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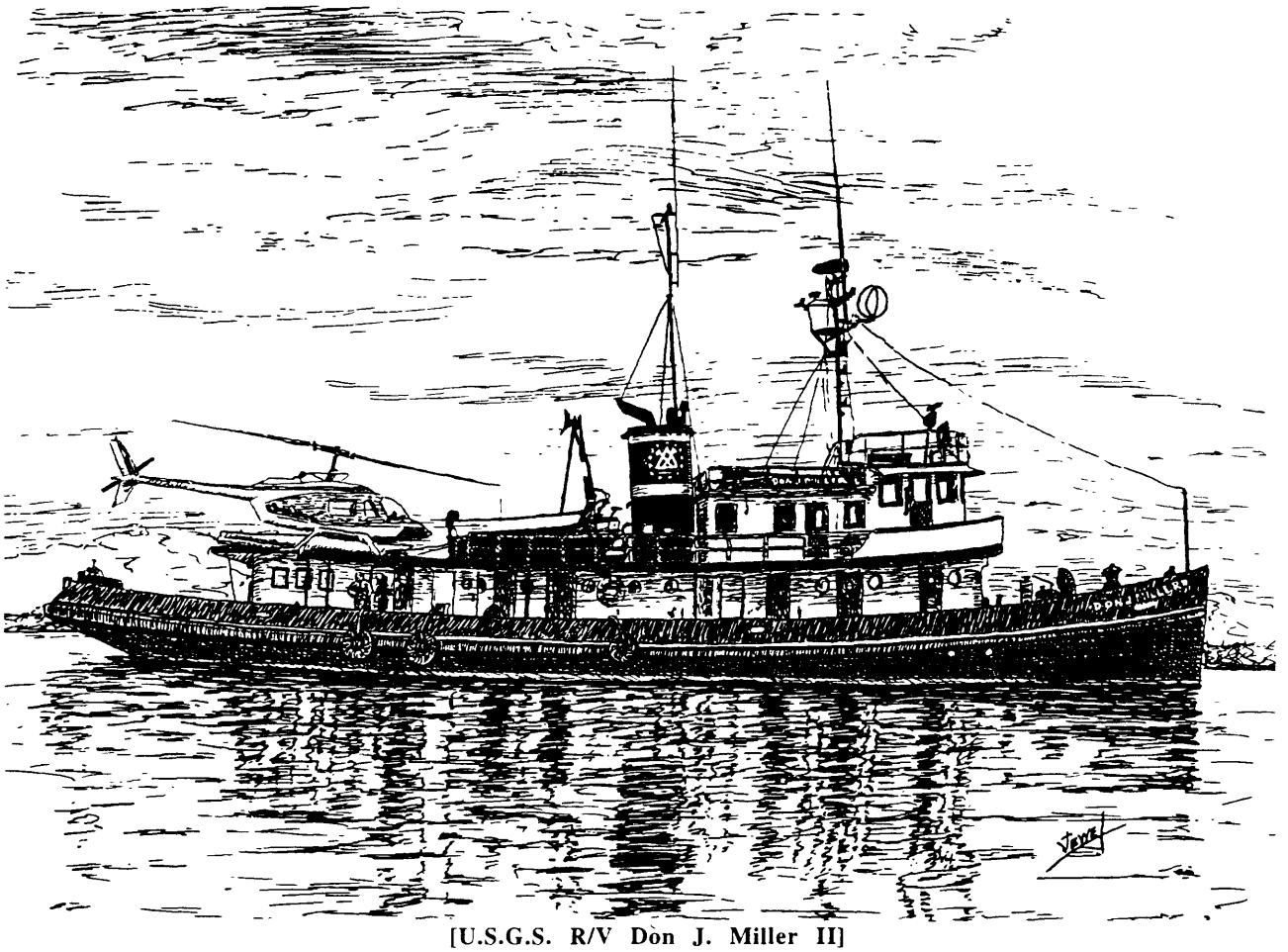

[U.S.G.S. R/V Don J. Miller II]

RECONNAISSANCE GEOLOGIC MAP OF THE PETERSBURG C-1 QUADRANGLE, SOUTHEASTERN ALASKA

Open-File Report 97-156-H

By David A. Brew

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Reconnaissance Geologic Map of the Petersburg C-1 Quadrangle, Southeastern Alaska

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INTRODUCTION

This map and its accompanying information were prepared specifically as part of the State of Alaska Division of Geological and Geophysical Surveys and the U.S. Department of Interior Bureau of Land Management Alaska Minerals Section (Juneau, Alaska) in their mineral-resource studies of part of the Petersburg, Alaska 1:250,000-scale quadrangle. These studies are a direct follow-up to the U.S. Geological Survey investigations in the area in 1978-1983 which are cited below.

The geologic information presented here has been released previously in generalized form (Brew and others, 1984); the information is based on reconnaissance field mapping and thus does not have the density of field-station control, samples, or field observations that are expected in most U.S. Geological Survey 1:63,360-scale geologic maps. This map is one of a series that share the same format and general information (Brew, 1997a-m; Brew and Koch, 1997). There are both a combined description and a combined correlation of the map units for this whole series of maps (Brew and Grybeck, 1997).

