash and brown glass. Unit **Tlpa** has maximum thickness of about 370 m. K-Ar age of 3.64 ± 0.22 Ma (Table 1) was obtained from near its base. Unit is overlain by basalt of Cupola Rock (unit **Tpc**) with probable basal age of 2.7-2.41 Ma

Tmi — **Ignimbrite of Trailbridge Reservoir (upper Miocene or lower Pliocene)** — Highly plagioclase-phyric, gray basaltic andesite ash-flow tuff (Taylor, 1968). Unit is 24 m thick. K-Ar age of 5.5 ± 0.2 Ma (Armstrong and others, 1975; Fiebelkorn and others, 1983)

Upper Miocene and lower Pliocene volcanic and volcaniclastic rocks

Equivalent to the volcanic rocks of the early High Cascade episode of Priest and others (1983) and the lower part of the volcanic rocks of the High Cascade Range and Boring Lava of Peck and others (1964)

Tmp3 — **Olivine basaltic andesite and aphyric basaltic andesite (lower Pliocene)** — Medium- to dark-gray, fine-grained, compact, platy-jointed olivine basaltic andesite lava flows (53.3-55.3 percent SiO_2). Thin sections show sparse rounded microphenocrysts of iddingsitized olivine in a subtrachytic groundmass of plagioclase, augite, and Fe-Ti oxides. Unit occurs on Horsepasture Mountain, where it fills canyons cut into units **Tmp2**, **Tmpa**, and **Tmps**; the ridge between Tipsoo Butte and Yankee Mountain, where it occupies a canyon in unit **Tmp2**; and Pyramid Mountain, Olallie Mountain, and Lamb Butte, where it fills canyons cut in basalt of Tipsoo Butte (unit **Tmp**). Normal magnetic polarity. Maximum thickness is approximately 150 m on Pyramid Mountain. Plagioclase separate from an Olallie Mountain lava gave a K-Ar age of 4.96 ± 0.37 Ma, and a whole-rock age of 5.14 ± 0.08 Ma was obtained from a lava at Horsepasture Mountain (Table 1). Average age, weighted for error, is 5.13 ± 0.01 Ma

Tmp2 — **Porphyritic olivine basalt (upper Miocene or lower Pliocene)** — Light- to medium-gray compact porphyritic olivine basalt and (rarely) basaltic andesite (50.1-53.6 percent SiO_2). Thin section shows 10-25 percent plagioclase phenocrysts with 1-5 percent iddingsitized olivine in an intergranular groundmass of plagioclase, augite, olivine, and Fe-Ti oxides. Unit occurs on Sawtooth Ridge, O'Leary and Horsepasture Mountains, English and French Mountains, and along the ridge crest between Tipsoo Butte and Lowder Mountain. It also occurs in a downfaulted block along Eugene Creek. Not recognized in map area north of the McKenzie River. Maximum thickness approximately 210 m. Normal magnetic polarity. Published K-Ar dates from lava flows at English Mountain are 10.2 ± 1.0 Ma and 9.6 ± 1.5 Ma on a sample from the top of the unit (Priest and Vogt, 1983) and 6.5 ± 4 Ma on a sample from the base of the unit (Flaherty, 1981). Unit **Tmp2** is overlain by unit **Tmp3** with average age, weighted for error, of 5.13 ± 0.01 Ma and underlain by basalt of Tipsoo Butte (unit **Tmp**), which has an approximate age of 6.3 Ma to > 5.1 Ma

Tmpa — **Porphyritic two-pyroxene andesite and dacite (upper Miocene)** — Medium-gray, brown-weathering porphyritic andesite lava flows (59.7-68.2 percent SiO_2). Includes at least one thin andesitic ash-flow tuff at the base of the unit on Horsepasture Mountain. Thick flows are columnar jointed, with well-developed subhorizontal platy jointing. Often forms prominent cliffs. Thin section typically shows 10-20 percent plagioclase phenocrysts with lesser amounts of hypersthene, augite, and rare hornblende in an intersertal devitrified groundmass of plagioclase, augite, hypersthene, and Fe-Ti oxides. Occurs on Horsepasture Mountain, Taylor Castle, and in the downfaulted block east of Horse Creek. Maximum exposed thickness is 80 m at Taylor Castle. Normal magnetic polarity. Overlain by units **Tmp2** and **Tmp3** at Horsepasture Mountain. At Taylor Castle, unit **Tmpa** overlies basalt of Tipsoo Butte (unit **Tmp**), which has an approximate age of 6.3 Ma to > 5.1 Ma. Unit **Tmpa** is intercalated into the upper part of basalt of Tipsoo Butte on the ridge trending east from Taylor Castle and in the downfaulted block east of Horse Creek. Flaherty (1981) obtained a K-Ar date of 5.5 ± 2 Ma on an andesite lava flow of unit **Tmpa** intercalated with basalt of Tipsoo Butte east of Taylor Castle. This date seems reasonable but has a large analytical error

Tmp — **Basalt of Tipsoo Butte (upper Miocene and lower Pliocene)** — Dark-gray to gray, fresh basalt and basaltic andesite with fresh or iddingsitized olivine phenocrysts set in a medium-grained subophitic groundmass. Less commonly, flows have fine-grained intersertal, intergranular, or felty groundmasses and are rarely hypohyaline. West of Lookout Mountain and in the Tipsoo Butte-Sawtooth Ridge areas, basal flows are diktytaxitic basalt. Minor pillow lavas occur locally near base of section. Unit contains local interbeds of ash-flow tuff, volcaniclastic sediment, cinders, and andesite. Maximum thickness is about 400 m at Olallie Mountain. Plug near Frissell Point (SE¼ sec. 6, T. 16 S., R. 6 E.) probably marks one vent area for the unit. In Lookout Ridge-Frissell Point area, age is constrained by the following: (1) a lava in the uppermost part (Table 1) has a K-Ar age of 4.43 ± 0.67 Ma; (2) unit **Tmi** with a K-Ar age of 5.5 ± 0.2 Ma (Armstrong and others, 1975; Fiebelkorn and others, 1983) locally overlies the unit; (3) a basal lava flow has K-Ar ages of 6.37 ± 0.09 Ma (Table 1) and 8.39 ± 0.36 Ma (Priest and Vogt, 1983), and average of the two ages (weighted for error) is 6.49 ± 0.09 Ma; (4) this lava flow overlies lava flow of the andesite of Walker Creek (unit **Tma**) with an age of 8.86 ± 0.34 Ma (recalculated from Brown and others, 1980); (5) other basal lava flows overlie the basalt of Frissell Point (unit **Tmf**) with a K-Ar age of 6.3 ± 0.2 Ma (Armstrong and others, 1975; Fiebelkorn and others, 1983); (6) unit **Tmp** overlies basalt of Frissell Creek (unit **Tml**) with a K-Ar age of 6.18 ± 0.08 Ma at the top (Table 1); (7) diatomite from base of unit (sample BR-48 on map) contained a centric diatom equal or related to the genus *Mesdictyon*, an early Hemphillian fossil (preliminary unpublished data of J.P. Bradbury, 1988). In the Tipsoo Butte-Olallie Mountain area, age is constrained by the following: (1) unit is overlain by unit **Tmp3** with K-Ar ages of 4.96 ± 0.37 Ma and 5.14 ± 0.08 Ma (average, weighted for error, is 5.13 ± 0.01 Ma; Table 1); (2) basal flow has K-Ar age of 7.80 ± 0.77 Ma (Brown and others, 1980; Priest and Vogt, 1983). Mean age, based on all available data, is 6.85 ± 1.85 Ma. Based on the most precise data, the age is approximately equal to 6.3 Ma at base and > 5.1 Ma at top. Age and lithology are similar to lava flows of the Deschutes Formation described by Taylor (1980) and Smith (1986)

Tmps — **Volcaniclastic rocks (upper Miocene)** — Includes cobble and gravel conglomerate, coarse-grained sandstone, mudstone, cinder-cone deposits, and minor diatomite; chiefly cinder-cone deposits east of English Mountain. Conglomerate in uppermost part contains clasts of the basalt of Tipsoo Butte (unit **Tmp**) and unit **Tmp2**. Unit **Tmps** includes sedimentary rocks intercalated in lower part of basalt of Tipsoo Butte. Maximum thickness approximately 180 m at Horsepasture Mountain, where the sedimentary rocks are overlain by lava flows of units **Tmp2** and **Tmp3**. Probably overlain by andesites of unit **Tmpa** at Horsepasture Mountain, but the exact nature of the relation is obscured by glacial drift. Unit **Tmps** is approximately the same age as basalt of Tipsoo Butte, about 6.3 Ma to >5.1 Ma

Tmga — **Andesite of Frissell Point (upper Miocene)** — Black glassy columnar-jointed andesite lava flows with maximum thickness about 120 m. Because unit is overlain by basalt of Tipsoo Butte (unit **Tmp**) with K-Ar age of 6.3 Ma to > 5.1 Ma and underlain by the basalt of Frissell Point with a K-Ar age of 6.3 ± 0.2 Ma (Table 1), its age is approximately 6.3 Ma

Tmcc — **Cinder cone deposits (upper Miocene)** — Moderately indurated cinder deposits with bedding indicative of a cinder cone. Cut by numerous north- to northwest-trending andesite dikes, possibly related to the same eruptive episode. Maximum thickness is about 180 m. Overlain and probably related to unit **Tmga**. Because unit **Tmcc** is overlain by basalt of Tipsoo Butte (unit **Tmp**) with basal K-Ar age of approximately 6.3 Ma and underlain by the basalt of Frissell Point (unit **Tmf**) with a K-Ar age of 6.3 ± 0.2 Ma (Table 1), age is approximately 6.3 Ma

Tmf — **Basalt of Frissell Point (upper Miocene)** — Medium-gray vesicular olivine basalt (50.4 percent SiO_2) with 30 percent plagioclase phenocrysts averaging 1 cm in length and 5 percent highly resorbed olivine 5-6 mm in diameter. The groundmass has subophitic clinopyroxene with randomly oriented plagioclase, intergranular Fe-Ti oxide, and numerous 0.5- to 1-mm olivine microphenocrysts. Best exposed north and east of Frissell Point, where it lies in the bottom of an east-west paleovalley system filled by lava flows of basalt of Tipsoo Butte (unit **Tmp**). Maximum thickness is about 90 m. K-Ar age is 6.3 ± 0.2 Ma (Armstrong and others, 1975; Fiebelkorn and others, 1983). Because unit overlies lava flows of basalt of Frissell Creek (unit **Tml**) with a K-Ar age of 6.18 ± 0.08 Ma (Table 1) and is overlain by basalt of Tipsoo Butte (unit **Tmp**) with K-Ar age of 6.3 Ma to > 5.1 Ma, 6.3-Ma age is reasonable

Tt — **Tuff of Tipsoo Butte (upper Miocene)** — Cliff-forming cream-colored nonwelded dacite(?) ash-flow and possibly air-fall and hyaloclastic tuff with maximum thickness about 150 m. Overlain by basalt of Tipsoo Butte (unit **Tmp**) with K-Ar age of approximately 6.3 Ma at base and underlain by andesite of Walker Creek (unit **Tma**) with K-Ar age of approximately 8.7 Ma at top. Possibly equivalent to various tuff units in lower part of Deschutes Formation of Taylor (1980) and Smith (1986)

