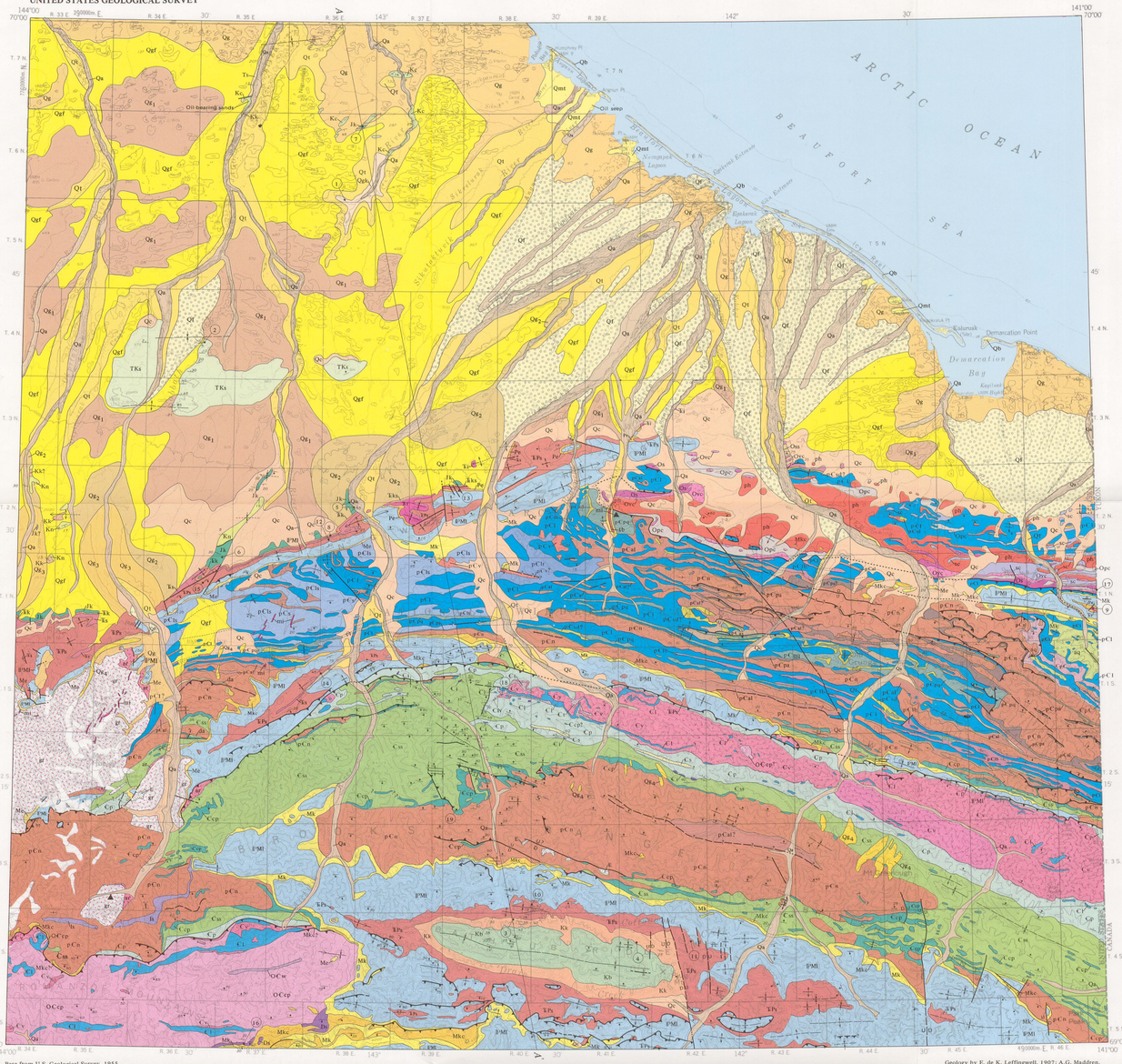


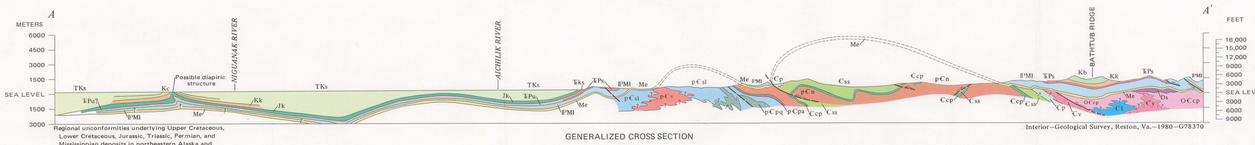
Base from U.S. Geological Survey, 1955

SCALE 1:250 000

CONTOUR INTERVAL 200 FEET
DOTTED LINES REPRESENT 100-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES IN FEET DATUM IS MEAN LOWER LOW WATER
SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
1980 MAGNETIC DECLINATION AT SOUTH EDGE OF SHEET VARIES FROM 33°30' TO 35°30' EAST