The available information on known mineral deposits in the whole Petersburg-Wrangell area was released previously (Grybeck and others, 1984) and Brew and others (1989, 1991). Bedrock, stream-sediment, and other geochemical data were released and interpreted by Karl and others (1985), Karl and Koch (1990), Cathrall and others (1983a-w), and Tripp and Cathrall (1984). Aeromagnetic and aeroradioactivity surveys information was released by the U.S. Geological Survey (1978, 1979) and Bouguer gravity information by Barnes and others (1989). Remotely-sensed features were described by LeCompte (1981). Burrell and others (1982) released a preliminary bibliography of Petersburg and Port Alexander quadrangles-related items.

Assessments of the undiscovered mineral resources for the whole Petersburg/Wrangell area are also available (Brew and others, 1989, 1991; Brew and Drinkwater, 1991). Some of the mineral-resource-assessment tract information in neighboring areas was revised by Brew and others (1996). Brew (1993) presented a generalized view of metallogenic belts that includes this area.

Detailed information on the Late Cretaceous plutonic rocks in the Petersburg 1:250,000-scale quadrangle is found in Burrell (1984abc); major-element chemical and other data for the area were reported by Douglass and others (1989), and relatively young volcanic features were described by Brew and others (1984) and by Brew (1990). McClelland and Gehrels (1990) reinterpreted some of the geology in and around the Duncan Canal area, which lies to the west of this quadrangle.

The index map on the over-size sheet shows the major geological elements of the Petersburg-Wrangell area. They are, from west to east, (1) the Alexander belt, consisting of generally unmetamorphosed Lower Paleozoic through Upper Triassic rocks intruded by scattered mid-Cretaceous plutons, (2) the Gravina belt, consisting of unmetamorphosed to highly metamorphosed, variably deformed Upper Jurassic(?) through mid-Cretaceous flysch and volcanic rocks intruded by both mid- and Upper Cretaceous plutons, and (3) the Mainland belt, consisting of metamorphic rocks intruded by Upper Cretaceous, lower Tertiary, and mid-Tertiary plutons. Younger than almost all parts of all of these belts, and extending from the Alexander belt across the Gravina and onto the mainland belt, is the lower to middle Tertiary Kuiu-Etolin belt that consists largely of varied volcanic rocks, associated plutons, and minor sedimentary rocks. The Alexander belt corresponds more or less to the Alexander terrane of Berg and others (1978), the Gravina belt is a refined interpretation of their Gravina belt. This quadrangle includes only rocks of (1) a small part of the Gravina belt , and (2) Mainland belt (see Correlation of Map Units diagram on the oversize sheet).

DESCRIPTION OF MAP UNITS

[Note: All formational and descriptive map-unit names in the text of the following descriptions are set off with quotation marks to make them easier to identify.]

Qs SURFICIAL DEPOSITS (Holocene and(or) Pleistocene)--Includes alluvium, colluvium, tidal mudflat deposits, and some glaciofluvial deposits. The distribution of most large areas of surficial deposits was mapped in the field, but the deposits have not been studied in detail; many small areas are not shown.

MAINLAND BELT

This belt was informally named by Brew and others (1984) to facilitate discussion of 1) rocks that have been metamorphosed to the extent that the age and nature of their protoliths is highly uncertain, and 2) the granitic and other rocks that intrude them. The rocks in this belt, as well as some of those to the west in the Gravina belt, make up the Coast plutonic-metamorphic complex as defined by Brew and Ford (1984abc), which has been redefined as the Coast Mountains Complex by Brew and others (1995).

Qi GLACIAL ICE AND PERMANENT SNOWFIELDS (Holocene)

INTRUSIVE ROCKS OF BEHM CANAL PLUTONIC BELT (Miocene and(or) Oligocene)--Belt informally named by Brew and Morrell (1983); as mapped in this quadrangle, includes two units:

Tdr Rhyolite and Related Rocks--

Generally flow banded, locally quartz porphyritic; weathers light brown and yellowish-brown, light gray where fresh. Occurs in broad swarm of dikes from 0.5 to a few m wide with little included country rock; the swarm is more or less centered on the granite stock at Groundhog Basin ("Tag", see below). A few small isolated plugs occur along strike. Several exposures within the unit are of vent breccia similar to the "Vent Breccia" (QTv) in the Kuiu-Etolin belt to the west of this quadrangle. The breccias consist of dominant angular 5-20 cm maximum dimension rhyolite, granitic, and metamorphic rock fragments with essentially no matrix; see Gault (1954) and Gault and others (1953) for details. Age of the rhyolites is inferred from the closely associated granite stock at Groundhog Basin in the southeastern corner of this quadrangle ("Tag", described below). The dike swarm has been prospected for both molybdenite and base metals, but no economic occurrences are known within it.

