Open File 356

SURFICIAL GEOLOGY, SOUTHEAST KEEWATIN

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INTRODUCTION TO EXPANDED LEGEND FOR MAP-SHEETS 55 E, 55 F, 55 L, 65 H

Methods

This expanded legend explains surficial geological units delineated on map-sheets 55 E (Eskimo Point), 55 F (Dawson Inlet), the south half of 55 L (Kaminak Lake), and the eastern half of 65 H (Henik Lakes). A cross-reference is provided so that the symbols used on these maps can be keyed to an earlier legend used by Boydell (1974) for adjoining map-sheets (Open File 192, map-sheets 55 J, K, M, N, O).

The maps were compiled from interpretations of aerial photographs of approximately 1: 60 000 scale. The interpretations were supplemented by air traverses carried out in 1973 and 1975 (Fig. 4). These traverses included ground checks of all unit types, but the model for photo interpretation and rationale for the legend comes largely from observations made during drift geochemical sampling projects carried out over more than 2000 square miles of terrain near the junctions of map-areas 55 E, 55 L, 65 H, 65 I (62°00'N, 96°00'W). Within this sample area (shaded on Fig. 4) terrain observations were made at one-mile intervals or less at over 5000 sites. At each site a hole averaging 40 cm (16") depth was dug to sample drift; over 90 per cent of the holes were in mudboils, developed on map-units 1, 1s, 4, 4s, and 4m, but the other 10 per cent were in all other units shown on the map. The most infrequently checked units are 6, 4r, 4s, and 3B; the most intensively studied units are 1, 1s, and 7m.

Glacial Model

The glacial model that was used as a guide for the aerial photograph interpretation was that of a glacier front shrinking towards the Keewatin ice divide (Lee *et al.*, 1957; Lee, 1959) while standing in the Tyrrell Sea, an expanded version of Hudson Bay, which inundated areas up to 550 feet above modern sea level inland and 700 feet a.s.l. near the present coast. The glacial features seen on these maps are influenced strongly by the ice fronting in and retreating through deep water of this sea.

Following the retreat of the glacier from the map-area, the land rose due to isostatic rebound, rapidly at first, but at an ever decreasing rate. As the land rose out of the sea (which maintained a relatively constant level), shorelines migrated towards the present coast of the Bay, forming a series of beaches across the region. Beaches and shallow-water features are best developed 1) where sand and gravel deposited by the glacier were available for washing or 2) in the areas where uplift rates were slowest, i.e. where the strandlines rested for the longest period of time. The rate of uplift decreased towards the present coast. The younger the nearshore features are, the better they are developed.

As the sea retreated from the area, permafrost grew to depths of greater than 1000 feet, and various periglacial patterns developed, largely controlled by the physical properties (texture, Atterberg limits, thermal conductivity, etc.) of the surficial sediments. For the most part, circular or elliptical features, such as mudboils, are confined to muds of glacial or marine origin; polygonal or orthogonal cracking patterns are confined to more stable sandy, gravelly, or peaty sediments such as eskers, beaches, or sediments along alluvial flats.

References

Boydell, A.N.
1974: Surficial geology and geomorphology of 55 J, K, M, N, O, legend; Geol. Surv. Can., Open File 192.

Lee, H.A.
1959: Surficial geology of southern District of Keewatin and the Keewatin ice divide, Northwest Territories; Geol. Surv. Can., Bull. 51, 42 p.

Lee, H.A., Craig, B.G., and Fyles, J.G.
1957: Keewatin ice divide; Geol. Soc. Am., Bull., Abstr., v. 68, no. 12, p. 1760-61.

EXPANDED LEGEND FOR 1:125 000 SURFICIAL GEOLOGY MAPS

ESKIMO POINT (55E), DAWSON INLET (55F), KAMINAK LAKE (55L), AND HENIK LAKES (65H)

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A. Symbols: R, R/1, R/X

B. Unit: Bedrock

C. Periglacial Features-Patterned ground-typical maximum active layer thickness (MALT) if known:

Some outcrops are covered with felsenmeer or frost-heaved bedrock, but this phenomenon cannot presently be predicted by rock type, structure, or topographic setting; some circular, crater-like rock bursts have been observed in Hurwitz Quartzite above marine limit, north of Carr Lake. MALT - NA.

D. Brief Description: Bedrock; represents areas of extensive outcrop with pockets of unconsolidated sediment comprising <20% of the surface.

R/1 or R/X refers to areas with an average of <1m of unconsolidated sediment over bedrock, 20 to 80% outcrop, or both. Individual outcrops too small to map separately are marked with an "X". It is entirely possible that some outcrops have been missed or some areas have been misinterpreted as outcrop, particularly in the southern 2/3 of the Eskimo Point map-area and in the tree-covered portions of the Henik Lakes map-area.

Bedrock surfaces range from smooth, rounded, glacially polished surfaces, to surfaces with all degrees of frost heaving, to surfaces completely mantled by a dense cover of angular, frost-heaved and shattered blocks or felsenmeer. There seems to be no consistent lithologic control over the type of surface observed except that low, granitic areas seem to be more prone to felsenmeer development than volcanic or sedimentary rocks. The granite hills at the northeast side of Carr Lake, however, have little or no felsenmeer whereas outcrops of volcanic rock at some places northwest of Kaminak Lake are extensively covered by felsenmeer. It is often difficult to differentiate felsenmeer from the glacial boulder cover (boulder trains) that is commonly associated with ribbed moraine, as the two tend to occur together. The fact that rocks in the vicinity of these surface trains are particularly liable to felsenmeer formation might suggest that there is some genetic (lithologic) relationship between rocks liable to frost shattering and boulder train formation.

