PRELIMINARY GEOLOGIC MAP
OF THE NEWPORT NUMBER 1 QUADRANGLE,
PEND OREILLE COUNTY, WASHINGTON
AND BONNER COUNTY, IDAHO

By
FRED K. MILLER
U.S. GEOLOGICAL SURVEY

Prepared cooperatively by the U.S. Geological Survey
PRELIMINARY GEOLOGIC MAP OF THE NEWPORT NUMBER 1 QUADRANGLE, PEND OREILLE COUNTY, WASHINGTON, AND BONNER COUNTY, IDAHO

By

Fred K. Miller

INTRODUCTION

The Newport Number 1 quadrangle straddles the divide separating the Pend Oreille River and Priest River drainages. It lies mainly in Pend Oreille County, Washington, but the Idaho-Washington state line lies 2 miles inside the eastern boundary. The area is a 15-minute composite of four preliminary 7.5-minute quadrangles prepared by the U.S. Geological Survey; Galena Point, northeast quarter; Browns Lake, northwest quarter; Skookum Creek, southwest quarter; and Bead Lake, southeast quarter.

In the initial stages of preparing modern topographic maps of the Newport 30-minute quadrangle, the U.S. Geological Survey divided the area into four 15-minute and sixteen 7.5-minute quadrangles. No 15-minute quadrangles of the area were published, so the temporary name, Newport Number 1, is used for this report.

Geologic mapping in the quadrangle was begun by the author in 1969 under the cooperative arrangement between the Division of Mines and Geology of the Washington State Department of Natural Resources and the U.S. Geological Survey. Able field assistance was provided by J. S. Tinker in 1969 and P. N. Castle in 1970.

Most of the quadrangle is underlain by the Precambrian Belt Supergroup, or by plutonic rocks of Cretaceous and Tertiary (?) age. Cambrian quartzite and Tertiary andesite and conglomerate underlie relatively small areas.

The area is on the west flank of a broad north-trending anticline whose axis lies east of the quadrangle. Numerous faults that have apparent displacements of as much as several thousand feet disrupt this simple pattern near the west edge of the quadrangle.

M. C. Schroeder (1952) prepared an excellent geologic map of an area that included the region covered by this quadrangle. Although he recognized that the Precambrian rocks were correlative with parts of the Belt Supergroup, he did not use Belt names but named them the Newport Group. Schroeder (1952, p. 28) considered the plutonic rocks to be part of the Kaniksu batholith as defined by Park and Cannon (1943, p. 24), but he did not map individual plutons.

Exposures in the quadrangle are comparatively good for a heavily forested region. Outcrops are poorest in the northern and northeastern part, but numerous logging roads and U.S. Forest Service roads in that area provide many good roadcut exposures. Extensive glacial and alluvial cover is restricted mainly to the valleys of the Pend Oreille River and Lower West Branch of the Priest River.

# STRATIGRAPHY

## PRECAMBRIAN ROCKS

### BELT SUPERGROUP

About 30,000 feet of the Precambrian Belt Supergroup is found in the quadrangle. A complete Belt section from the Prichard Formation to the Striped Peak Formation is represented, although, because of faulting, some of the Wallace Formation may be present only in subsurface. The Belt rocks here can be correlated directly with those in the Cœur d'Alene district (see Hobbs and others, 1965) and around Pend Oreille Lake (see Harrison and Jobin, 1963 and 1965). Therefore, the names Newport Group, Bead Lake Formation, No Name Argillite, and Skookum Formation proposed by Schroeder (1962, p. 9) are abandoned in favor of the older and more widely used Belt terminology.

### Prichard Formation

The Prichard Formation underlies much of the eastern two-thirds of the quadrangle and forms a west-dipping homoclinal section composed of interbedded argillite, siltite, and quartzite. Compensating for all faults that have been recognized, a composite section is estimated to be about 17,000 feet thick. Thickness of beds in the unit is closely related to grain size in that most argillite beds are finely laminated, siltite is thin to thick bedded, and quartzite is mostly thick bedded. Surfaces of most exposures show the yellow to reddish-brown iron-oxide staining that is characteristic of this formation wherever it has been described. Films and thin layers of pyrite and (or) pyrrhotite are found in most argillitic parts of the formation and at some places make up one percent or more of the rock.

The formation can be divided into four informally defined members, although the various members have not been mapped. Four informal members in the Loon Lake quadrangle described by Miller (1969, p. 1) appear to differ in thickness and character from those in the Newport area, so they are comparable only in part.