Tmr Foliated Rhyolite and Related rocks--

The rocks of this unit are interpreted to be the same as those of the "Rhyolite and Related Rocks" (Tdr) unit, except that they are foliated and appear metamorphosed in outcrop. The foliation is so marked that field mappers were not sure if the rocks had been subjected to the same metamorphism as the enclosing rocks or if they were part of the dike swarm that extends northwest and southeast from the outcrop of "Chlorite Granite" (Tag). Their location within the boundaries of that swarm and the absence of distinctive metamorphic minerals indicates that their foliation is due to intrusive processes.

Tag Chlorite Granite--

Homogeneous, fine- to medium-grained, C.I. 03 to 06; very light gray to yellow where fresh, yellow to yellowish-gray where weathered. Chlorite replaces biotite; generally seriate texture, but some samples are distinctly bimodal with a very fine-grained mosaic interstitial to larger biotite/chlorite, quartz, plagioclase, and K-feldspar grains. Age is based on a 17 Ma K-Ar determination on chlorite (Ken Fink, Amax Minerals, oral commun., 1978). Exposed only on the north side of Groundhog Basin (Gault and others, 1953) and in a possible small plug (not shown on map) that outcrops along Porterfield Creek about 1 km downstream from where the Groundhog Basin creek joins it. The body on the north side of Groundhog Basin has been the target of exploratory drilling for molybdenite.

GRANODIORITE OF CENTRAL COAST METAMORPHIC-PLUTONIC COMPLEX AND ASSOCIATED MIGMATITES (Eocene)--Age is based on preliminary K-Ar age determinations by M. A. Lanphere (U.S. Geological Survey, written commun., 1984) on a unit that occurs outside of this quadrangle but is interpreted to be part of and to be applicable to the whole suite, that consists of the following:

Map unit	General location	Biotite age	Hornblende age
Tgdb	Mount Pratt	51.3	49.3
Tgdb	Castle Mountain	50.9	-

These units are similar in petrographic and field characteristics to similarly dated units in the Sumdum, Taku River, Bradfield Canal and Ketchikan quadrangles (Webster, 1984). Divided into:

Tmgz Migmatite Consisting of Schist, Gneiss, Tonalite, and Granodiorite Invaded by Biotite Granodiorite--

Mixture of amphibolite facies hornblende-biotite quartzofeldspathic schist and gneiss, calc-silicates, mafic agmatite, tonalitic gneiss, tonalite, and K-feldspar-megacrystic biotite granodiorite that has been invaded and deformed by leucocratic (C.I. 1-8) biotite granite, granodiorite, and granodiorite gneiss. Deformation is intense and shows no consistent structural trends. The neosome is heterogeneous in texture and composition and is gradational to the homogeneous "Sphene-Bearing Biotite-Hornblende Granodiorite" (Tgdb) mapped to the north of this quadrangle. This migmatite is mapped along the western margins of this granodiorite, and to the east of the family of tonalite sill plutons. It usually, but not always, occurs to the east of the K-feldspar-megacrystic migmatite (Tmgx) described below. Inclusions of both that migmatite unit (Tmgx) and the K-feldspar-megacrystic-neosome (Tmgy) can be recognized within the leucocratic granite-granodiorite neosome. Schist and gneiss portions of some outcrops are conspicuously iron-stained, some portions of most other outcrops are visibly iron-stained. Most outcrops have an extremely heterogeneous appearance. See Karl and Brew (1983, 1984) for further information.

Tgdp Porphyritic Biotite-Hornblende Granodiorite--

Homogeneous to slightly foliated; medium-grained; C.I. 9 to 22. gray to buff where fresh, weathers to darker gray. Faint foliation defined by biotite and hornblende; rare mafic inclusions. Petrographic features include slightly inequigranular, hypidiomorphic-granular texture; biotite more abundant than hornblende and always chloritized. Euhedral to subhedral K-spar phenocrysts up to 3.5 cm normally constitute a small percentage of the rock; myrmekite common. Unit differs from "Sphene-bearing Biotite-Hornblende Granodiorite" (Tgdb) mapped elsewhere by the presence of phenocrysts and slight foliation. Unit is exposed immediately southwest of the International Boundary in the northeastern corner of this quadrangle.

Tgrg Gneissic Biotite Granite and Granodiorite--

Foliated, generally leucocratic, locally porphyritic and banded. Medium-grained, C.I. 3 to 30; light gray where fresh, weathers darker gray; K-spar phenocrysts or porphyroblasts up to 3x5 cm, locally augen-like. Locally has inclusions of quartz and hornblende. Petrographic features include inequigranular, hypidiomorphic-granular texture; biotite more abundant than hornblende and shows only slight alteration to chlorite; sphene found locally; myrmekite intergrowths are common. Unit differs from "Sphene-bearing Biotite-Hornblende Granodiorite" (Tgdb) and the "Porphyritic Biotite-Hornblende Granodiorite" (Tgdp) units by gneissic structure. Unit exposed in the northeastern corner of this quadrangle.