An unusual form of frost heaving is present on Hurwitz Quartzite above marine limit on a hill north of Carr Lake. Here, circular (3m- diameter) holes in the vertically dipping quartzite are surrounded by 2m- high rims of shattered rock. The aspect of the feature is that of an impact or explosion crater.

On the southeast side of Kaminak Lake, many of the rock surfaces are strongly lineated by glacial erosion. These "mega-striations" are indicated on the map and parallel the general trend of the drumlin/fluting field that lies southeast of them.

A. Symbols: 1, 1s

B. Unit: Till

C. Periglacial Features - Patterned ground-typical maximum active layer thickness (MALT) if known:

Mudboils (Figure 1) averaging 1.5m diameter, surrounded by or outlined with:

1) boulders (sorted circles) where till is thin, stoney, or site of recent tundra fire;

2) fibrous, peaty, turf ridges up to 70cm high and commonly extending to <50cm below mudboil surface. Cracks superficially resembling tundra polygons are particularly prominent above marine limit but are due to rigid, desiccated surface layer (carapace) over underlying plastic mud. Striped pattern is common almost everywhere but is most prominent where till and marine sediment occur together (undifferentiated) or where till is particularly clayey and mobile and mudboils are active. MALT is 1.4-1.7m under centre of mudboils, 65 - 80cm under vegetated rims.

D. Brief Description: This unit indicates till cover and may include minor areas of outcrop, alluvium (1:7 is used where this is a strong possibility), and marine clayey silt (which may be much more common than indicated, particularly below 200 feet a.s.1); in places where it is most likely to occur, 1:4 is used. Till is relatively sandy and silty (Figure 2) with few clasts larger than cobble size, except in areas of ribbed moraine. (see unit 3). It has a low liquid limit (10 - 18%) and narrow plasticity index (0 - 8%) (Figure 3). Its natural moisture content below 40 cm depth in the active layer is near to the liquid limit so that slight changes in moisture content or loading will cause the till to liquify (Table 1). The active layer on till is universally characterized by mudboils, mud circles averaging 2m diameter, whose centres are roughly 3m apart. Mudboils are surrounded by rings of turf or stones that are wedge-shaped in cross-section and extend to depths of 40cm or more around each mudboil. The circular wedges of individual mudboils intersect each other so that the active layer resembles a "honeycomb" consisting of stone or turf nets, with individual cells filled with mud. The underlying permafrost surface mirrors this surface net, being depressed to depths of 1.4 - 1.9 m beneath the bare centres of mudboils and rising to depths of 70-90cm under the circles of stones or peat. Total relief of the permafrost table is just under 1 m.

Till surfaces may be fluted or drumlinized. Major lineated till plains seem to occur down-ice from bedrock that, because of lithology, frost shattering, or structure, was easily excavated by the glacier. Thus, excellent drumlin fields are found extending down-ice from the granite pluton in which the shallow basin of Kaminak Lake was excavated as well as southeastward from Carr, Maguse, and Henninga Lakes.

1s is striped terrain and is the most common type of till surface. Where well-developed, the striped pattern is taken as an indication of active mudboil movement with attendant slope instability. The causes of instability are apparently 1) steep slopes that cause till to move down hill relatively rapidly when thawed; 2) till with abundant silt and clay is very plastic and poorly drained and prone to flow readily on slight slopes. Mudboils on this type of till appear to be particularly active, and some, tagged at random, moved substantially over a period of two years. Striped terrain is well developed in areas covered by tills with substantial content of red detritus derived from late Precambrian red beds of the Baker Lake area; the ribbon of red till extends between southeastwardly trending lines drawn across the map area through Carr and Quartzite Lakes; 3) many places mapped as 1s might be more properly mapped as 4s because of admixtures or covers of marine silty clay (W_l = 20 - 30%, I_p = 2 - 10%) that is poorly drained and prone to flow on even slight slopes. 4s is only used where nearshore marine features or burial of glacial features indicate significant marine sedimentation, but marine sediments have been observed in thin pockets too small to map, virtually everywhere below marine limit (540-560 feet a.s.l). Ground traverses around the NW portion of Kaminak Lake and around Yandle, Kinga, Henninga Lakes and Maguse River reveal that marine cover is particularly common near the shores or banks. From these limited traverses it is evident that detailed ground checking is necessary to split 1s from 4s and only the crudest indications of the occurrence of 4s can be made on the accompanying maps.

Till surfaces of the map area seem to show a gradation of striping from apparently unstriped to faintly striped to heavily striped. The fainter patterns are probably relics from a period when slope activity was much greater than at present. The striped patterns are much more extensive and of different form below marine limit, indicating that marine reworking or admixtures of marine sediment may promote the formation of striped patterns.

Till generally forms a plain, but, where bedrock relief is great and cover is thin, it mirrors the bedrock surface. Areas where till has significant constructional surface irregularities are classified as 3 where irregularities are minor moraines; other irregularities caused by glaciation are shown by symbols: 1) Along the present coast several areas of DeGeer moraine are preserved. These are common near the coast from Rankin Inlet to Dawson Inlet, but some are found as far south as Eskimo Point. They are thought to mark ice-front positions at a time when the glacier still had significant internal flow: judging by the significant area covered by these features on the east side of Hudson Bay, along the west edge of the Labradoran ice cap, it is possible that a significant area of these types of features is still submerged beneath the Bay along its west side.

2) Drumlins and fluted till plains are symbolized, and, where possible, individual flutes or drumlins each carry a symbol. A long, straight line is used to show glacial lineations in areas where individual features are not easily picked out due to tree cover (east of Henik Lakes above marine limit) or to heavy marine sedimentation and/or reworking (as in the vicinity of Eskimo Point).