Tml — **Basalt of Frissell Creek (upper Miocene)** — Basalt, basaltic andesite, and minor andesite lava with local interbeds of debris flow deposits, breccia, and epiclastic volcaniclastic rocks. Lava flows are commonly platy or blocky and dark gray; groundmass has pilotaxitic to felty plagioclase and intergranular ferromagnesian minerals with or without fresh intersertal tachylite or sideromelane. Phenocrysts are of fresh, iddingsitized, or rarely altered olivine in basalt and basaltic andesite and orthopyroxene and clinopyroxene in andesites. Locally difficult to separate from basaltic andesite of the East Fork (unit **Tmb**) in isolated outcrops, which has led to uncertainly located contacts west of Lookout Mountain. Rocks of unit **Tml** are generally slightly fresher than basaltic andesite of the East Fork, a series of flows in which all glass is altered. Also, the ratio of basalt and basaltic andesite to more silicic rocks is higher relative to basaltic andesite of the East Fork. Lava flows apparently issued from a swarm of northwest-trending dikes immediately north of the map area, where they were mapped as the Iron Mountain formation by Avramenko (1981). As much as 610 m thick on the south side of Frissell Point. Overlies basaltic andesite of the East Fork and andesite of Walker Creek (unit **Tma**) (age of uppermost part of both approximately 8.7 Ma) and underlies the basalt of Tipsoo Butte (unit **Tmp**) (basal age approximately 6.3 Ma). K-Ar ages are 3.98 ± 0.06 (Sutter, 1978; Fiebelkorn and others, 1983) and 6.18 ± 0.08 Ma near the top and 6.84 ± 0.58 Ma near the bottom (Table 1). The sample with the 3.98-Ma age may be inaccurately located (Priest and others, 1983). Age is approximately 6.8-6.3 Ma based on isotopic ages and stratigraphic relationships

Middle and upper Miocene volcanic and volcaniclastic rocks

Equivalent to the volcanic rocks of the late Western Cascade episode of Priest and others (1983) and to the Sardine Formation as mapped in this area by Peck and others (1964)

Tcr — **Andesite of Castle Rock (upper Miocene)** — Light-gray, nearly aphyric two-pyroxene andesite (60 percent SiO_2) lava capping Castle Rock. Characterized by minor phenocrysts of either orthopyroxene ± clinopyroxene pseudomorphic after olivine or iddingsitized olivine ± xenocrystic quartz with reaction coronas of clinopyroxene and minor iddingsitized olivine. Possible plug dome. Maximum thickness of unit is about 180 m. K-Ar age is 9.31 ± 0.44 Ma (Table 1)

Tmb — **Basaltic andesite of the East Fork (middle and upper Miocene)** — Chiefly basaltic andesite and mafic andesite (SiO_2 close to 58 percent) with minor basalt. Dark-gray, dense, blocky lava flows, with minor breccia and debris-flow deposits. Groundmass is poorly crystallized and fine grained. Generally not highly phyric, and most phenocrysts are small (about 1-2 mm). Phenocrysts are olivine, clinopyroxene, and plagioclase with or without minor orthopyroxene. Up to 150 m thick on north side of McKenzie River. Interbedded in andesite of Walker Creek (unit **Tma**) and equivalent in age (approximately 13.5-8.7 Ma). Therefore K-Ar age of 8.1 ± 2.3 Ma (Priest and Vogt, 1983) from lower part of unit at the East Fork of South Fork of the McKenzie River is probably inaccurate. Basalt sample reportedly from Lookout Ridge yielded age of 8.69 ± 0.11 Ma (Sutter, 1978; Fiebelkorn and others, 1983); however, no basalt crops out at this location, although outcrop of the upper part of basaltic andesite of the East Fork occurs about 100 m away. If published location is slightly in error, this sample dates upper part of unit. Unit is equivalent to unit **Tmb** of Priest and others (1987) which, because of low-grade alteration, was similarly difficult to analyze with K-Ar method

Tmtl — **Tuff of Lookout Creek (Miocene or Pleistocene?)** — Medium-gray andesite ash-flow tuff with about 2 percent plagioclase, 0.5 percent clinopyroxene, and trace of orthopyroxene crystals in matrix. Contains abundant light-gray pumice lapilli and subrounded bombs of poorly vesiculated andesite (62.2 percent SiO_2). Well exposed in a 70-m section on the south side of Lookout Creek. K-Ar age is 1.59 ± 0.47 Ma on a plagioclase separate (Table 1). Field relationships are more consistent with Miocene age (similar to tuff of Rush Creek [unit **Tmt**]) than a Pleistocene age

Tma — **Andesite of Walker Creek (middle and upper Miocene)** — Chiefly highly porphyritic, reddish-gray plagioclase-rich two-pyroxene andesite forming thick, locally platy lava flows and minor debris-flow deposits, sandstones, and mudstones. Locally includes minor basaltic andesite and dacite lava flows. Generally contains quite large and abundant (25-40 percent) phenocrysts in devitrified or very fine-grained groundmass of cryptofelsic material, plagioclase, and pyroxene. Queried in the Lookout Creek area, where locally difficult to distinguish from andesite and dacite of the Blue River. Unit is at least 610 m thick at Cougar Reservoir and Foley Springs (base not exposed there). Most precise K-Ar data on uppermost part are from Lookout Ridge, where an andesite has a K-Ar age of 8.86 ± 0.34 Ma (recalculated from Brown and others, 1980), and an interbedded basalt of basaltic andesite of the East Fork (unit **Tmb**) has a K-Ar age of 8.69 ± 0.11 Ma (Sutter, 1978; Fiebelkorn and others, 1983). Average age for these two rocks, weighted for error, is 8.71 ± 0.10 Ma. Tuff of Rush Creek (unit **Tmt**) immediately underlying andesite of Walker Creek (unit **Tma**) west of the map area has an age of 13.8 ± 0.8 Ma. Similar age of 13.2 ± 0.7 Ma was obtained near the middle of section of unit **Tma** at Cougar Reservoir (Priest and Vogt, 1983; Priest and Woller, 1983). Mean of these two ages, 13.5 Ma, is an approximation of basal age. Age is therefore approximately 13.5-8.7 Ma

Tmd — **Dacite and andesitic to dacitic volcaniclastic rocks (middle and upper Miocene)** — Composed chiefly of andesitic to dacitic block-and-ash flows; also includes lesser amounts of air-fall and ash-flow tuff, epiclastic sedimentary rock, and interbedded dacite lava flows. Forms hoodoos on the ridges north of Taylor Castle and Horsepasture Mountain. Hornblende is the most common mafic mineral in the dacitic tuffs and lava flows. Maximum thickness is approximately 210 m on a ridge northeast of Horsepasture Mountain. Unit **Tmd** is interbedded in the upper part of the andesite of Walker Creek (unit **Tma**)

Tmh — **Hornblende-bearing andesite (middle Miocene)** — Crops out in only one locality near the Blue River, where unit is about 50 m thick. Fills paleocanyon cut in the tuff of Rush Creek (unit **Tmt**) and tuff of Cougar Reservoir (unit **Ttc**), the base of which is at same elevation as base of andesite of Walker Creek (unit **Tma**). Unit **Tmh** is therefore probably about the same age as the base of andesite of Walker Creek (about 13.5 Ma)

Tmt — **Tuff of Rush Creek (middle Miocene)** — Chiefly nonwelded ash-flow tuff with subordinate welded ash-flow tuff and air-fall tuff, debris-flow deposits, and fine-grained sedimentary rocks. Most common rock type is soft, cream-colored, nonwelded ash-flow tuff that is unstable on steep slopes and responsible for most large landslides in map area. Minor welded tuff occurs locally, mainly west of map boundary (Priest and Woller, 1983). Shown queried where locally difficult to distinguish from tuff of Cougar Reservoir (unit **Ttc**). Maximum thickness of unit **Tmt** in map area is about 210 m at Lookout Creek. Interbedded in the lower part of and underlies andesite of Walker Creek (unit **Tma**). Unit **Tmt** has a K-Ar age of 13.8 ± 0.8 Ma immediately west of the map area, where unit underlies andesite of Walker Creek (unit **Tma**) (Priest and Vogt, 1983; Priest and Woller, 1983)

Oligocene and lower Miocene volcanic and volcaniclastic rocks

Equivalent to the volcanic rocks of the early Western Cascade episode of Priest and others (1983) and to the Little Butte Volcanic Series of Peck and others (1964)

Ta — **Andesite and dacite of the Blue River (Oligocene? to lower Miocene?)** — Moderately altered andesite to dacite (58.0-69.6 percent SiO_2) lava flows. Chiefly fine grained and hypohyaline with minor phenocrysts of plagioclase and pyroxene. Commonly displays varying degrees of alteration to birefringent clay minerals and fine-grained quartz; some dacite vitrophyres are relatively fresh. Contains subordinate, highly phyric two-pyroxene andesite. Generally interbedded with tuffaceous epiclastic sedimentary rocks and debris-flow deposits of tuff of Cougar Reservoir (unit **Ttc**). Unit **Ta** is probably locally intrusive or invasive into tuff of Cougar Reservoir; field relations are generally ambiguous on this point. Maximum thickness about 340 m. K-Ar age of 14.0 ± 0.2 Ma (Sutter, 1978; Fiebelkorn and others, 1983) and $^{40}Ar/^{39}Ar$ isochron age of 10.8 ± 0.16 Ma (Table 2) were obtained in upper part of unit. Both samples are from areas subjected to at least low-grade alteration, so the isotopic ages may not be accurate. The complicated age spectra of the $^{40}Ar/^{39}Ar$ age data (Table 2) cast doubt on the validity of that age. Unit **Ta** is overlain by tuff of Rush Creek (unit **Tmt**) so is older than 13.8 ± 0.8 Ma

Ttc — **Tuff of Cougar Reservoir (Oligocene? to lower Miocene?)** — Tuffaceous debris-flow deposits, volcaniclastic sandstone and mudstone with subordinate nonwelded ash-flow tuff, and minor welded ash-flow tuff. Pumice lapilli in ash-flow tuffs are generally too altered to give meaningful chemical composition. One altered sample has 72.5 percent SiO_2. Chemically analyzed lithic clasts in the debris-flow deposits have 49-60 percent SiO_2; about two-thirds of analyzed clasts have iron-enriched (tholeiitic) compositions. Some analyzed clasts are from debris-flow deposits too thin to map separately from andesite and dacite of the Blue River (unit **Ta**). Unit **Ttc** locally includes minor andesite (andesite and dacite of the Blue River), basalt (basalt and basaltic andesite of the Blue River [unit **Tb**]), and rhyodacite flows (rhyodacite of Cougar Creek [unit **Tr**]) that are too thin to show at the map scale. All rocks in unit **Ttc** contain moderately altered to fine-grained birefringent phyllosilicates with or without fine-grained quartz; K-Ar ages for unit are therefore not reliable. Although base is not exposed, unit is at least 335 m thick in map area and probably much thicker. Unit **Ttc** is intruded by unit **Tmic**, with age of 16.3 ± 1.8 Ma (Brown and others, 1980), and is locally overlain by queried outcrops of basalt and basaltic andesite of the Blue River, with K-Ar ages of 20.4 ± 2.0 Ma, 35.3 ± 0.9 Ma, and 14.7 ± 0.3 Ma (see discussion of basalt and basaltic andesite of the Blue River, below) (Sutter, 1978; Fiebelkorn and others, 1983). Unit **Ttc** is petrologically identical to, and probably contemporaneous with, Breitenbush Tuff in North Santiam area. If coeval with Breitenbush Tuff, then upper part of unit could be as young as about 18 Ma, whereas lower part could be at least as old as 26.46 ± 0.52 Ma (Priest and others, 1987)