The basal part of the Prichard is poorly exposed, and the stratigraphy uncertain. The rocks are siltite, quartzite, and argillite that have been hornfesled by younger plutonic rocks a short distance to the east. The basal part is overlain by about 2,000 to 3,000 feet of light-gray to tan quartzite and siltite that contains only minor amounts of interbedded argillite. This member characteristically weathers to a lighter color than the fresh rock.

A member consisting of about 7,000 feet of interbedded siltite, quartzite, and argillite overlies the quartzite

*Name changed to Division of Geology and Earth Resources (1973)
and siltite member. It is composed of about equal proportions of the three lithologies and is distinguished as a member only because it is bounded by distinctive rocks above and below.

The uppermost member, about 2,000 to 3,000 feet thick, is composed mostly of dark- to light-gray laminated argillite. The contact with the overlying Burke Formation is reasonably well exposed on the ridge due north of Browns Lake, where thick quartzite zones are interbedded with thinner argillite zones in the upper 500 to 1,000 feet. The quartzite-argillite beds grade upward into siltite of the Burke Formation through a stratigraphic interval of about 200 feet. This quartzite-rich zone, assigned here to the uppermost Prichard Formation, is included in the Burke Formation in the Chewelah-Loon Lake area (Miller and Clark, 1974).

Burke Formation

The Burke Formation is about 2,600 to 3,100 feet thick and consists predominantly of medium-gray siltite, subordinate amounts of argillite, and numerous quartzite beds in the middle and upper parts of the formation. Weathered surfaces are characteristically lighter colored than the fresh rock. The unit is medium to thick bedded but almost everywhere contains thin irregular laminations of darker colored material. Just above the middle of the formation, a zone about 200 feet thick of red to maroon siltite and argillite, similar to that which makes up the bulk of the younger St. Regis Formation, is interbedded with the gray siltite. This same zone is well developed in the Loon Lake quadrangle (Miller, 1969, pl. 1). Other than some small-scale cross laminations and locally, ripple marks, sedimentary structures are not abundant in the Burke Formation within the quadrangle.

The gray color that typifies the unit almost everywhere is somewhat variable in this area. The Burke is medium gray north of Browns Lake and east and west of Cee Cee Ah Peak, but in the vicinity of Vance Lake and along part of the Bead Lake Road, more than 50 percent of the formation is red to maroon, similar to the thin red zone that normally occurs near the middle of the formation.

Revett Formation

The Revett Formation is probably the most uniform in composition of the Belt formations in the area. It is predominantly white, tan and light-gray fine-grained quartzite. The beds range in thickness from less than an inch to more than 5 feet, but average about 1.5 feet. Quartzitic siltite zones 100 to 300 feet thick are found near the upper and lower contacts and near the middle of the formation. Argillite beds are present, especially near the base, but are minor in amount.

The formation is about 2,300 to 2,600 feet thick and forms a north-south-trending, fault-disrupted belt that extends from one end of the quadrangle to the other. Apparent variation in thickness from one place to another in the area is due, at least in part, to placement of both the upper and lower contacts at different stratigraphic horizons at different localities. The contact with the Burke Formation is more difficult to locate consistently because the change in lithology is so gradational. The contact with the overlying St. Regis Formation is also gradational but is well defined at most places because the lithology changes from quartzite in the Revett to siltite in the St. Regis and the color changes from white to red or maroon. However, on the east flank of Skookum Peak, and to a lesser degree along the ridge south of Cooks Lake, the distinctive pigmentation of the St. Regis Formation is present at least 500 feet below the Revett-St. Regis contact.

Well-developed cross bedding in the Revett Formation has been described at several localities (Hobbs and others, 1965, p. 38; Harrison and Jobin, 1963, p. K11) but has not been observed in this quadrangle. The apparent absence of cross bedding here may be due to the lack of large exposures in which this type of structure is most obvious. Ripple marks are common but not abundant near the top of the formation.

St. Regis Formation

The conspicuously colored St. Regis Formation, which is well exposed at the headwaters of Sandwich Creek and west of Cooks Mountain, is one of the most distinctive units in the area. The lower two-thirds to three-quarters of the formation is composed of red-purple to maroon siltite, argillite, and a lesser amount of quartzite. The upper one-third to one-quarter is light-green, finely laminated siliceous argillite, some of which is carbonate bearing. Bed thickness in the lower red beds ranges from thin laminations in the argillite to layers a foot or two thick in the siltite and quartzite; the average bed is about 3 inches thick. The average thickness of the formation is about 1,000 feet.