A. Symbols: 2, 2m, 2o

B. Unit: Ice-contact stratified drift

C. Periglacial Features - Patterned ground-typical maximum active layer thickness (MALT) if known:

Orthogonal frost crack patterns occur on linear features, such as eskers; polygonal cracks occur on more irregular features. Mudboils are found only on the rare pockets of marine clay that occur on these deposits below marine limit. MALT 1.5 to 3m; difficult to determine because these deposits contain little free water so that they are not cemented by ice below the permafrost table. 2m and 2o commonly have peaty organic covers resulting in a MALT of 15 - 50cm.

D. Brief Description: 2 comprises ice-contact stratified drift composed of sand and gravel deposited in tunnels or crevasses relatively near to the ice front, or over or around ice in channels or depressions in front of the glacier. Because of its association with ice, it is often hummocky or contains individual kettle holes.

Eskers, which occur in long, straight to sinuous ridges, are the most common form of this deposit. Below marine limit eskers tend to be flanked by thick sandy deposits, 2m, that represent distal proglacial deposits, fine material debouching from the submarine esker tunnel mouth as the esker was uncovered by back melting of the ice front (which retreated while standing in several hundred feet of water in most places up to marine limit). This fine sand and silt settled in the depression between the esker ridge, which generally runs down the middle of a swale and the till-covered valley side, forming a sandy "esker pad". The pad is variously mapped as 7m or 2m depending on the presence of modern drainage in the depressions lateral to the esker.

Two major esker systems occur almost wholly within the map area and parts of two others are represented. The Maguse system and Copperneedle-

Ferguson River system start near Henik and Ferguson Lakes, respectively and pass discontinuously for over 100 km across the map area before disappearing beneath the waters of Hudson Bay. The eskers have numerous major tributaries and are broken periodically by massive gravel bulges, assumed to be subaqueous deltaic or fan deposits formed when the regular back-melting of the Keewatin ice slowed or was interrupted. These gravel masses take the form of delta-shaped distributary fans, in some places, analogous in form to "bird foot" deltas built into lakes and seas by non-glacial streams. Where such interruptions occur, short esker-like ridges may occur laterally between the main systems for a distance of a few kilometers back from the inferred ice front. Such a complex of distributory fans and short, intervening esker ridges has been reworked by wave action and longshore drift into the massive gravel escarpment that forms the landward boundary of the coastal plain west of Eskimo Point.

2o is subaerial outwash derived from the esker tunnel above marine limit. It comprises hummocky and terraced gravel deposited on either side of a previously exposed esker ridge. The unit has been mapped near Henik Lakes and forms the west side and sides of the south end of McConnell Lake (at the head of McConnell River).

A. Symbols: 3, 3A, 3B

B. Unit: Minor Moraines

C. Periglacial Features - Patterned ground-typical maximum active layer thickness (MALT) if known:

Mudboils, particularly the sorted circle variety, occur on till ridges; frost cracks occur on ridges composed of well-sorted sediment (sands or gravels). Where boulder cover is heavy, as in Kaminak Lake - Quartzite Lake - Dawson Inlet area, patterned ground is relatively rare. MALT varies corresponding to typical depth for till or gravel depending on composition; low areas between ridges are commonly peat-covered, giving MALT's of < 1m

D. Brief Description: Units 3, 3A, and 3B comprise areas of minor moraines.

3 represents ribbed moraine which occurs as ridges transverse to ice flow or as irregular mixtures of ridged and hummocky elements.

Ribbed moraine tends to occur in belts that are many times as long as they are wide. Belts are extended parallel to direction of ice flow. Ribbed moraine is generally associated with a dense cover of large (> 1m-diameter) boulders, that overlie even isolated areas of other terrain types (such as bedrock or till plain) that occur within belts mapped as 3. Individual ribs may be up to 2 km long, but are generally shorter, and average 2-4 m high by 100 - 200 m wide; they are generally, but not always, asymmetric, with steep slopes consistently facing the down-ice direction. "3" occurs preferentially in broad swales or valleys and passes laterally into fluted or drumlinized till plain with little or no boulder cover. The transition is usually sharp, but drumlins with incipient ribbed moraine on their sides or drumlinized elements on individual ribs indicate that the two features are probably related genetically as well as in time and space. Eskers often occur within and along areas of major ribbed moraine development, but they are probably later features. The two are related only by their preferential formation in low areas on the subglacial floor.

Ribbed moraine is thought to form under actively flowing glacial ice with the individual ribs being the upturned (leading) edges of shear plates composed of till and boulders. The plates are thrust one on the back of another. The hummocky facies may consist of broken or partially formed plates or may be erosional remnants resulting from subglacial fluvial, wave, or post-marine fluvial action.

The depressions between rib crests may be filled with alluvium or marine sand (7m) covered by peat.

3A This variety of minor moraine occurs as ridges transverse to ice flow or as hummocks. Both forms are similar in scale to 3, and both may be associated in space if not in time with 3. Ribs of unit 3A are more symmetrical than 3 and are composed of till with little or no boulder cover and extensive mudboil development. They probably originated as ice push features at the glacier front . 3A may occur around or in association with both 3 and 3B, suggesting that it may form by at least two processes - one occuring beneath active ice and one occuring in the vicinity of the ice front. Ribs east of South Henik and Roseblade Lakes were probably formed by melt water that escaped the ice front only after cutting channels parallel to it - thus, the "ribs" in that area are a series of till ridges between subparallel erosional channels, and are represented by the rib symbol and unit "1".

3B This variety of minor moraine is recognized only in the south-central part of Henik Lakes sheet in the vicinity of Roseblade Lake, and eastward on either side of the Tha-Anne River. It consists of ridges and hummocks of a scale similar to "3", but the ridges are not noticeably asymmetric and are much narrower and sharper than 3. They appear light-coloured on air photos indicating that they might be partially composed of sorted sediment.