QUADRANGLE LOCATION

Geology by E. de K. Leffingwell, 1907; A.G. Maddren, G.L. Harrington, 1912; M.D. Mangus, 1953; E.G. Sable, G.R. Kunkle, 1957; E.G. Sable, R.S. Bunnell, 1958; W.P. Brosgé, H.N. Reiser, 1960; L.L. Tailleur, A.K. Armstrong, H.N. Reiser, H.A. Tourtelot, 1968; H.N. Reiser, W.P. Brosgé, J.T. Dutro, Jr., R.L. Detterman, E.G. Sable, A.K. Armstrong, 1969-70; H.N. Reiser, W.P. Brosgé, J.T. Dutro, Jr., R.L. Detterman, A.K. Armstrong, 1971; H.N. Reiser, W.P. Brosgé, 1972; H.N. Reiser, O.J. Ferrians, Jr., 1973; H.N. Reiser, W.P. Brosgé, Arthur Grantz, 1975; W.P. Brosgé, R.L. Detterman, C.G. Mull, H.N. Reiser, 1976



GENERALIZED CROSS SECTION

Interior—Geological Survey, Reston, Va.—1980—G78370

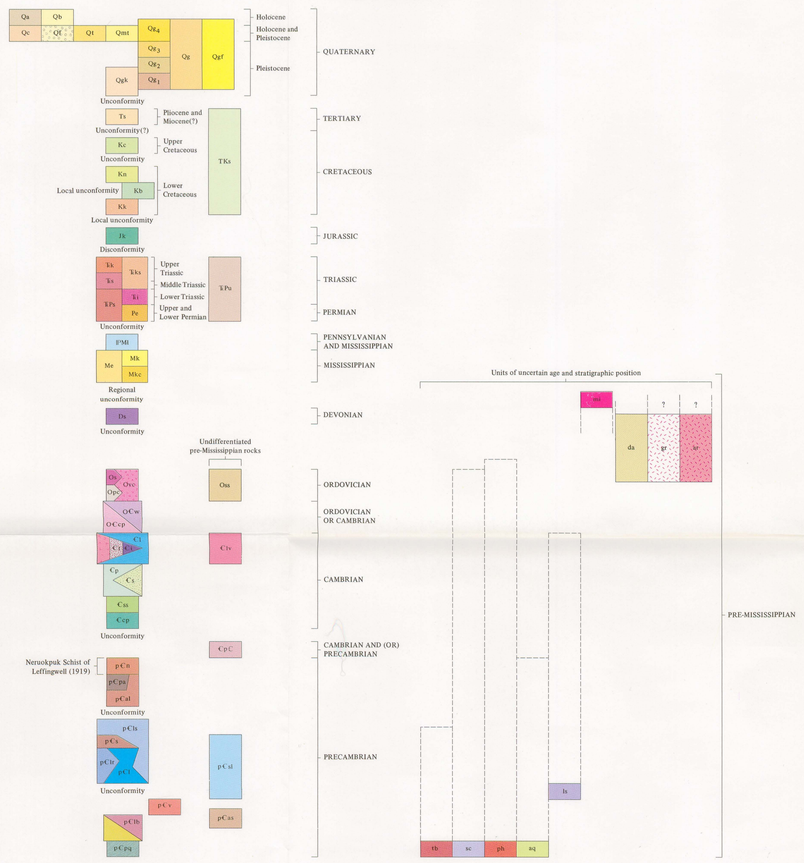
Table 1. *Selected fossil collections*

Map No.	Field collection No. and stratigraphic distance above base of section, in meters	USGS Locality No.	Lithologic unit, fossils, and age	Latitude, longitude, township, and range
			Gubik Formation	
1	70ADi275		*Populus* (*Salicaceae*) sp.	69°49'30" N.; 143°05' W
		1/	^{14}C age > 34,000 yr	T. 6 N., R. 36 E.
			Lower part of Nanushuk Group	
2	71ADi300-P-1		*Tyrbodiscus* (?) . . . ; marine gastropod form that ranges from Jurassic to Recent and is common in the Late Jurassic-Early Cretaceous, shales of North Slope . . .(?). Collection also included reworked Devonian spores.	69°41' N.; 143°30'10" W. T. 4 N., R. 35 E.
			Kongakut Formation	
3	70ADi214		*Buchia sublaevis*	69°07'45" N.; 142°37' W. T. 4 S., R. 39 E.
4	71ADi313	M5815	*Aucellina*(?) sp. (Aptian?)	69°06'10" N.; 142°17' W. T. 4 S., R. 41 E.
		M5817	*Simbirskites* sp.; *Lytoceras* sp.; belemnites and brachiopods (Hauterivian)	
		M5818	*Buchia sublaevis* (Valanginian)	
			Kingak Shale	
5	71ADi330	30074	*Amaltheus* cf. *A. stokesi* and *Ostrea* sp. (Pliensbachian)	69°33' N.; 143°05' W. T. 2 N., R. 37 E.
		30075	*Arctioceras kochi*, *A. kochi* var. *pseudamberti*; *Choffatia* cf. *C. subb.keri* (Bathonian)	
		30073	*Pentacrinus* sp. and pelecypod fragments (Early Jurassic)	
		30136	*Cadoceras* sp. (Callovian)	
6	71ADi368	30135	*Pseudolioceras maclintocki* (basal Bajocian)	69°28'45" N.; 143°26' W. T. 1 N., R. 35 E.
7	75ARr205G, H, I	30903	*Pseudolioceras whiteavesi* and	69°54'30" N.; 143°02' W.; T. 6 N., R. 36 E.
		30905	*Erycitoides howelli* (Late early Bajocian)	
	75ARr205B, E	MF2931	*Haplophragmoides topagorukensis* Tappan; *Reophax troyeri* Tappan; *Trochammina eilete* Tappan (Neocomian)	
		MF2932	*Ammodiscus rotularius* Loeblich and Tappan; *Haplophragmoides topagorukensis* Tappan; *Ammobaculites fragmentarius* Cushman; *Gaudryina talliseri* Tappan; *Reophax* sp. cf. *R. troyeri* Tappan (Neocomian)	
			Shublik Formation	
8	71ADi283 +50 m		*Halobia* of the *H. zitteli* ornatissima group and rhynchonellid brachiopods (Karnian)	69°30' N., 143°07' W. T. 2 N., R. 37 E.
			Ivishak Formation of Sadlerochit Group	
9	71ADi326	M6076	*Euflemingites romanderi* (Smithian)	69°25' N.; 141°00'10" W. T. 1 N., R. 45 E.
			Echooka Formation of Sadlerochit Group	
10	70ADi204 +58 m	24387-PC	Stenoporoid and fenestrate bryozoans, undet.; Derbyia(?) sp.; *Chonetina* cf. *C. superba*; *Lissochonetes spitzbergianus*; *Anemomaria pseudohorridus*; *Waagenoconcha* sp.; *Cancrinella* sp.; *Megousia harlandi*; *Yakovleria duplex*; *Stenocisma* sp., *Neophricodostyrix asiatica*; *Spiriferella sarana*; *Punctospirifer*(?) sp. (". . .Characteristic lower part of Echooka Member . . .")	69°08'30" N.; 142°33'45" W. T. 3 S., R. 39 E.
	70ADi204 +12 m	24386-PC	*Yakovleria*(?) sp.; *Attenusatella* sp.	

