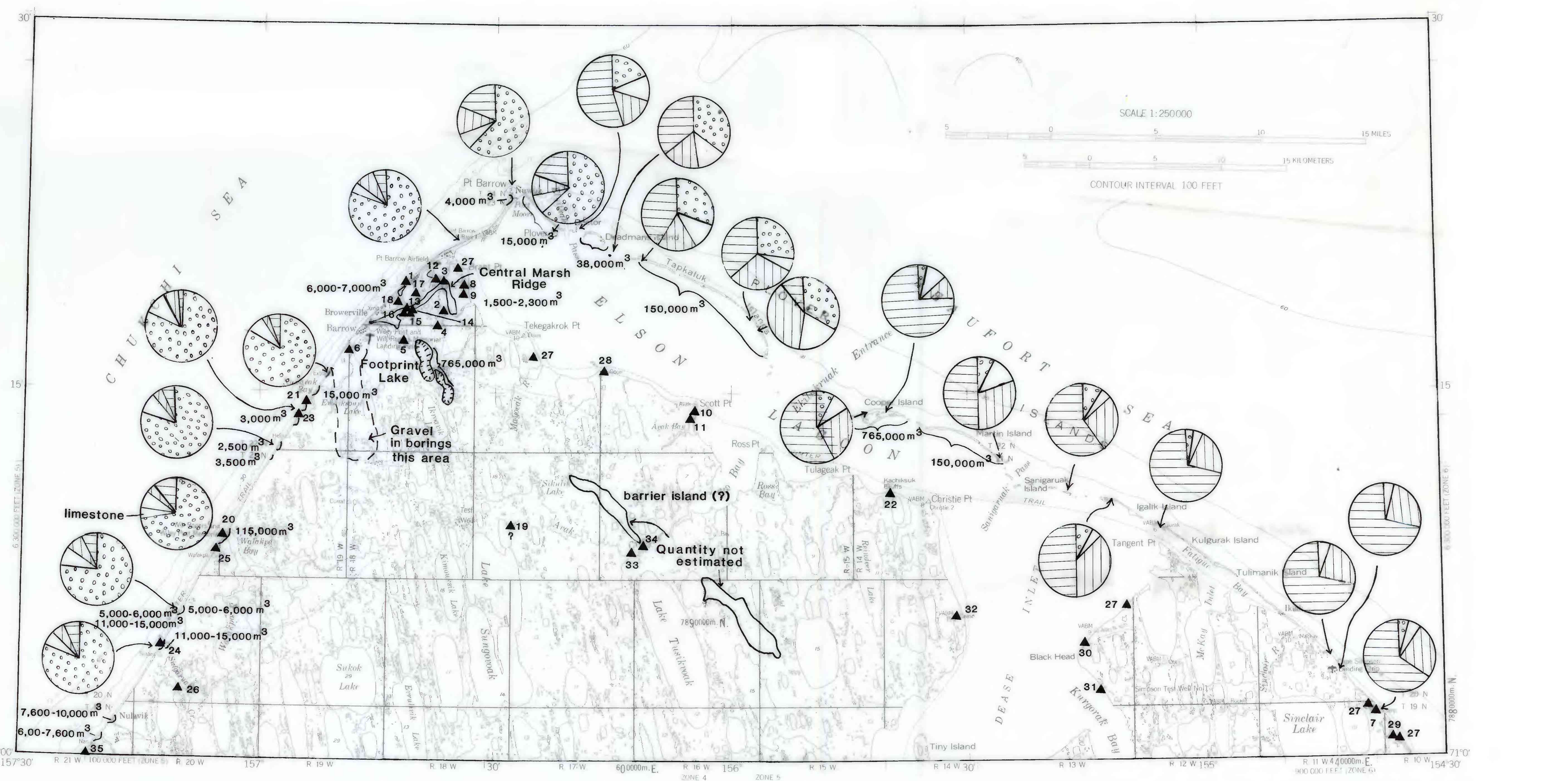
OPEN-FILE REPORT 84-124
PLATE 2



Base from USGS 1:250,000 BARROW 1955

Figure 3 Map showing sources and availability of gravel and location of erratic stones

Map showing sources, composition, and availability of gravel and location of erratic stones