Tb — **Basalt and basaltic andesite of the Blue River (Oligocene? to lower Miocene?)** — Fine-grained, dark-gray, nearly aphyric basalt and basaltic andesite (51.5-55.8 percent SiO_2) lava flows generally altered in varying degrees to moderately birefringent clay minerals and zeolite. Generally calc-alkaline in chemical composition, although some flows have modest iron enrichment. Queried where locally difficult to distinguish from basaltic andesite of the East Fork (unit **Tmb**). Maximum thickness is about 150 m in the Blue River area but could be as much as 210 m, assuming that the queried unit at Lookout Creek is part of this sequence. Interbedded with andesite and dacite of the Blue River (unit **Ta**) and tuff of Cougar Reservoir (unit **Ttc**) and therefore of approximately the same age. Queried unit on northwest flank of Lookout Ridge has K-Ar ages ranging from 35.3 ± 0.9 Ma (Sutter, 1978; Fiebelkorn and others, 1983) to 11.8 ± 0.5 Ma (Table 1). A 30-60-mesh split from whole-rock sample dated at 35.3 Ma yielded K-Ar age of 14.7 ± 0.3 Ma (Sutter, 1978; Fiebelkorn and others, 1983). Interpretation of age data from this queried unit is consequently uncertain. K-Ar age of 20.4 ± 2.0 Ma was obtained for basalt whose published location is 1.3 km northeast of another queried outcrop of the unit on Lookout Creek (Sutter, 1978; Fiebelkorn and others, 1983). Queried outcrop, a prominent quarry, is most likely location of the K-Ar date (A.R. McBirney, oral communication, 1987). Andesite of Walker Creek (unit **Tma**) occurs laterally from quarry in all directions, but contact relations with rock in quarry are obscure

Tr — **Rhyodacite of Cougar Creek (Oligocene? to lower Miocene?)** — Gray platy rhyodacite (72.2 percent SiO_2) lava with somewhat altered, weathered appearance; contains 4 percent 0.5- to 1.0-mm-long plagioclase phenocrysts in hyalopilitic, devitrified groundmass. Maximum thickness about 90 m. Interbedded with, and therefore same age as, tuff of Cougar Reservoir (unit **Ttc**)

INTRUSIVE ROCKS

Tib — **Basaltic dikes and plugs (middle Miocene to lower Pliocene)**

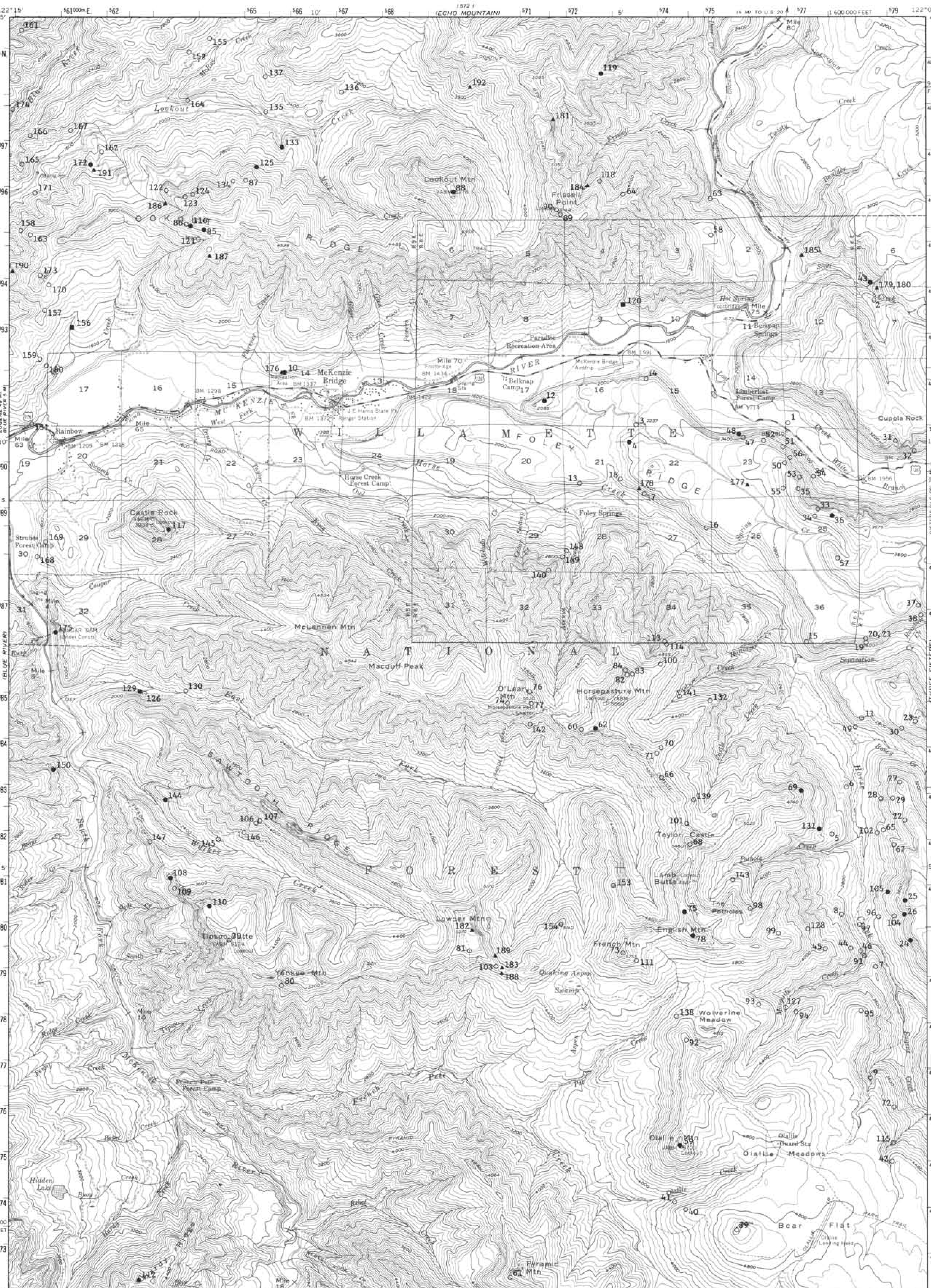
Tmic — **Intrusion of Cougar Reservoir (middle Miocene)** — Dark-gray, glassy, porphyritic two-pyroxene dacite intrusive. Prominent cliff-forming unit that forms abutments of Cougar Reservoir dam. Maximum thickness about 213 m. K-Ar age is 16.2 ± 1.8 Ma (Brown and others, 1980; Priest and Vogt, 1983)

Tia — **Andesitic dikes and plugs (Oligocene to Miocene)** — Two-pyroxene or hornblende-bearing andesite dikes and plugs. Local lithologic similarity to andesite of Walker Creek (unit **Tma**) and unit **Tmh** suggests that at least some of unit relates to them. Unit **Tia** includes altered dikes and queried units on western margin of map area north of McKenzie River that closely resemble andesite and dacite of the Blue River (unit **Ta**) and are probably contemporaneous with it. Queried unit **Tia** at this location may be andesite and dacite of the Blue River invasive into tuff of Cougar Reservoir (unit **Ttc**)

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
DONALD A. HULL, STATE GEOLOGIST

SAMPLE LOCATION MAP AND DATA TABLES FOR THE MCKENZIE BRIDGE QUADRANGLE, LANE COUNTY, OREGON

GMS-48
Geologic Map of the McKenzie Bridge Quadrangle, Lane County, Oregon
By G.R. Priest and others
Plate 2
Funded by U.S. Department of Energy
Grant No. DE-FG07-84 ID 12526



SCALE 1:62500

CONTOUR INTERVAL 80 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Control by USGS and USC&GS
Topography from aerial photographs by multiplex methods
Aerial photographs taken 1954. Advance field check 1955
Polyconic projection. 1927 North American datum
10,000-foot grid based on Oregon coordinate system, south zone
1000-meter Universal Transverse Mercator grid ticks, zone 10, shown in blue
Dashed land lines indicate approximate locations
Unchecked elevations are shown in brown

UTM GRID AND 1955 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

OREGON
QUADRANGLE LOCATION

Geology by George R. Priest, Gerald L. Black, and Neil M. Woller (Oregon Department of Geology and Mineral Industries) and Edward M. Taylor (Department of Geology, Oregon State University)

Field work conducted in 1986

Cartography by Mark E. Neuhaus

▲ **Sample point for K-Ar date** — Date are listed in Table 1

■ **Sample point for $^{40}Ar/^{39}Ar$ date** — Data are listed in Table 2

○ **Sample point for chemical analysis** — Data are listed in Table 3

● **Sample point for K-Ar age and chemical analysis** — Data are listed in Table 1 and Table 3

Table 2. Isotopic age data for samples analyzed by the $^{40}Ar/^{39}Ar$ method

Map no.	Sample no.	Unit	Lat (N)	Long (W)	Heating increment	$^{40}Ar/^{36}Ar$	$^{40}Ar/^{34}Ar$	$^{37}Ar/^{40}Ar$	% ^{39}Ar of total	% $^{40}Ar_{rad.}$	Age ± 1σ (Ma)	Analyst
120	ET-74	Tml	44°11'39"	122°04'59"	1	314.14	22.629	0.03414	5.4	6.0	4.82±0.92	
					2	335.22	12.939	0.07255	8.7	12.2	5.64±0.40	
					3	471.43	5.512	0.16391	17.9	38.5	7.56±0.08	1
					4	447.43	4.991	0.00084	23.4	37.7	6.71±0.11	
					5	441.58	4.483	0.54288	18.7	37.5	6.00±0.19	
					6	326.67	16.402	0.11604	25.8	10.3	6.04±0.14	
		Total fusion age (all steps)									6.35	
		Isochron age (all steps)									6.84±0.58	
		$^{40}Ar/^{36}Ar$ Intercept							290±11			
156	BR-31	Ta	44°11'23"	122°13'58"	1	439.31	10.266	0.01942	4.9	32.7	11.93±1.41	
					2	1700.8	3.912	0.05252	21.3	83	11.53±0.10	1
					3	373.07	3.253	0.21822	51.4	93.9	10.85±0.09	
					4	372.41	14.043	0.11649	17.4	21.4	10.71±0.60	
					5	292.15	277.38	0.03261	4.6	0.0	0.0	
					6	289.48	2808.8	0.00386	0.0	0.0	0.0	
		Total fusion age (all steps)									10.48	
		Isochron age (first four steps)									10.82±0.16	
		$^{40}Ar/^{36}Ar$ intercept							323±32			