INTRUSIVE ROCKS OF THE GREAT TONALITE SILL BELT AND ASSOCIATED MIGMATITE (Upper Cretaceous and(or) Paleocene)--Belt informally named the "Coast Complex Sill Belt" by Brew and Morrell (1983) and now re-named; located northeast of Coast Range Megalineament (Brew and Ford, 1978). Regional aspects of this belt discussed by Brew and others (1976), Brew and Ford (1981), Ford and Brew (1981), and Brew (1994); belt is currently interpreted to be 62-69 Ma old on the basis of Pb-U analyses of zircons from rocks in the Sumdum and Juneau map areas to the northwest (Gehrels and others, 1983, 1984, 1991; Brew, 1994). The one attempt at K-Ar dating of the belt in this map area west of the headwaters of Aaron Creek (M. A. Lanphere, U.S. Geological Survey, written commun., 1984) gave a biotite age of 50.4 Ma and a hornblende age of 49.1 Ma. These ages are interpreted to be the result of complete thermal resetting of the K-Ar system by the thermal effects of the Eocene granodiorites (Tgdp, and Tgrg). As mapped in this quadrangle, divided into:

Tmgx Migmatite Consisting of Schist and Gneiss Invaded by Tonalite--

Amphibolite facies (hornblende-) biotite-quartz-feldspar schist and gneiss that has been invaded and deformed by tonalite. The schist and gneiss are fine grained, thinly layered (1-30 cm), may include calc-silicate layers (calcite, epidote, diopside, tremolite, garnet), and typically weather rusty. The tonalite invader is the "Biotite-Hornblende- and Hornblende-Biotite Tonalite, etc." (Ttos) characterized by its uniform C.I. (20-35), medium grain size, and local aligned hornblende phenocrysts. Biotite, sphene, epidote, and magnetite are common accessory minerals. This migmatite includes wavy deformed gneisses and raft structures, but on a large scale conforms to regional structural trends. It is mapped on the eastern margin of the Great Tonalite Sill Belt of tonalitic plutons and extends several kilometers to the east. It is successively invaded by younger neosomes to the east and can be recognized as paleosomes in almost all migmatites west of the homogeneous "Sphene-Bearing Biotite-Hornblende-Granodiorite" (Tgdb). Schist and gneiss portions of small outcrops are conspicuously iron-stained, some portions of most other outcrops are visibly iron-stained. See Karl and Brew (1983, 1984) for further information.

Ttos Biotite-Hornblende- and Hornblende-Biotite Tonalite, Quartz Diorite, and Minor Granodiorite-Homogeneous, foliated and non-layered;. Medium- to coarse-grained; C.I. averages 29, ranges 16 to 40. Gray where fresh, weathers darker gray. Locally hornblende porphyritic with phenocrysts up to 2 cm; inclusions and schlieren of dioritic composition common; gneiss inclusions occur locally. Petrographic features include: equigranular to seriate texture, hornblende as the dominant mafic, biotite replaces hornblende and is chloritized, plagioclase (An_{35}-An_{50}) is subhedral to euhedral and rarely zoned, poikilitic hornblende with inclusions of quartz and plagioclase are common, and epidote minerals rare. Unit trends northwest through the northeastern corner of this quadrangle.

Tgdg Gneissic Biotite Granodiorite and Quartz Monzodiorite--
Homogeneous at outcrop scale, foliated, locally banded/layered. Fine- to medium-grained; C.I. 5 to 25,. Light gray to gray where fresh, weathers darker gray. Local K-spar augen and K-spar phenocrysts up to 2.5 cm. Petrographic features include inequigranular texture, local disseminated garnet, subhedral plagioclasethat is unzoned and usually altered, local myrmekite, biotite is usually unaltered. Exposed along the Stikine River in this quadrangle.

METAMORPHIC ROCKS OF COAST MOUNTAINS COMPLEX (Upper Cretaceous and(or) Paleocene)--A progressively metamorphosed belt that forms the western edge of the Coast Mountains Complex; the western part adjoins the metamorphic rocks of the Gravina Belt. The rocks are in general so metamorphosed that no original textures or structures remain. The protoliths must have included a variety of clastic rocks, dominantly fine-grained, but including some sandstones and conglomerates. The fine-grained sediments probably occurred in thicker units than the coarser-grained. Other protoliths were limestones 10's to 100's of m thick, sediments and volcanic rocks of intermediate to mafic composition, and probably some intermediate to mafic sill-like intrusions. No fossils have been found in any of these rocks in this map area, but proximity to the Gravina belt suggests that some of the protoliths may have been of Jura-Cretaceous age; fossils collected in somewhat similar rocks to the northwest in the Tracy Arm area (Brew and Grybeck, 1984) and in the Juneau area (Ford and Brew, 1977; Brew and Ford, 1977) suggest that Lower Permian and Upper Triassic rocks of the Wrangellia terrane may also be present. Brew (1983) and Brew and Ford (1983, 1984a) argued that these rocks are the metamorphosed equivalent of rocks in the upper part (Permian and Triassic) of the Alexander Belt section, rather than a separate tectonostratigraphic terrane (or terranes) as espoused by Berg and others (1978). Nevertheless, isotopic evidence summarized by Brew and Ford (1994) and Brew and others (1994) indicates the some of the protoliths are Late Proterozoic or Early Paleozoic in age and belong to the Nisling assemblage, or lithotectonic terrane, of Wheeler and McFeely (1991). The age of metamorphism is interpreted to be Late Cretaceous and(or) Early Tertiary (Brew and Ford, 1984ab; Gehrels and others (1983, 1984, 1991). No obvious contrast, other than metamorphic grade, exists between the metamorphic rocks west of the Coast Range Megalineament and those engulfed in the plutons between there and the International Boundary, even though more than one lithotectonic terrane may be present. As mapped, divided into:

