DEPARTMENT OF THE INTERIOR

61-103 GL-103

# GEOLOGY OF THE YAKUTAT DISTRICT, GULF OF ALASKA TERTIARY PROVINCE, ALASKA

By

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Scale 1:96,000

1 ½ 0 1 2 3 4 5 6 7 MILES

Depth contours in feet
Datum is mean lower low water
1961

This map is preliminary and has not been edited or reviewed for conformity with U. S. Geological Survey standards and nomenclature.

Base map compiled from preliminary U. S. Geological Survey topographic maps of Yakutat A-1, A-2, A-3, B-1, B-2, B-3, B-4, B-5, C-3, C-4, and C-5 quadrangles. Mainly from aerial photographs taken in 1948, with revisions in coastal area and along Alsek River from photographs taken in 1958. Hydrography from U. S. Coast and Geodetic Survey chart

Geology mainly from field mapping and photo-interpretation by D. J. Miller, 1960. Bedrock geology in area adjoining Yakutat Bay and Russell Fiord from R. S. Tarr and B. S. Butler, U. S. Geological Survey Prof. Paper 64, pl. 37, 1909, and in vicinity of Moser Creek and Miller Creek from field notes of Eliot Blackwelder, 1906.

## EXPLANATORY NOTES

This map of the Yakutat district is one of five maps at the same scale, showing the geology of the Gulf of Alaska Tertiary province (see index map). In this province, an arcuate belt more than 300 miles long and 2 to 40 miles wide, sedimentary rocks of Tertiary age are exposed or are inferred to underlie lowland areas covered by Quaternary unconsolidated deposits or ice (Miller, Payne, and Gryc, 1959, p. 37-47). Field studies were carried out in the province intermittently from 1944 to 1960, under the Geological Survey's program of petroleum investigations in southern Alaska.

### Bedrock geology

The rocks mapped as the volcanic unit (Mzv) in low-lying wave-planed areas from Bear Island northwest to the vicinity of Ustay River are poorly exposed and were examined at only a few places. The outcrops seen are mainly highly fractured and deformed greenstones, derived from flows, volcanic breccias, tuffs, and volcanic graywackes. Varicolored chert, black argillite, and gray to greenish-gray fine-grained graywacke are interbedded with or occur as lenses in the greenstone at some localities. This sequence of altered volcanic and sedimentary rocks continues southeastward into the Lituya district, and is part of the belt of rocks described as the slate-greenstone group in the vicinity of Lituya Bay (Mertie, 1933, p. 126-127).

Rocks exposed in small areas on Akwe Lake and near the south end of Russell Fiord, although partly intrusive, are included in the volcanic unit because of their relationship to the overlying Yakutat group and the presence of greenstone or greenstone-like rocks. Massive green diorite?, showing evidence of incipient low-grade metamorphism, and bedded, poorly sized fragmental greenstone are exposed in part in depositional contact and in part in fault contact with the Yakutat group at the head of Akwe Lake. Angular fragments in the greenstone at this locality include chert, marble, and volcanic rocks of intermediate and mafic composition. The rocks near the south end of Russell Fiord were described by Tarr and Butler (1909, p. 151-152, pl. 37) as quartz diorite and a coarsely crystalline rock containing large inclusions of marble, resembling the greenstone and associated crystalline limestone which they mapped beneath the Yakutat group farther north on Russell Fiord.

The volcanic unit in this district is overlain unconformably by beds of the Yakutat group that contain fossils which may be as old as Late Jurassic, but it is believed to be not much older than the basal part of the Yakutat group and probably of early or middle Mesozoic age.