Map No.	Field collection No. and stratigraphic distance above base of section, in meters	USGS Locality No.	Lithologic unit, fossils, and age	Latitude, longitude, township, and range
11	71ADi303 +117 m	23459-PC	*Septospirifer*(?) sp. and strapparollid snails	69°06'20" N.; 142°08' W. T. 4 S., R. 41 E.
	+88 m	23458-PC	*Anidanthus*(?) sp.; *Waagenoconcha* sp.; *Spiriferella* sp.; *Septospirifer* sp.	
			23458 and -9-PC ". . . possibly some part of Zone F (Leonard and Ladogan) (Bamber and Waterhouse, 1971)	
	+22 m	23457-PC	*Chonetina* sp. and *Attenuatella* sp. (Wolfcampian) (". . . may be correlated with Zone Ea (Bamber and Waterhouse, 1971) . . .")	
12	71ADi283	23452-PC	*Chonetina* (?) sp.; *Anemomaria*(?) sp.; productoid, indet.; stenocismid, indet.; *Spiriferella* sp. (". . .possibly Zone G (Bamber and Waterhouse, 1971) . . .previously called the "lower Echooka fauna". . .")	69°30'20" N.; 143°07' W. T. 2 N., R. 37 E.
13	71ADi284 +50 m	23453-PC	"A coquina of *Megousia-like* shells . . . probably the species *Kureloustia sphiva* of Waterhouse" (". . . Zone G (Bamber and Waterhouse, 1971) . . .")	69°32'30" N.; 142°46' W. T. 2 N., R. 38 E.
			Karen Creek Sandstone and Shublik Formation, undivided	
14	71ADi290 +8–18 m	23454-PC	*Spiriferella* (?) sp.	69°22'15" N.; 143°09'20" W. T. 1 S., R. 37 E.
	+52–56 m	23455-PC	*Spiriferella* sp.; undetermined horn coral (". . . possibly Zone G . . .")	
15	71ADi296 +12 m	23456-PC	Stenoporoid bryozoans, indet.; *Chonetina* (?) sp.; *Anidanthus* (?) sp.; productoid fragments, indet. (". . . possibly Zone G . . .")	69°27' N.; 143°28'30" W. T. 1 N., R. 35 E.
			Sandstone and calcareous sandstone (unit Ds)	
16	71ABe459E	8900-SD	*Warrenella*? sp.; *Goniophora* sp.;	69°00'15" N.; 143°21'30" W.
	71ABe463A, B,C,D,E	8898-SD	*Deceptiria* sp. (or *Nuculoidea* sp.);	T. 5 S., R. 37 E.
		8899-SD	*?Xenokrizodus* sp.; *Actinopteria* sp.; *Dechenella* sp. (Middle(?) Devonian)	
			Black slate (unit Os)	
17	71ABe430D		*Orthograptus* of the *O. quadrimucronatus* type	69°26'30" N.; 141°00' W. T. 1 N., R. 45 E.
	71ABe431E	10/	*Nereites*; *Paleodictyon*?; *Zoophycos*?; *Dictyodora*	
			Limestone (unit Cl)	
18	70ABe173C	6983-CO	*Geragnostus* sp.; *Saratogia* sp.; psychopavoid trilobite; *Billingsella*? sp. (Late Cambrian)	69°20'45" N.; 142°39' W. T. 1 S., R. 39 E.
			Calcareous siltstone and sandstone (unit Ccs)	
19	70ARr316	8/	Echinoderm debris	69° 13'45" N.; 142°46'30" W. T. 2 S., R. 39 E.