Ripple marks, mud cracks, mud-chip breccia, and cross laminations are common but do not appear to be as abundant as at other localities outside the area.

Wallace Formation

The Wallace Formation is one of the chief carbonate-bearing units in the Belt Supergroup. In this quadrangle it consists of quartzite, siltite, argillite, carbonate-bearing quartzite and siltite, and dolomite. The quartzite and siltite, whether they contain carbonate or not, are light tan to light gray. They are irregularly interbedded with dark-gray, evenly and irregularly laminated argillite, which commonly is slightly phyllitic.

The amount of carbonate varies considerably in different parts of the formation. The lower 500 to 1,000 feet contains numerous beds of highly impure dolomite and a much higher proportion of carbonate-rich siltite and quartzite than most of the rest of the formation. The upper part of the formation is mostly dark-gray laminated argillite that also has a few zones of tan dolomite as much as 100 feet thick. On the ridge in the SE 1/4 sec. 14, T. 33 N., R. 44 E., about 1,000 feet of tan dolomite overlies dark-gray laminated argillite, but the stratigraphic position of this dolomite in the Wallace Formation is uncertain due to faulting in that area.

Sedimentary structures including ripple marks, mud cracks, and cross laminations are common. Structures interpreted to be preinduration deformational features, such as small elastic dikelets and pronounced pinching and swelling of beds, are some of the most distinctive characteristics of the formation.

Internal faulting prevents an accurate estimate of the thickness of the formation. Division into members, as was done by Harrison and Jobin (1963, p. K13) around Pend Oreille Lake, and by Hobbs and others (1965, p. 42)
in the Coeur d'Alene district, may allow construction of a composite section. The maximum thickness of the greatest partial section presumed to be unfaulted is 4,200 feet.

**Striped Peak Formation**

The Striped Peak Formation crops out only in the area west of Half Moon Lake. There it is almost identical to the Striped Peak Formation described by Harrison and Jobin (1963, p. 16) east of Pend Oreille Lake in the Clark Fork quadrangle. Because of the close similarity, it is possible to use their four-member breakdown.

**Member 1.**—Red, green, and gray siltite and quartzite make up most of member 1. Numerous argillite beds are found throughout the unit, but they are most abundant near the base and middle. Abundant thin beds of carbonate-rich siltite and several beds ofstromatolite dolomite as much as 3 feet thick are found in all parts of the member, but they increase in number toward the top. Most of the green siltite and quartzite is restricted to the central part of the member. Beds range in thickness from less than an inch, usually in the finer grained rocks, to more than 5 feet in the siltite and quartzite. Some of the quartzite is almost medium grained, but most is fine grained. Much of the siltite carries abundant fine-grained sand, which makes the rock look coarser grained than it is. Detrital muscovite flakes are abundant in both the quartzite and siltite.

The contact with the Wallace Formation is poorly exposed and is locally faulted. Just north of Half Moon Lake it appears to be a rather abrupt transition from dark-gray laminated argillite of the Wallace Formation to pale-grayish-green siltite of member 1. The calculated thickness of the member is 500 to 600 feet.

**Member 2.**—Member 2 is composed of impure dolomite and minor amounts of interbedded argillite. The dolomite is thinly laminated but blocky. Thin silice veins, at high angles to bedding, and stromatolitic structures are numerous. Most of the dolomite is light tan or gray and weathers to orangish tan. Some is red or maroon, and all of it weathers to form a deep red soil.

The lower contact is gradational into siltite of member 1 below and into dark-gray argillite of member 3 above. Calculated thickness of the member is 500 to 650 feet.

**Member 3.**—Member 3 is only about 200 to 300 feet thick, but because of its dark-gray color is distinctive among the relatively gaudy colors of the other three members. It is composed entirely of dark-gray laminated argillite and a minor amount of thin-bedded siltite. The unit is very evenly laminated and weathers flaggy. This member strongly resembles laminated argillite of the Prichard or Wallace Formation but is so thin that it is invariably found with one of the more distinctive members of the Striped Peak Formation. Other than a few thinly cross-laminated and subtly graded beds, sedimentary structures are rare.

**Member 4.**—Member 4 is dark-red to maroon siltite, quartzite, and argillite. In places the unit is pale green. It is similar in color to part of member 1 but lacks the abundant carbonate found in that member. Beds range in thickness from less than an inch to 4 or 5 feet but average about 4 inches. Unlike the upper member described by Harrison and Jobin (1963, p. K19) in the Clark Fork quadrangle, less than half of member 4 in this area is quartzite. Most of the unit is coarse siltite interlayered with numerous thin argillite interbeds and thicker beds of fine-grained quartzite.