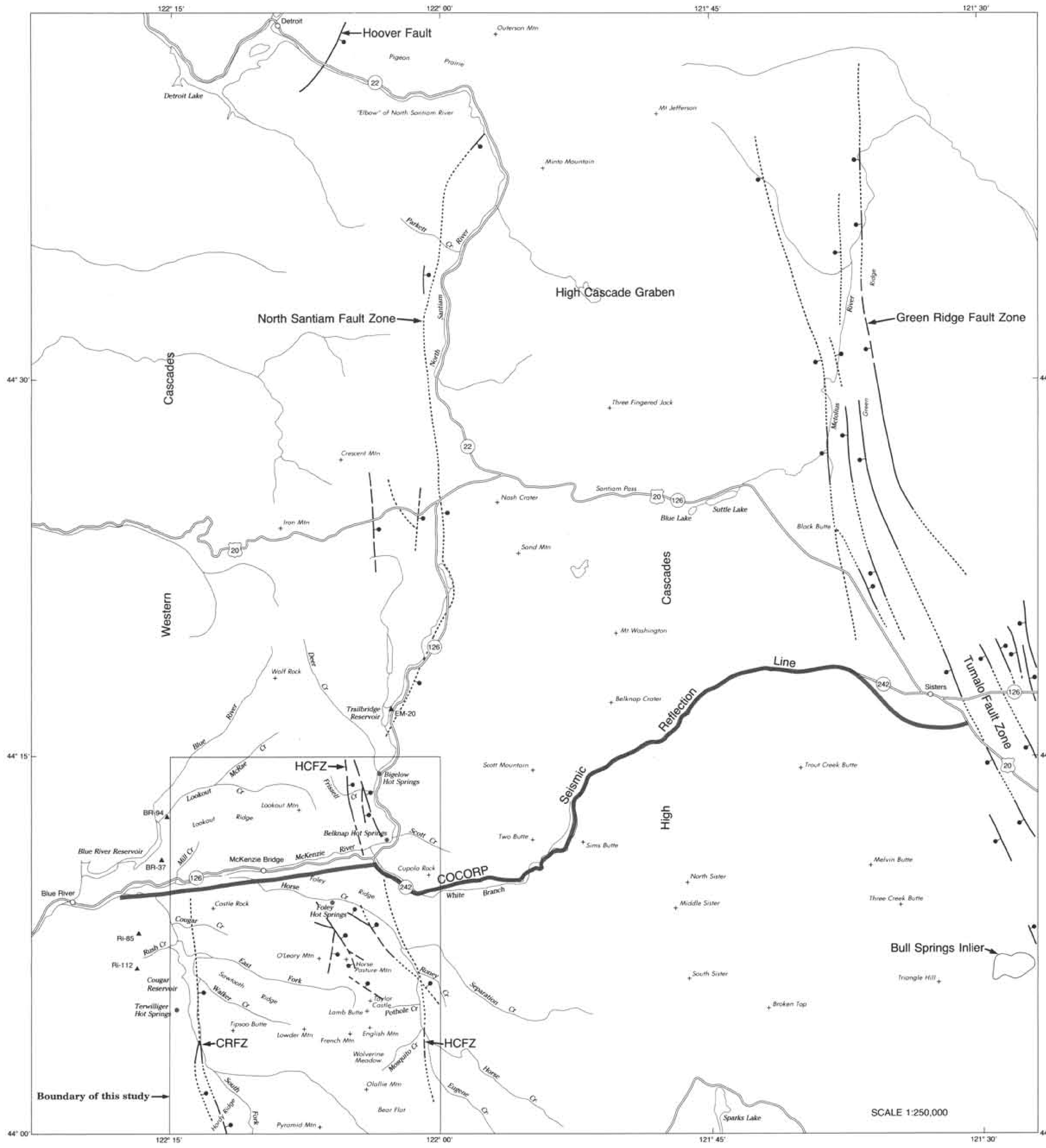
REFERENCE
1. R.A. Duncan, analyst. Age determined for this report.