[1] Plant fossil identified by Richard A. Scott, U.S. Geol. Survey. Radiocarbon age determination by Meyer Rubin, U.S. Geol. Survey.
[2] Identified by Richard A. Scott, U.S. Geol. Survey.
[3] Identified by R.W. Imlay and D.L. Jones, U.S. Geol. Survey.
[4] Identified by R.W. Imlay, U.S. Geol. Survey.
[5] Identified by W.V. Sliter, U.S. Geol. Survey.
[6] Identified by N.J. Silberling, U.S. Geol. Survey and Dept. of Geology, Stanford University.
[7] Identified by J.T. Dutro, Jr., and Dave Bieler, U.S. Geol. Survey.
[8] Identified by J.T. Dutro, Jr., U.S. Geol. Survey.
[9] Identified by J.T. Dutro, Jr., and John Pojeta, Jr., U.S. Geol. Survey.
[10] Identified by W.B.N. Berry, Univ. of California, Berkeley.
[11] Trace fossils identified by J.T. Dutro, Jr., U.S. Geol. Survey.
[12] Identified by J.T. Dutro, Jr., and A.R. Palmer, U.S. Geol. Survey.

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qa — ALLUVIUM—Unconsolidated flood-plain deposits of poorly to well-sorted silt, sand, pebbles, and cobbles. Restricted to narrow flood plains and low terraces. Locally includes colluvium (unit Qc) in narrow valleys

Qb — BEACH DEPOSITS—Modern unconsolidated sand and gravel deposited on shore and in bars paralleling present coastline

Qc — COLLUVIUM—Poorly sorted rock debris, sand, silt, and clay resulting from gravity, frost, and sheet-flow processes

Qf — ALLUVIAL FANS—Poorly sorted silt and gravel deposited by rivers debouching onto coastal plain

Qt — TERRACE DEPOSITS—Moderately to well-sorted gravel, sand, and silt. Several levels. Locally paired

Qmt — MARINE TERRACE DEPOSITS—Unconsolidated gravel, sand, and silt

Qg — GLACIAL DEPOSITS—Undifferentiated glacial drift

Qgf — GLACIAL FLUVIAL DEPOSITS—Poorly sorted and poorly stratified clay, silt, sand, gravel, and boulders

Qg_4 — GLACIAL AND GLACIAL FLUVIAL DEPOSITS—Clay, silt, sand, gravel, and boulders of present or recent mountain glaciations. Includes rock glacier in SE 1/4 T. 1 S., R. 36 E.

Qg_3, Qg_2, Qg_1 — GLACIAL DEPOSITS—Include moraine and glacial fluvial deposits, clay, silt, sand, pebbles, cobbles, and boulders. Subscripts 1 to 3, respectively, represent deposits of oldest to youngest recognized advances

Qgk — GUBIK FORMATION (Pleistocene)—Marine deposits of well to poorly sorted and well to poorly stratified silt, sand, and gravel. Locally includes wood and woody material. Carbon-14 date of greater than 34,000 years from sample at Niguanak River (No. 1, table 1). Thickness more than 10.5 m, probably less than 60 m

Ts — UPPER PART OF SAGAVANIRKTOK FORMATION (Miocene? and Pliocene)—Grayish-brown to olive-brown laminated to thin-bedded micaceous poorly indurated claystone, siltstone, and shale. Weathers to grayish-brown adhesive clay. Correlated with Tertiary (Miocene? and Pliocene) sediments (Detterman and others, 1975) west of map area. Thickness more than 300 m

TKs — SEDIMENTARY ROCKS—Marine and nonmarine strata of Cretaceous and Tertiary age. Marine strata of interbedded greenish-yellow fine-grained calcareous sandstone, dark-colored siltstone, and shale. Crossbedding and conglomeratic lenses common in sandstone. Nonmarine strata of dark-brownish-gray polymictic conglomerate, salt-and-pepper sandstone, gray fine-grained sandstone, and dark-gray to black micaceous and carbonaceous siltstone and shale. In part lithologically correlated with Nanushuk Group (Tuktu Formation and lower part of Chandler Formation) of Early Cretaceous (Albian) age (Detterman and others, 1975). Includes areas of unmapped Bathtub Graywacke (unit Kb) in NW 1/4 T. 3 N., R. 35 E. Incomplete 4,000 m section (includes probable foreset beds) on Sabbath Creek (Tps. 3 and 4, R. 35 E.)

Kc — COLVILLE GROUP (Upper Cretaceous)—Brown fine- to medium-grained sandstone and siltstone. Locally carbonaceous; locally pebbly; locally oil bearing on lower Jago River. Gray rusty-weathering locally limy siltstone and sandstone. Gray shale and black organic shale with interbedded tuffs and tuffaceous sediments including bentonites. Weathers bright yellow, orange, red, green, and gray. Lithologically correlated with Upper Cretaceous (Turonian to Maestrichtian) rocks to west (Detterman and others, 1975). Thickness more than 450 m

Kn — LOWER PART OF NANUSHUK GROUP (Lower Cretaceous)—Marine strata of interbedded dark-gray to greenish-yellow, fine-grained, locally calcareous, locally ferruginous graywacke, dark-colored siltstone, and shale. Graywacke is micaceous, locally with abundant wood fragments. Locally irregular bedding with flow rolls. Thickness 0 to more than 50 m

Kb — BATHTUB GRAYWACKE (Lower Cretaceous)—Dark-gray to green fine- to coarse-grained graywacke; predominantly thin to medium bedded but some massive; cyclically interbedded with dark-gray shale, siltstone, and conglomerate. Plant detritus abundant. Crossbedding and graded bedding common. Early Cretaceous (Albian) age on basis of stratigraphic relations. Well exposed at Bathtub Ridge (T. 4 S., R. 39 E.). Thickness between 800 and 1,200 m