3B is considered to comprise crevasse fillings and kames which, taken together, could be described as disintegration moraine, formed within the crevassed edges of the dying Keewatin ice sheet. These features have not been checked on the ground at this writing .

A. Symbols: 4, 4m, 4s, 4r

B. Unit: Marine Offshore Deposits - Silty sand, clayey silt.

C. Periglacial Features - Patterned ground typical maximum active layer thickness (MALT) if known:

Mudboils prominent, 0.5 to 1m-diameter; commonly surrounded by rings of fibrous turf up to 60cm high, but may form mud circles that stand above turf. Striped terrain with 10 - 20m - wide stripes extending 100's of metres downslope common; mottled terrain with 5 - 10m - diameter clusters of mudboils, projecting 50cm or less above grassy intervening flats; mottled terrain is particularly common in Maguse River valley west of Kinga Lake.

MALT 80 - 100cm under mudboil centres, 50 - 70cm under mudboil edges.

D. Brief Description: This unit is marine silt, clayey silt, or silty sand deposited in the relatively quiet offshore areas below wave base. Although virtually all areas below marine limit were at one time within this zone, these deposits are relatively rare and thin except in four cases:

1) Deposits are thick where major rivers, such as the Maguse, were carrying large sediment loads into the sea; sediment was derived either by excavation of unconsolidated drift from their valleys or because glacial meltwaters were supplying high sediment loads into their valleys.

2) Where the retreating glacier front halted for one reason or another in the sea, depositing large amounts of sand and gravel near the front with a thick seaward apron of clayey silt or silty sand that buried glacial features. At least three such halts have been recognized, the gravelly facies of one forming the sharp landward boundary of the coastal plain;

3) Below about 200 feet a.s.l. altitude; offshore conditions persisted much longer there than at higher altitudes because of the rapid (negative exponential) decay of the rate of rebound. i.e. 60% of rebound (360 feet) took place in roughly 2000 years (6600 B.P. to 4600 B.P.).

The remaining 40% took over twice that long, so that low-altitude offshore areas were receiving sediment over a considerably longer period of time than those above 200 feet;

4) In areas surrounding major beach development, fine sediment has been deposited as an apron around or in front of the beaches in the offshore zone. The striped appearance of these deposits gives rise to a 4s or 1s classification.

4m is "mottled" terrain consisting of regularly spaced, 5 m-diameter, > 1 m high mudboil-covered hummocks of marine clayey silt or silty sand, surrounded by grass-sedge vegetation growing on a peaty substrate. This terrain is common up to altitudes of 540 feet in the valley of Maguse River west of Kinga Lake. Drilling by Polar Gas indicates that this unit is probably relatively thick clayey silt or silty sand with some horizontal ice lenses, the irregular growth of which has probably caused heaving of the surface and development of the hummocks.

4s is "striped" terrain-marine clayey silt or silty sand characterized by prominent solifluction stripes. This unit cannot be confidently separated from similar-appearing "1s" except by careful ground checking or by inference where it forms a distinct apron seaward from strong development of nearshore features.

4r is a sandy deposit reworked from fine-grained offshore muds by the offlapping shoreline. It occurs mostly on flat portions of the coastal plain and can be seen to grade laterally into beach-like deposits. It is thought to be a thin sheet, probably averaging less than 2 m thickness and with occasional traces of a former strand line on it. Where the traces are definite, the unit is mapped as 5; however, in many areas, the sheet of sand takes on a mottled appearance on air photographs and is mapped as 4r.

The light-coloured mottles are sandy remmants of the sheet separated by shallow depressions filled by vegetation. Whether the intervening dark, vegetated areas are sites of erosion or whether the sheet is being broken up by some presently little-understood periglacial process is not known.

A. Symbols: 5, 5D

B. Unit: Marine Nearshore Deposits - gravel, sand, boulders.

C. Periglacial Features - Patterned ground-typical maximum active layer thickness (MALT) if known:

5 commonly has orthogonal frost cracks with trends parallel and at right angles to trend of feature; 5D is characterized by tundra polygons. Where texture of deposit is bouldery or cobbly, little frost cracking is apparent. Rare sorted circles or mudboil-like sand "boils" noted in pebbly sand facies. MALT = 1.5 - 2m

D. Brief Description: This symbol indicates areas of near-shore marine sediments deposited as a result of wave and ice-shove action during offlap of the Tyrrell Sea. They are usually mapped only where clear evidence of strand-line traces can be seen. Although these traces are best developed on ice-contact (glacial) gravel deposits, an attempt is made to map these as ice-contact gravels (unit 2) rather than unit 5, which represents modification of their surface. In some cases it is impossible to differentiate 5 from 2 (esker) where long points projected perpendicular to the Tyrrell Sea coastline, i.e. parallel to the regional east to southeast ice flow of the map area. Thus, washed areas at the crests of exceptionally long glacial flutings (or drumlins) take on the appearance of eskers and differentiation is difficult to make without drilling or subsurface exposures. Waves refracting around long, offshore projections at the present coast of Hudson Bay eventually break at right angles to the shore, piling up gravel and boulders at the crest of the projections and creating esker-like features. The texture of these deposits ranges from bouldery to sandy; because it would be very difficult to visit and determine textures for the numerous areas of 5 on these maps, no textural modifiers are provided. Textures can only be evaluated by ground study of specific sites.

5D is a relatively little-used unit representing identifiable marine deltas built by "normal" (non-glacial) streams into the retreating sea. It is probable that much of what is mapped as unit 7m in major river valleys is, in reality, 5D, but there is no ready way to make a distinction, even by ground checking. 5D tends to have a sandy, pebbly sand, or fine, gravelly texture.