EXPLANATION

Pie diagram showing percentages of gravel clasts of the lithologic types described below. Gravel composition from counts of 100 stones (Hopkins and Hartz, 1978)

Eastern (Flaxman) provenance; dolomite facies of Rodeick, (1975)

Eastern (Flaxman) provenance; other rock types such as red and gray granite, diorite, andesite, gneiss, quartzite, gabbro, and basic igneous rocks

Brooks Range provenance; chiefly sandstone, conglomerate, chert, siltstone, shale, the chert facies of Rodeick (1975)

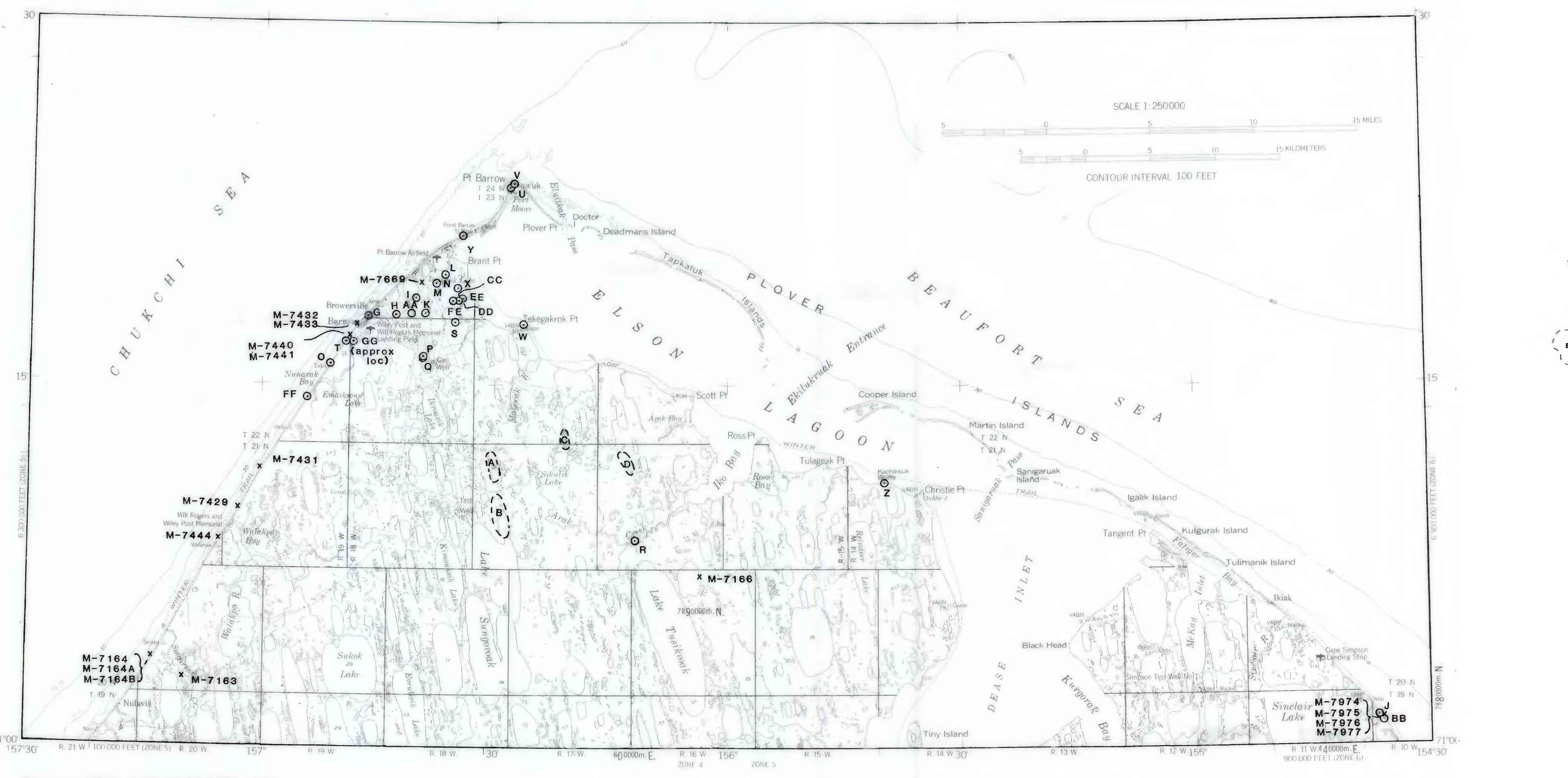
Indeterminate rocks

40,000 m3
Volume of gravel in cubic meters from estimates by LaBelle (1973)