Kk — KONGAKUT FORMATION (Lower Cretaceous)—Upper part mostly dark-gray locally manganiferous pebbly shale (pebble shale member) and dark-olive-gray brownish-gray-weathering siltstone (siltstone member). Minor interbedded sandstone. Lower part mostly dark-gray finite shale (clay shale member) overlain by thin interval of quartz arenite (Kemik Sandstone Member). Clay ironstone beds locally common. Rare arenaceous limestone beds near base contain fossils of Early Cretaceous (Valanginian to Aptian?) age (Nos. 3,4, table 1). Well exposed in vicinity of headwaters of Kongakut River (T. 4 S., R. 39 E.). At Bathtub Ridge unconformably overlies the Ivishak Formation of Sadlerochit Group. Thickness more than 700 m, probably less than 1,000 m

Jk — KINGAK SHALE (Jurassic)—Upper part clay shale, silty shale, and siltstone with red rusty-weathering ironstone beds; atypical bentonite and bentonitic shale in cutbank in sec. 8, T. 2 N., R. 36 E. Middle and Late Jurassic ammonites and pelecypods collected from isolated rocks west and south of map area (Detterman and others, 1975). Lower part dark-gray to black fissile paper shale, dark-gray clay shale, minor claystone, and beds and nodules of red-weathering ironstone. Unit contains Middle Jurassic ammonites and Early Jurassic pelecypods, crinoids, and ammonites (Nos. 5, 6, table 1). Thickness 0 to 500 m

Ŧks — KAREN CREEK SANDSTONE (Upper Triassic)—Dark-gray fine-grained quartzitic sandstone and siltstone. Locally calcareous or dolomitic. Phosphatic nodules. Late Triassic (Norian) fossils collected from type section west of map area (Detterman and others, 1975). Unit absent from southern part of quadrangle. Thickness 0 to approximately 30 m

Ŧs — SHUBLIK FORMATION (Triassic)—Interbedded black shale, black calcareous siltstone, and black limestone. Abundantly fossiliferous. Contains Late Triassic (Karnian) fossils (No. 8, table 1). Fossils collected from reference section at Fire Creek, 58 km west of map area, establish Middle and Late Triassic (Anisian to Norian) age for the Shublik Formation in northern Alaska (Detterman and others, 1975). Unit absent from southern part of quadrangle. Thickness 0 to approximately 100 m

Ŧks — KAREN CREEK SANDSTONE AND SHUBLIK FORMATION, UNDIVIDED

ŦPs — SADLEROCHIT GROUP, UNDIVIDED (Permian and Triassic)—Composed of the Ivishak and Echooka Formations. These formations are readily recognized in field traverse but generally mapped here as Sadlerochit Group, undivided owing to limits of scale and field control

Ŧi — Ivishak Formation, undivided (Lower Triassic)—Comprises three lithologic units. Upper unit, Fire Creek Siltstone Member, medium-dark-gray thin-bedded to massive commonly laminated siliceous siltstone, minor silty shale, and argillaceous sandstone. Contains middle Early Triassic (Smithian) fossils (No. 9, table 1). Thickness 0 to more than 30 m. Middle unit, Ledge Sandstone Member, clean light-gray massive sandstone. Weathers red to reddish brown. Locally conglomeratic. Correlated with similar rocks of middle Early Triassic age just west of map area (Detterman and others, 1975). Thickness variable; 15 m just south of map area, about 120 m in vicinity of Canada-Alaska boundary monument No. 5. Lower unit, Kavik Member, dark-colored laminated to thin-bedded silty shale and siltstone with minor argillaceous sandstone beds. Fossils of Early Triassic (Griesbachian) age collected from this unit west of map area (Detterman and others, 1975). Thickness 35 to probably less than 150 m

Pe — Echooka Formation, undivided (Lower and Upper Permian)—Comprises two lithologic units. Upper unit, Ikinkpuzuk Member, red-weathering resistant ferruginous orthoquartzite, quartzitic sandstone, and siltstone. Contains Late Permian (Guadalupian) fossils (Nos. 12-15, table 1) at base of upper unit, probably equivalent in age to top of lower unit to south. Thickness of upper unit 50 to 110 m; thins to north. Lower unit, Joe Creek Member, almost entirely restricted to extreme southern part of area. Best exposed in ridge north of Joe Creek south of map area. Top of lower unit thin- to medium-bedded quartzose calcarenite and biogenetic limestone that includes brachiopod coquinas. Thickness approximately 20 m. Top of lower unit underlain by about 25 m of medium- to thick-bedded chert and siliceous siltstone. Base of lower unit dusky-yellow thin-bedded limy mudstone and calcareous siltstone. Thickness approximately 50 m. Lower unit yields early and Late Permian (Wolfcampian to Guadalupian) fossils (Nos. 10 and 11, table 1). Total thickness for lower unit about 100 m; thins rapidly to northwest (Detterman and others, 1975)

ŦPu — SHUBLIK FORMATION AND SADLEROCHIT GROUP, UNDIVIDED (Shown in cross section only)