A. Symbol: 6

B. Unit: Coastal Plain Sediments

C. Periglacial Features - Patterned ground-typical maximum active layer thickness (MALT) if known:

Tundra polygons, thaw ponds, shallow ephemeral ponds dammed by marine deposits, mudboils; pingo-like features (5m-diameter by 2m-high mounds with radial tension cracks and occasionally concentric fault traces) are particularly prominent north of Maguse River; striped and mottled terrain is common as are raised strandline features caused partially by pack-ice shove. MALT is variable, 15 cm to >1 m.

D. Brief Description: This unit represents the complex mixture of marine, fresh-water, and reworked glacial sediments of the coastal plain that stretches from Dawson Inlet to the Manitoba border. Where checked, it was a sand or stony sand overlain by varying thicknesses of peat, and having a relatively thin (<1 m) active layer. Extensive areas near the present coast are devoid of vegetation however. The plain is characterized by innumerable small, round, shallow lakes, most of which freeze to the bottom in winter and many of which hold water only in May, June and early July. North of Maguse River, the coastal plain is marked by a 200km^2 + field of small, circular pingo-like features. (PLF's), many of which have the radial tension cracks typical of updoming of the surface due to ground ice growth. The PLF's average 3-4 m diameter and 2 - 3 m high. The sediment on which they are formed is a medium to fine-grained blanket sand (probably derived by wave reworking during offlap over fine-grained offshore deposits) and no visible ice was noted in it. Some PLF's are surrounded by a series of concentric cracks representing small high-angle reverse faults with downthrown sides consistently toward the centre of the PLF, indicating degradation of an ice body at some depth beneath the feature.

(Ecologically, a high proportion of these mounds serve as denning sites for arctic foxes who feed on lemmings and sea birds common in the coastal zone. It is possible to hear a hollow barking noise emmanating from the holes in the PLF's, in response to human activity.)

A. Symbols: 7, 7m, 7o, 7L

B. Unit: Fluvial, Marine-washed, and Lacustrine Deposits.

C. Periglacial Features - Patterned ground-typical maximum active layer thickness, (MALT) if known:

Tundra polygons and thaw ponds common; smaller streams are likely to be beaded; mudboils rare, but present, and usually indicate areas of marine clayey silt or silty sand; 60cm - high x 1m diameter turf hummocks common. MALT = 15cm - 50cm except in mudboils or unvegetated areas where generally > 90cm.

D. Brief Description: These sediments represent a complex range of post-glacial depositional environments. They occur as flat infillings in depressions, and their general insulative cover of peaty sediments causes them to have a shallow active layer and high content of ice in the form of vertical wedges underlying fissures that outline tundra polygons. Their texture tends to be sandy but may be gravelly to bouldery in channels. 7 is a relatively rare unit at this map scale and represents definitely identifiable channel and flood plain deposits of modern fluvial systems.

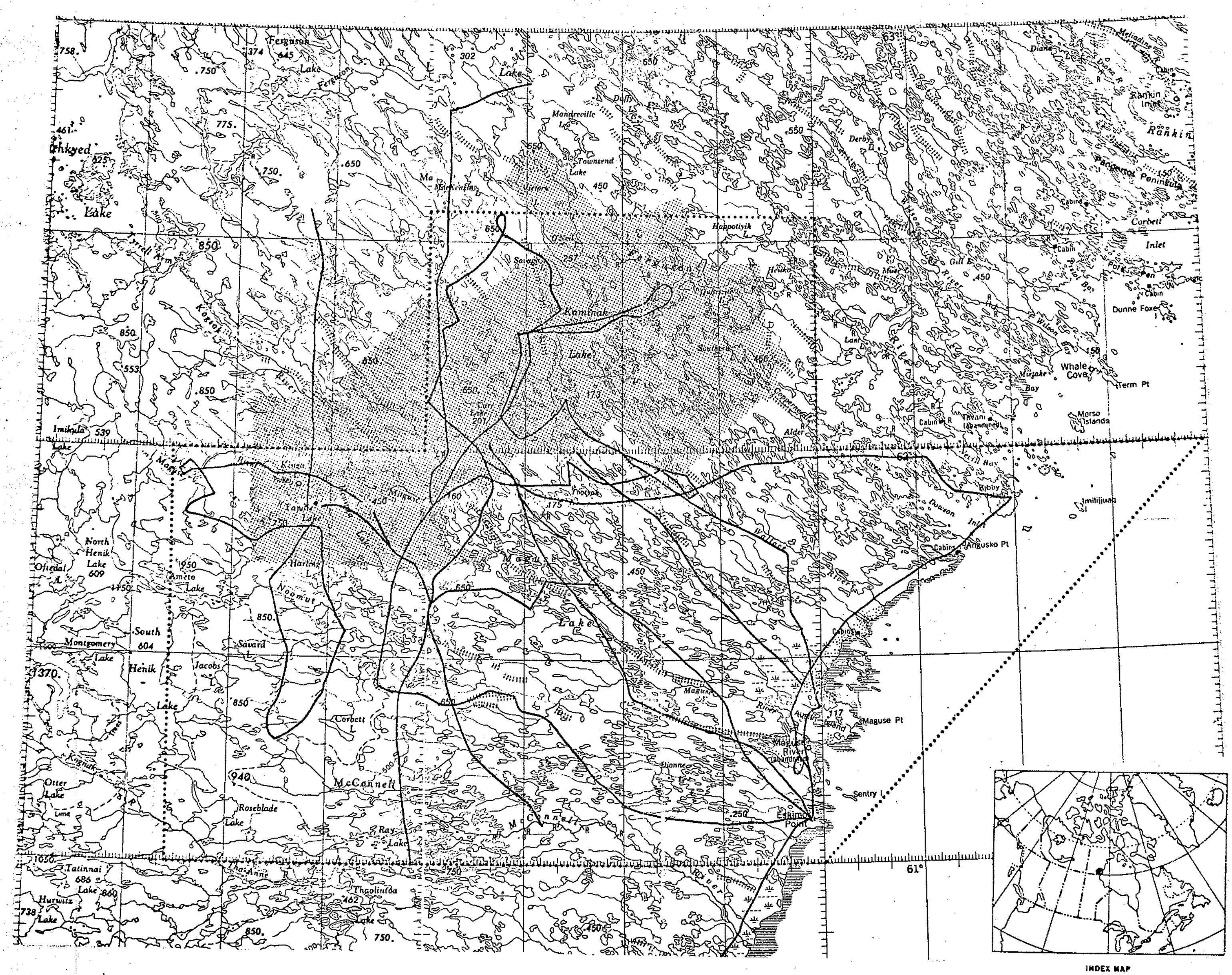
7m is very common below marine limit. Generally represents areas of sandy to silty deposits derived by wave washing of glacial or marine muds with the result that silt and clay were carried offshore in suspension, gravel and boulders were left at the strand. Sand was washed into the nearest downslope depression. The sand washed into valleys presently occupied by streams or lakes has probably been partially reworked or covered by other post-marine sediment, and some sand in these valleys was deposited as deltas built by the stream into a steadily retreating sea. All this complex of marine, fluvial and lacustrine deposits is mapped under the symbol 7m, which means alluvium and sand or silt washed in by marine processes, undifferentiated.