Former barrier island

Artifically drained thaw lake

11 ▲ Location of erratic boulder described in table 3



Base from USGS 1:250,000 BARROW 1955

Figure 4 Map showing locations of radiocarbon and paleontological samples

Explanation

× M 7164 Location of and U.S.Geological Survey identification number of fossil collections described in table 4

○ AA Location and letter denoting radiocarbon-dated sample listed in table 2

B Thaw lake basins from which numerous radiocarbon samples were dated and reported by Carson (1968) to determine history of thaw lakes development

Table 2. Radiocarbon dates

Map No. (fig. 4)	Age, yr before 1950	Sample and lab no.	Stratigraphy	Significance	Source of information
A	Less than 2,695	GX-0075-0079 GX-0234-0237	Basal surface peat or sod.	Correlation of similar lacustrine surfaces bordering four thaw-lake basins was only partially successful, but may be possible with more data. Suggests a lacustrine transgressive expansion reaching a maximum between 4,000 and 8,000 yr ago; a period of basin intersection and drainage began after 3,500 BP.	Carson, 1968, site A
B	Less than 4,865	GX-0080-0085 GX-0238-0241	do		Carson, 1968, site B
C	Less than 4,280	GX-0242-0243 GX-0444-0445	do		Carson, 1968, site C
D	Less than 2,980	GX-0400-0405	do		Carson, 1968, site D
E	36,300	I-1394	Thin frozen organic layer in silt and sand, depth 18.9 m; elevation 3.5 m.	Shows age greater than dating method for silty unit beneath the sand at Barrow.	Brown, 1965
F	9,155± 300	I-1183	Frozen peat in fine-grained ice-rich sediment (Plot X, depth 0.9 m). Elev. 5.2 m.	Provides minimum age for subjacent beach ridge and dates age of soil; zone 1 of Colinvaux (1964).	Sellmann and Brown, 1973; Brown, 1965, 1969; Colinvaux, 1964
G	6,450± 200	TX-220	Wood from base of lowermost black clay unit, -10.3 to 11.0 m below sea level. BIA Hole 4.	Provides minimum date for initial lagoonal deposits, interrupted by coarse marine storm deposits. Date fits sea level curves of Fairbridge.	Faas, 1964; 1966, p. 346 Fairbridge, 1960
H	1,775± 120 9,550± 240 10,525± 280 8,200± 300 14,000± 500	I-699 I-700 I-701 I-992 I-1171	Frozen peat in fine sediments, depth 0.6 m. Frozen peat in fine sediments, depth 1.5 m. Frozen peat in fine sediments, depth 3.0 m. Organic residue in ice wedge, depth 3.3 m. Organic residue in ice wedge, depth 3.6 m.	Overlies active ice wedge (elev. 8.4 m). Adjacent to inactive fissure-like wedge, elev. 8.5 m. Surface elevation 8.5 m. Dates ice wedge between 8,200 and 14,000 yr ago, approximately; surface elev. 8.5 m. Zone 0 of Colinvaux (1964).	Brown, 1965 do do Brown, 1965 do
I	10,700± 350	L-400B	Frozen peat in fine-grained, ice-rich sediments. Depth 0.6 m; surface elev. 5.6 m. After humic acid removal. Humic acid portion 11,050± 350.	In situ peat horizon of a wet tundra soil on top of beach ridge. Minimum age for underlying beach deposits.	Brown, 1965; Reported as 10,600± 260 and 10,900± 260 by Douglas and Tedrow, 1960
J	10,140± 150 6,780± 110 6,050± 70 7,190± 250	I-11,672 I-11,914 USGS-1,034 USGS-1,035	Base of 15-cm-thick peat at top of unit 6 (60, table 1 and fig. 1). From 1 m below top of unit 6, where basal peat is deformed by ice-wedge growth. From top of 25- to 60-cm-thick peat at base of unit 6 (see table 1, 60, and fig. 1). From base of 25- to 60-cm-thick peat at base of unit 6 (see 60, table 1 and fig. 1).	Material evidently anomalously old material transported from knoll island. Probably is basal in situ peat that was deformed by ice-wedge growth. Note much younger age than peat at top of unit. Both USGS-1034 and 1035 are basal peat dates.	L. D. Carter, unpublished do do
