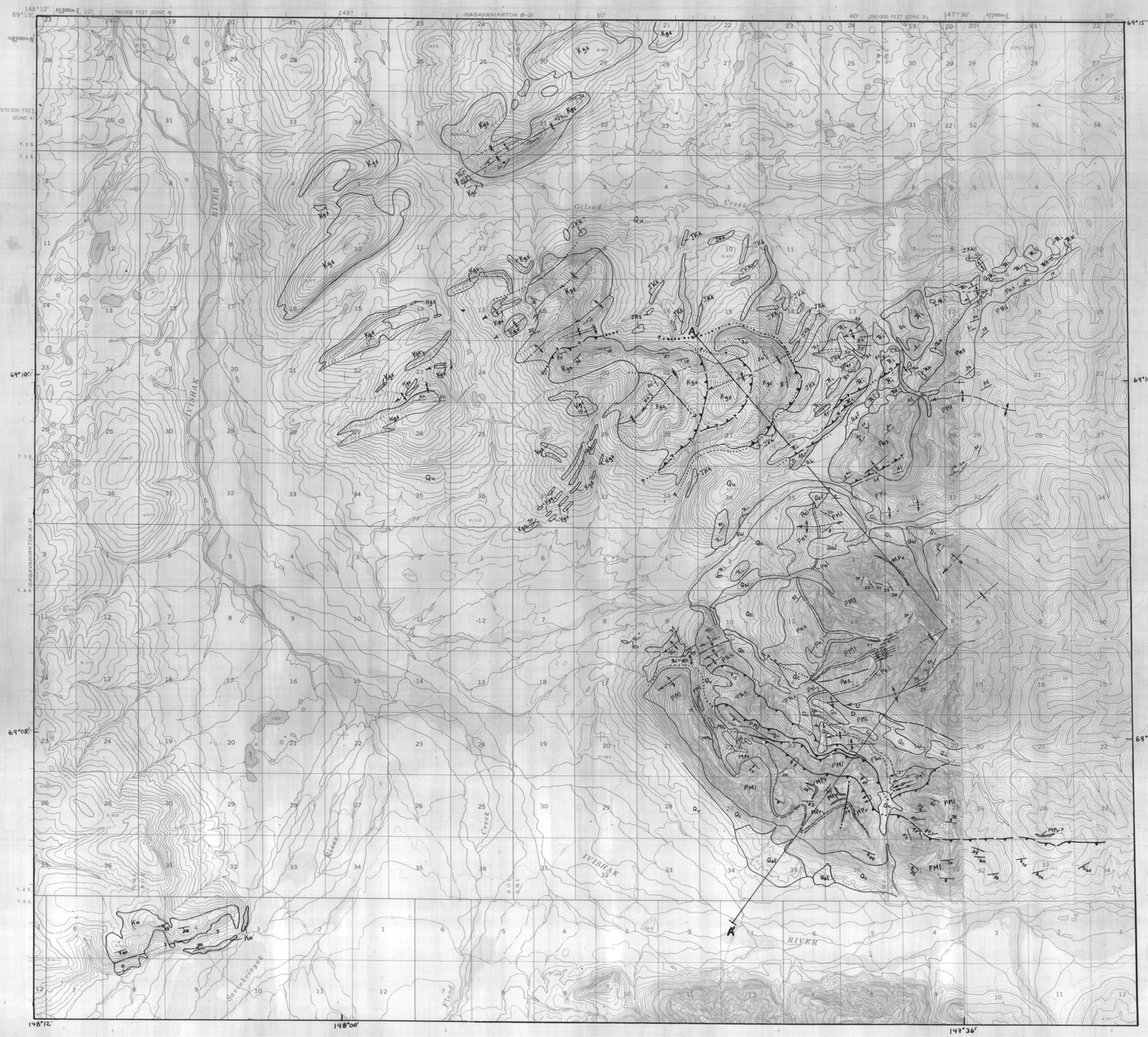


Base map from U.S. Geological Survey
Sagavanirktok A-2 and A-1 (1971) Quadrangles, Alaska