Table 3. Chemical composition of rock samples. All values are in weight percent

Map no.	Source	Sample no.	Formation	Elev. (ft)	Lat. (N)	Long. (W)	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	H_2O+	H_2O-	P_2O_5	Total
1	4	MB-1	Qbs	1810	44°10'14"	122°02'15"	55.00	1.30	16.70	-	8.40	-	6.30	8.00	3.20	0.80	-	-	-	99.70
Off map	4	TS-210	Qbs	4950	44°11'28"	121°52'28"	54.70	1.35	16.40	-	8.60	-	6.10	8.50	3.30	0.75	-	-	-	99.70
Off map	4	TS-382	Qbs	3700	44°10'30"	121°54'12"	54.10	1.30	16.90	-	8.70	-	6.50	8.20	3.50	0.75	-	-	-	99.95
Off map	4	TS-384	Qbs	2400	44°09'56"	121°58'26"	55.10	1.25	16.20	-	8.40	-	6.20	7.80	3.60	1.00	-	-	-	99.55
---	4	xxx-11B	Qbs	-	-	-	54.00	1.20	16.80	-	8.70	-	6.70	8.20	3.50	0.80	-	-	-	99.90
Off map	4	EM-43	Qbsm	2490	44°16'38"	122°00'45"	52.00	1.42	16.40	-	9.00	-	8.00	8.80	3.20	0.78	-	-	-	99.60
Off map	4	TS-35	Qbsm	4970	44°13'32"	121°53'07"	53.30	1.40	17.00	-	8.40	-	5.80	8.70	4.10	0.85	-	-	-	99.55
Off map	4	TS-36	Qbsm	5030	44°13'55"	121°53'21"	53.90	1.48	17.80	-	8.50	-	5.60	8.60	3.90	0.83	-	-	-	100.61
Off map	4	TS-169	Qbsm	6000	44°14'21"	121°54'56"	53.30	1.49	17.70	-	8.70	-	5.00	8.60	3.80	0.77	-	-	-	99.36
Off map	4	TS-170	Qbsm	5600	44°14'48"	121°54'52"	54.10	1.51	16.80	-	9.00	-	4.30	8.60	3.80	1.00	-	-	-	99.11
Off map	4	TS-478	Qbsm	5610	44°14'10"	121°54'55"	52.10	1.58	15.90	-	9.00	-	6.30	9.40	4.00	0.80	-	-	-	99.08
Off map	4	TS-500	Qbsm	4160	44°14'15"	121°57'16"	52.70	1.51	16.90	-	8.80	-	5.00	9.10	4.10	1.00	-	-	-	99.11
Off map	4	TS-4960	Qbsm	5000	44°13'04"	121°54'08"	52.00	1.61	16.10	-	9.30	-	6.80	9.10	3.60	0.85	-	-	-	99.36
2	4	MB-24	Qbt	2560	44°11'41"	122°00'51"	50.30	1.40	16.60	-	9.50	-	8.20	9.40	3.70	0.53	-	-	-	99.63
Off map	4	TS-7	Qbt	3780	44°11'45"	121°58'07"	50.70	1.40	16.20	-	9.80	-	8.20	9.10	3.80	0.41	-	-	-	99.61
Off map	4	TS-516	Qbt	4830	44°11'48"	121°55'11"	51.50	1.34	15.70	-	9.40	-	8.00	9.70	3.20	0.50	-	-	-	99.34
Off map	4	TS-621	Qbt	4830	44°11'48"	121°58'11"	50.20	1.35	17.10	-	9.40	-	9.10	9.00	3.30	0.55	-	-	-	100.00
3	6	ST-15	Qba	2265	44°10'12"	122°04'45"	50.70	1.35	16.70	8.60	-	0.14	5.80	8.13	3.95	1.96	0.62	-	0.58	98.53
4	6	ST-16	Qba	2360	44°10'00"	122°04'46"	52.70	1.33	16.50	8.51	-	0.13	5.60	8.43	3.77	1.82	0.08	-	0.55	99.42
5	6	HC-108	Qp	3140	44°05'22"	122°01'31"	50.50	1.50	15.80	8.58	-	0.13	5.54	8.50	3.73	2.23	1.23	-	0.92	98.66
6	6	HC-110	Qb	2620	44°05'56"	122°01'20"	48.90	1.36	16.50	10.10	-	0.16	8.28	9.69	3.09	0.60	0.31	-	0.29	99.28
7	6	HC-147	Qbh	3100	44°03'50"	122°00'51"	47.60	1.10	16.10	9.12	-	0.16	7.13	8.39	2.14	0.73	6.93	-	0.20	99.60
8	6	HC-312	Qbh	2880	44°04'26"	122°01'34"	47.90	1.08	16.50	9.71	-	0.16	8.63	10.40	2.40	0.52	1.62	-	0.19	99.11
9	6	HC-399	Qe	3700	44°02'34"	122°00'55"	53.50	1.16	17.60	8.59	-	0.14	4.45	8.03	3.66	1.14	0.85	-	0.30	99.42
10	5	U-FOLEY	Qf	1600	44°10'49"	122°10'31"	50.07	1.20	16.46	2.12	7.65	0.17	8.06	8.97	3.18	0.47	0.29	0.12	0.30	99.06
11	6	HC-421	Qf	2820	44°06'45"	122°01'04"	49.80	1.33	17.20	10.00	-	0.15	7.22	9.66	2.99	0.54	1.16	-	0.26	100.31
12	5	MB-133	Qf	2040	44°10'30"	122°06'12"	49.76	1.51	17.79	8.40	2.15	0.17	6.94	8.66	3.16	0.47	0.92	0.45	0.37	100.75
13	2	MB-175	Qf	2090	44°09'31"	122°05'42"	49.44	1.78	16.68	2.61	7.46	0.17	6.77	8.89	3.54	0.83	0.81	0.60	0.40	99.98
14	2	MB-315	Qf	2110	44°10'45"	122°04'35"	48.66	1.33	17.42	6.59	3.45	0.16	7.27	8.98	3.25	0.58	0.70	1.64	0.27	100.30
15	2	MB-322	Qf	2490	44°07'39"	122°01'58"	49.17	1.40	17.38	7.39	2.61	0.16	7.27	9.56	3.33	0.63	0.72	0.46	0.30	100.38
16	2	MB-335	Qf	2400	44°08'58"	122°03'35"	49.45	1.28	17.45	2.52	6.69	0.16	7.24	9.29	3.44	0.53	0.55	0.20	0.22	99.02
17	6	MT-9	Qf	2170	44°09'23"	122°04'36"	49.10	1.29	16.40	10.50	-	0.17	9.45	10.10	3.00	0.35	-0.23	-	0.19	100.32
18	6	MT-13	Qf	2010	44°09'33"	122°05'00"	49.80	1.46	16.70	10.70	-	0.17	7.88	9.27	3.22	0.61	-0.19	-	0.32	99.94
18	6	MT-13A	Qf	2010	44°09'33"	122°05'00"	50.00	1.48	16.70	10.70	-	0.18	7.88	9.30	3.19	0.60	-0.10	-	0.38	100.31
19	6	ST-47	Qf	2720	44°07'38"	122°00'59"	48.40	1.36	16.40	10.60	-	0.17	9.43	10.00	3.17	0.35	-0.23	-	0.19	99.84
20	6	ST-48D	Qf	2810	44°07'40"	122°01'01"	48.00	1.46	16.40	10.40	-	0.17	8.66	9.70	3.23	0.56	0.23	-	0.27	99.08
21	6	ST-48J	Qf	2940	44°07'40"	122°01'01"	49.10	1.54	16.40	10.50	-	0.17	8.10	9.39	3.21	0.70	0.47	-	0.32	99.90
21	6	ST-48JA	Qf	2940	44°07'40"	122°01'01"	49.20	1.51	16.30	10.40	-	0.17	8.03	9.38	3.25	0.71	0.54	-	0.31	99.80
Off map	6	BR-37	QTr	2430	44°10'55"	122°15'20"	48.70	1.65	16.20	11.50	-	0.19	6.88	9.28	3.06	0.65	-0.30	-	0.35	98.16
22	6	HC-347	QTr	3680	44°05'33"	122°00'21"	47.20	2.00	16.30	12.90	-	0.21	7.48	9.35	2.94	0.42	-0.07	-	0.42	99.15
23	2	MB-223	QTr	3685	44°06'41"	122°00'10"	50.62	1.34	17.22	6.17	3.25	0.17	7.75	9.46	3.09	0.60	-	-	0.32	99.99
24	2	MB-294	QTr	3320	44°04'09"	122°00'07"	48.12	1.80	17.43	2.82	8.59	0.19	7.06	9.49	3.20	0.27	1.01	1.02	0.39	101.39
25	5	MO-159	QTr	4000	44°04'37"	122°00'22"	49.48	1.45	16.61	1.51	8.79	0.18	7.85	9.78	3.07	0.37	0.18	0.22	0.28	99.77
26	6	HC-302	QTs	3620	44°04'27"	122°00'23"	50.30	1.63	16.70	11.30	-	0.19	6.59	9.33	3.13	0.69	-0.07	-	0.36	100.15
27	6	HC-160	Tpc	3700	44°06'00"	122°00'27"	51.40	1.72	17.20	10.70	-	0.17	4.96	8.06	3.64	0.91	0.00	-	0.58	99.34
28	6	HC-339	Tpc	2760	44°05'48"	122°00'47"	47.70	1.76	16.50	12.40	-	0.20	7.09	9.23	3.04	0.50	0.23	-	0.39	99.04
29	6	HC-343	Tpc	3290	44°05'48"	122°00'34"	48.60	1.75	17.50	11.80	-	0.19	5.83	9.37	3.33	0.51	0.54	-	0.41	99.83
30	6	HC-420	Tpc	3230	44°06'37"	122°00'26"	50.10	1.86	16.90	10.80	-	0.17	5.24	8.28	3.60	0.87	0.23	-	0.55	98.60
31	2	MB-CR-1	Tpc	3170	44°10'01"	122°00'30"	49.85	2.50	15.20	1.69	10.50	0.76	6.25	9.43	3.08	0.97	-	-	0.16	100.39
32	2	MB-3-33	Tpc	2600	44°09'52"	122°00'12"	47.95	1.67	15.53	12.64	-	0.20	7.59	8.68	3.18	0.39	-	-	0.30	98.13
Off map	2	MB-309	Tpc	2440	44°09'30"	121°59'26"	46.59	2.05	16.45	2.24	10.17	0.25	7.55	9.56	3.30	0.34	0.35	0.35	0.46	99.66
Off map	2	MB-310	Tpc	2760	44°09'18"	121°59'45"	49.00	1.72	16.63	8.97	3.04	0.19	7.40	9.25	3.18	0.46	0.59	0.29	0.35	101.07
33	2	MB-324	Tpc	3350	44°09'10"	122°01'47"	47.78	1.68	17.29	4.03	7.40	0.20	7.11	9.67	3.14	0.36	0.73	0.25	0.36	100.00
34	6	ST-1	Tpc	3390	44°09'07"	122°01'49"	46.90	1.94	16.80	13.40	-	0.21	6.51	8.61	2.95	0.49	1.39	-	0.39	99.59
35	6	ST-3	Tpc	3335	44°09'25"	122°02'07"	47.80	2.05	15.70	13.30	-	0.21	7.47	9.09	3.04	0.55	-0.61	-	0.39	98.99
36	6	ST-27	Tpc	2640	44°09'06"	122°01'31"	45.80	1.92	16.80	12.70	-	0.20	7.23	8.33	2.82	0.38	2.08	-	0.40	98.66
37	6	ST-41	Tpc	3180	44°08'04"	122°00'08"	48.30	1.71	16.80	12.00	-	0.20	7.21	9.41	3.13	0.37	0.00	-	0.35	99.48
38	6	ST-44	Tpc	3000	44°07'56"	122°00'07"	47.50	1.89	15.60	12.60	-	0.21	8.25	9.70	2.84	0.43	-0.30	-	0.35	99.07
39	6	HC-234	Tpbf	2225	44°00'45"	122°03'06"	50.40	1.33	17.00	9.67	-	0.15	7.25	8.67	3.43	0.70	0.08	-	0.28	98.96
40	6	HC-251	Tpbf	4500	44°00'59"	122°03'55"	51.90	1.15	16.80	8.79	-	0.14	6.16	8.05	3.39	0.95	1.08	-	0.45	98.86
41	6	HC-252	Tpbf	4080	44°01'04"	122°04'06"	51.40	1.31	17.90	10.10	-	0.19	4.83	7.44	3.88	1.22	0.47	-	0.86	99.60
42	6	ST-319	Tpbf	4470	44°01'32"	122°01'36"	47.00	1.53	15.80	11.70	-	0.19	9.37	9.40	2.72	0.33	0.70	-	0.26	99.00
43	6	ET-104	Tpsl	2410	44°11'52"	122°00'55"	47.90	2.13	15.50	13.60	-	0.21	7.51	9.46	2.79	0.55	-0.15	-	0.46	99.96
---	1	Jan 3	Tpsl	-	-	-	47.80	1.63	15.62	1.70	9.54	0.21	4.43	10.20	3.50	1.30	1.36	-	0.02	97.11
---	1	Jan 4	Tpsl	-	-	-	48.08	1.89	15.89	2.36	9.41	0.20	5.88	8.64	3.57	0.65	1.75	-	0.41	98.73
---	1	Jan 5	Tpsl	-	-	-	48.38	2.19	15.47	1.83	10.36	0.20	5.80	8.21	3.60	0.64	1.39	-	0.43	98.50
---	1	Jan 6	Tpsl	-	-	-	49.80	1.68	15.42	2.20	9.08	0.21	4.17	9.88	3.90	1.25	0.86	-	0.15	98.60
44	2	MB-10	Tpm	3100	44°04'03"	122°01'15"	51.39	1.27	17.20	6.11	3.15	0.17	7.31	10.31	2.92	0.58	-	-	0.25	100.66
