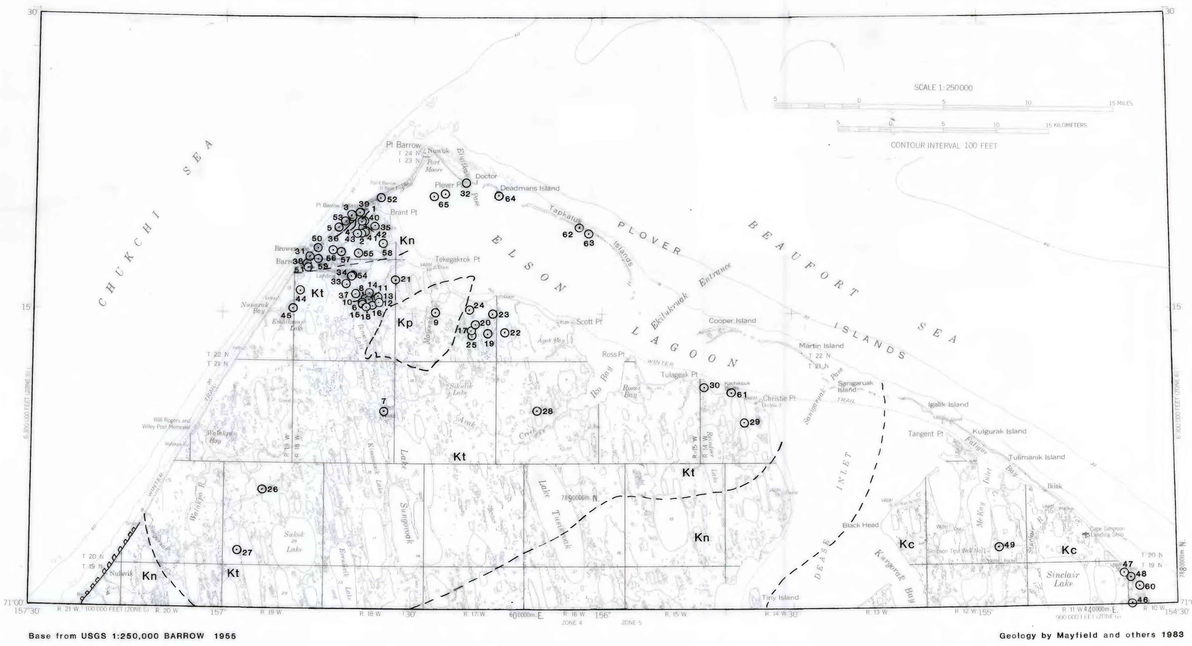
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

OPEN-FILE REPORT 84-124
PLATE 1



Base from USGS 1:250,000 BARROW 1955

Geology by Mayfield and others 1983

Figure 1 Bedrock geologic map (subcrop map) and location of subsurface data

Explanation

Bedrock map units entirely concealed by overburden of unconsolidated Gubik Formation, except in southwestern corner of map area where bedrock, shown by special symbol, is exposed in vertical coastal bluffs.

Geologic mapping by Mayfield and others (1983).

Kc — Upper Cretaceous

Colville Group

Sandstone, shale, conglomerate, bentonite, and coal

Kn — Upper and Lower Cretaceous

Nanushuk Group

Sandstone, conglomerate, shale and coal

Kt — Lower Cretaceous

Torok shale

Dark gray to black clay shale, locally calcareous, and thin interbedded siltstone with subordinate wacke.

Kp — Lower Cretaceous

Pebble shale

Black, organic marine shale with scattered floating quartz and chert sand grains and pebbles. Local thin sandstone beds. Mapped in "disturbed zone" southeast of Barrow.