IPMI — LISBURNE GROUP, UNDIVIDED (Mississippian and Pennsylvanian)—Upper unit (Wahoo Limestone) fine-grained limestone and oolitic limestone, some glauconite and minor dolomite. Weathers characteristic light gray to yellowish cream. Contains megafauna and microfauna of Morrowan and Atokan (Early and Middle Pennsylvanian) age; microfaunal zones 20 and 21 (Mamet and Armstrong, 1972; Armstrong and Mamet, 1974). Thickness of upper unit variable due to erosion, 0 to about 375 m. Lower unit (Alapah Limestone) gray fossiliferous limestone, dolomite, and black chert. Weathers gray to dark gray. Contains megafauna and microfauna of Meramecian and Chesterian (Late Mississippian) age; microfaunal zones 15 to 19 (Mamet and Armstrong, 1972; Armstrong and Mamet, 1974). Thickness of lower unit 275 to 655 m. The Wachsmuth Limestone, lowest formation of the Lisburne Group, is not present in the mapped area. In extreme south-central part of quadrangle, unit includes unmapped areas of Joe Creek Member of Echooka Formation (Lower Permian)

ENDICOTT GROUP (Mississippian)—Composed of Kayak Shale, Itkilyariak Formation, and Kekiktuk Conglomerate

Me — Endicott Group, undivided

Mk — Kayak(?) Shale—Dark-gray to black shale. Locally interbedded with gray- to red-weathering limestone. Locally contains anthracite at base. Includes unmapped area of probable Itkilyariak Formation in secs. 2 and 12, T. 1 S., R. 39 E. and in secs. 13 and 16, T. 1 N., R. 44 E. Thickness as much as 50 m

Mkc — Kekiktuk Conglomerate—Resistant massive quartzite and granule to cobble conglomerate. Quartzite is generally light gray, clean, well indurated, and weathers light gray; locally iron stained. Conglomerate is interbedded and lenticular in quartzite; clasts predominantly of quartz and chert. Locally contains anthracite. Thickness less than 75 m; locally absent

Ds — SANDSTONE AND CALCAREOUS SANDSTONE—Gray fine-grained thin-bedded locally manganiferous carbonaceous sandstone interbedded with rusty-black slaty shale and ferruginous calcareous fossiliferous sandstone with abundant brachiopods. Unit includes hematitic brick-red-weathering sandstone, chert arenite, silicified chert pebble to boulder conglomerate, and platy to thin-bedded gray- to brownish-red-weathering limestone. Contains Middle(?) Devonian brachiopods (No. 16, table 1). Thickness probably more than 100 m. Rests with angular unconformity on chert and phyllite (unit OCcp)

NOTE

Many of the units listed below were included in the Neruokpuk Formation in earlier reports (Brosgé and others, 1962; Reed, 1968; Dutro and others, 1972; Sable, 1977). The Neruokpuk is used herein in the restricted sense as described by Leffingwell (1919).

Units mapped may contain rocks of other units, particularly where exposure is limited.

Os — BLACK SLATE—Locally phyllitic slate and black slaty shale interbedded with dark-colored thin-bedded locally laminated micaceous limonitic locally pyritic siltstone and quartzite. Weathers brown to rusty red. Worm trace fossils locally abundant. Yielded one graptolite of Late Ordovician age (No. 17, table 1). Thickness less than 20 m

Opc — GRAY PHYLLITE AND CHERT—Light- to dark-greenish-gray and white to grayish-black vitreous to dull chert, grayish-black to greenish-gray phyllite, phyllitic slate and argillite, silicified locally, and silicified to nonsilicified finely banded mudstone. As mapped, locally includes limestone, tuffaceous limestone, limy tuffs, and agglomerates. Overlain by and locally gradational(?) with black slate (unit Os). May include unmapped areas of volcaniclastic and volcanic rocks (unit Ovc). Designated gray phyllite and chert member by Dutro and others (1972). Thickness at least 70 m. Conformable(?) on red and green phyllite (unit ph)

Ovc — VOLCANICLASTIC AND VOLCANIC ROCKS—Basaltic volcanic wacke, tuff, agglomerate, tuffaceous sandstone, volcanic conglomerate, flow breccia, calcareous volcanic wacke, tuffaceous limestone, and tuffaceous dolomite. Mostly dark greenish gray; weathers mottled greenish gray; dolomitic facies weathers yellowish brown. Thickness 10 to 100 m. Intertongues with black slate (unit Os) and gray phyllite and chert (unit Opc). Sedimentary portion rests on slate, argillite, quartzite, and chert (unit sc) and red and green phyllite (unit ph). Slate (unit Os), phyllite and chert (unit Opc), and volcaniclastic and volcanic rocks (unit Ovc) west of the Kongakut River are on trend with and lithologically correlate with the sequence of rocks that occur at the Ordovician graptolite locality (No. 17, table 1). In the vicinity of the fossil locality, Precambrian limestone overlies these Ordovician rocks in fault contact. Farther west along the same trend, however, volcanic rocks lithologically similar to volcaniclastic and volcanic rocks (unit Ovc) appear to be depositionally overlain by the Precambrian limestone and are therefore interpreted and mapped as Precambrian (unit pCv) rather than Ordovician

OCw — VOLCANIC WACKE AND TUFFACEOUS SANDSTONE—Gray to dark-green fine to very coarse grained volcanic wacke and tuffaceous sandstone. Weathers yellowish orange and brownish orange. Chats mostly fragments of acidic and basic(?) volcanic rocks. Chert clasts common. Thickness more than 50 m