TKp Phyllite--

Dominantly well foliated and commonly lineated, dark gray where fresh; very fine- to fine-grained phyllite with minor thin, dark-gray, semischist interlayers. Weathers medium- to dark gray; some extensive areas of interlayered green phyllite that weathers light green. The dark-gray phyllite and semiscist are probably derived from a fine grained clastic section; the green phyllite from either tuffs or fine-grained volcanogenic sediments. Both form alternately rounded and serrated ridge tops and cliffy slopes. Metamorphic grade generally increases from prehnite-pumpellyite/low greenschist facies in the southwest to upper greenschist facies in the northeast. The common mineral assemblage of the semischist is (epidote-) albite-white mica-chlorite-quartz. Presence of foliation and spatial relationship to the well defined Barrovian metamorphic sequence, together with lack of actinolite or biotite, all indicate prehnite-pumpellyite facies. Typical greenschist metamorphic facies mineral assemblages in the dark gray semischists and phyllites are (garnet-)muscovite-chlorite-biotite-albite-quartz and in the green phyllites (biotite-)(actinolite-)(sphene-)clinozoisite-albite-quartz-chlorite-calcite-muscovite. With increase in grade, clastic and other relict textures disappear, grain size increases, and crenulation cleavage and transposition become well developed. Foliation is defined by parallel, intergrown laths of actinolite, biotite, chlorite, or white mica. Garnet is porphyroblastic, epidote and clinozoisite subidioblastic, calcite xenomorphic interstitial, and quartz and albite form a subgranoblastic matrix. This unit is enigmatic in that its distribution pattern includes semi-isolated areas almost surrounded by the "Biotite Schist and Semischist" (TKbs); this is currently interpreted to mean that this unit (TKp) actually records two metamorphic episodes that are difficult to distinguish from each other. The first is a post-Early Cretaceous pre-Late Cretaceous (110 to 90 Ma) low-grade regional event, the second overprints the first and is part of the low- to high-grade Late Cretaceous-Early Tertiary metamorphic-deformational event that is closely related to the emplacement of the Great Tonalite Sill Belt rocks (Ttos, Tgdg). Commonly observed polydeformation textures such as multidirection crenulation cleavage and nearly complete transposition are compatible with this interpretation. Where the 90 Ma Admiralty-Revillagagedo Belt plutons intruded the unit, hornblende hornfels facies thermal aureoles formed that are characterized by staurolite, biotite, and garnet. Porphyroblasts of staurolite and garnet, and decussate biotite laths have been rotated and realigned by development of the post-aureole foliation. Only rarely can an early foliation be detected through the superposed thermal and later dynamic-thermal metamorphic effects. Exposed along the northeastern shore of Eastern Passage in this quadrangle.

TKbs Biotite Schist--

Dominantly well foliated and lineated biotite schist, with lesser amounts of interlayered biotite semischist and hornblende schist and semischist. Fine- to medium-grained; weathers grayish-brown, brownish-gray where fresh. Forms craggy ridges and steep slopes. Metamorphic mineral assemblages suggest derivation from the same protoliths as the "Phyllite, Slate, and Semischist" (TKp) above. Metamorphic grade generally increases from southwest to northeast, from greenschist facies to upper amphibolite facies, in a Barrovian facies series. Mineral isograds marking the first occurrence of biotite, garnet, staurolite, and kyanite trend north-northwest and appear to steepen northeastward towards the Coast Range Megalineament which coincidentally locally marks the sillimanite isograd. Typical greenschist mineral assemblages are (epidote-)(clinozoisite-)(calcite-)(garnet-)biotite-muscovite-chlorite-albite-quartz and (actinolite-)epidote-calcite-sphene-chlorite-muscovite-albite-quartz. Higher grade pelitic assemblages include (kyanite-)quartz-muscovite-plagioclase (oligoclase to andesine)-biotite-garnet-staurolite. More mafic assemblages include (clinopyroxene-)hornblende-biotite-quartz-garnet-plagioclase. East of the Coast Range Megalineament sillimanite-potassium feldspar-muscovite-biotite-garnet-quartz-plagioclase assemblages represent the highest grade of regional metamorphism. The above assemblages may or may not contain the following accessory minerals: graphite, magnetite, ilmenite, apatite, and tourmaline. There may be four different metamorphic episodes recorded in different parts of this map unit: 1) a higher grade phase of the post-Early Cretaceous, pre-Late Cretaceous regional metamorphism discussed above, 2) the superposed thermal effects of the 90 Ma Admiralty-Revillagigedo Belt intrusions on those previously deformed rocks, 3) the "main" Late Cretaceous to Early Tertiary event that is the most likely cause of the features in this unit, and 4) thermal effects of the Eocene age Granodiorite of central Coast Mountains Complex (units Tgdb, Tgdp, Tgrg) that occur nearby. Textural and mineralogical evidence of the post-Early Cretaceous, pre-Late Cretaceous regional metamorphism have for the most part been obscured by local amphibolite-facies porphyroblastic, dicussate, and granoblastic recrystallization caused by 2) above, and the effects of 3) above. These events caused deformation-crenulations, shattered porphyroblasts with fragment trains, and in places totally disrupted the foliation. Foliation is defined primarily by alignment of mica laths and amphibole prisms that wrap around pre-existing garnet, biotite, staurolite, and/or kyanite grains. Recrystallized quartz and plagioclase are most commonly subgranoblastic, polygonal, and slightly elongate parallel to the foliation. Local zones of cataclasis in rocks exposed along the Coast Range Megalineament include blastomylonites, rare mylonites, and exhibit late greenschist-facies recrystallization. Exposed along the northeastern shores of Eastern Passage in this quadrangle and northeast to the Great Tonalite Sill Belt; and also in a few screens and pendants between there and the International Boundary.