Symbol

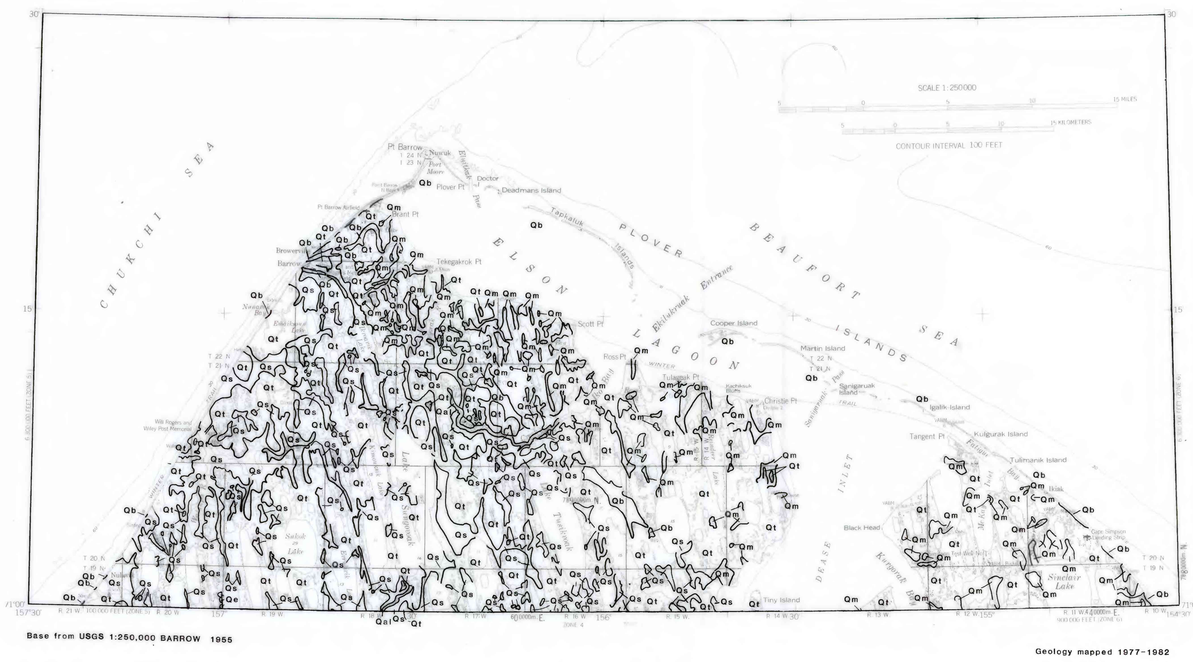
Bedrock exposed in vertical cliff

⊙ 14 — Location and number of subsurface data in table 1

Contact indefinite, plotted from subsurface and geophysical data

Table 1. Subsurface data

Location No. (fig. 1)	Name or type of hole	Total depth (m)	Depth base of permafrost (m)	Year drilled	Materials encountered (summarized) (Depth, thickness in meters)	Remarks	Source of information
1	Barrow core rig test 1	105	105+	1944	0-28 clay, silt, sand, some ice (Gubik Fm); clay, silt, some bentonitic beds (bedrock) 28-105 m. Collins (1961) places top of bedrock at 26 m	Plugged and abandoned	Collins, 1961, p. 573-574
2	Barrow core rig test 2	72	72+	1944	0-30.5 m sand, silt, some ice (Gubik); 30.5-72 m sandy shale, shale, some ice (bedrock)	Plugged and abandoned	Collins, 1961, p. 574
3	Barrow big rig test 1	209	203(?)	1944	0-30.5 m mostly sand and gravel (Gubik Fm); 30.5-49.5 m clay and shale continuing to 209 m	Dry, abandoned	Collins, 1961, p. 574-575
4	Arcon Barrow core test 1	440	280 base ice 305 thermal	1947	0-18 m, sand and gravel, some mud and ice (Gubik Fm); top bedrock 18.3 m based on uppermost bentonitic horizons	Dry and abandoned; salt water	Collins, 1961, p. 582-586; Osterkamp and Payne, 1981
5	South Barrow test well 1	1,083	204	1948	0-7.9 m gravel and coarse sand on 9 m clay (Gubik Fm); bedrock at 17.4 m	Plugged and abandoned. -2.5°C at 27 m	Collins, 1961, p. 586-596; Brewer, in Collins, 1961, p. 596
6	South Barrow test well 2	764	172+	1948-9	0-21 m Gubik Fm; 21 m to 764 m bedrock	Gas well; junked and abandoned	Collins, 1961, p. 596-611
7	South Barrow test well 3	884	405	1949	0-7.9 m blue gray clay, gravel; 7.9-15.5 soft blue clay, sand streaks and carbonaceous matter. Bedrock at 15.5 m	Dry and abandoned. -9.0°C at 18 m	Collins, 1961, p. 611-620; Brewer, 1958, p. 19, fig. 3
8	South Barrow test well 4	774	-	1950	0-29 m Gubik Fm; bedrock at 29 m	Gas well	Collins, 1961, p. 620-629
9	Avak test well 1	1,225	-	1951-2	0-26 m Gubik Fm; at 26 m bedrock	Dry hole; abandoned	Collins, 1961, p. 629-641
10	South Barrow test well 5	749	-	-	0-26 m Gubik Fm; at 26 m bedrock	Gas well	Bird, 1982, p. 24
11	South Barrow test well 6	720	-	-	0-31 m Gubik Fm; at 31 m bedrock	Gas well	Bird, 1982, p. 25
12	South Barrow test well 7	717	-	-	0-30 m Gubik Fm; at 31 m bedrock	Gas well	Bird, 1982, p. 25
13	South Barrow test well 8	719	-	-	0-26 m Gubik Fm; at 26 m bedrock	Gas well	Bird, 1982, p. 25
14	South Barrow test well 9	749	-	-	0-26 m Gubik Fm; at 26 m bedrock	Gas well	Bird, 1982, p. 26
15	South Barrow test well 10	716	-	-	0-27 m Gubik Fm; at 27 m bedrock	Gas well	Bird, 1982, p. 26
16	South Barrow test well 11	716	-	-	0-26 m Gubik Fm; at 26 m bedrock	Gas well	Bird, 1982, p. 26
17	South Barrow test well 12	696	-	-	0-26 m Gubik Fm; at 26 m bedrock	Dry hole	Bird, 1982, p. 27
18	South Barrow test well 13	773	-	-	0-25 m Gubik Fm; at 25 m bedrock	Marginal gas well	Bird, 1982, p. 27
19	South Barrow test well 14	688	-	-	0-19 m Gubik Fm; at 19 m bedrock	Gas well	Bird, 1982, p. 28
20	South Barrow test well 15	694	-	-	0-16 m Gubik Fm; at 16 m bedrock	Gas well	Bird, 1982, p. 30
21	South Barrow test well 16	732	-	-	0-18 m Gubik Fm; at 18 m bedrock	Dry hole. Plugged and abandoned	Bird, 1982, p. 28
22	South Barrow test well 17	726	-	-	0-16 m Gubik Fm; at 16 m bedrock	Edge well, gas and water	Bird, 1982, p. 28
23	South Barrow test well 18	648	-	-	0-17 m Gubik Fm; at 17 m bedrock	Gas well	Bird, 1982, p. 30
24	South Barrow test well 19	701	-	-	0-18 m Gubik Fm; at 18 m bedrock	Gas well	Bird, 1982, p. 29
25	South Barrow test well 20	718	-	-	0-17 m Gubik Fm; at 17 m bedrock	Shows of gas and oil	Bird, 1982, p. 30