45	2	MB-12	Tpm	3920	44°04'00"	122°01'38"	49.67	1.14	18.22	3.11	6.19	0.16	6.64	9.74	3.19	0.64	0.63	0.76	0.22	100.31
46	2	MB-135	Tpm	2770	44°04'01"	122°01'03"	49.96	0.96	17.37	5.59	3.45	0.15	8.07	10.27	2.82	0.54	0.52	1.19	0.18	101.07
47	6	BR-13	Tlpa	2300	44°10'02"	122°02'59"	55.30	1.04	17.30	8.16	-	0.14	4.60	7.37	3.53	1.42	0.93	-	0.48	100.27
48	6	BR-15	Tlpa	2120	44°10'05"	122°03'05"	55.10	1.04	17.40	8.19	-	0.14	4.65	7.53	3.61	1.31	0.85	-	0.48	100.32
49	6	HC-422	Tlpa	2380	44°06'38"	122°01'09"	49.30	1.43	17.80	9.84	-	0.16	4.61	8.97	3.34	0.98	2.85	-	0.41	99.69
50	2	MB-338	Tlpa	3060	44°09'43"	122°02'19"	53.45	1.44	18.08	3.37	5.48	0.17	4.00	7.81	3.94	1.02	-	-	0.68	99.44
51	2	MB-340A	Tlpa	2490	44°09'56"	122°02'18"	54.49	1.18	17.27	2.22	6.09	0.22	4.13	7.39	4.10	1.66	0.34	0.38	0.83	100.30
52	2	MB-342	Tlpa	2590	44°10'01"	122°02'40"	51.96	1.05	18.05	2.77	5.95	0.15	5.66	8.34	3.51	0.86	0.53	0.91	0.45	100.19
53	6	ST-11	Tlpa	2650	44°09'33"	122°02'04"	61.00	0.79	16.40	5.21	-	0.10	2.67	5.34	4.33	1.90	0.85	-	0.19	98.78
54	6	ST-14	Tlpa	2160	44°09'33"	122°01'51"	61.90	1.22	15.70	6.42	-	0.14	1.41	3.80	5.69	1.75	1.16	-	0.33	99.52
55	6	ST-21	Tlpa	2970	44°09'25"	122°02'20"	64.70	0.80	15.90	4.89	-	0.11	0.37	1.72	5.57	2.80	2.16	-	0.17	99.19
56	6	ST-26	Tlpa	2680	44°09'47"	122°02'15"	52.50	1.10	16.50	8.98	-	0.17	5.14	7.16	3.52	1.82	0.62	-	0.72	98.23
57	6	ST-31	Tlpa	3325	44°08'36"	122°01'28"	51.60	1.41	19.50	9.38	-	0.14	3.23	9.12	3.76	0.71	0.62	-	0.25	99.72
58	6	ET-31	Tmi	2890	44°12'27"	122°03'31"	54.30	1.40	17.20	-	9.10	-	4.10	9.30	3.50	0.69	-	-	-	99.59
59	6	HC-180	Tmp3	5700	44°01'44"	122°04'02"	52.30	1.38	17.20	9.24	-	0.15	5.46	7.96	3.74	0.92	0.47	-	0.53	99.35
60	2	MB-194	Tmp3	5140	44°06'37"	122°05'40"	55.02	1.28	17.39	3.65	5.12	0.15	4.02	7.89	3.99	1.43	0.36	0.27	0.51	101.08
61	6	MT-64	Tmp3	5100	44°00'10"	122°06'47"	53.60	1.22	17.30	9.39	-	0.16	4.83	7.30	3.71	1.37	0.54	-	0.60	100.02
62	6	ST-263	Tmp3	5400	44°06'38"	122°05'23"	54.50	1.64	16.10	10.40	-	0.17	3.58	7.34	4.37	1.34	0.39	-	0.48	100.21
63	6	ET-103	Tmf	2000	44°12'52"	122°03'30"	50.50	1.71	18.40	10.70	-	0.17	4.99	8.90	3.75	0.94	-0.23	-	0.38	100.21
64	6	ET-101	Tmga	4060	44°12'53"	122°04'58"	52.10	1.26	16.60	9.52	-	0.16	5.44	7.77	3.75	1.10	0.31	-	0.59	98.60
65	6	HC-354	Tmpa	3000	44°05'26"	122°00'45"	58.60	1.01	17.30	6.57	-	0.14	2.58	5.68	4.83	1.72	0.70	-	0.24	99.37
66	6	HC-363	Tmpa	4980	44°06'03"	122°04'20"	61.50	0.98	16.10	6.03	-	0.12	2.65	5.00	4.89	2.18	0.39	-	0.25	100.09
67	2	MB-220	Tmpa	3350	44°05'15"	122°00'29"	59.49	1.15	17.09	3.93	3.11	0.11	1.81	5.22	4.82	1.94	0.77	0.60	0.48	100.52
68	2	MB-270	Tmpa	5400	44°05'17"	122°03'51"	61.23	0.95	17.54	2.50	3.44	0.15	2.28	5.29	5.13	1.70	0.29	0.41	0.25	101.16
69	2	MB-274	Tmpa	4400	44°05'51"	122°02'02"	66.97	0.63	15.45	1.14	2.36	0.09	0.75	2.28	5.48	3.01	0.75	1.34	0.16	100.41
70	6	ST-270	Tmpa	5060	44°06'24"	122°04'19"	61.70	0.97	16.10	5.87	-	0.12	2.43	4.73	5.14	2.27	0.39	-	0.24	99.96
71	6	ST-271	Tmpa	5170	44°06'21"	122°04'23"	65.20	0.77	15.50	4.18	-	0.11	0.78	2.06	5.93	2.77	1.23	-	0.20	98.73
72	6	ST-325	Tmpa	3700	44°02'11"	122°00'33"	66.00	0.66	15.40	3.40	-	0.10	0.66	2.36	5.73	2.91	0.92	-	0.16	98.30
73	6	HC-247	Tmp2	5680	44°03'59"	122°04'58"	52.80	1.26	19.00	8.79	-	0.15	3.72	8.33	3.62	1.01	1.00	-	0.53	100.21
74	2	MB-35	Tmp2	5270	44°06'56"	122°06'51"	48.72	1.46	19.08	4.04	6.68	0.19	5.02	7.65	3.72	0.68	2.02	1.12	0.80	101.18
75	2	MB-61	Tmp2	5360	44°04'29"	122°03'57"	52.86	1.18	20.02	2.33	5.64	0.14	3.56	9.57	3.67	0.77	0.54	0.55	0.27	101.10
76	2	MB-171	Tmp2	5120	44°07'02"	122°06'28"	51.06	1.21	20.02	2.83	5.49	0.13	4.98	9.48	3.41	0.60	0.60	0.98	0.41	101.20
77	2	MB-212	Tmp2	4770	44°06'54"	122°06'28"	51.65	1.31	17.23	3.99	5.62	0.16	4.76	7.45	4.06	1.32	1.80	1.02	0.72	101.09
78	5	MO-EngB	Tmp2	5610	44°04'13"	122°03'49"	51.96	1.22	18.14	6.36	2.45	0.16	4.39	8.45	3.61	0.71	0.49	0.29	0.55	98.78
79	6	ST-159	Tmp2	5135	44°04'08"	122°11'25"	52.10	1.15	18.50	8.16	-	0.14	3.78	8.77	3.72	1.13	0.62	-	0.43	98.50
80	6	ST-162	Tmp2	5000	44°03'30"	122°10'33"	50.00	1.35	18.70	9.28	-	0.15	5.57	7.67	3.77	0.76	1.31	-	0.34	98.90
81	6	ST-182	Tmp2	5440	44°04'02"	122°07'28"	48.70	1.30	18.50	10.30	-	0.17	5.99	8.85	3.24	0.55	1.00	-	0.54	99.14
82	6	ST-281	Tmp2	5460	44°07'13"	122°04'51"	48.90	1.47	19.90	10.20	-	0.16	4.41	9.16	3.55	0.46	0.77	-	0.35	99.33
83	6	ST-299	Tmp2	5270	44°07'15"	122°04'45"	48.90	1.56	19.70	9.99	-	0.15	3.88	9.25	3.53	0.56	0.62	-	0.35	98.49
84	6	ST-TBA	Tmp2	5320	44°07'18"	122°04'55"	50.90	1.70	18.90	9.76	-	0.15	3.68	8.83	4.04	0.89	0.31	-	0.37	99.53
84	6	ST-TBAA	Tmp2	5320	44°07'18"	122°04'55"	50.50	1.69	19.00	9.70	-	0.15	3.66	8.84	4.08	0.91	0.39	-	0.37	99.29
85	6	BR-45	Tmp	3940	44°12'29"	122°11'50"	48.20	1.07	17.00	10.30	-	0.18	8.90	10.50	2.47	0.47	0.08	-	0.28	99.45
86	6	BR-46	Tmp	3970	44°12'31"	122°12'02"	48.80	1.03	17.00	9.84	-	0.17	8.20	10.70	2.39	0.44	1.00	-	0.32	99.99
87	6	BR-72	Tmp	3830	44°13'05"	122°13'09"	48.20	1.07	16.90	10.50	-	0.18	8.80	10.30	2.46	0.40	0.70	-	0.28	99.79
88	6	BR-203	Tmp	5280	44°12'55"	122°07'43"	49.10	1.36	18.50	10.60	-	0.17	6.32	8.63	3.18	0.47	1.08	-	0.37	99.78
89	6	ET-46	Tmp	5000	44°12'42"	122°06'01"	48.50	1.44	18.60	11.30	-	0.18	6.37	8.59	3.27	0.35	0.85	-	0.41	99.86
90	6	ET-102	Tmp	5145	44°12'43"	122°06'01"	49.50	1.49	16.70	11.30	-	0.18	7.24	8.94	3.12	0.59	0.08	-	0.35	99.49
91	6	HC-144	Tmp	2620	44°03'55"	122°01'05"	48.50	1.17	16.70	10.10	-	0.16	7.12	10.00	2.82	0.56	2.54	-	0.23	99.90
92	6	HC-186	Tmp	5330	44°02'58"	122°03'56"	51.40	1.20	17.70	9.54	-	0.16	6.04	8.68	3.48	0.88	-0.07	-	0.30	99.31
93	6	HC-224	Tmp	4180	44°03'21"	122°02'43"	50.60	1.24	17.30	9.61	-	0.21	5.81	8.85	3.36	0.86	0.47	-	0.46	98.77
94	6	HC-229	Tmp	3910	44°03'17"	122°02'10"	46.90	1.61	16.00	12.30	-	0.20	7.88	8.94	2.69	0.53	1.39	-	0.35	98.79
95	6	HC-233	Tmp	4200	44°03'18"	122°01'03"	48.80	1.38	16.90	10.80	-	0.18	8.53	9.72	2.95	0.30	0.31	-	0.28	100.15
96	6	HC-310	Tmp	2780	44°04'25"	122°00'48"	47.00	1.06	16.40	9.69	-	0.16	8.45	10.00	2.15	0.52	3.54	-	0.18	99.15
97	6	HC-311	Tmp	2600	44°04'20"	122°01'07"	49.90	1.49	17.80	10.10	-	0.17	4.87	8.36	3.30	0.66	2.47	-	0.47	99.59
98	2	MB-25	Tmp	4470	44°04'32"	122°02'54"	53.46	1.40	17.52	3.03	5.77	0.15	4.43	7.93	4.09	1.19	0.50	0.56	0.63	100.66
99	2	MB-72	Tmp	4700	44°04'13"	122°02'26"	49.16	1.00	17.08	5.32	4.16	0.16	9.31	9.63	2.53	0.51	0.63	0.94	0.20	100.63
100	2	MB-183	Tmp	4810	44°07'23"	122°04'21"	53.10	1.05	16.84	2.58	5.53	0.14	6.84	8.79	3.41	1.45	0.23	0.24	0.52	100.72
101	2	MB-213	Tmp	4800	44°05'30"	122°03'53"	50.61	1.00	17.54	3.47	5.21	0.15	7.80	10.12	2.89	0.56	0.80	0.68	0.20	101.03
102	2	MB-221	Tmp	2870	44°05'22"	122°00'50"	54.61	1.15	18.88	2.60	5.26	0.14	3.91	7.99	4.24	1.09	0.44	0.43	0.29	101.03
103	2	MB-300	Tmp	5000	44°03'50"	122°07'02"	49.10	0.71	18.70	2.02	6.16	0.14	9.51	11.22	2.13	0.21	0.74	0.49	0.08	101.21
104	5	MO-155	Tmp	3280	44°04'26"	122°00'34"	50.42	1.19	18.70	5.76	3.27	0.16	4.42	8.83	3.67	0.54	0.61	0.54	0.54	98.65
105	5	MO-160	Tmp	3200	44°04'43"	122°00'37"	48.20	1.34	17.36	8.17	1.99	0.16	6.34	10.33	2.84	0.58	0.96	1.58	0.24	100.09
106	3	Ri-45	Tmp	4000	44°05'31"	122°10'55"	51.32	1.47	16.26	4.42	6.80	0.18	5.30	7.90	3.45	1.09	0.57	0.47	0.64	99.87
107	3	Ri-46	Tmp	4100	44°05'32"	122°10'53"	48.20	1.36	17.81	-	11.86	0.18	7.97	9.34	2.31	0.38	1.53	-	0.32	101.26
108	3	Ri-62	Tmp	3720	44°04'54"	122°12'22"	47.35	2.37	16.69	2.98	8.84	0.20	6.29	8.50	3.21	0.61	1.00	0.75	0.68	99.47
109	3	Ri-63	Tmp	4710	44°04'45"	122°12'18"	47.64	1.46	16.90	1.99	9.21	0.20	7.87	9.72	2.42	0.38	0.79	0.53	0.47	99.58
110	3	Ri-64	Tmp	3910	44°04'32"	122°11'48"	53.42	1.26	16.93	2.38	6.86	0.17	4.29	7.52	3.83	1.64	0.46	0.07	0.87	99.70