TKhs Hornblende Schist and Semischist--

Poorly to well foliated, locally lineated interlayered hornblende schist, semischist, and lesser amounts of biotite schist; fine- to coarse-grained. Weathers greenish-gray, dark greenish-gray where fresh. Probably derived from intermediate to mafic volcanic flows, tuffs, or volcanic sediments, but some may be from fine-grained sills. Metamorphic grade increases towards the northeast from upper greenschist facies to amphibolite facies and is compatible with metamorphic facies of nearby "Biotite Schist and Semischist" (TKbs). Typical greenschist facies mineral assemblages are (garnet-)(zoisite-)(epidote-) plagioclase (albite-oligoclase)-hornblende-quartz-biotite-chlorite-sphene, and amphibolite facies assemblages are (clinopyroxene-)(garnet-) (potassium feldspar) plagioclase (andesine)-hornblende-quartz-biotite. In outcrops east of the Coast Range Megalineament chlorite-actinolite-calcite-epidote-white mica retrograde or alteration assemblages are present. Petrographic features include poikiloblastic hornblende and garnet. Hornblende and biotite laths define foliation with leucocratic and mafic minerals commonly segregated into bands. Protoclastic, quartz-ribbon, and augen textures are present within the Coast Range Megalineament zone. Exposed only in relatively narrow elongate masses adjacent to the Coast Range Megalineament.

TKmb Marble and Calc-Silicate Granofels--

Poorly foliated, rarely lineated, marble, calc-silicate granofels, and schist interlayered with highly variable amounts of biotite and hornblende schist. Fine- to coarse-grained; weathers white and light gray or yellowish-gray, white, and light gray where fresh. Commonly forms distinctive, poorly vegetated outcrops. Some marble masses are several hundreds of m thick and may have been reefoid limestones; alternatively they may simply be large detached fold hinges or a combination of the two. Others consist of 1-cm to 10-cm scale marble layers interlayered with equal amounts of marble and biotite schist. In the latter case they are mapped as this unit to emphasize the presence of the metacarbonates. Typical greenschist and amphibolite facies mineral assemblages are (quartz-)(white mica-) calcite-tremolite-chlorite, and (diopside-)(scapolite-)calcite-wollastonite-quartz. These are compatible with metamorphic facies assignments of nearby "Biotite-Schist" (TKbs) and "Hornblende Schist and Semischist" (TKhs) units (the latter is exposed in quadrangles to the north and east). The assemblages are also typical of thermal aureoles formed adjacent to 90 Ma Admiralty-Revillagigedo Belt plutons. Commonly lower temperature recrystallization has introduced tremolite and chlorite into these hornblende-hornfels or amphibolite-facies assemblages. Petrographic features include abundant lamellar twinned xenoblastic calcite, interstitial xenoblastic quartz, subidioblastic tabs of white mica, and decussate clusters, blades, and needles of tremolite and wollastonite. Mapped as elongate lenses within "Phyllite" (TKp), "Biotite Schist" (TKbs), and (to the north) "Hornblende Schist and Semischist" (TKhs) units and as screens within the intrusive bodies to the northeast of the megalineament. Several outcrops were sampled for conodonts but none were recovered.