Mud cracks, mud-chip breccia, ripple marks, and salt casts, although common, are less abundant than in the Clark Fork section. The calculated thickness of the part of the member that is preserved is 500 to 650 feet. The upper contact is either faulted or unconformably overlain by the Cambrian Addy Quartzite.

**Metadiorite sills**

Mafic sills, ranging in thickness from a few feet to more than 1,500 feet, are common in the Belt Super-group. In this quadrangle, with the exception of one small sill in the Burke Formation, they are all confined to the Prichard Formation. They are more abundant in the southern part of the quadrangle, and many thin to the north. The northern part of the quadrangle may contain more sills than are shown, however, especially in the Pelke Divide area, because exposures are poor there, and the sills do not crop out well.

The sills are composed of hornblende, biotite, plagioclase, quartz, and ore minerals. Hornblende forms over 50 percent of the rock in most sills. Most of the rocks are medium to fine grained. A few sills are noticeably differentiated and have relatively leucocratic centers that in some cases contain pegmatitic segregations.

The chemical composition of the sills is that of basalt or diabase. Most appear recrystallized or altered. The texture in some thin sections looks slightly granoblastic or poikiloblastic; and in these the plagioclase is oligoclase, too sodic for a rock of this composition. In addition, most of the diorite carries some free quartz. The chemical composition is a further indication that the sills have been recrystallized, because the mineralogy of this rock is not that of a diabase or basalt.

The large sill that passes through Bead Lake appears to have caused a small amount of recrystallization and alteration in the Prichard Formation on the west side of the sill. Other sills have had little effect on the rocks they intrude.

**PALEOZOIC ROCKS**

**CAMBRIAN SYSTEM**

**Addy Quartzite**

The Addy Quartzite is found only in two small fault-bounded blocks along the west edge of the quadrangle, where it rests unconformably on the Striped Peak Formation. The Addy is a thick-bedded medium-grained vitreous quartzite that contains a few thin pebble beds as high as 20 feet above the base. Approximately the lower 50 to 100 feet is dark purple that grades upward into pink and then white. Much of the rock is moderately brecciated, probably due to the proximity to several large faults.

No fossils were found in the quadrangle, but the distinctive purple quartzite at the base allows a reasonably good correlation with the Addy Quartzite near Addy, Washington. There, Early Cambrian trilobites and brachiopods have been found.
MESOZOOIC ROCKS
CRETACEOUS SYSTEM
Blickensderfer Quartz Monzonite

Near the center of the quadrangle, a light-gray to white coarse-grained muscovite-biotite quartz monzonite is exposed over an area of about 10 square miles. This rock is here named the Blickensderfer Quartz Monzonite for its type locality, the headwaters of Blickensderfer Creek, (sec. 33, T. 34 N., R. 45 E.) a creek that drains the area underlain by the southeastern part of the body.

The rock consists principally of quartz, microcline, plagioclase, muscovite, and biotite. Both micros are visible in hand specimen, and the quartz forms large smoky crystals. The microcline locally forms phenocrysts. Average plagioclase composition is oligoclase, but many crystals are zoned from sodic andesine to albite. Accessory minerals include zircon, apatite, and trace amounts of opaque minerals. The texture is hypidiomorphic granular, and the grain size averages about 0.3 to 0.4 inch. Both texture and grain size are uniform except at a few places around the margins where the rock is finer grained.

A contact metamorphic aureole is exposed at several places. North of Kings Lake within a few feet of the quartz monzonite, carbonate-bearing siltite of the Wallace Formation is converted to quartz-plagioclase-tremolite hornfels. South of Little Skookum Creek, argillite of the Prichard Formation is recrystallized to andalusite-cordierite-bearing hornfels. At distances greater than 2,000 feet from the quartz monzonite, the host rocks show almost no recrystallization.

Joan C. Engels of the U.S. Geological Survey obtained an age of 98.3±3.2 m.y. on biotite from this pluton using the potassium-argon method. Although only a single mineral was dated, the age obtained is considered to be the age of emplacement and not a reset age, because mineral pairs from other plutons in the area have been dated and given concordant numbers of about the same age.