OCcp — CHERT AND PHYLLITE—Black, gray, white, and green chert with interbedded dark-gray, brown, green, and red phyllite, slate, and rare thin-bedded limestone and mafic intrusive rocks. Thickness 300 to 1,000 m

Units OCw and OCcp formerly designated chert and phyllite member by Dutro and others (1972)

Cv — VOLCANIC AND VOLCANICLASTIC ROCKS—Dark-grayish-green to greenish-black and brown mafic vesicular flows, basaltic tuffs, agglomerate(?), and pebble- to cobble-sized volcanic conglomerate. Weathers dark olive brown and dark gray. Minor gray, dark-gray-weathering chert, chert conglomerate, and silicified chert breccia. Locally includes basaltic tuff (unit Ct) and mafic intrusive rocks (unit Ci). Intertongues with limestone (unit Cl). Thickness probably between 700 and 1,300 m

Ct — BASALTIC TUFF—Dark-brown to greenish-brown basaltic tuff. Weathers dark brown. Mapped only locally. Thickness less than 70 m

Ci — MAFIC INTRUSIVE ROCKS—Dense dark-grayish-green chloritized locally schistose dikes and sills(?); occurrence restricted to within phyllite (unit Cp)

Cl — LIMESTONE—Dark-gray fine-grained medium- to thick-bedded partly silicified limestone. Minor dolomite, conglomeratic sandstone, and fossiliferous orange-weathering shaly limestone with interlaminated calcareous sandstone. Minor tuffaceous limestone and black bedded locally conglomeratic chert. Contains Late Cambrian brachiopods and trilobites (No. 18, table 1). Unit intertongues with volcanic and volcaniclastic rocks (unit Cv) and phyllite (unit Cp). Thickness less than 200 m

Units Cv, Ct, and Cl formerly designated volcanic and carbonate member by Dutro and others (1972)

Cp — PHYLLITE—Black, dark-gray, and greenish-gray phyllite; locally schistose; locally slaty; locally grades to siltstone. Calcareous sandstone concretions, brown and gray limestone (unit Cl) pods, and rare chert in upper part. Locally includes sandstone (unit Cs). Locally includes lenses of limestone and tuffaceous limestone (unit Cl) with associated volcaniclastic rocks (unit Cv). Thickness less than 1,300 m

Cs — SANDSTONE—Grayish-black to gray fine-grained sandstone grading to siltstone. Locally includes beds of gritty lithic wacke. Intertongues with phyllite (unit Cp). Thickness less than 50 m

Units Cp and Cs formerly designated black phyllite and sandstone member by Dutro and others (1972)

Css — CALCAREOUS SILTSTONE AND SANDSTONE—Predominantly gray to olive brownish-weathering micaceous partly calcareous phyllitic siltstone and brown-weathering very thin bedded finely crossbedded partly calcareous micaceous sandstone. Locally includes orange-weathering limestone and calcareous graywacke. Rare echinoderm columnals (No. 19, table 1). Thickness about 700 to 1,300 m

Ccp — CHERT AND PHYLLITE—Black, white, gray, and variegated green and red bedded chert and local red-brown-weathering poorly to completely silicified siltstone and slate. Includes maroon-red, green, and brown phyllite, locally grading to slate and argillite. Locally includes manganiferous siltstone and slate. Thickness probably less than 100 m

Units Css and Ccp formerly designated calcareous siltstone and sandstone member by Dutro and others (1972)

pCn — NERUOKPUK SCHIST OF LEFFINGWELL (1919)—Southern exposures: interbedded thin- to thick-bedded resistant massive quartz wacke and semischist, subordinate phyllite and argillite, and rare calcareous sandstone. Generally weathers greenish to brownish gray. Northern exposures: generally less metamorphosed; formerly mapped as ferruginous sandstone member (Dutro and others, 1972); fine- to coarse-grained quartz wacke locally grading to subfeldspathic and lithic graywacke. Mostly greenish to brownish gray and grayish black. Weathers distinctive reddish orange and brown. Locally granule grit conglomeratic. Rounded quartz grains common. Unit includes siltstone of similar composition, red, green, and black phyllitic slate, and rare limy beds. Estimated thickness, more than 1,700 m

pCpa — PHYLLITE AND ARGILLITE—Gray, green, red, and maroon phyllite and argillite. Locally includes gray to green chert. Underlain and overlain by Neruokpuk Schist of Leffingwell (1919). These rocks are similar to chert and phyllite (unit Ccp) and locally may be mismapped. Thickness less than 100 m

pCal — ARGILLITE AND LIMESTONE—Gray, green, and red argillite and phyllite interbedded with orange-weathering thin-bedded limestone, white, gray, and green chert, laminated chert, white and gray quartzite and sandstone, minor calcareous grit, calcareous sandstone, pale-orange very fine grained thin- to thick-bedded sandy limestone and dolomite, and dolomitic quartzose siltstone. Unit weathers distinctive yellow orange. Unit may include some unmapped areas of sandstone and dolomite (unit pCsd). Formerly designated argillite and limestone member by Dutro and others (1972). Thickness about 300 to 650 m