111	6	SH-50	Tmp	5370	44°03'54"	122°04'46"	51.60	1.56	17.70	10.20	-	0.16	4.16	7.92	3.74	0.90	1.39	-	0.60	99.93
112	6	ST-68	Tmp	4810	44°00'08"	122°12'55"	53.70	1.24	17.40	8.86	-	0.15	4.12	6.90	3.95	1.15	0.85	-	0.45	98.77
113	6	ST-283	Tmp	4270	44°07'38"	122°04'15"	55.60	0.96	18.20	7.51	-	0.12	3.75	7.11	4.15	0.95	1.70	-	0.32	100.37
114	6	ST-284	Tmp	4300	44°07'36"	122°04'14"	49.30	1.01	17.00	9.22	-	0.16	8.77	9.85	2.81	0.49	0.39	-	0.22	99.22
115	6	ST-321	Tmp	3950	44°01'46"	122°00'33"	51.40	1.25	17.30	9.83	-	0.17	6.31	8.21	3.49	0.82	-0.07	-	0.47	99.18
116	5	TPB LO	Tmp	3920	44°12'33"	122°12'02"	49.00	1.09	16.99	2.94	6.64	0.17	8.11	10.49	2.59	0.47	0.37	0.38	0.31	99.55
117	3	Ri-136	Tcr	3360	44°08'56"	122°12'25"	58.66	1.06	16.95	3.06	3.26	0.10	3.14	6.56	3.85	0.94	0.65	0.97	0.19	99.39
118	6	ET-38	Tml	4000	44°13'04"	122°05'20"	52.70	1.33	16.80	9.28	-	0.16	4.92	7.53	3.85	1.26	1.39	-	0.69	99.91
119	6	ET-43	Tml	3760	44°14'21"	122°05'19"	54.60	0.82	18.60	7.91	-	0.13	4.57	8.07	3.54	1.03	0.16	-	0.22	99.65
120	6	ET-74	Tml	1880	44°11'39"	122°04'59"	56.50	1.04	17.50	7.65	-	0.16	3.17	6.55	4.24	1.38	0.85	-	0.56	99.60
121	6	BR-44	Tmb	3680	44°12'25"	122°11'55"	56.70	0.99	18.00	7.38	-	0.12	3.30	5.60	3.63	0.98	2.77	-	0.21	99.68
122	6	BR-67	Tmb	3400	44°12'55"	122°12'37"	49.90	1.27	16.00	10.00	-	0.15	8.25	8.67	3.06	0.52	0.16	-	0.22	98.20
123	6	BR-68	Tmb	3600	44°12'53"	122°12'08"	57.70	0.83	17.60	6.61	-	0.11	2.84	5.49	3.85	1.13	2.47	-	0.18	98.81
124	6	BR-69	Tmb	3680	44°12'56"	122°12'00"	58.50	0.87	17.50	6.68	-	0.12	3.16	6.39	3.90	1.05	1.54	-	0.19	99.90
125	6	BR-133	Tmb	3220	44°13'13"	122°10'58"	58.00	0.82	17.40	6.45	-	0.11	2.86	5.97	4.14	1.20	1.85	-	0.18	98.98
126	3	EFKA	Tmb	1670	44°07'02"	122°12'45"	53.41	0.90	16.83	3.19	4.45	0.13	6.54	8.85	3.24	0.79	0.74	1.33	0.11	100.51
127	6	HC-228	Tmb	3540	44°03'20"	122°02'19"	53.50	1.23	17.50	8.81	-	0.17	4.28	7.38	3.80	1.04	1.31	-	0.49	99.51
128	6	HC-320	Tmb	4080	44°04'16"	122°01'58"	49.50	1.32	16.90	10.40	-	0.16	7.19	8.56	3.03	0.67	2.00	-	0.34	100.07
128	6	HC-320A	Tmb	4080	44°04'16"	122°01'58"	49.40	1.33	16.90	10.50	-	0.16	7.20	8.59	3.04	0.66	1.93	-	0.34	100.05
129	3	Ri-28	Tmb	1600	44°07'05"	122°12'54"	51.56	1.01	16.70	3.83	5.03	0.14	7.65	8.92	3.26	0.61	0.64	0.76	0.14	100.35
130	3	Ri-34A	Tmb	1835	44°07'05"	122°12'03"	51.47	1.06	16.83	2.61	5.93	0.14	7.37	8.61	3.34	0.77	1.00	0.94	0.18	100.25
131	2	MB-51	Tmd	3340	44°05'32"	122°01'50"	64.72	0.59	16.56	2.93	1.79	0.06	1.66	4.60	4.40	1.69	1.42	1.02	0.16	101.60
132	2	MB-103	Tmd	4240	44°06'55"	122°03'32"	62.89	0.59	17.02	2.53	2.43	0.09	2.40	5.08	3.84	2.08	1.13	1.54	0.17	101.89
133	6	BR-129	Tmtl	2460	44°13'28"	122°10'32"	59.10	1.21	15.40	6.83	-	0.13	2.18	4.89	3.82	1.73	3.31	-	0.27	98.87
134	6	BR-70	Tma	3820	44°13'04"	122°11'20"	54.30	0.85	17.50	7.80	-	0.12	4.14	4.87	3.22	1.18	5.23	-	0.28	99.49
135	6	BR-138	Tma	2050	44°13'52"	122°10'52"	55.40	1.32	15.90	9.00	-	0.16	4.09	8.00	3.63	0.76	1.16	-	0.26	99.68
136	6	BR-143	Tma	2690	44°14'07"	122°09'34"	51.80	1.17	18.10	8.66	-	0.15	5.51	6.59	3.15	0.43	3.85	-	0.23	99.64
137	6	BR-263	Tma	2640	44°14'16"	122°10'53"	61.80	1.34	15.40	7.02	-	0.17	1.74	4.64	4.78	1.56	1.00	-	0.47	99.92
138	6	HC-187	Tma	4560	44°03'15"	122°04'05"	60.20	0.80	17.20	5.83	-	0.11	2.14	5.27	4.51	1.35	1.31	-	0.28	98.99
139	6	HC-382	Tma	4540	44°05'47"	122°03'46"	60.80	0.74	17.80	5.77	-	0.12	2.42	5.38	4.23	1.65	1.00	-	0.19	100.10
140	2	MB-118	Tma	3560	44°08'28"	122°06'12"	53.64	1.03	19.37	3.46	4.08	0.14	3.75	7.95	3.67	0.74	1.26	1.52	0.31	100.92
141	2	MB-153	Tma	3510	44°07'00"	122°04'01"	59.83	0.67	17.79	3.36	2.08	0.08	2.45	5.96	4.72	1.35	0.99	0.82	0.15	100.25
142	2	MB-188	Tma	4560	44°06'40"	122°06'30"	56.18	0.93	18.22	3.16	3.89	0.12	3.85	7.06	4.12	0.90	1.00	0.91	0.30	100.64
143	2	MB-272	Tma	4420	44°04'53"	122°03'10"	60.82	0.67	16.97	2.90	2.69	0.09	2.66	5.47	4.45	1.58	1.29	0.61	0.24	100.44
144	3	Ri-22	Tma	2780	44°05'48"	122°12'29"	59.10	0.85	18.20	-	6.69	0.09	3.23	6.49	3.94	1.77	0.40	-	0.16	100.93
145	3	Ri-40	Tma	2330	44°05'19"	122°11'35"	57.22	0.89	17.12	3.21	3.62	0.12	4.02	7.22	3.89	1.20	0.40	1.05	0.17	100.13
146	3	Ri-43	Tma	3435	44°05'25"	122°11'08"	61.08	0.86	17.04	2.45	2.80	0.10	2.47	5.59	3.56	2.06	1.18	0.37	0.19	99.75
147	3	Ri-60	Tma	3160	44°05'17"	122°12'40"	59.60	0.84	18.53	-	6.56	0.15	3.14	5.72	3.80	1.78	0.99	-	0.16	101.26
148	6	ST-305	Tma	2360	44°08'42"	122°05'52"	53.50	0.95	17.70	7.78	-	0.13	4.53	7.59	4.05	0.85	1.62	-	0.24	98.94
149	6	ST-308	Tma	2780	44°08'37"	122°05'58"	54.90	0.98	17.70	7.51	-	0.12	4.22	8.00	3.99	0.97	1.62	-	0.25	100.26
150	3	TMWL	Tma	2000	44°06'08"	122°14'18"	54.86	0.88	17.03	2.12	4.70	0.13	5.29	8.41	3.00	0.49	0.88	1.13	0.16	99.08
151	6	BR-28A	Tia	1200	44°10'12"	122°14'37"	54.40	1.01	17.40	6.92	-	0.12	3.21	8.15	3.20	0.81	3.47	-	0.21	98.88
152	6	BR-119	Tia	2230	44°14'34"	122°12'04"	56.00	1.17	17.30	7.84	-	0.14	3.22	7.53	3.94	1.01	1.47	-	0.23	99.85
153	6	HC-189	Tia	5200	44°04'47"	122°05'06"	66.60	0.70	15.80	3.56	-	0.09	0.83	2.49	5.64	2.69	0.62	-	0.18	99.20
154	6	HC-275	Tia	5140	44°04'20"	122°06'28"	60.20	0.82	17.20	6.18	-	0.11	2.52	5.65	4.36	1.41	0.77	-	0.17	99.39
155	6	BR-306	Tmt	2100	44°14'44"	122°11'51"	54.20	1.19	14.50	7.02	-	0.14	2.79	5.45	1.38	1.09	11.50	-	0.25	99.51
156	6	BR-31	Ta	1980	44°11'23"	122°13'58"	67.60	0.74	15.70	3.99	-	0.07	0.57	2.38	4.39	1.94	2.77	-	0.12	100.27
157	6	BR-33A	Ta	2560	44°11'31"	122°14'29"	67.70	0.72	15.10	3.94	-	0.11	0.72	2.16	5.24	2.05	2.08	-	0.15	99.97
158	6	BR-88	Ta	2400	44°12'29"	122°14'56"	66.10	0.77	15.80	4.18	-	0.11	0.53	3.08	5.28	2.11	1.70	-	0.18	99.84
159	6	BR-280	Ta	2030	44°10'59"	122°14'34"	57.50	1.29	16.00	8.84	-	0.14	3.43	6.95	4.02	1.12	0.77	-	0.25	100.31
160	6	BR-281	Ta	1800	44°10'54"	122°14'24"	57.00	1.35	16.50	8.40	-	0.16	3.21	6.93	4.14	0.99	0.34	-	0.36	99.58
161	6	BR-309	Ta	2470	44°14'49"	122°14'50"	61.80	0.99	16.10	5.44	-	0.13	1.71	4.43	5.20	1.41	2.31	-	0.26	99.78
162	6	BR-61A	Ttc	2020	44°13'20"	122°13'36"	50.60	1.09	17.90	9.18	-	0.23	4.62	8.75	3.01	0.94	3.31	-	0.21	99.84
163	6	BR-86	Ttc	2680	44°12'27"	122°14'41"	46.70	1.39	14.40	10.90	-	0.30	6.41	11.70	2.35	0.44	4.85	-	0.26	99.70
163	6	BR-86A	Ttc	2680	44°12'27"	122°14'41"	46.60	1.40	14.40	11.00	-	0.30	6.42	11.70	2.39	0.44	4.85	-	0.26	99.76
164	6	BR-120	Ttc	1920	44°14'01"	122°12'05"	48.60	1.35	17.40	9.77	-	0.31	4.93	9.76	3.27	0.41	3.00	-	0.29	99.09
165	6	BR-160	Ttc	2050	44°13'17"	122°14'51"	50.40	1.09	17.60	8.81	-	0.13	4.72	9.49	3.26	1.29	3.39	-	0.18	100.36
166	6	BR-165	Ttc	2300	44°13'37"	122°14'40"	49.70	1.20	16.80	9.50	-	0.23	5.93	10.00	3.07	0.62	2.39	-	0.23	99.67
167	6	BR-193	Ttc	1760	44°13'40"	122°13'59"	58.50	1.11	17.40	6.79	-	0.17	1.26	3.82	5.48	2.31	2.23	-	0.29	99.36
168	3	Ri-150	Ttc	1525	44°08'40"	122°14'35"	64.03	0.48	12.10	2.71	0.71	0.03	1.30	4.65	0.43	2.06	5.31	5.87	0.06	99.74
169	3	Ri-149	Tr	1990	44°08'53"	122°14'12"	71.46	0.36	15.15	2.36	0.40	0.09	0.38	1.66	4.85	2.31	0.95	0.87	0.11	100.95
170	6	BR-32	Tb	2580	44°11'50"	122°14'20"	51.20	1.18	16.70	9.68	-	0.19	5.49	9.23	3.05	0.79	2.62	-	0.23	100.36
171	6	BR-58	Tb	1590	44°12'54"	122°14'38"	58.10	1.39	15.80	8.22	-	0.14	2.64	5.76	4.03	1.23	2.70	-	0.28	100.29
172	6	BR-63	Tb	2400	44°13'17"	122°13'44"	52.20	1.18	16.70	9.48	-	0.16	5.76	10.40	3.24	0.41	0.62	-	0.22	100.37
173	6	BR-83	Tb	2920	44°11'55"	122°14'33"	52.30	1.18	16.60	9.39	-	0.19	5.48	9.57	3.25	0.72	1.00	-	0.23	99.91
Off map	6	BR-94	Tb	1650	44°12'32"	122°15'07"	53.30	2.10	14.30	11.60	-	0.19	3.41	6.53	3.30	1.47	3.08	-	0.39	99.67
174	6	BR-180	Tb	1620	44°13'53"	122°14'55"	51.50	1.39	17.00	9.35	-	0.15	5.43	8.02	3.74	0.98	0.39	-	0.53	98.48
175	3	COUGAR	Tmic	1600	44°07'42"	122°14'12"	61.95	1.10	15.32	1.81	3.94	0.12	2.36	5.10	4.65	1.08	2.23	0.57	0.21	100.44