7o is a unit comprising outwash and post-glacial alluvium, undifferentiated. It represents deposits in valleys above marine limit where drainage was free to flow away from the ice front. The unit has not been investigated on the ground but probably has a much coarser texture than 7m.

7L represents deposits of lakes that have dried up or drained catastrophically. On the maps this unit is indicated by areas of slanting ruled lines. Former bays and areas of major inflow tend to be sandy but the offshore deposits commonly consist of an organic-rich silty sediment with low specific gravity.

Commonly used symbols from Boydell (Open File 192) 55J,K,M,N,O		Equivalent symbols, this report Shilts et. al. (Open File) 55E,F,L,65H
A	=	7,7o
C	=	No equivalent
MA	=	7m, 
MN	=	5
MIC	=	2m
MT	=	1.4
MSH	=	No equivalent
IC	=	2
TIC	=	3,3A,3B
T	=	1,1s,4,4s
T/R	=	No equivalent
TMN	=	5,4r
R	=	R
R/T	=	R/1
R/X	=	R/X

7o, 2o, 4m, 5D, 6 - no real equivalent units in OF192.



TERRAIN MAPPING TRAVERSES — 1973 & 1975

very detailed observation from geochemical sampling

traverse

Figure 1. Block diagram of mudboil surface of till or marine clayey silt

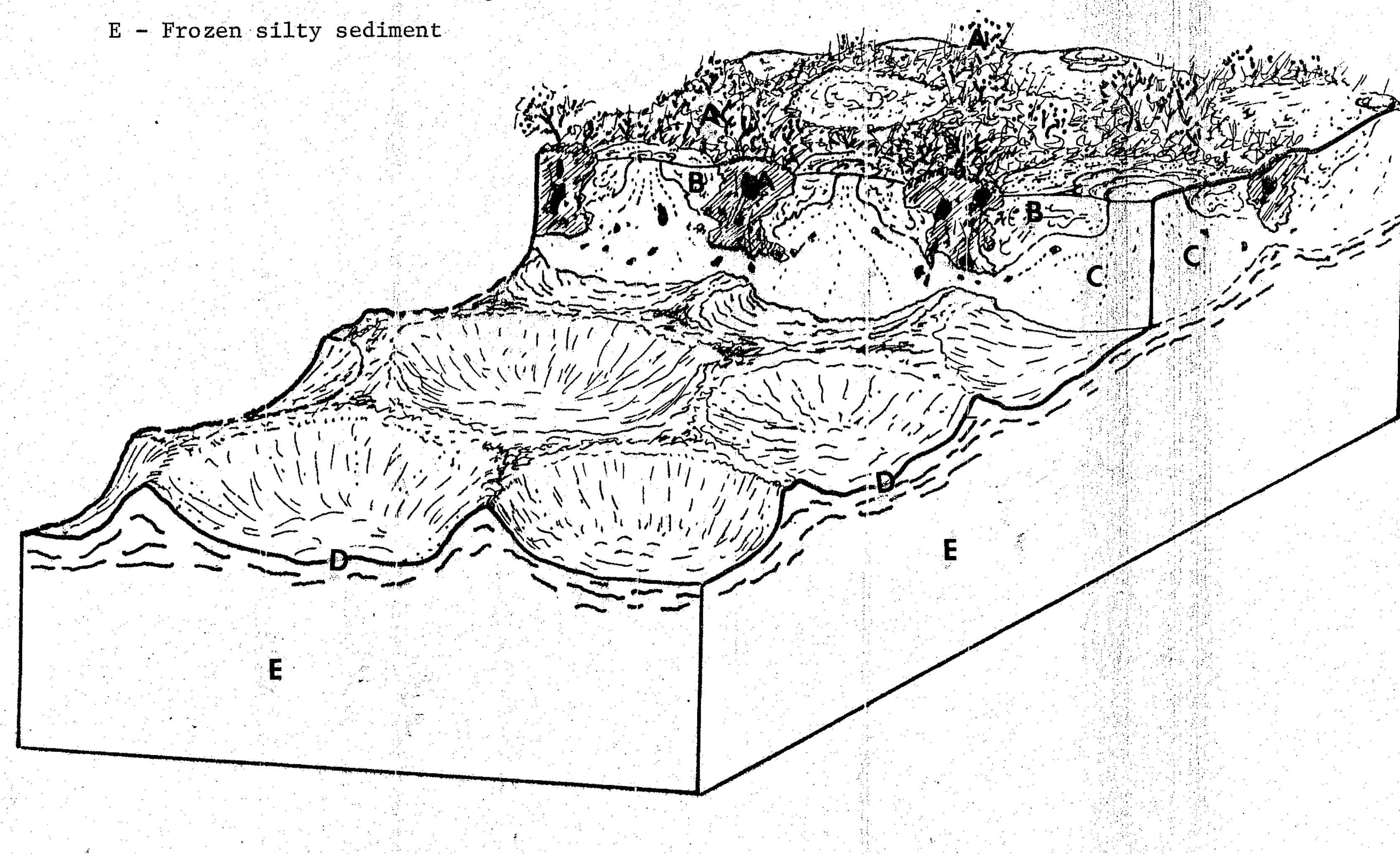
A - Humus, plants, stones

B - Sandy carapace

C - Saturated silty sediment, thawed

D - Permafrost surface in August

E - Frozen silty sediment



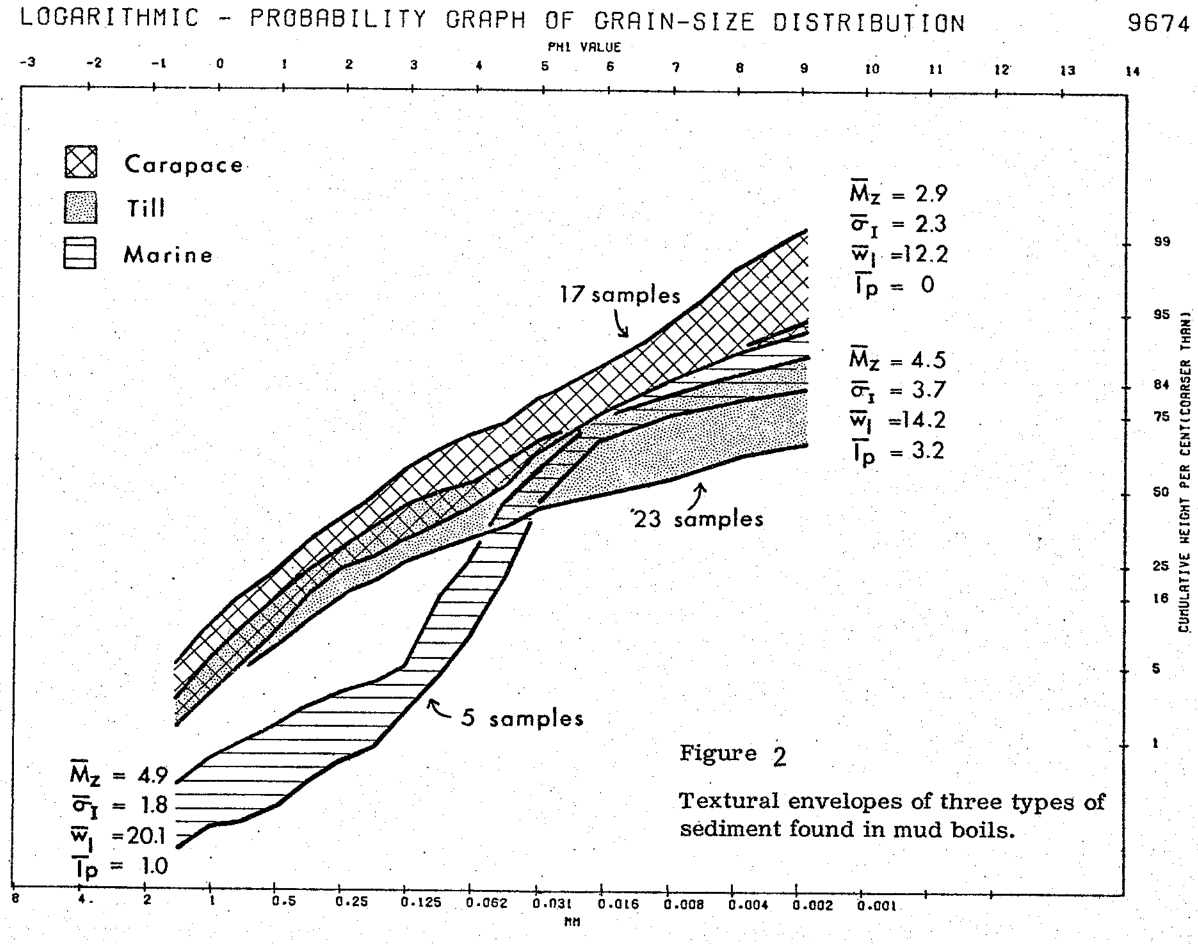


Figure 2

Textural envelopes of three types of sediment found in mud boils.