TKbg Biotite Gneiss--

Dominantly well-foliated, well-layered, locally lineated, fine- to coarse-grained quartz-biotite-feldspar gneiss with lesser amounts of garnet-quartz-biotite-plagioclase schist and still less hornblende-plagioclase schist and gneiss. Weathers grayish-brown, gray where fresh. Probably derived from the same protoliths as the "Phyllite, Slate, and Semischist" (TKp) and "Biotite Schist and Semischist" (TKbs) units. Generally, but not exclusively, lies to the northeast of those units. Metamorphic characteristics are spatially dependent, as follows: Near the Coast Range Megalineament the unit is well foliated; commonly exhibits protomylonitic to phyllonitic, quartz-ribbon, and myrmekitic textures. Epidote-amphibolite facies synkinematic assemblages are (hornblende-)plagioclase-chlorite-biotite-epidote-quartz and (garnet-)biotite-muscovite-quartz-plagioclase-chlorite. Typically these 'sheared' rocks are strongly altered with abundant late chlorite, white mica, and calcite. East of, and locally to the west of, the Coast Range Megalineament the unit exhibits less cataclasis, and the foliation becomes poorer as grain size increases. Metamorphic mineral assemblages indicate the kyanite and sillimanite zones of the amphibolite facies. Typical mineral assemblages are (kyanite-)(staurolite-)biotite-muscovite-plagioclase-quartz-garnet and (sillimanite-)(potassium feldspar-) plagioclase-quartz-biotite-garnet. To the west of the Coast Range Megalineament, sillimanite (fibrolitic) rarely occurs in kyanite-bearing gneisses. "Regional" prismatic sillimanite occurs only east of the megalineament. Segregation is well developed between mafic biotite-rich and leucocratic layers; garnet, kyanite, and staurolite are poikiloblastic. An anastomosing foliation is defined by sub-equant-stubby laths of biotite outlining partially recrystallized porphyroblasts of plagioclase. Exposed both as elongate masses within the "Biotite Schist and Semischist" (TKbs) and as isolated screens within the granitic rocks northeast of the Coast Range Megalineament.

TKhg Hornblende Gneiss--

Moderately to poorly foliated, poorly layered, medium- to coarse-grained hornblende gneiss with lesser amounts of hornblende and biotite schist. Weathers greenish-gray or grayish-green, dark greenish-gray where fresh. Probably derived from same protolith as "Hornblende Schist and Semischist" (TKhs) mapped in quadrangles to the north and east. Metamorphic mineral assemblages increase in grade towards the northeast, consistent with a Barrovian facies series: epidote-amphibolite-facies assemblages such as hornblende-biotite-plagioclase-epidote and hornblende-biotite-garnet-plagioclase-quartz typify the lower grade portion of unit while (clinopyroxene-)garnet-hornblende-biotite-plagioclase-quartz and (potassium feldspar-)(hornblende-) clinopyroxene-biotite-plagioclase-quartz assemblages represent the northeastern, higher grade portions. The accessory minerals magnetite, sphene, zircon, and apatite occur in most assemblages. Foliation is commonly anastomosing or lenticular and is defined by parallel schlieren of biotite and sparse hornblende. Intergrown biotite hornblende, garnet, and(or) pyroxene also occurs in sparse patches, clusters, and swirls which show minor chlorite and rarely calcite alteration. Poikiloblastic hornblende has inclusions of biotite, apatite, and quartz. Porphyroblastic garnet has xenomorphic, partially resorbed, outlines. Clinopyroxene is subidioblastic. Subidioblastic plagioclase and xenomorphic, interstitial potassium feldspar show minor sericite alteration. Quartz is xenomorphic to subidioblastic and commonly exhibits undulose extinction. The unit crops out as elongate masses on the west side of the Coast Range Megalineament in this quadrangle.

INTRUSIVE ROCKS OF ADMIRALTY-REVILLAGIGEDO PLUTONIC BELT AND ASSOCIATED MIGMATITE (Upper Cretaceous)--General age relations are described for the Petersburg B-2 quadrangle (Brew, 1997d) under Gravina Belt. As discussed in that section, these plutons are about 90 Ma; in general, they have narrow thermal metamorphic aureoles that are superposed on deformed and low-grade regionally metamorphosed country rocks. Here in the Mainland Belt a further complication is present. Parts of some of this same family of plutons have been involved in the deformation and progressive low- to high-grade metamorphism in latest Cretaceous and earliest Tertiary time that gave rise to the "Metamorphic Rocks of the Coast Mountains Complex" super unit described above. Thus, the metamorphic age given for those rocks differs from with the emplacement age given for this family of plutons. The alternative was to assign the same metamorphic age to these plutons, but that is equally inadequate because not all of them show metamorphic features. The belt was informally named by Brew and Morrell (1983) and is described by Burrell (1984abc); K-Ar determinations by M. A. Lanphere (U.S. Geological Survey, written communs., 1981, 1982) interpreted to be applicable to the whole suite, including the rocks in this quadrangle, are as follows:

Map unit	General location	Biotite age	Hornblende age
Ktif unit	Wrangell Is.	83.2 Ma	91.6 Ma
" "	Mitkof Is.	-	89.1 Ma
Ktef unit	Zarembo Is.	90.4 Ma	93.0 Ma

Somewhat similarly dated rocks occur in lithically correlative units to the east in the Bradfield Canal quadrangle (R. L. Elliott and R. D. Koch, U.S. Geological Survey, oral commun., 1982; Koch and Berg, 1996). Divided into:

Kmgf Migmatite (Upper Cretaceous)--

Varied migmatitic rocks, mainly agmatite and irregular banded gneiss, in zones between the "Hornblende-Biotite Tonalite and Granodiorite, etc," (Ktef) and "Biotite Tonalite, Quartz Diorite, etc." (Ktgp) units and the "Biotite Schist" (TKbs). The granitic leucosomes generally resemble the main rock types in the above-mentioned units (Ktef and Ktgp); the metamorphic melasomes are fine- to medium-grained (garnet-)(sillimanite-)biotite hornfels, schist, and semischist. Crops out only south of the Stikine River; in this quadrangle crops out between Government Creek and South Fork (of Andrews Creek).