K	8,330± 250	I-1202	Frozen peat in fine-grained sediment, depth 2.5 m in initial surface residual that is 6.8 m above sea level.	From initial surface residual not subject to thaw-lake activity. Date suggests a deeper thaw than occurs now.	Brown, 1965
L	25,300± 2,300 44,000	I-1384 W-2676	Thinly layered, fibrous organic material in sandy beach gravel at depth of 2.1 m; reworked, 2 cm thick. Sample split and submitted to two laboratories.	Provides dates that apply to organic material of beach bordering Central Marsh. Surface elevation 6.3 m beach.	Brown, 1965 Sellmann and Brown, 1973, p. 177
	37,000 + 2,900 − 2,000 36,000± 2,000	I-2359 W-2679	Fine organic layer in clean sand, depth 5 m Sample split and submitted to two laboratories.	Provides dates for sandy material below the beach gravel. Surface elev. 7 m.	Brown, 1965a Sellmann and Brown, 1973, p. 177
M	3,000± 130	L-400A	A_1 horizon of Arctic Brown Soil after humic acid removal (2100± 180 before removal).	Indicates more than 3,000 yr of stability for soil formation and minimum age of beach deposits.	Drew and Tedrow, 1962; Brown, 1965
N	8,715± 250	I-1182	Frozen humidified peat of buried soil at 0.4 m overlying gravel of beach ridge; soil covered with 30-50 cm silt.	Dates in situ soil on beach ridge and provides maximum date for overlying wind-blown(?) silt and minimum age for beach gravel.	Colinvaux, 1964; Brown, 1965
O	> 38,000	W-380	Frozen log embedded 10 m below top of sea cliff at base of upper (sandy, gravelly) member of Gubik Formation.	Shows basal part of upper member of Gubik is beyond dating range.	Coulter and others, 1960
P	3,540± 300	W-432	Thin, semi-continuous, in situ peat in lacustrine silt; depth 0.3 m; elev. 4.2 m.	Provides younger limit on age of marine part of the Gubik Formation beneath the dated thaw-lake deposits.	Coulter and others, 1960; Brown, 1965
Q	9,100± 200	W-847	Small mass of peat at depth of 1.1 m in clean lacustrine silt and fine sand. Elev. 4.2 m.	do	Coulter and others, 1960; Brown, 1965
R	9,800± 160 7,940± 130 8,340± 140	I-4001 I-4002 I-4003	Basal organic sand at bottom of channel. Reworked driftwood in basal organic layer. Small twigs in clean sand above basal sand.	These three dates relate to the age of the channel deposits of the highest fluvial terrace near Avak Creek gaging station.	Lewellen, 1972b, p. 166
S	31,400 + 3,600 − 2,400	I-1604	Fine organic layer in marine sediments (core 714) at depth of 6 m. Surface 3 m above sea level.		Sellmann and Brown, 1973, p. 177
T	39,900	I-3628	Fibrous and woody fragments collected from fine-grained marine deposits beneath marine sand and gravel about 2 m above sea level.	Provides age for upper part of older marine member, referred to by Black (1964) as Skull Cliff unit of Gubik.	Sellmann and Brown, 1973, p. 177
U	1,100± 120 1,090± 140 10,800± 300	I-387 I-388 I-389	Driftwood fragments in frozen gravel, depth 1.9 m. Driftwood fragments in frozen gravel depth, 2.9 m. Driftwood fragments in frozen gravel, depth 3.3 m. (Elev. surface is about 4.1 m).	All samples probably retransported, but 10,800 yr date seems unreliable; others consistent with small ice veins or active wedges in gravel.	Péwé and Church, 1962