Data sources

1. Jan (1967). Does not have precise sample locations.
2. Flaherty (1981).
3. Priest and Vogt (1983).
4. Unpublished data of E.M. Taylor; E.M. Taylor, analyst. One sample not precisely located.
5. Unpublished data of G.R. Priest; C. McBirney, analyst.
6. Analyzed for this report; X-ray Assay Laboratories Limited of Don Mills, Ontario, analyst.



Index map showing location of geographic and tectonic features in the McKenzie Bridge quadrangle and adjacent central Oregon Cascade Range. Dashed lines show boundaries of areas mapped primarily by the indicated individuals. Triangles indicate the location of samples with K-Ar dates outside of the map area (Table 1). HCFZ = Horse Creek fault zone; CRFZ = Cougar Reservoir fault zone. Sources for data on the North Santiam fault zone are Avramenko (1981), Black and others (1987), and Priest and others (1987). Green Ridge and Tumalo fault zones taken from Conrey (1985), Hales (1975), Peterson and others (1976), and Taylor (unpublished mapping). Bull Springs inlier taken from description of Hill (1988) and map of Peterson and others (1976). Location of COCORP seismic reflection line taken from Keach (1986).

Table 1. Potassium-argon age data

Map number	Sample number	Geologic unit	Material dated	Rock type	Wt % K_2O	% $^{40}Ar_{rad}$	Moles/g $^{40}Ar_{rad}$ (x 10-11)	Age Ma ± 1σ	Lat (N)	Long (W)	References
4	ST-16	Qba	Whole rock	Basaltic andesite	1.893	2.93	0.1246	0.46±0.06	44°10'00"	122°04'46"	9
176	BR-1	Qf	Whole rock	Basalt	0.369	0	0.0	<0.1 ±0.1	44°10'48"	122°10'30"	9
					0.381	0	0.0	<0.1 ±0.1			
176	BR-1	Qf	Plagioclase	Basalt	0.334	0	0.0	<0.1 ±0.1	44°10'48"	122°10'30"	9
177	CP-208	Qf(?)	Whole rock	Basalt	(1.089)[a]	15.4	0.8150	5.19±0.06	44°09'30"	122°02'55"	8
					1.100						
					1.077						
12	MB-133	Qf	Whole rock	Basalt	0.521	8	0.167	2.23±0.37	44°10'30"	122°06'12"	2
178	MT-12	Qf	Plagioclase	Basalt	0.803	1.01	0.4576	3.96±1.12	44°11'55"	122°00'50"	9
10	U-FOLEY	Qf	Whole rock	Basalt	0.660	5	0.193	2.05±0.52	44°10'49"	122°10'31"	1,2
Off map	BR-37	QTr	Plagioclase	Basalt	0.783	6.81	0.1889	1.68±0.16	44°11'01"	122°15'08"	9
24	MB-294	QTr	Whole rock	Basalt	0.27	-	-	3.5 ±1.1	44°04'09"	122°00'17"	3
								4.8 ±1.4			
25	MO-159	QTr	Whole rock	Basalt	0.400	8	0.392	6.80±1.18	44°04'37"	122°00'22"	2
26	HC-302	QTs	Plagioclase	Basalt	0.812	7.74	0.2002	1.71±0.18	44°04'27"	122°00'23"	9
179	MB-110	Tpc	Whole rock	Basalt	0.451	(38.0)[a]	(0.1431)[a]	2.2 ±0.1	44°11'46"	122°00'50"	4,5
						93.0	0.1316				
						12.0	0.1495				
						9.0	0.1482				
180	MB-132	Tpc	Whole rock	Basalt	0.451	(8)[a]	(0.1691)[a]	2.6 ±0.2	44°11'46"	122°00'50"	4,5
						6	0.1584				
						10	0.1798				
36	ST-27	Tpc	Plagioclase	Basalt	0.300	1.35	0.0380	0.88±0.33	44°09'06"	122°01'31"	9
43	ET-104	Tpsl	Plagioclase	Basalt	(0.428)[a]	(13.1)[a]	(0.1446)[a]	2.35±6.14	44°11'52"	122°00'55"	10
					0.422	13.1	0.1462				
					0.434	13.1	0.1344				
					0.427	13.1	0.1510				
						13.1	0.1468				
48	BR-15	Tlpa	Whole rock	Basaltic andesite	1.258	4.42	0.6594	3.64±0.22	44°10'05"	122°03'05"	9
59	HC-180	Tmp3	Plagioclase	Basaltic andesite	(0.918)[a]	(16.4)[a]	(0.6563)[a]	4.96±0.37	44°01'44"	122°04'02"	10
					0.946	16.1	0.6707				
					0.909	17.6	0.6575				
					0.895	15.5	0.6406				
					0.921						
62	ST-263	Tmp3	Whole rock	Basaltic andesite	1.235	44.1	0.9142	5.14±0.08	44°06'38"	122°05'23"	9
Off map	EM-20	Tmi	Whole rock	Basaltic andesite ash-flow tuff	0.790	17.9	0.624	5.5 ±0.2	44°16'39"	122°02'38"	5,6
181	MB-130	Tmf	Whole rock	Basalt	0.862	(32)[a]	(0.779)[a]	6.3 ±0.2	44°13'10"	122°06'07"	4,5
						32	0.759				
						32	0.799				
69	MB-274	Tmpa	Whole rock	Dacite	3.01	-	-	5.5 ±2	44°05'51"	122°02'02"	3
75	MB-61	Tmp2	Whole rock	Basalt	0.77	-	-	6.5 ±4	44°04'29"	122°03'57"	3
78	MO-Eng-B	Tmp2	Whole rock	Andesite	0.230	14	0.340	10.2 ±1.0	44°04'13"	122°03'49"	2
					0.230	19	0.319	9.6 ±1.5			
182	3S-46 (G)	Tmp2	Whole rock	Basalt	1.043	16.19	2.144	14.2 ±2.0	44°04'24"[c]	122°07'24"	6
85	BR-45	Tmp	Whole rock	Basalt	0.499	23.90	0.4578	6.37±0.09	44°12'29"	122°11'50"	9
88	BR-203	Tmp	Whole rock	Basalt	0.524	3.10	0.3344	4.43±0.67	44°12'55"	122°07'43"	9
105	MO-160	Tmp	Whole rock	Basalt	0.430	11	0.476	7.67±0.96	44°04'43"	122°00'37"	2
108	Ri-62	Tmp	Whole rock	Basalt	0.578	14	0.651	7.80±0.77	44°04'54"	122°12'22"	6,7
110	Ri-64	Tmp	Whole rock	Basalt	1.67	36.0	2.274	9.41±0.42	44°04'32"	122°11'48"	6,7
112	ST-68	Tmp	Whole rock	Basaltic andesite	1.140	49.19	1.5103	9.19±0.13	44°00'08"	122°12'55"	9
116	TPB-LO	Tmp	Whole rock	Basalt	0.440	39	0.529	8.39±0.36	44°12'33"	122°12'02"	1,2
183	3S-47 (G)	Tmp	Whole rock	Basalt	0.047	.004	0.0105214	1.55±0.2	44°03'47"[c]	122°06'57"	6
117	Ri-136	Tcr	Whole rock	Andesite	0.910	34	1.2232	9.31±0.44	44°08'56"	122°12'25"	1
184	CP-205	Tml(?)	Whole rock	Basaltic andesite	(0.625)[a]	16.8	0.3588	3.98±0.06	44°13'00"	122°05'30"	8
					0.625						
					0.625						
119	ET-43	Tml	Whole rock	Basaltic andesite	1.052	67.32	0.9363	6.18±0.08	44°14'21"	122°05'19"	9
185	MB-17	Tml	Whole rock	Basaltic andesite	1.052	(24.8)[a]	(0.9704)[a]	6.4 ±0.2	44°12'13"	122°02'00"	4,5
						16	0.9791				
						33.6	0.9617				
186	MS-253	Tmb	Whole rock	Andesite	(1.724)[a]	55.7	2.162	8.69±0.11	44°12'45"	122°12'40"	8
					1.730						
					1.717						
129	Ri-28	Tmb	Whole rock	Basalt	0.63	5	0.734	8.1 ±2.3	44°07'05"	122°12'54"	2
131	MB-51	Tmd	Whole rock	Dacite	1.69	-	-	8.9 ±3	44°05'32"	122°01'50"	3
133	BR-129	Tmtl	Plagioclase	Andesite ash-flow tuff	0.343	0.94	0.0784	1.59±0.47	44°13'28"	122°10'32"	9
144	Ri-22	Tma	Whole rock	Andesite	1.591	28	3.029	13.2 ±0.7	44°05'48"	122°12'29"	7
Off map	Ri-112	Tma	Plagioclase	Andesite	0.251	35	0.414	11.5 ±0.5	44°07'00"	122°17'07"	1,2
150	TMWL	Tma	Whole rock	Andesite	0.530	7	0.950	12.4 ±2.5	44°06'08"	122°14'18"	2
187	TMW-Top	Tma	Whole rock	Andesite	1.35	39	1.726	8.86±0.34[b]	44°12'12"	122°11'56"	1,2
188	3S-33 (G)	Tma	Whole rock	Andesite	0.615	0.54	0.04074	0.46±0.46	44°03'43"[c]	122°06'57"	6
189	3S-44 (G)	Tma	Whole rock	-	0.083	2.96	0.102775	8.6 ±7.0	44°03'56"[c]	122°07'04"	6
Off map	Ri-85	Tmt	Plagioclase	Andesite	0.421	26	0.838	13.8 ±0.8	44°07'41"	122°16'18"	1,2
190	MS-251	Ta	Whole rock	Basalt	(1.162)[a]	28.6	2.354	14.0 ±0.2	44°12'15"	122°15'00"	8
					1.167						
					1.158						
172	BR-63	Tb	Whole rock	Basalt	0.393	7.31	0.6710	11.8 ±0.5	44°13'17"	122°13'44"	9
191	MS-252	Tb	Whole rock	Basalt	(0.690)[a]	6.8	3.537	35.3 ±0.9 (whole)	44°13'15"	122°13'35"	8
					0.694						
					0.685						
			30/60 mesh		(0.659)[a]	34	1.404	14.7 ±0.03 (30/60)			
					0.659						
					0.658						
192	MS-254	Tb	Whole rock	Basalt	(0.624)[a]	6.3	1.847	20.4 ±2.0	44°14'12"	122°07'30"	8
					0.627						
					0.622						
175	COUGAR	Tmic	Plagioclase	Dacite	0.286	13	0.669	16.3 ±1.8	44°07'42"	122°14'12"	1,2

REFERENCES
1. Brown and others (1980)
2. Evans and Brown (1981)
3. Flaherty (1981)
4. Laursen and Hammond (1978)
5. Armstrong and others (1975)
6. Fiebelkorn and others (1983)
7. Priest and Vogt (1983)
8. Sutter (1978)
9. R.A. Duncan, analyst. Age determined for this report.
10. P.E. Damon, analyst. Age determined for this report.

FOOTNOTES
[a] Parentheses indicate mean value.
[b] Previously published date calculated incorrectly.
[c] Published locations incorrect.
Locations based on personal communication with G.W. Walker.