26	Walakpa test well 1	1,117	-	1980	0-2 m turf and ice, silt, 2-3.4 m sandy silt, 3.4-6.4 m clayey silt; bedrock at 5.4 m	Shows of gas Plugged and abandoned	Bird, 1982, p. 29
27	Walakpa Test well 2	1,329	-	1980	Silt, silty sand, sandy silt, some fine gravel of Gubik Fm, 0-10 m; at 10 m bedrock	Gas well (shut in)	Bird, 1982, p. 31
28	Iko test well 1	832	-	-	0-22 m Gubik Fm; at 22 m bedrock	Marginal gas well. Plugged and abandoned	Bird, 1982, p. 27
29	West Dease test well 1	1,272	-	-	0-41.5 m Gubik Fm; at 41.5 m bedrock	Poor shows Plugged and abandoned	Bird, 1982, p. 29
30	Tulageak test well 1	1,224	-	-	0-3.4 m turf; ice, ice-rich silty sandy clay, silty sand, 3.4-9 m silt, clay, little to no ice; at 9 m thin sandy chert gravel, 9-15.5 m silty sand, sandy clayey silt. Frozen 15.5+ m. Gubik to 25 m; bedrock below 25 m	Few poor oil shows. Plugged and abandoned	Bird, 1982, p. 31
31	Internat. Polar Expedition	11.3	11.3+	1882	0.6-4.6 m alternating clay and gravel, 4.6-11.3 m alternating sand and clay; Gubik Fm. No bedrock	Meat cellar -9.4°C in brine in hole	Ray, 1885; LaBelle, 1973, p. 96
32	Test holes Etluktak Spit	24.8	-	-	0-1.7 m above sea level, dry gravel; 0-2 m below sea level unfrozen gravel saturated with sea water; 2-5 m below s.l. black mud; 5 to 24.8 m below s.l. alternating mud and gravel. Second hole, 3.7 m frozen gravel on 57 m of unfrozen sediments	Test holes	Beal, 1967; Lewellen, 1972b
33	Footprint Lake, hole P	5.8	-	-	0.8 m diameter auger hole	Test hole	Hussey and Michelson, 1966
34	Footprint Lake, hole B-II	5.4	-	-	0.8 m diameter auger hole	Test hole	Hussey and Michelson, 1966
35	Seismic shaft	6.1	-	-	0-0.3 m tundra mat and silt; 0.3-5.3 m sandy stratified gravel, sand beds and lenses; 5.3-6.1 m sand, scattered pebbles. Radiocarbon dates collected. No bedrock	Test hole	Sellmann and Brown, 1973; LaBelle, 1973, p. 93
36	Old NARL ice cellar	9.8	-	1946	0-0.9 m organics, sandy clay, silt; 0.9-2.4 m silty clay, sand, pebbles, much granular ice; 2.4-5.5 m clean sand, little gravel; 5.5-7.5 m bedded sand; 7.5-8.2 m fine gravel, sand; 8.2-9.4 m bedded sand, organic material; 9.4-9.8 m sand, silty, gravel to 5 cm diameter. No bedrock noted	Meat cellar	Black, 1964; LaBelle, 1973, p. 93
	New NARL meat cellar	10	10+	1950	Upper 7 m not logged; 7.0-7.8 m sand, scattered pebbles and shells; 7.8-8.5 m uniform sand, little organic material; 8.5-9.8 m sand and organic material; 9.8-10 m silty sand, coarse pebbles, large shells; pots organic silt. No bedrock	Meat cellar	Black, R. F., 1950 notes
37	Footprint Lake hole FL	0.8		1955	0-.25 m mixed organic material and sandy gravel; 0.25-0.66 m silty sand and sand; permafrost table 0.8 m	Test hole	Carlson and others, 1959; LaBelle, 1973, p. 92, 102
38	Barrow water supply dam	32	-	1962	0-2.6 m ice and water; 2.6-3.5 m fetid lagoonal mud; 3.5-5.8 m sand and gravel; 5.8-9.1 m black clay; 9.1-11.9 m fine-medium sand, silt; 11.9-15.2 m fine-medium sand, silt, some coal; 15.2-18.6 m silty sand; 18.6-20.0 m gravel and sand (basal Gubik?--top of bedrock at 20 m?); 20.0-32.0 m silty sand, sand, silt, and clay, with Cretaceous megafossils, pyritized worm tubes, etc.	Foundation exploration	Faas, 1965, Hole 5
39	NARL hangar test hole	7.9	-	-	0-1.5 m gravel; 1.5-1.8 m vegetation; 1.8-3.0 m gravelly sand, irregular ice segregations; 3.0-3.4 m ice; 3.4-4.7 m silty sand, black silt; 4.7-5.5 m well bonded saturated frozen sand; 5.5-5.8 m silty sand, black silty organic layers; 5.8-7.9 m well-bonded frozen sand. No bedrock	Foundation exploration	LaBelle, 1973, p. 92 (data from CRREL, U.S. Army)