V	5,575± 375	GX 0230	Badly weathered log 2 m long, 20 cm in diameter, 2 m above mean low water.	All driftwood from beach gravel.	Hume, 1965
	1,700± 110	GX 0380	Log 15 cm long, 2.5 cm in diameter, 1.4 m above sea level.	do	do
	2,365± 100	GX 0381	Wood, 3.1 cm in diameter, 21.5 cm long, 1.7 m above sea level.	do	do
W	8,160± 120	I-6075	Organic material at 113 cm beneath center of polygon.	Polygon believed active last 9,000 yr	Lewellen, 1972, p. 166
X	3,200± 230	I-1544	Peat and organic silt below 30 cm lacustrine silt. Sampled at depth of 0.4 m; surface elevation 2.7 m.	Two dates bracketing gray lake silt brought to drained lake by wind(?). Lake drained after deposition, sometime during last 3,200 years.	Brown, 1965
	5,010± 320	I-1545	Frozen fibrous peat mass over inactive ice wedge, depth 1.2 m; beneath 20 cm gray silt	do	do
Y	2,650± 160	I-1868	Upper 25 cm of 1.5-m core of frozen fresh-water peat.	Peat was formed in shallow fresh-water environment encroached on by sea, perhaps accompanied by rise in sea level.	Brown and Sellmann, 1966, p. 299-300
	4,570± 130	I-1869	Basal 25 cm of abaove 1.5-m core.	do	do
	2,860± 140	I-1949	Middle 25 cm of above 1.5-m core.	do	do
Z	9,330± 130	I-6074	Mass of twigs at depth of 2.1 m below surface.	Probably part of thaw-lake sediments above marine silt in this 3.7-m bluff.	Lewellen, 1972b, p. 166
AA	12,160± 200	I-3244	Basal organics of thaw lake deposits on marine sand. Elevation 2.2 m.	One of oldest known thaw-lake deposits in Barrow area. Maximum age of thaw lake.	Lewellen, 1972b, p. 166; Brown and others, 1980, p. 15
BB	3,400± 100	L-567	Frozen organic-rich horizon in fine-grained sediment after humic acid removal (before removal 3,400± 200 in humic acid portion). Elev. 12 m; depth 0.7 m.	From a topographic high not recently worked over by thaw-lake processes, but provides an anomalously young date.	Douglas and Tedrow, 1960; Brown, 1965
CC	7,580± 140	I-2050	Buried peat, depth 60-85 cm in core plot 40, unit VIII, CRREL transect.	Brown (1969b) notes three generations of buried peat, 9,155 to 10,430; 6,690 to 7,860; and 2,450 to 4,595.	Brown, 1969b
DD	2,450± 120	I-2123	Depth 50-57 cm, CRREL unit VI, plot 29.		do
EE	4,595± 110	I-2600	Depth 45-60 cm, CRREL, unit VI, plot 29, core 21-1 (4,390± 110 volatiles; 4,800± 115 residue).	Youngest of the buried soils overlie actively growing ice wedges.	do
	7,860± 120	I-2601	Depth 58-70 cm, CRREL unit VI, plot 29, core 22-1.		do
	10,430± 320	I-2049	Depth 55-80 cm, CRREL unit VI, plot 29, core 22.	Oldest in situ soil, like top of beach ridges, e.g., site F.	do
	6,690± 130	I-2048	Depth 55-75 cm, CRREL unit VI, plot 7, core 21.		do
	2,200± 105	I-2602	Top peat along Elson lagoon ice wedge.		Brown, 1969b, p. 165
FF	>36,000	BETA-1766	Spruce log in gravelly marine deposits 5.6 m above sea level.	Probably driftwood which, if not redeposited fine older beds, could provide indication of minimum age of enclosing sediments.	Brigham, written commun., 1983
GG	31,200 + 810 − 910	DIC-2569	Marine shells from upper unit of Gubik Formation (Walakpa beds) near Barrow.	A minimum estimate for age of Walakpa beds (= Pelukian?).	Brigham and Miller, 1983