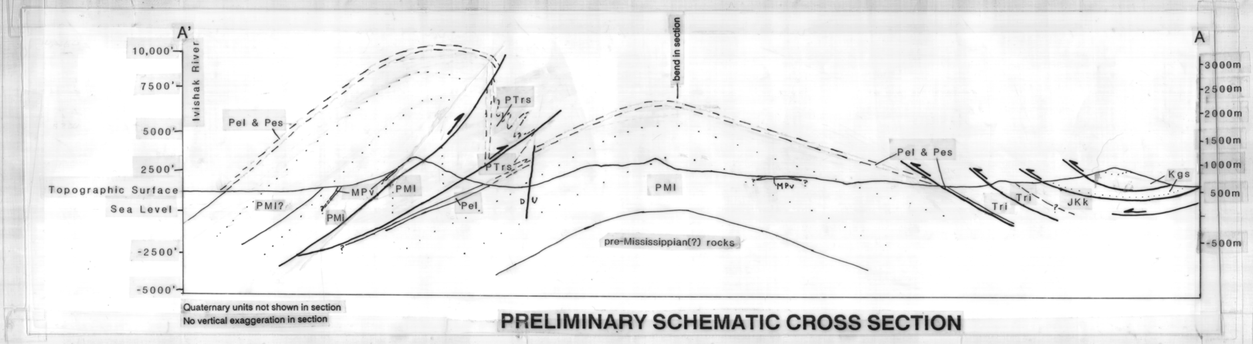
SCALE 1:63,360

1 0 1 2 3 4 MILES
1 0 1 2 3 4 5 KILOMETERS

31°
TRUE NORTH
MAGNETIC N
APPROXIMATE MEAN DECLINATION, 1971

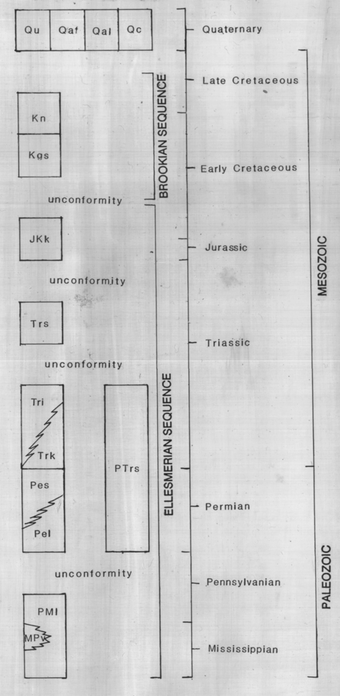
ALASKA
STUDY AREA

Geology by: G.H. Pessel, M.S. Robinson, J.G. Clough, T.A. Imm, R.R. Reifenstuhl, C.G. Mull, M.D. Myers, and T.J. Ryherd, 1989.
Reviewed by S.A. Liss. Compiled by R.F. Clement.



PRELIMINARY SCHEMATIC CROSS SECTION

CORRELATION OF MAP UNITS



MAP SYMBOLS

- Contact - solid where known, dashed where inferred
- High-angle fault - solid where known, dashed where approximately located, queried where questionable; U, upthrown side; D, downthrown side
- Thrust fault - sawteeth on upper block, dashed where approximately located, queried where questionable
- Overturned thrust fault

Folds, showing trace of axial plane and direction of plunge, dashed where approximately located

- Anticline
- Minor anticline
- Syncline
- Minor syncline

Strike and dip of beds

- Vertical
- Inclined
- Overturned
- Form lines, approximate trace of prominent bedding

DESCRIPTION OF MAP UNITS

UNCONSOLIDATED DEPOSITS

Qu Undivided Quaternary deposits- Includes alluvium, terrace gravel, glacial moraine, and outwash.

Qal Flood-plain alluvium- Poorly to well-sorted loose sand and gravel with trace to abundant silt deposited by modern streams. Consists mostly of subangular to well-rounded pebbles and cobbles; locally contains boulders up to 75 cm diameter.

Qaf Alluvial-fan deposits- Poorly to moderately sorted silt, sand, and gravel deposited by streams at valley mouths. Surface generally smooth; dissected by a few stream channels. Surface slopes less than 20° and slightly concave upward. Clasts consist of subangular to subrounded cobbles and boulders. Clast compositions match rock types in the associated drainage basin. Inactive fan surfaces often capped by overbank silt and sand.

Qc Colluvium and alluvium undifferentiated- Very poorly to moderately sorted silt, sand, and gravel on steep slopes, derived from underlying or nearby bedrock or unconsolidated deposits and left on slopes by frost creep and solifluction. Size distribution of clasts is dependent on source deposit or bedrock. Where present, clasts are subangular to subrounded and range up to boulder size. Topography generally smooth, and follows the contour of the underlying bedrock surface.

BEDROCK UNITS

BROOKIAN SEQUENCE

The Brookian Sequence was named for a Cretaceous to Recent age sedimentary sequence in arctic Canada. In the Sagavanirktok A-2 Quadrangle the Brookian Sequence is composed of a thick marine and nonmarine succession derived from sediments shed northward by the uplift of the Brooks Range orogen. North and west of the map area, the Brookian sequence is as thick as 4,000 m (Bird and Molenaar, 1987).