40	Special hole 7 (rig floor 1 m above ground)	33.2	-	1950	3.7-6.7 m cored- very fine-fine sand, silty, chert pebbles; 6.7-9.8 m fine sand, calcareous clay beds; 9.9-11.3 m sand, very fine to fine, silty; 11.3-12.8 m sand, fine, and clay with chert pebbles; 12.8-14.3 m clay, more silt, few to no pebbles; 14.3-31.7 m no record, other than sandstone; 31.7-33.2 m silty sandy clay, some shell fragments	Instrument hole	Black, 1964, and 1950 field notes; LaBelle, 1973, p. 94-95
41	Special hole 1 (rig floor 1 m above ground)	32.6	-	1950	0-3.4 m gravel, sand, silt; 3.4-6.4 m gravel (mostly fine sand, chert pebbles, silt); silt, fine sand and black clay; 6.4-20.4 m no core recovery; 20.4-21.6 m blue clay; no information 21.6-32.6 m	Temperature hole	Black, 1964, and 1950 field notes; LaBelle, 1973
42	Special hole 2 (rig floor 1.1 m above ground)	30.8	-	1950	0-4.9 m tundra, silty sandy clay, scattered chert grains and pebbles; 4.9-6.4 m silty sand, fine gravel; 6.4-7.9 m fine sand, silty, grading to cleaner sand; 7.9-9.4 m sand, sandy silt, and clay layers, chert pebbles, organic zones; 9.4-10.2 m sand, fine gravel, coal; chert grains, silt, very fine sand; 10.2-12.5 m very fine silty sand and clay; 12.5-15.0 m very fine silty sandstone; 15.0-29.3 m (using rock bit; no record); 29.3-30.8 m clay shale	Temperature hole	Black, 1964, and 1950 field notes; LaBelle, 1973
43	Camp Hole 3	49	-	1950	Partial record; hit brine; sand and silt above 36.6 m; hard limestone 36.6-37.9 m; unconsolidated clay below 37.9 m	Temperature hole	Black, 1964, and 1950 field notes
44	Bureau Indian Affairs test	4	-	-	0-1.8 m fine gravel, silt; 1.8-4 m coarse gravel	Test hole	LaBelle, 1973
45	Bureau Indian Affairs test	4	-	-	0-1.5 m fine gravel, silt; 1.5-4 m coarse gravel	Test hole	LaBelle, 1973
46	Simpson core test 21 (rig floor 1.2 m above ground)	458	250	-	1.8-4.9 m clay, peat, 30% ice; 4.9-7.9 m clay, micro- and macrofossils; 7.9-11.0 m clay on silt containing chert pebbles, basal fine sand; 11.0-29.2 m fine to coarse sand; pyritized zone at top of bedrock at 29.8 m (Bird states 24.7 m)	Core test. Temperature -9.9°C at 30.5 m	Robinson, 1964, p. 681-684; Brewer, in Robinson, 1964, p. 725-726
47	Simpson core test 23 (rig floor 1 m above ground)	315	-	-	0-2.1 m tundra, ice, clay, sand; 2.1-5.2 m medium to coarse sand with fragments of quartz, chert, wood and coal; 5.2-11.3 m sand and clay; 11.3-29.6 m fine to very coarse sand, granule and pebble gravel; 29.6-32.6 m clay, silt with chert pebbles; 32.6-34.1 m contact zone between Gubik and clay/shale bedrock	Core test	Robinson, 1964, p. 685; Bird, 1982, p. 21
48	Simpson core test 24 (rig floor 0.9 m above ground)	275	-	-	0-8.2 m tundra, ice, clay, minor sand; 8.2-11.3 m sand containing fragments quartz and chert; 11.3-23.5 m fine to very coarse sand, granules and pebbles of chert, quartzite, and dark igneous rock, also clay; 23.5-29.0 m clay, sand. Bedrock at 29.0 m	Core test	Robinson, 1964, p. 686; Bird, 1982, p. 21
49	North Simpson test well 1 (rig floor 4.5 m above ground)	1,150	152 ice-bearing	1950	0-1.2 m (below ground) cellar; 1.2-25.0 m sand, pebbles chert and quartzite, small amount of clay; top of bedrock about 22.9 m below ground	Dry and abandoned oil/gas test well	Robinson, 1958, p. 524; Bird, 1982, p. 21
50	Transmitter building	5.6	-	-	0-0.4 m muddy pea gravel; 0.4-0.76 m silty fine sand, pebbles; 0.76-2.7 m peat; 2.7-3.9 m sandy and pebbly peat; 3.9-5.64 m muddy silt. No bedrock	Foundation test hole	LaBelle, 1973
51	Barrow airport	6.9	6.9+	-	0-0.2 m peat; 0.2-0.5 m sandy silt; 0.5-1.8 m clayey sand; 1.8-3.3 m silty gravelly sand; 3.3-6.9 m silty sand. Frozen below 0.5 m. No bedrock	Test hole in runway	LaBelle, 1973, p. 102; Aitken, 1965