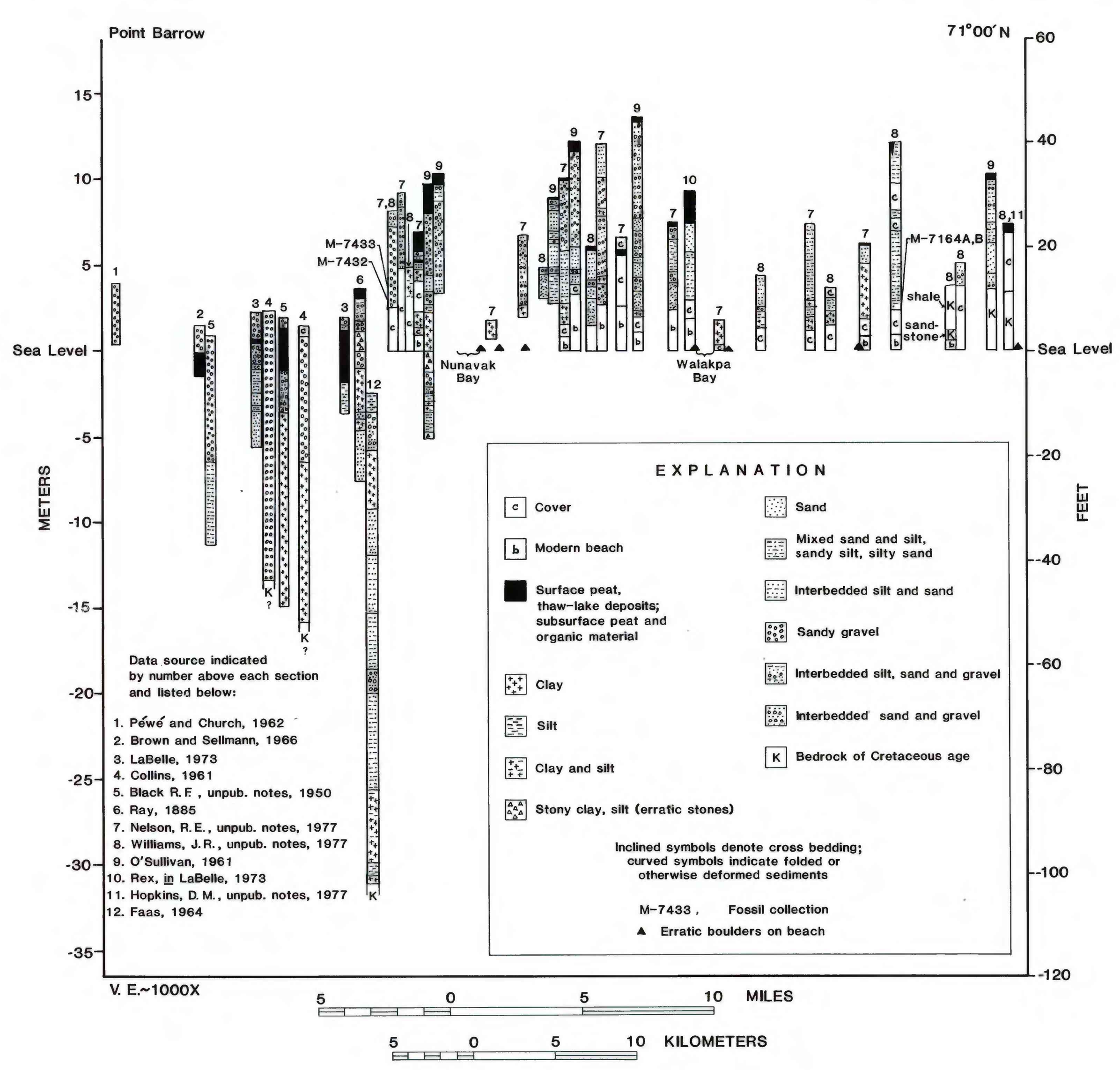


Figure 5 Cross section along Chukchi Sea Coast from 71° N to Point Barrow

Table 3. Description of erratic boulders

Distribution, fig. 3, is strongly biased toward the Barrow area and along the coast, where scientific observation has been concentrated. Few observations have been made in most other areas simply because these areas have not been investigated. Boulders have also been dredged from sea floor.