Galena Point Granodiorite

Porphyritic biotite granodiorite underlies most of the eastern third of the quadrangle. It is here named the Galena Point Granodiorite for its type locality, Galena Point (N E 1/4 sec. 4, T. 34 N., R. 45 E.), in the northern part of the area. The body appears to be elongate and extends beyond the quadrangle to the southeast and north. Excellent though deeply weathered exposures are found along the road that follows the Lower West Branch of the Priest River. In the northern part of the quadrangle, the pluton is uniformly porphyritic except locally along the margins where a finer-grained phase occurs. In the southeastern corner of the quadrangle the granitic rock is so deeply weathered, even in deep roadcuts, that it is not possible to identify it positively as the Galena Point Granodiorite.

The rock consists essentially of quartz, potassium feldspar, plagioclase, and biotite. The phenocrysts are potassium feldspar and do not show grid twinning in thin section. They are euhedral and range in length from 1/4 to 2½ inches. The plagioclase is oligoclase in overall composition, but it is zoned from sodic andesine to calcic albite. Biotite is the only mafic mineral and usually makes up about 12 percent of the rock. Trace amounts of muscovite in small crystals have been seen in several thin sections, but it is not clear whether the muscovite is primary or secondary. A few specimens contain small amounts of hornblende and sphene. Accessory minerals commonly found in the rock include zircon, apatite, and opaque minerals. The essential minerals are medium to coarse grained.

The contacts of the pluton are irregular and ill defined due to numerous dikes of the granodiorite that intrude the country rock. On the Bead Lake Road, east of where the large metadiabase sill crosses it, about 5 to 10 percent of the rock shown on the geologic map as Prichard Formation is granodiorite. The highly metamorphosed rocks shown as Prichard Formation in the Pelke Divide area also contain abundant granodiorite dikes.

The contact metamorphic aureole around the Galena Point Granodiorite extends as much as a mile from the main contacts shown on the map. This large extent is probably due in part to the numerous dikes and sills extending from the pluton. Contact-metamorphic assemblages that formed within 200 to 500 feet of the main granodiorite mass include cordierite and andalusite in addition to the usual minerals of the Prichard: muscovite-biotite-plagioclase-quartz. Farther from the contact, the common assemblage is medium- to coarse-grained muscovite-biotite-quartz-plagioclase.

Joan C. Engels of the U.S. Geological Survey obtained an age of 100.3±2.8 m.y. on muscovite from this pluton using the potassium-argon method. Although only a single mineral was dated, the age obtained is considered to be the age of emplacement and not a reset age, because mineral pairs from other plutons in the area have been dated and given concordant numbers of about the same age. The Galena Point is considered Cretaceous.

MESOZOOIC AND (OR) CENOZOIC ROCKS
CRETACEOUS AND (OR) TERTIARY SYSTEMS

Muscovite-biotite quartz monzonite

Muscovite-biotite quartz monzonite is sparsely exposed over about 4 square miles along the eastern edge of the quadrangle. Unlike the other two plutons in the area, this rock is inhomogeneous with respect to texture and appearance. North of Big Meadows the rock is medium grained and contains only small amounts of muscovite. It has an indistinct foliation and is difficult to distinguish from the nonporphyritic marginal part of the Galena Point Granodiorite. South of Big Meadows, the rock somewhat resembles the Blickensderfer Quartz Monzonite, but it is finer grained and contains a smaller percentage of muscovite. It is likely, however, that the body is related to the Blickensderfer Quartz Monzonite. Oligoclase, microcline, quartz, muscovite, and biotite make up most of the rock. Apatite, zircon, and sparse opaque minerals make up the accessories. Neither the absolute nor relative age of the pluton is known. Because of similarities to known Cretaceous and Tertiary plutonic rocks, it is assigned a Cretaceous and (or) Tertiary age.

CENOZOIC ROCKS

TERTIARY SYSTEM

Pend Oreille Andesite

M.C. Schroeder (1952, p. 24) named the Pend Oreille Andesite for its occurrence within the valley of the Pend Oreille River. The excellent exposures 1.5 miles north of Purport are here designated as the type locality, as Schroeder did not choose one. The formation, which is
known only within this quadrangle, is composed of flows, flow breccias, and, locally, thin interflow sedimentary rocks. Both flow rock and breccia are massive and contain almost no internal layering. It has not been possible to map individual flows, although interflow sedimentary rocks at one locality and fine-grained chilled flow margins at several localities indicate that more than one is present.

The flow rock and breccia are light gray to pinkish gray and invariably contain phenocrysts of hornblende and biotite from 0.05 to 0.2 inch in length. The chilled border rock at the margins of flows is dark gray to black and contains hornblende phenocrysts as much as 0.4 inch in length. Commonly, the phenocrysts are glomeroporphyritic, and some form radiating clusters.