52	Compressed air drill tests	7.3	-	1950	0-7.3 m gravel containing brine in unfrozen zones as shallow as 2.1 m; at 7.3 m marine sand	Test hole for thermal cable	Black, R. F., 1950 field notes
53	Arctic Test Laboratory	18.3	-	1950	0-7.6 m gravel (including gravel, muck and vegetation, and clay); 7.6-18.3 m black clay. No bedrock	Foundation test hole	Black, R. F., 1950 field notes
54	Sample hole	4	-	-	1.1-1.4 m chiefly sand, silt, and clay; 1.8-2.1 m chiefly silt and clay, some sand; 3.0-3.3 m silt, clay, and sand; 3.8-4.0 m clay, silt, some sand	Test of percent particle size	LaBelle, 1973, after J. B. O'Sullivan
55	Hole B - J						Carson and others, 1962, hole A
56	CRREL hole 55.5	19	19+				Sellmann and Brown, 1973, fig. 2
57	CRREL hole 79	13.7	13.7+				Sellmann and Brown, 1973, fig. 2
58	CRREL hole 26B	21	21+				Sellmann and Brown, 1973, fig. 2
59	Barrow water supply	31	-	1962	0-0.9 m ice; 0.9-1.2 m gravel, sand silt; 1.2-2.3 m gravel, increasingly sandy; less silty; 2.3-4.6 m gravelly sand; 4.6-6.7 m well sorted sand; 6.7-11.0 m sand and gravel; 11.0-15.2 m silty sand; 15.2-17.5 m gravel, sand increasing; 17.5-19.8 m silty sand, increasing silt and clay at depth; 19.8-24.7 m mixed sand, silt, clay; 24.7-26.7 m increasingly sandy; 26.7-31.1 m silty sand and sandy silt	Test of materials beneath reservoir	Faas, 1964, test hole 13
60	Cape Simpson sea bluff exposures (no higher than 6.5 m at any point)	Generalized stratigraphic section (top to bottom) Unit 7 0.25-0.90 m clay, olive-brown. Contains erratic pebbles, cobbles and boulders; a slope deposit derived from the hill inland from the bluff data Unit 6 0-1.2 m peat and ice-rich organic silt and clay. Complex, highly deformed by ice wedges. Peat at base of unit is 6,000 to 7,200 years old (J, table 2), but that at top of unit is about 10,000 years old. This reversal of ages apparently caused by transport and redeposition of material from knoll immediately inland from the bluff Unit 5 0-1 m pebbly sand containing silty and clayey zones. Discontinuous. Contains shell fragments but no whole valves. Chunks of peat with small twigs occur locally at base and may indicate redeposition Unit 4 0-0.30 m very fine sand, olive-brown, discontinuous Unit 3 1-2 m gray clay, with sand stringers and lenses; contains striated erratic cobbles and boulders in basal part of unit and marine mollusk shells Unit 2 1-2 m fine brown sand with layers, lenses, streaks and blebs of clay. Pebbly in places. Contains marine mollusk shells Unit 1 1 m (base not exposed) gray to olive-brown clay containing marine mollusk shells		See also tables and maps of fossil and radiocarbon data	Carter, L. D., 1980 field notes
61	Kachiksuk Bluffs section	Top (0-0.3 m), active layer consisting of peat, brown silt 0.07-0.10 m thick, and basal peat; ice-rich peat and silt; yellow brown silt; olive-brown silt having 30 to 40 percent ice; and 0-1.83 m of gray silt that dips northwest from bench mark into sea. Top of the gray silt is 2.44-3.05 m below top of bluff; note radiocarbon date this area (Z, table 2)					Black, R. F., 1946 field notes
62	Tapkaluk Islands	3	-	-	0-3 m gravel and sand on fine lagoonal deposits	Test hole	Lewellen, 1977, fig. 1
63	Tapkaluk Islands	2.6	-	-	0-2.6 m gravel and sand on finer lagoonal deposits	Test hole	Lewellen, 1977, fig. 1
64	Deadman's Island	3.7	-	-	0-3.7 m gravel and sand on finer lagoonal deposits	Test hole	Lewellen, 1977, fig. 1
65	Northwestern Elson Lagoon	16	-	-	0-0.4 m organic silt, lagoon bottom sediments; 0.4-14 m silty sand, some gravel and organic material, fossils; 14-16 m sticky gray black sandy silt	Test hole	Lewellen, 1974, fig. 8