pCls — LIMESTONE AND CALCAREOUS SANDSTONE—Predominantly dark-gray platy to thin-bedded silty limestone. Weathers distinctive pink orange and yellowish orange. Locally crossbedded. Locally contains abundant quartz grains. A few intervals contain black phyllite laminae. Includes medium- to dark-gray and dark-greenish-gray fine-grained thin- to medium-bedded calcareous sandstone grading to siltstone. Weathers orange, dark orange, and olive. Locally massive. Locally laminated. Locally crossbedded. Locally interbedded with black shaly limestone and black phyllite. Rare dark-gray resistant calcareous reddish-brown-weathering quartz wacke. Thickness less than 300 m

pCs — SHALE—Gray and black slaty shale and gray micaceous shale. Light-grayish-green, dark-gray, and greenish-black banded slate; weathers dark reddish brown. Intervals with beds of red-weathering ironstone and large ellipsoidal bedded ironstone concretions. Thickness less than 30 m

pClr — RED-WEATHERING LIMESTONE—Probably equivalent to limestone (unit pCl). Differs from limestone (unit pCl) by weathering red, having well-defined crossbedding, and by being more ferruginous and generally coarser grained. Recognized only in area between Egaksrak and Ekalusakat Rivers. Thickness less than 150 m

pCl — LIMESTONE—Dark-gray to grayish-black thick- to medium-bedded limestone. Weathers medium to light gray. In part pelletoidal, pisolitic, and recrystallized. Commonly contains abundant floating rounded quartz grains. Locally grades to coarse-grained calcareous sandstone and calcareous grit conglomerate. Distinctive intricate net of white calcite veins. Rests unconformably on sandstone and dolomite (unit pCsd), brown-weathering limestone and shale (unit pClb), and volcaniclastic rocks of Redwacke Creek (unit pCv); by faulting overlies black slate (unit Os), gray phyllite and chert (unit Opc), volcaniclastic and volcanic rocks (unit Ovc), red and green phyllite (unit ph), and argillite, quartzite, and limestone (unit aq). Thickness less than 150 m

pCv — VOLCANICLASTIC ROCKS OF REDWACKE CREEK—Basaltic fine-grained volcanic wacke; dark grayish green; finely banded; weathers distinctive deep-hued brownish red; locally clasts predominantly clinopyroxene in volcanogenic clay matrix, also locally clasts predominantly plagioclase and volcanogenic? quartz in carbonate matrix. In NW 1/4 T. 1 N., R. 39 E. includes chloritic pyrophyllitic iron-rich fine-grained slightly metamorphosed volcanogenic? clastic rocks. Section is well exposed in SE 1/4 T. 2 N., R. 39 E. Thickness more than 200 m

NOTE: Since this map was submitted for publication, potassium-argon determinations by M.L. Silberman, C.L. Connor, and J.L. Morton on pyroxene and plagioclase clasts from the volcaniclastic rocks of Redwacke Creek (unit pCv) indicate ages of 188 ± 6 m.y. and 219 ± 7 m.y., respectively. These data are not supported by field evidence, which suggests that the overlying Precambrian rocks (units pC1, pClb, and pClr) are in simple depositional contact with these volcaniclastic rocks.

pClb — BROWN-WEATHERING LIMESTONE AND SHALE—Laminated to thin-bedded brown-weathering limestone, interbedded brown shale, gray phyllite, pink to medium-gray fine-grained calcareous and dolomitic quartzite. Locally contains greenish-gray slate and white chert. Rests on phyllite and quartzite of Old Grungy Mountain (unit pC|sq). Thickness less than 150 m

pCsd — SANDSTONE AND DOLOMITE—Fine-grained lamellar to thin-bedded calcareous and dolomitic sandstone, siltstone, and silty dolomite. Weathers light brownish orange to yellowish orange. Prominent crossbedding. Interbedded with thin beds of black slate or phyllite and occasional pink fine-grained clean hard quartzite. Rests on phyllite and quartzite of Old Grungy Mountain (unit pC|sq). Thickness probably less than 50 m

Units pClb, pCs, pCl, pClr, pClb, and pCsd formerly designated limestone member by Dutro and others (1972)

pC|sq — PHYLLITE AND QUARTZITE OF OLD GRUNGY MOUNTAIN—Grayish-green to gray phyllite interbedded with thin beds of white to pinkish-gray fine-grained dense quartzite. Locally (T. 2 N., R. 40 E.) includes beds of calcareous quartzite and brownish-gray-weathering platy quartzose black limestone. Commonly intensely crenulated. Total thickness unknown but more than 150 m

UNDIFFERENTIATED PRE-MISSISSIPPIAN ROCKS

Oss — BLACK SLATE (UNIT Os) AND GRAY PHYLLITE AND CHERT (UNIT Opc), UNDIVIDED

Ci v — LIMESTONE (UNIT Cl) AND VOLCANIC AND VOLCANICLASTIC ROCKS (UNIT Cv), UNDIVIDED

CpC — PHYLLITE AND ARGILLITE (UNIT pCpa), AND (OR) ARGILLITE AND LIMESTONE (UNIT pCal) AND (OR) CHERT AND PHYLLITE (UNIT Ccp), UNDIFFERENTIATED

pCal — LIMESTONE AND CALCAREOUS SANDSTONE (UNIT pClb) AND LIMESTONE (UNIT pCl), UNDIVIDED (Shown in cross section only)

pCas — ARGILLITE AND LIMESTONE (UNIT pCal) OR SANDSTONE AND DOLOMITE (UNIT pCsd)

UNITS OF UNCERTAIN AGE AND STRATIGRAPHIC POSITION

tb — TECTONIC BRECCIA—Tectonic breccia and crush conglomerate composed of