Ktef Hornblende-Biotite Tonalite and Granodiorite, Quartz Monzodiorite, and Quartz Diorite--

Foliated to massive equigranular; average grain size is medium, fine-grained near some margins. C.I. is 17 to 50; light to medium gray where fresh, weathers brownish to dark gray. Foliation varies both in direction and development: moderately developed in west to very well developed on east side of Wrangell Island to the southwest. Locally semischistose and cataclastic. Contains aplite dikes, pegmatite dikes and veins, and rounded very fine-grained hornblende diorite inclusions. Generally occurs in concordant intrusions, especially as sills with country rock and screens of country rock in margin of body. Mineralogy includes zoned, complexly twinned plagioclase with minor alteration to sericite. Mafic minerals usually biotite greater than hornblende; subhedral epidote; and local garnet and pyroxene. Accessory minerals are sphene, apatite, opaque minerals and allanite. Unit differs from "Hornblende-Biotite Tonalite, Granodiorite, etc" (Ktif) mapped in other quadrangles by presence of pyroxene and garnet, and biotite as the dominant mafic phase. Unit is exposed in the northeastern part of this quadrangle on the mainland.

Ktgp Biotite Tonalite, Quartz Diorite, and Granodiorite--

Porphyritic and foliated; medium- to coarse-grained; C.I. 11 to 35; cut by pegmatite and basalt dikes; local cataclastic texture and inclusions of country rock. Mineralogical features include zoned, complexly twinned plagioclase, quartz, interstitial K-feldspar, partly chloritized biotite, epidote, minor local hornblende; and accessory garnet, sphene, apatite and allanite. Unit differs from "Biotite-Epidote-Hornblende Quartz Monzonite" (Kqop) mapped in the quadrangle to the south by lack of hornblende and presence of garnet. Exposed in the southeastern part of this quadrangle in Mainland belt.

Kgb Metagabbro--

Biotite-plagioclase-hornblende granofels or semischist. Fine- to medium-grained; C.I. 70; dark green where fresh, weathers grayish-green. Crops out as a small plug on the ridge above the headwaters of Government Creek south of the Stikine River.

GRAVINA BELT

The term Gravina belt is used here to denote sedimentary and volcanic rocks of Late Jurassic and Early Cretaceous age, as well as the pre-Cenozoic granitic and other rocks intruded into that section) in the east-central part of the Petersburg-Wrangell map area. The Gravina belt as used here more or less corresponds to the Gravina belt as defined by Berg and others (1978), but the map distribution does not correspond because of newer information and differing interpretations.

METAMORPHOSED STEPHENS PASSAGE GROUP ROCKS (Upper Cretaceous)--Most of these units are associated with the Upper Cretaceous and Tertiary plutons (of the Kuiu-Etolin Belt) in the Gravina Belt, but in this quadrangle they are associated with "Intrusive Rocks of the Wrangell-Revillegigedo Plutonic Belt". The rocks have been rather arbitrarily assigned a Late Cretaceous age. One unit is mapped in this quadrangle:

Kss Schist and Hornfels--

Greenschist and albite-epidote to hornblende-hornfels-facies metamorphic rocks derived from "Seymour Canal Formation" turbidites and related rocks (KJss) mapped in quadrangles to the west. Original textures and structures generally preserved. Dominantly fine- to medium-grained, grayish-brown and reddish-brown weathering, locally foliated, usually compositionally layered chlorite-biotite-quartz-feldspar schist and semischist; minor phyllite. Some strongly hornfelsed rocks close to plutons: clear-cut aureoles around Upper Cretaceous plutons are (garnet-andalusite-staurolite-)biotite-quartz-feldspar hornfels and schistose hornfels; some calc-silicate and intermediate composition layers and lenses locally. Age of metamorphism in this quadrangle is the age of the plutons; age of protolith is Late Jurassic to middle Cretaceous based on derivation of this unit from the "Seymour Canal Formation".

ACKNOWLEDGEMENTS

This report could not have been produced without the efforts of my mapping colleagues, all of whom are identified in the note on the map; the supportive and enthusiatic crew of the former U.S. Geological Survey research vessel, the R/V Don J. Miller II; the several helicopter pilots and mechanics who provided efficient air transport during the field mapping; the reviewer, D.J. Grybeck, Computer Graphics Specialist J. B. Weathers, and Scientific Illustrator Kevin Ghequiere. I thank them all.

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