Kn Nanushuk Group - Gray- to light-gray, gray- to yellowish- to reddish-gray, fine- to very fine grained, quartzose sandstone, interbedded with sandy siltstone and siltstone; forms resistant ledges up to 15 m thick separated by up to 70 m of generally poorly exposed black shale and mudstone. Sandstone beds are up to 1 m thick, locally burrowed, generally fining upward sequences, homogeneous to evenly plane-parallel bedded and evenly laminated, with locally abundant rippled intervals at the top. Sequence appears to represent shallow marine deposition. Several hundred meters exposed in northwest Gilead Creek. An extensive outcrop of probable Nanushuk Group occurs along the north side of the Saviukviayak River near its confluence with the Ivishak River. At this location 100 m of dark-gray- to black, clay-shale underlies very-fine- to fine-grained, thin-bedded, flaggy sandstone with common sole marks and cross beds. Sandstone includes interbeds of siltstone and black shale.

Kgs 'Gilead Creek sandstone' (informal name) - Dark-gray, and medium-gray, dark-gray and orange-brown-weathering, fine- to coarse-grained, subangular, moderately sorted sandstone (litharenite) with lesser siltstone (< 5 percent) and shale. Shale intervals (typically < 5 cm thick) are very dark-gray to black and contain carbonaceous plant fragments and coalified material. The sandstone to shale ratio (ss/sh) is greater than 10/1. Sandstone clast-type, and estimates in percent are: quartz (50), chert (30), metamorphic rock fragments (10), plagioclase feldspar (2), limonitic-weathered clasts (2), white mica (1), and carbonaceous material (3). Matrix and cement in the litharenite consists of < 10 percent clay and iron oxide; carbonate cement may locally comprise 10 percent of the rock. Porosity is estimated to be low. Sandstone is non-channelized, and typically massive, with minor parallel-bedded exposures. Local wavy laminations (upper flow regime ?), hummocky cross stratification, climbing ripples, grading, and trough cross stratification occur; loadcasts and groove casts are locally abundant. Bedding plane-parallel laminations, graded bedding and shale rip-ups suggest event-type deposition. Medium- and coarse-grained sand layers are erosive into the underlying, finer grained beds. Zones of carbonate-cemented, medium- and coarse-grained sandstone occur in trough cross stratified beds. Sandstone beds are typically medium-bedded, 1 to 20 cm thick, and resistant thick-bedded units of featureless, medium- and coarse-grained sandstone (> 50 cm thick) also occur. Total thickness of the Gilead Creek sandstone is 933 m (Reifenstuhl, 1989). Probably correlative with the Fortress Mountain Formation (early Albian) to the southwest.

ELLESMERIAN SEQUENCE

The Ellesmerian sequence was named for a Mississippian to Jurassic age sedimentary sequence in arctic Canada. In the Sagavanirktok A-2 Quadrangle, the Ellesmerian sequence includes the Alapah Limestone and Wahoo Limestone of the Lisburne Group (Mississippian and Pennsylvanian, respectively), the Echooka Formation and Ivishak Formation of the Sadlerochit Group (Permian and Triassic), the Shublik Formation (Triassic), and the Kingak Shale (Jurassic-Early Cretaceous).

JKk Kingak Shale - Black, orange-brown-weathering, soft clay-shale, and iron-stained, very-fine-grained sandstone interbeds with clay ironstone concretions to 15 cm in diameter locally. The Kingak Shale crops out below the Gilead Creek sandstone at an apparent thrust fault that is suggested by abundant slickensides, local brecciation and by open-space fractures with quartz crystals to 1.5 cm long. The unit is soft and incompetent, typically folded and contorted, recessive, poorly exposed except in cut banks, and forms grass-covered and shale-rubble slopes in the map area. The approximate thickness is 3,000 feet (Keller and others, 1961).

Trs Shublik Formation - Dark-gray to black, thin- to medium-bedded, fine- to medium-grained, calcareous and siliceous, phosphatic sandstone interbedded with dark-gray to brown, sooty, phosphatic and organic-rich bioclastic limestone, calcareous siltstone, and shale. The Shublik includes four distinct lithologic units: 1) A lower unit composed of organic-rich siltstone with thin (< 2 cm) fine-grained quartzarenite beds that are laterally continuous at outcrop scale and are often graded and plane-parallel- to ripple laminated; this lower siltstone unit is abruptly overlain by: 2) A bioclastic limestone containing minor glauconite and conspicuous phosphate nodules to 1 cm in diameter, and abundant shells of *Halobia* and *Monotis*. The bioclastic limestone beds are thinly stratified and laterally continuous, and are arranged in an upward-coarsening-and-thickening sequence; the bioclastic limestone is abruptly overlain by: 3) An organic-rich marl and black mudstone, which grades upsection into: 4) A calcareous siltstone and very fine-grained sandstone that probably represent the Karen Creek Sandstone at the top of the formation. Generally poorly exposed. The approximate thickness is 200 to 300 feet (Keller and others, 1961).