Number	Description and size (cm)	Source of information ( ) indicate observer's number
1	Quartzite, blastoclastic, indurated, 23x13x11	MacCarthy (1958) (2)
2	Granite, coarse 190x127x91	do (50)
3	Igneous or metamorphic rock, quartz veins 15x9x5	do (49)
4	Granite, foliated	do (3)
5	Diabase 28x20x15	do (48)
6	Granite, dark red 37x33x16	do (51)
7	Diabase, olivine, coarse angular 198x173x58 and diabase 23x7x2.5	do (7) (9a,b)
8	Chert, gray 23x15x13	do (29)
9	Chert, brown 20x17x13	do (30)
10	Quartzite, red, angular, with pebbles of chert, chalcedony, quartzite 56 56x41x15	do (33)
11	Granite, genissic, reddish subang. 53x41x36	do (34)
12	Variety of faceted and striated boulders of gray quartzite, augite diabase, red granite, chert, aplitic red granite to 58x38x30	do (12-28)
13	Quartzite, red-banded, limestone fossiliferous, 28x23x10	do (35a,b)
14	Quartzite, with chert, chalcedony, and quartzite pebbles (23x18x13) and tonalite, gray 22x16x9	do (36,37)
15	Granite pegmatite, gray 60x60x36	do (38)
16	Diabase	do (39a)
17	Granite, red	do (40)
18	Aplitic granite, red 36x20x15; quartzite 22x17x8	do (41a,b)
19	Granite 1-ton boulder, approximate location	do (42)
20	Granite, light reddish, approx. located 66x46x30	do (48)
21	Pebbles black chert, red and brown quartzite, and red granite as dropstones in clay	Black (1964, p. 69; Nelson, R. E., 1978 notes)
22	Chert, red brown, yellow white quartzite, red granite, hornblende granite or diorite, black slate, vein quartz sandstone, and dolomite in gravel lenses in clay	Black (1964, p. 69)
23	Quartzite, red, angular, in creek bed 25 cm	Nelson, R. E., 1977 notes
24	Quartzite, red, broken boulder 45x40x25	do do
25	Graywacke, numerous slabs 20-100 cm	do do
26	Altered volcanic (amphibolite) 25 cm diameter	Williams, J. R., 1978 notes
27	Several locations where erratic boulders noted	Hopkins, D. M., field notes
28	Granite, coarse-grained, 30 cm diameter	Williams, J. R., 1978 notes
29	Erratic cobbles, boulders on beach and tundra	Carter, L. D., 1980 notes
30	Erratic boulder 1 m diameter	do
31	Granite, 1 m largest dimension	do
32	Granite, pink, 70 cm longest dimension	do
33	Erratic boulders in floodplain Avak Creek	do
34	Erratics near gaging station and in piling holes	Lewellen (1972b, p. 124)
35	Diabase, red quartzite at base of Gubik on bedrock at 3.3 m above sea level	Hopkins, D. M., field notes

Table 4. Checklist of marine macrofossils at selected localities

(Identified by L. N. Marincovich, Jr., and Dale Russell, U.S. Geological Survey)