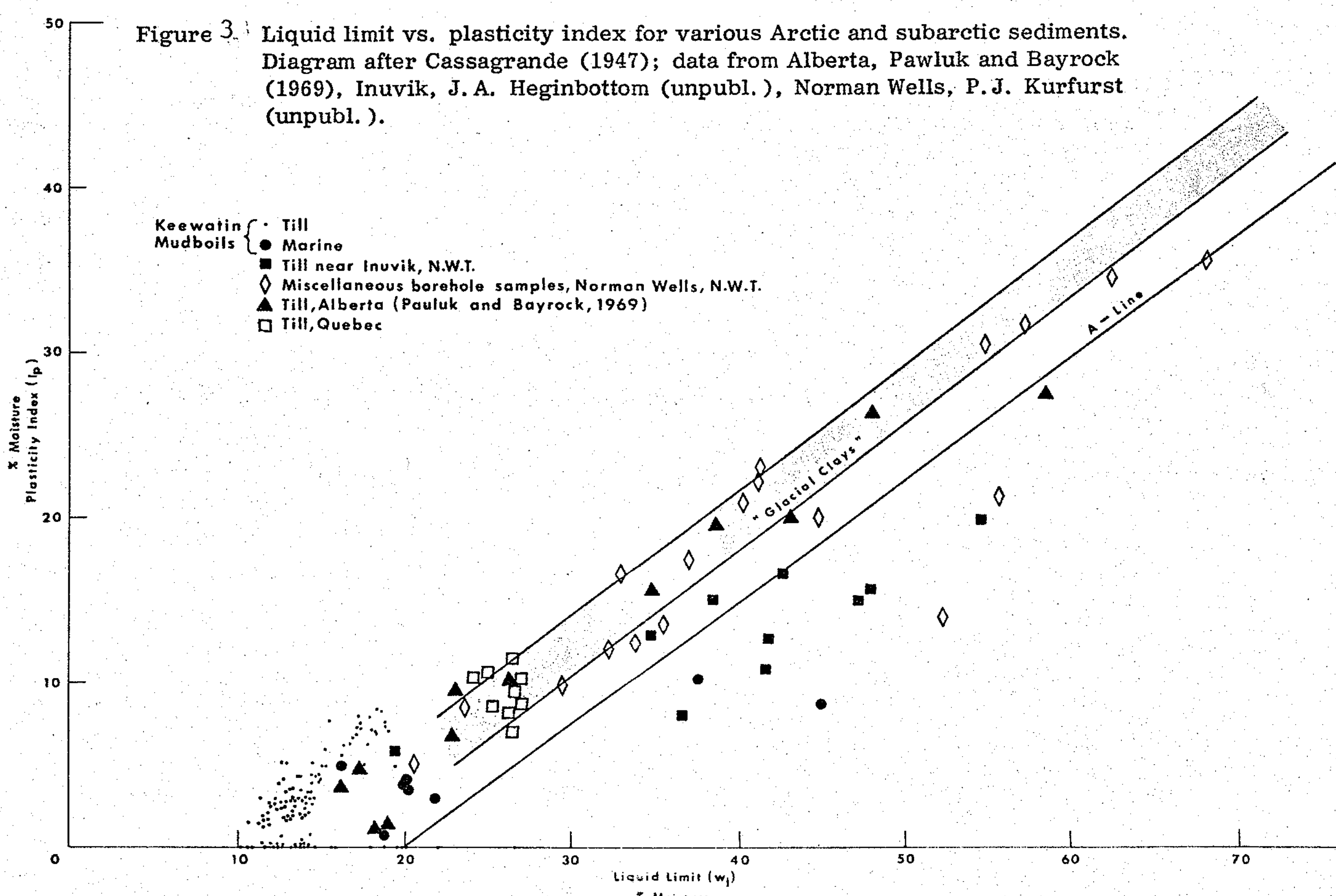


Figure 3. Liquid limit vs. plasticity index for various Arctic and subarctic sediments. Diagram after Cassagrande (1947); data from Alberta, Pawluk and Bayrock (1969), Inuvik, J. A. Heginbottom (unpubl.), Norman Wells, P. J. Kurfurst (unpubl.).

TABLE 1

SAMPLE TYPE			LIQUID LIMIT		PLASTICITY INDEX		MOISTURE CONTENT		MOISTURE CONTENT / LIQUID LIMIT		EXCESS WATER		pH	
			Mean/# of Samples	Range	Mean/# of Samples	Range	Mean/# of Samples	Range	Mean/# of Samples	Range	Mean/# of Samples	Range	Mean/# of Samples	Range
MINERAL SOILS FROM MUDBOILS	A	SAMPLES FROM THAWED ZONE	12.2/15	9.7-14.3	0	0-0.8	7.0/16	3.0-10.6	0.60/15	0.36-0.82	NA	NA	6.1/15	5.2-8.1
	B		14.2/33	12.1-19.0	3.2/33	0-8.0	10.1/33	6.8-16.8	0.71/33	0.48-0.99	NA	NA	6.6/33	5.3-7.4
	C		20.1/14	16.2/29.7	1.0/14	0-4.9	16.7/14	7.3-39.1	0.80/14	0.35-1.35	NA	NA	5.8/14	4.7-7.7
MODERN LAKES	D		29.1/9	18.1-64.3	0	0-8.8	39.6/10	14.0-87.1	1.24/9	0.75-1.77	NA	NA	4.9/6	3.9-5.7
	E		16.5/6	12.4-20.2	0	0	14.1/6	11.9-16.2	0.87/6	0.72-1.05	NA	NA	5.5/6	4.6-6.0
ORGANIC AND MINERAL SOILS IN TERRAIN WITH FROST CRACKS	F	FROZEN SAMPLES TOP OF FROST TABLE	25.5/19	16.6-35.2	0	0	44.9/35	13.7-132.1	1.42/19	0.58-3.38	48.4/31	0-300	5.0/26	4.5-6.0
	G		160.5/5	105.4-269.9	NA	NA	390.4/15	185-801	1.89/5	0.89-3.36	8.2/6	0-26	4.6/8	4.5-5.0
	H		NA	NA	NA	NA	900/7	442-1210	NA	NA	0/7	0	4.8/4	4.5-5.0

Selected physical and chemical properties of unconsolidated sediments from Carr Lake-Kaminak Lake area

1,1s,3	A. till carapace,
	B. till,
4,4s	C. marine silty clay,
7L	D. shallow water lake-bottom sediment,
7L	E. nearshore lake sediment or modified glacial sediment in subaqueous mud boil,
7m	F. frozen marine and/or alluvial silty sand,
7m	G. frozen grass-sedge peat,
7m	H. frozen Sphagnum peat.