The rock as seen in thin section is made up of small phenocrysts of oxyhornblende in a groundmass of andesine, finely crystalline feldspar of undetermined composition, and devitrified glass. The rock has a trachytic texture and locally is glomeroporphyritic. The chilled border rock contains small phenocrysts of pyroxene and larger ones of oxyhornblende and biotite set in a fine-grained matrix of andesine and devitrified glass. Alteration of the oxyhornblende and biotite are obvious, but the pyroxene is unaffected. According to Rittman's (1952) chemical classification, the andesite is actually a rhyodacite.

J. D. Obradovich, of the U.S. Geological Survey, has dated samples collected by R. C. Pearson (oral communication, 1971) and has obtained an age of 51.0 m.y. on hornblende and 50.4 m.y. on biotite (K/Ar method). The rock is considered to be of Eocene age. The dated samples were collected near the center of section 27, T. 33 N., R. 44 E.

Tiger Formation

Conglomerate interlayered with a few conglomeratic arkose beds crops out along the west edge of the quadrangle. To the west, this unit appears to be restricted to the Pend Oreille River Valley and as in the Newport number 2 quadrangle is found only at elevations below 3,500 feet. Exposure of the unit are poor except for those in sec. 16, T. 33 N., R. 44 E. The rock is poorly stratified except where arkosic beds are found. The conglomerate clasts consist of argillite, quartzite, siltite, and dolomite from the Belt Supergroup. Granitic clasts and clasts of Pend Oreille Andesite are locally abundant. Sorting and degree of roundness are very poor, except for a few places where the clasts are fairly well rounded.

In the Metaline quadrangle to the north, Park and Cannon (1943, p. 28) applied the name Tiger Formation to a formation similar to this one. The age of the Tiger was given as Tertiary. The conglomerate and conglomeratic arkose in this quadrangle are correlated with the Tiger Formation in the Metaline quadrangle. Both here and in the Metaline quadrangle the formation may represent deposition during more than one epoch of the Tertiary. No fossils have been found in the unit within the quadrangle.

QUATERNARY SYSTEM

Glacial, alluvial, and talus deposits, undifferentiated

Glacial and alluvial deposits are largely confined to floors and walls of valleys. Thin patches of glacial material mantle some of the slopes at higher elevations, but most are too small or too patchy to be shown on the geologic map. Clast size ranges from boulders to fine silt. Talus is confined to the lower part of steeper slopes such as those on the west flank of Cooks Mountain.

STRUCTURE

The pre-Mesozoic rocks in the Newport Number 1 quadrangle form a complexly faulted, west-dipping homocline. Barnes (1965, pl. 1) has mapped east-dipping beds east of the quadrangle and has referred to the fold as the Snow Valley anticline. The section in the Newport Number 1 quadrangle is the west flank of this fold. The west-dipping sequence is known to continue to a large east-dipping thrust fault on the west side of the Pend Oreille River Valley that places the Belt against high-grade metamorphic rocks. This fault may underlie part or all of the Newport Number 1 quadrangle.

The faults in the Newport Number 1 quadrangle cannot readily be separated into different age groups on the basis of attitude or crosscutting relationships. Movement appears to be contemporaneous on many intersecting faults even though one may truncate another. In this respect the faults are similar to some of the block faults in the Basin and Range Province. None of the faults have demonstrable strike-slip movement.

Several of the faults have apparent displacements of many thousands of feet. The northwest-striking fault that passes through Brown Lake has an apparent left-lateral separation of about 7,500 feet. Each of the faults that pass up Cee Cee Ah and Brown Creeks has several thousands of feet of apparent displacement along it, but exactly how much is difficult to establish due to other north-south faults that terminate against the northeast faults. The rocks west of the north-striking faults are upthrown relative to the rocks on the east, repeating lower parts of the Belt section; the faults therefore are not responsible for uplift of the mountains.

The lack of faults in the Prichard Formation may be more apparent than real. Other than the metadiabase sills, no stratigraphic markers have been mapped in the formation. Therefore, any north-south striking faults would be difficult to recognize in the unit. All the faults appear to be older than the Pend Oreille Andesite, although a fault that may cut the andesite may pass up Sandwich Creek, west of Skookum Peak. No faults have been recognized in the plutonic rocks as yet but they are known to cut plutons of presumably the same age in the Newport Number 2 quadrangle.

REFERENCES CITED