	M-7163	M-7164	M-7164A	M-7164B	M-7166	M-7429	M-7431	M-7432	M-7433	M-7440	M-7441	M-7444	M-7669	M-7974	M-7975	M-7976	M-7977
BIVALVE																	
Astarte sp.	X	X			X	X						X					
Astarte borealis Schumacher, 1817								X		X	X			X		X	
Axinopsida orbiculata (Sars)													X				
Bathyarca glacialis (Gray, 1824)														X			
Clinocardium sp.		X	X													X	
Clinocardium ciliatum (Fabricius)										X		X					
Crenella decussata (Montagu, 1808)																X	
Cyclocardia crebricostata (Krausse)	X	X	X			X	X					X			X	X	X
Cyrtodaria kurriana Dunker, 1862																X	
Hiatella arctica (Linnaeus)				X			X	X	X	X	X	X					
Macoma sp.		X	X			X	X		X								
Macoma brota (Dall)		X		X		X											
Macoma (Macoma) balthica (Linnaeus)							X								X		
Macoma (Macoma) lama (Bartsch)							X				X		X				
Mya sp.						X	X	X	X	X		X	X		X		
Mya (? Arenomya) pseudoarenaria Schlesch											X	X					
Mya (Mya) truncata Linnaeus											X	X					
Portlandia sp.															X		
Serripes sp.						X					X				X		X
Serripes cf. S. laperoussi (Deshayes, 1839)																X	
Serripes groenlandicus (Brugiere)		X	X	X	X		X	X	X	X		X	X				
Siliqua sp.							X										
Spisula sp.		X															
Spisula polynyma (Stimpson, 1860)															X		
Spisula voyi (Gabb)				X													
Tellina lutea alternidentata (Broderip and Sowerby)													X				
GASTROPODS:																	
Acteocina sp.																X	
Admete sp.																X	
Admete cf. A. couthouyi (Jay)		X	X	X													
Admete cf. A. middendorffiana Dall				X													
Beringius sp.							X										
Boreotrophon sp.		X		X				X								X	
Buccinum sp.			X	X			X	X	X	X							
Buccinum cf. B. tenellum Dall				X													
Buccinum tenellum Dall												X					
Colus sp.			X	X								X					
Crepidula grandis Middendorf		X															
Epitonium greenlandicum (Perry)				X								X					
Liomesus sp.																X	
Margarites costalis (Gould)												X		X			
Natica (tectonatica) janthostoma Deshayes		X		X													
Natacid sp.			X													X	
Neptunea sp.		X				X	X	X				X		X	X		X
Neptunea (Neptunea) heros heros Gray				X													
Neptunea (Neptunea) lyrata leffingwelli Dall				X													
Obesotoma sp.								X									
Oenopota sp.			X	X				X								X	
Plicificus kroyeri (Moeller)			X	X													
Polinices (Euspira) pallidus (Broderip and Sowerby)				X													
Polinices (Euspira) new species																X	
Tachyrhynchus erosus (Couthouy)		X	X			X											
Trichotropis bicarinata (Sowerby, 1825)		X														X	
Trichotropis borealis Broderip and Sowerby		X	X	X				X									
Volutopsius attenuatus Dall				X				X									
BARNACLE:		X												X			
ECHINOID (sand dollar):															X	X	

Table 4. Cont.

M-7163 Shells in bed of Sinaruak Creek cut 5 m below sand into clay with erratic stones.

M-7164, 7164A, 7164B Coastal bluffs, collected about 4 m below top of brown silty sand which lies beneath 5 m of thaw lake (?) deposits; about 2.3 m above beach. M-7164A and M-7164B collected at same horizon 60 m and 150 m, respectively, south of M-7164.

M-7166 Shells from surface exposure of barrier beach gravel.

M-7429 Shells from lower unit of vertically-bedded gravel. Coll. by R. E. Nelson.

M-7431 Coll. by R. E. Nelson from middle of exposed seabluffs.

M-7432 From 3.5 m above sea level, gravelly lens, sea cliffs.

M-7433 From 2.5 m above sea level in coastal bluffs.

M-7440 Sampled by R. E. Nelson from 2.5 m clay unit at base of bluff, and
M-7441 (in M-7441) large Mya from gravel lens at base of bluff.

M-7444 Shell-bearing coarse sand over unconformity marked by beach gravel. Coll. by R. E. Nelson.

M-7669 Collected by R. E. Nelson from upper 2.5 m of exposed wall of Barrow ice cellar.

M-7974 M-7976 Collected from Units 1-3 of Cape Simpson section (in text
M-7975 M-7977 table) by D. M. Hopkins and L. D. Carter.

Notes: Natica (Tectonatica) janthostoma Deshayes now lives in more southerly seas from Vladivostok to Hokkaido to Kamchatka but is known in early Pleistocene to Pelukian beds, indicating slightly warmer ocean temperature. Neptunea (Neptunea) lyrata leffingwelli Dall is known only from deposits of upper Beringian to Kotzebuan marine transgressions (Hopkins, 1967) of the Bering Strait region. Echinoids rare in Pleistocene deposits of this area. Bathyarca glacialis rare, lives currently in North Atlantic and Arctic Ocean but not in Bering Sea. Otherwise, all taxa are those living today in adjacent ocean.

ENGINEERING - GEOLOGIC MAPS OF NORTHERN ALASKA, BARROW QUADRANGLE

BY
John R. Williams and L. David Carter

1984

Explanatory text accompanies map