The Yakutat group was mapped by Tarr and Butler (1909, p. 152-160, pl. 37) in the type area of the Yakutat Bay region, including the part of this map area adjoining Yakutat Bay and Russell Fiord. They described the group as consisting mainly of graywacke, black shale, and interbedded black shale and sandstone, with thick beds of black conglomeratic argillite and gray to brown conglomerate locally. Blackwelder (1907a, p. 83-84; 1907b) described these rocks as the Yakutat series in the area between the valley of Moser Creek and Harlequin Lake. Ground and aerial observations, and study of photographs in the present investigation have shown that the group continues southeastward in the Brabazon Range as far as the Alsek River. Black conglomeratic argillite (the boulder slate of Blackwelder) comprises the basal part of the group at the north end of Akwe Lake, where it is in depositional contact with the underlying volcanic unit. The rocks seen higher in the group on Akwe Lake, and in a traverse along the west side of the Fassett Glacier and Tanis Lake, are mainly massive graywacke, massive black argillite, and rhythmically interbedded thin-bedded argillite and graywacke.

Regional metamorphism of the Yakutat group increases southeastward from the vicinity of Fassett Glacier to Alsek River. The graywacke and argillite grade along strike into well-bedded schist and phyllite described along the Alsek River at Gateway Knob by Blackwelder (1907a, p. 83). A rapid increase in metamorphic grade northeastward across the regional strike is shown in outcrops at the inner margin of the coastal plain about 6 miles west of Gateway Knob.

Fossils were found in 1960 in the basal part of the Yakutat group on the shores of Akwe Lake in this district. The fossils are described by D. L. Jones of the U.S. Geological Survey as follows:

Locality M1030: Buchia sp. indeter. Specimens preserved as molds which show the typical byssal notch of Buchia but are not well enough preserved for specific identification. Their elongate outline is suggestive of species of Late Jurassic age.

Locality M1031. Inoceramus fragments. Jurassic or Cretaceous.

The Yakutat group in the vicinity of Yakutat Bay and in the Malaspina district to the west was considered by Plafker and Miller (1957) to be Cretaceous and probably largely or entirely of Late Cretaceous age. The Late (?) Cretaceous age herein assigned to the Yakutat group is supported by a fossil found well above the base in the Yakataga district (Brabb and Miller, 1960, p. 12), but an older age limit of Late Jurassic may be suggested by the fossils described above.

Sedimentary rocks of Tertiary age are not known to crop out in the area of this map, but they have been found beneath the Quaternary unconsolidated deposits in wells drilled recently near the coast in the Yakutat district (D. G. Benson, Colorado Oil and Gas Corp., oral communication, January 13, 1961).

### Mineral resources

Oil seeps were reported near Yakutat as early as 1891 (Russell, 1893, p. 91), but this and later reports of surface indications of petroleum in this district have not been substantiated. Oil claims staked in the vicinity of Yakutat Bay near the beginning of the present century (Tarr and Butler, 1909, p. 169-170) were abandoned without any attempt to explore them by drilling. The coastal plain in this district has more recently been included in a possible petroleum province (Gryc, Miller, and Payne, 1951, p. 159-160) on the assumption that the Quaternary deposits are underlain by sedimentary rocks of Tertiary age, which may be favorable for petroleum. Exploration begun in 1956 and involving, through 1960, surface mapping, seismic and gravity surveys, and the drilling of four deep test wells (table 1), has demonstrated the presence of petroleum and sedimentary rocks of Tertiary age. At the end of 1960 all of the lowland area of the Yakutat district was covered by Federal oil and gas leases.

### References cited


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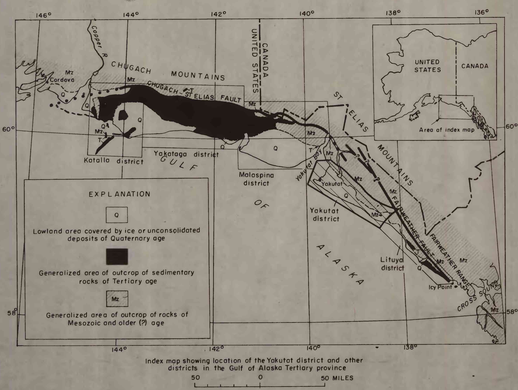


## EXPLANATION

### UNCONSOLIDATED SEDIMENTARY DEPOSITS

The units listed below overlap in age and therefore are not arranged in stratigraphic order.