Base from USGS 1:250,000 BARROW 1955

Geology mapped 1977-1982

Figure 2 Surficial geologic map

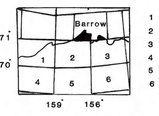
MAP SYMBOL

Contact between map units, plotted from aerial photographs

Correlation of Map Units

Thaw-lake deposits	Alluvial deposits	Eolian deposits	Beach and Barrier island deposits	Marine deposits			
Qt	Qal	Qe	Qb	Qm	Holocene		
			Qb		Late	Pleistocene	Quaternary
			Qb	Qs	Middle		
					Early		
					Pliocene		Tertiary

Location Index



1 Wainwright 83-457
2 Meade River 83-294
3 Teshekpuk 83-634
4 Utukok River
5 Lookout Ridge 83-279
6 Ikpikpuk River

Published U.S. Geological Survey Engineering - Geologic Maps of Northern Alaska with Open-File Report numbers

DESCRIPTION OF MAP UNITS

	Description of materials	Distribution and thickness	Topography and drainage	Permafrost	Susceptibility to frost action	Suitability for construction	Special problems
Qt Thaw-lake deposits	Consist of sediment thawed and eroded from perennially frozen lake banks and redistributed by currents and wave action. Deposits derived from marine sand consist of medium to fine sand and sandy silt; those within areas of marine silt and clay consist of silt, sandy silt, and clay. Local pebble accumulations. Deposits throughout unit have high organic content as disseminated organics, lenses, beds, and chunks of retransported or in situ peat and sticks.	Individual and coalesced thaw-lake basins commonly elongated in a N. 10° to 15° W. direction; occupy 50 to 80 percent of map unit area. Basin deposits generally less than 3 m thick.	Occupy interlocking and overlapping basins having local relief of less than 5 m below residual surfaces which are the former level of the coastal plain after formation of ground ice, but before thaw processes formed the thaw-lake basins. Either undrained or connected by small meandering creeks that enter the Beaufort Sea in small estuaries, e.g., Avak Creek, or in narrow, incised valleys forming a reentrant in the cliffed Chukchi Sea coastline.	Permafrost is present immediately below a thin active layer under lakes less than 2 m deep and beneath adjacent marshes and meadows. Lakes deeper than 2 m may have a small perennially thawed bulb between the bottom of the active layer and the permafrost table. Hussey and Michelson (1966) and Sellmann and others (1975) show that the upper 6 to 8 m of the ground contains ice in excess of the voids in the material, as small masses, veins, and lenses, and as large ice masses; excluding wedge ice Hussey and Michelson found that the ground is subject to settlement on thawing of about 0.1 m beneath present lakes to 1.2 m beneath the ancient drained lake basins, if the depth of thaw extends to the base of the zone of excess ice at 6 m.	Thaw-lake deposits in silty sand with admixed organic material are frost-susceptible. Silt and clay in thaw-lake basins within marine silt and clay unit highly susceptible to frost action.	Unsuitable as a borrow site and for foundations because of fine-textured soils, frost-susceptibility of silt, clay, and silty sand, summer high water table, flood hazard, and thaw settlement potential due to excess ice (though lower than in Qs and Qm units).	Although used as sites for construction of large projects, such as Pump Station 1 of the trans-Alaska pipeline, thaw-lake basins have potential for differential settlement upon thaw of permafrost that may require refrigerated foundations. A common site for formation of pingos in sandy terrain elsewhere, but none identified in Barrow quadrangle. Subject to flooding.
Qal Alluvial deposits	Stratified to lenticular fine to medium sand and silt; local coarse sand and lag gravel, including (erratic) boulders of both eastern and southern provenance. The coarser materials are found along small brooks draining to the Chukchi Sea, where they have been eroded out of the underlying older marine deposits. Deposits include organic silt and detrital peat and sticks.	Form floodplains and low terraces in narrow belt adjacent to streams. Creeks generally small; for most part, deposits are too narrow to be mapped except along largest streams. Deposits approximately 1 m thick on most small streams which have a low potential for scour; underlain by marine deposits.	Floodplain and low-terrace complex of small creeks slightly incised to depth of 1 to 3 m where creeks flow through thaw-lake basins to Beaufort Sea, and to depth of 3 to nearly 20 m where creeks are incised through cliffs bordering Chukchi Sea. Some of the lowermost creek valleys have the form of estuaries ponded behind active barrier or baymouth bars and beaches, suggesting a lowering, then a rise of sea level after incision by the stream.	Perennially frozen from 1 m below the surface; local variations in thickness of active layer caused by warming effect of deep lakes and ponds that may cause small perennial unfrozen zones at the base of the active layer, and above the permafrost table. Few subsurface data, but probably deposits contain interstitial ice, small ice masses, and wedges.	Alluvial silty sand and silt is frost-susceptible.	Generally fine sand and silt, with very little coarse, granular material suitable for borrow. Subject to flooding. Subject to unknown amount of differential settlement on thaw of permafrost containing excess ice either in alluvium or in underlying marine deposits.	Banks locally subject to lateral erosion, and much of unit subject to spring flooding. Icings not reported from unit. Sandy material exposed to wind erosion forms local blowouts and dunes of limited areal extent.