SADLEROCHIT GROUP

PTrs Sadlerochit Group undivided - (Early Permian to Middle Triassic) Includes lithologies of Ivishak Formation, Kavik Formation, and Echooka Formation described below.

Tri Ivishak Formation - Dark-gray, yellow-brown-weathering, thin-to medium-bedded, locally massive, siltstone and shale; highly fractured perpendicular to bedding. Horizontal burrows common on bedding surfaces. Siltstone is planar and ripple-laminated 2-10 cm thick. Grades downward into lower part (Kavik Shale Member) which is predominantly composed of silty shale with interbedded siltstone lenses. The thickness ranges from is 1,000 to 2,000 feet (Keller and others, 1961).

Trk Kavik Shale Member - Dark-gray, dark reddish-brown, to black and brown, light-gray-weathering, silty shale, minor sandy siltstone, and locally very fine-grained quartzarenite. Shale is locally micaceous and contains very fine-grained silt. Although difference in grain size between upper Echooka Formation and lower Kavik Formation of the Ivishak is minor, the contact is sharp. The internal stratification of the Kavik Member is well-organized whereas the Echooka Formation exhibits slumping or soft-sediment deformation. Structural complexities preclude thickness determination.

Pes Echooka Formation: siliceous facies - Medium dark-gray, brown-weathering, siliceous, cherty, fine-to very-fine-grained sandstone, and siliceous siltstone. Sandstone is medium- to massive-bedded; trough cross bedding, basal scour, and convolute lamination are common. Locally abundant vertical burrows (up to 8 cm long and up to 1 cm diameter) and contain dark-gray, silty material. *Zoophycus* and *Skolithos* trace fossils are common. The lower part of the siliceous facies is very-fine-grained, medium- to thick-bedded (10-30 cm), bioturbated, well-sorted quartzarenite with dense siliceous cement, large vertical to subvertical *Skolithos* burrows, and abundant spiriferid brachiopods and minor gastropods. Abundant pyrite results in a distinctive red-brown weathering. The 'siliceous facies' grades downward into the 'limy facies' near Rapid Creek. Total thickness of the Echooka Formation is 160 m but may be structurally thickened by small displacement thrust faults.

Pel Echooka Formation: limy facies - Medium-gray, greenish dark-gray, reddish dark-gray, and black, bioturbated, fossiliferous, glauconitic and calcareous quartzarenite, sandy limestone, and minor calcareous siltstone. Quartzarenite beds range between 2 cm and 10 cm thick and are separated by intervals of thinly-laminated, glauconitic, red, green, and black shale. Individual quartzarenite beds are laterally persistent and vary from medium- to thick-bedded and contain disseminated organic matter and concentrations of glauconite and pyrite at various horizons. Quartzarenite beds are typically thoroughly bioturbated (*Zoophycus* and other forms) and contain no internal primary stratification. The contact with the underlying Lisburne Group appears to be either gradational or an unconformity. Total thickness of the Echooka Formation is 160 m but may be structurally thickened by small displacement thrust faults.

LISBURNE GROUP

PMl Lisburne Group undivided - (upper part: Wahoo Limestone) Light- to medium-gray, thin- to massive-bedded, limestone and lime mudstone alternating with buff-colored, medium-bedded, bryozoan-rich dolomite. Bedding ranges from a few centimeters to several meters. Irregular layers and nodules of gray and black secondary chert are common. Contains a very distinctive volcanic sequence near the top(?) of the unit. The lower part (Alapah Limestone) consists of black, fetid limestone with locally abundant large (up to 3 m in diameter) colonial rugose corals. Locally, the Alapah Limestone is tightly folded and forms mostly rubble-crop on lower slopes. The Lisburne Group description above and field mapping recognize Wahoo Limestone and Alapah Limestone as discrete lithostratigraphic units, however, both units are included in the 'Lisburne Group undivided' unit on the map.

MPv Lisburne Group volcanic rocks - Dark-green- to green-gray and gray, fine-grained basalt, greenstone, brown-weathering, thin-bedded, plane- to cross-laminated, calcareous tuff, and tuffaceous limestone with disseminated pyrite, tuffaceous clasts (devitrified glass?) and minor opaque minerals. Contact with the overlying limestone is sharp. Uppermost unit contains multiple flow sequences defined by pillowed bases and vesicular flow tops. Distinct columnar jointing occurs locally. Dark-gray to gray, fine-grained, platy, skeletal packstone occurs within volcanic section and is unaltered; basal contact is sharp. Total thickness of mixed volcanic rock, tuffaceous rock and limestone section is approximately 95 m (Robinson and others, 1989).

PRELIMINARY GEOLOGIC MAP OF THE GILEAD CREEK AREA, SAGAVANIRKTOK A-2 QUADRANGLE, ARCTIC FOOTHILLS ALASKA

By
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