**Qs** — Undifferentiated surficial deposits

Mainly glaciofluvial and fluvial gravel, sand, and mud. Includes lagoon and tidal-estuary deposits at present and former shorelines

**Qg** — Glacial moraine deposits

Undifferentiated deposits of one or more glacial advances; mainly till, but include lake and glaciofluvial deposits in places. Arrow indicates direction of ice movement as inferred from trend of elongate ridges and trenches

**Qsp / Qsf** — Marine shoreline deposits

Mainly sand; gravel in places.
Qsp, beach and beach-ridge deposits associated with present shoreline
Qsf, beach, beach-ridge, and spit deposits associated with former shorelines

**Qes** — Eolian sand

Deposits with sparse vegetation cover, associated with present shoreline

Recent — QUATERNARY

### BEDROCKS

Unconformity

**Ky** — Yakutat group

Mainly argillite, graywacke, and conglomeratic argillite, with minor slate and conglomerate, over most of map area; mainly schist east of longitude 138°25'

Upper(?) Cretaceous — CRETACEOUS

Unconformity

**Volcanic unit**

Mainly interbedded flows, pyroclastic deposits, and volcanic graywacke, altered to greenstone; minor argillite and chert, and small bodies of dioritic intrusive igneous rocks

MESOZOIC

### GEOLOGIC SYMBOLS

Contact — Dashed where approximately located, queried where inferred

Fault — Dashed where approximately located, dotted where concealed; queried where inferred. U, upthrown side; D, downthrown side

Strike and dips of beds

Strike and dip of beds, up side not known

Strike of vertical beds

Attitude of beds

Dashed strike bar indicates attitude estimated from ground or aerial photographs or from distant views; query indicates bedding not definitely recognized

• Yakutat 1 — Location of test well drilled for petroleum. See table 1

• M 1030 — Fossil locality, showing Geological Survey Mesozoic locality number

### GLACIERS AND LANDFORMS

Present margin of glacier or ice field

Maximum stand of glaciers during youngest Recent advance; coincides with boundary of Qg deposit in places; dashed where approximately located. Projections are on side toward ice

Maximum stand of glaciers during older Recent advance; coincides with boundary of Qg deposit in places; dashed where approximately located, queried where inferred. Projections are on side toward ice

Raised sea cliff. Line is at base of cliff and shows position of former marine shoreline, dashed where approximately located; coincides with boundary of Qs deposit in places. Figure shows approximate altitude of former marine shoreline

Wave-cut bedrock surface overlain by thin or discontinuous unconsolidated deposits. Figure shows approximate altitude

Relatively flat erosion surface on bedrock, overlain by thin or discontinuous unconsolidated deposits; origin uncertain. Figures show approximate altitude

Ridge line

Table 1.--Wells drilled for petroleum in the Yakutat district, through year 1960

| Company and name of well | Location (see map) | Year | Total depth (feet) | Results |
|---|---|---|---|---|
| Colorado Oil & Gas Corp, Yakutat Unit 1 (drilled jointly with Frankfort Oil Co.) | Near Yakutat Airport | 1957 | 9,314 | Abandoned due to mechanical difficulties. Shows of oil. |
| Colorado Oil & Gas Corp, Yakutat Unit 2 (formerly A No. 1; drilled jointly with Frankfort Oil Co.) | ---do--- | 1957-1958 | 11,765 | Abandoned due to mechanical difficulties. Shows of oil and gas. |
| Colorado Oil & Gas Corp, Yakutat Unit 3 (drilled jointly with Frankfort Oil Co. and Continental Oil Co.) | ---do--- | 1958-1959 | 10,848 | Abandoned due to mechanical difficulties. Shows of gas. |
| Colorado Oil & Gas Corp, Dangerous River Unit 1 (drilled jointly with Frankfort Oil Co., Continental Oil Co., Sinclair Oil & Gas Co., and BP Exploration Co. (Alaska), Inc. | Dangerous River | 1960 | 8,634 | Abandoned. Dry hole. |