Qe Dune sand	Fine to medium sand containing abundant quartz with minor dark minerals; chert common. Well sorted, stratified to massive.	Active blowouts and small dunes localized on the west shore of a lake near 71° N. lat. about 14 km inland from Chukchi Sea coast. Thickness of dune sand probably 1 or 2 m. Elsewhere dune forms are subdued and difficult to separate from underlying marine deposits; map units Qs, Qm, Qb may include thin cover of eolian sand.	Small areas of dunes less than 2 m high above active blowouts in the lee of lake. Drainage good.	Probably perennially frozen at a depth of about 1 m in well drained ridges to less than 0.6 m in less well drained sites. Dune sand contains little excess ice, but new deposits beneath dune sand expected to contain large amounts of excess ice, including ice wedges, down to a depth of about 8 m.	Eolian sand is not frost-susceptible where silt content is less than 6 percent.	Fine eolian sand as mapped in this quadrangle probably lacks the wedge ice present in this unit elsewhere, but the deposit is thin, and wedges and other forms of ice in underlying units may result in thaw settlement. Deposit generally too thin and localized for important source of sand. Material generally requires stabilization or addition of binder for use as surfacing material or fill. Relatively easy to work in well-drained ridges where grains not completely cemented by ice. Subject to deflation by wind wherever vegetation mat is broken.	Very sensitive to wind erosion when surface vegetation is absent or disturbed.
Qb Marine beach, bar and barrier islands deposits	Chiefly coarse to fine sand, and gravelly and sandy granule and pebble gravel. Cobbles and boulders as large as 12 cm occur as surface lag and as beds and lenses in finer deposits. Generally contain less than six percent silt, except for local silt, clay, and organic layers and lenses. Also includes local driftwood and erratic boulders (fig. 3, table 3) to 1 m in diameter of eastern (Flaxman) provenance east of Barrow and mixed eastern and southern provenance along the Chukchi Sea coast. Slabs of Cretaceous rock incorporated in beach deposits south of Singaruak Creek. Beach gravel well rounded and of rock types described in fig. 3 as either of eastern or southern provenance. Contains mollusks, foraminifera, ostracodes, and sparse mammal remains.	Holocene deposits form beaches at base of sea cliffs along Chukchi Sea coast, narrow beneath actively caving banks there and along Beaufort Sea coast, but as wide as 50 m at northernmost tip of Chukchi Sea cliffs where streams enter sea. Beach deposits generally 1-3 thick, overlying marine deposits. Offshore bars, spits, and barrier island chains stretch from Barrow northward to Point Barrow and eastward to edge of quadrangle. Width of deposit a few m to nearly 1 km; thickness as great as 25 m (mixed with fines) at western shore of Elbaktak Pass. Older (Pleistocene) deposits are a few m thick and are 7.5 m above sea level northeast of Barrow, 10 m above sea level at Barrow airport, and nearly 20 m above sea level south of Barrow; a former barrier island chain extends from near Barrow intermittently to a point northeast of Tusikvoak Lake and thence across Dease Inlet toward the north shore of Teshekpuk Lake (Carter, 1983a, included these deposits in his Qs unit).	Holocene deposits form subparallel ridges in beaches, offshore bars, and barrier islands; local relief 1-3 m. Where tundra-covered and beyond the storm beaches, drainage is good on beach ridges, but poor in swales between ridges. Below the limit of storm surges (approximately 3 m) beaches are locally subject to the push or shove of pack ice to form irregular ridges and depressions in the beach deposits. Older (Pleistocene) deposits form subdued linear to curvilinear ridges that are moderately well drained and stand 1-5 m above surrounding terrain.	Modern beaches, offshore and barrier bars have active layer as thick as 2 m, but inland beaches related to old, higher sea levels are permanently frozen to within 1 to 1.5 m of surface and contain masses, lenses, and excess interstitial ice and ice wedges. The modern beaches have ground cracking in winter and formation of thin, developing ice wedges but little excess interstitial ice. Overall excess ice content of inland beaches expected to be less than in finer-grained materials of units Qs and Qm.	Granular materials generally not frost-susceptible, but unit contains silt, silty sand, and clay beds and lenses that are frost-susceptible.	Granular materials suitable for fill and for foundations with a minimum amount of differential settlement, compared to other units. Suitability of materials for concrete aggregate is poor because of high chert and coal content that is deleterious to concrete. Require stabilization for use as surfacing, although in some areas accompanying beds and lenses of fine grained material may provide adequate natural binder. Subject to storm waves below 3 m above sea level where structures would be subject to flooding and ice shove as pack ice is driven ashore.	Subject to ice shove along shore, and storm surge flooding and wave damage to about 3 m above sea level. Excavation of actively forming beaches requires environmental impact evaluation to determine effect of borrow on coastal erosion and deposition.
Qm Marine silt and clay	Clayey, silt, silty clay, and minor fine sand and sandy silt. Includes thin, superposed marine deposits, the uppermost of which contain scattered ice-rafted pebbles, cobbles, and boulders of red granite, pink quartzite, of eastern (Flaxman) provenance. Also present are mollusks, ostracodes, foraminifera, and remains of marine mammals. Deposits extensively reworked by thaw-lake processes and are overlain by 1 to 2 m of peat.	Forms lowest part of coastal plain in a belt 12-15 km wide along the Beaufort Sea coast. Silt-clay on Simpson Peninsula is underlain by sand at depths of 1 to 7 m below sea level. East of Barrow test holes in unit are in silt clay with a few notable exceptions, such as North Simpson well (40, fig. 1; table 1) reportedly largely in sand and gravel to bedrock at 22 m. At Tulagak Point silt clay extends to 12 m below sea level. At Barrow the sandy (beach) facies lies on an older marine silt and perhaps is mantled locally by clay and silt of the younger marine unit. The older marine silt clay rises southward along the coast from Barrow, and, along that coast is known to be much older than the near-surface unit of the Beaufort coast (Brigham, 1983a; Sellmann and Brown, 1973, fig. 3).	Forms poorly to moderately well-drained surfaces that stand in isolated areas 1 to 5 m above adjacent thaw-lake basins. Generally not subject to flooding.	Perennially frozen beneath an active layer that is generally less than 0.5 m thick. Active ice wedges well developed and fossil ice wedges locally occur at depths of a few meters. Interstitial ice content in excess of natural voids down to a depth of 6 or 8 m below surface may produce more settlement upon thawing than the 3.4 m noted in marine sand near Barrow (Hussey and Michelson, 1966).	Highly frost-susceptible.	Not suitable for foundations because of excessive differential settlement on thaw of ice-rich permafrost. Sources of sand and gravel borrow not generally available.	Easily eroded. Silt has high liquefaction potential when thawed.
Qs Marine sand	Fine to medium sand having a moderate to high silt content and containing scattered granules and pebbles chiefly of chert. Deposit includes minor beds and lenses of organic material, especially within the thin eolian mantle, as a cover of silt and peat, or in alluvial deposits included with the unit. Wind-winnowed lag pebbles form thin local surface layer. In many areas deposit lies above older, more silty and clayey marine sediments that are similar to but older than the Qm unit.	Separated from the coastal belt of marine silt and clay (Qm) along the Beaufort Sea by deposits of a former barrier island chain (Qb). Although underlain by older silt and clay in most areas, the marine sand reaches a maximum thickness of about 10 m along the Chukchi Sea coast, but is not well exposed east of Barrow; sparse subsurface data indicate silt and clay at depth inland as well as along the coast.	Forms well- to moderately well-drained surfaces that stand in isolated areas 1 to 5 m above adjacent thaw-lake basins. Not subject to flooding.	Contains ice wedges and very high volume of ice as interstitial grains, small masses, and lenses. Volumetric thaw settlements of upper 6 m of marine sand at Barrow (Hussey and Michelson, 1966) would be 55 percent or 3.4 m in undisturbed residual surfaces; ice content is greater than volume of natural voids (supersaturated with ice) down to about 6 m. Sellmann and others (1975) found that the depth of supersaturation with ice extended to about 6 m with ice content of 75 percent of volume at depth of 1 m, not including wedge ice. Active layer generally less than 0.5 m thick.	Much of unit contains more than six percent silt and is frost susceptible.	Not suitable for foundations because of excessive differential settlement on thaw of ice-rich permafrost. Sand may be suitable for fill, base course, or surfacing if silt content is appropriate and if stabilized to prevent deflation.	Easily eroded by running water if flow is concentrated by construction activities and readily eroded by wind once vegetation is disturbed.
Bedrock	Shale and sandstone of the Nanushuk Group of Cretaceous age, exposed only in vertical sea cliffs and gullies in southwestern corner of map area. Bedrock geology (unpublished mapping by Mayfield and others, 1983) (fig. 1) elsewhere is based on test wells, borings, and geophysical interpretation; unit lithology and thicknesses tabulated by Bird (1982).	Bedrock lies at the base of the unconsolidated deposits at a depth of a few meters in the southwestern corner of the quadrangle to at least 41 m at the western edge of Dease Inlet. The distribution of bedrock units is shown in fig. 1. Thickness of individual bedrock formations varies from place to place, but is given for each exploratory oil and gas well by Bird (1982).	Bedrock topography as noted from isolated exposures and drill holes seems relatively flat, from within a few meters of the surface in the southwestern part of the map area to about 18 to 30 m in the Barrow area, deepening eastward to about 41 m (hole 29, fig. 1, table 1).	Permafrost extends through unconsolidated deposits into bedrock throughout the area of the quadrangle. Base of permafrost, estimated at 182 to 405 m (holes 7 and 49, fig. 1 table 1) below the surface (based on position of 0° isogeotherm), is affected by proximity to heat sources such as the ocean or large deep lakes. Ice content of frozen bedrock and its potential for thaw settlement is not known, although some of the more shallow bedrock could contain wide ice wedges, as reported in adjacent quadrangles.	Shale subject to frost action, and both sandstone and shale readily broken down by frost action into small fragments.	Shale and sandstone not generally suitable for quarrying or for foundations; accessible only along Chukchi Sea coast near 71° N. lat.; elsewhere buried by a few to more than 41 m of frozen overburden. Shallow bedrock cut by ice wedges or containing excess ice may be subject to thaw settlement. Rocks are generally too weak for use as construction fill, rip rap, building stone or other purposes.	--

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