TERRAIN CLASSIFICATION AND SENSITIVITY SERIES

LEGEND

To accompany map sheet 107B (east half) Aklavik.

Map Unit	Name	General Description	Local Description	Permafrost, Ground Ice Conditions	Drainage (thaw season)	Hazards	Sources of Construction Material
I	ORGANIC TERRAIN (including muskeg)	Peat, fen, peat-fen complex; commonly occurring as patches on Units II, III, V, IX, and on flatter parts of VII. Peat also occurs in depressions within Units X, and XII. Fen occurs in drainageways in Units IX and X in the southern part of 107B east (Aklavik).	Peat-fen complex underlain by sedge and moss. Flat to gently sloping (up to 2°), relief to 3 ft. In part with reticulate network of low ridges. The surface of peat commonly takes on polygonal patterns of two types; high-centred peat polygons which range in diameter from 10-20 ft., and low-centred peat polygons ranging in diameter from 20-30 ft. Peat occurs largely in isolated depressions and on larger abandoned thermokarst lakes. The peat is 3-15 ft. thick and is commonly interbedded with lacustrine silts. Fen occurs in drainageways in Units IX and X in the southern part of the sheet. Note: organic terrain mapped only in the southern part of 107B (east) where it forms continuous areas.	Ice content high; commonly up to 60% segregated ice[1] by volume within peat; typically 1-3 ft. total thickness of segregated ice in mineral soil immediately below peat.	Higher surfaces of peat polygons dry, intervening trenches often contain water. Low-centre polygons commonly contain surface water; some near-surface seepage and flowing water common in fens located on drainageways.	Erosion along ice wedge cracks. Removal of vegetation can lead to subsidence of 5-10 ft.: unfrozen material highly compressible and of low strength.	Unsuitable
II	SILT-CLAY PLAINS (marine and lake deposits)	Clay and silt, with discontinuous organic cover (see Unit I).	Only lake deposits consisting of silt and clay 3-60+ ft. thick, present in 107B (east). Small local areas of sand and gravel included. Flat to gently sloping with extensive marshy areas. Discontinuous organic cover.	Moderate. Commonly up to 10% excess ice[3] as thin (<1") seams in upper 3-10 ft.	Ground surface wet in areas where low-centre polygons have developed.	Erosion along ice wedges. Removal of thawed material can lead to subsidence of 5 ft.+. Unfrozen material of low strength.	No sources of granular material or fill except in very small, local undifferentiated areas.
III	THERMOKARST[2] LAKE BEDS	Clay, silt, peat, and locally sand and gravel: low, flat areas formerly occupied by tundra ponds. These materials range in thickness from 5-25 ft.	See general description. Materials generally similar to those comprising adjacent map unit(s). Widespread peat cover to 10 ft.+ (see Unit I). Surface generally flat or gently sloping.	Generally moderate. 10-40% segregated ice as thin (<1 in) seams common in finer textured materials. Sands and gravels generally free of excess ice.	Areas wet and marshy where low-centre polygons are present at surface.	Erosion along ice wedge cracks. Thermokarst slumping may occur along steep slopes around lakes; removal of thawed material can lead to subsidence of 10+ ft., unfrozen material compressible if organic beds present, generally low strength.	Gravel and sand common in areas where tundra ponds have developed in Unit VII; otherwise unit is a poor source of granular material or fill.
IV	BEACHES (marine and lake)	Gravel and/or sand ridges or flat areas along present or former shorelines.	Marine and lake beaches, spits and bars, along and adjacent to present coast; consist of sand and gravel. Includes actively forming ridges 2-4 ft. above sea level, as well as stabilized shore deposits. Not mapped separately, but present along the Eskimo Lakes, Sitidgi Lake, Five Hundred Lake, and Old Man Lake.	Low ice content in active beaches; moderate ice content, including ice wedges, in stabilized beaches.	Ground surface relative dry on ridges; depressions between stabilized ridges wet and marshy.	Frequent flooding of lowest areas; flooding of higher actively forming ridges during major storms accompanied by minor coastal erosion and re-shaping of beach ridges.	Suitable source of gravel or mixed gravel and sand; exploitation may accelerate coastal erosion.
V	RIVER DEPOSITS - FINE	Silt and silty sand in river channels, floodplains, low terraces adjoining rivers, and alluvial fans; includes organic silt, peat and minor gravel.	Silt, fine sand and clay (10-15 ft.+) with peaty beds, forming floodplains and low bordering terraces, commonly with meander scars; in places with numerous channels and thermokarst ponds. The unit is flat; (overall relief ranges from 3-15 ft. except for channel and pond margins). Peat cover is negligible on the active floodplains, but is up to 10 ft. thick in the abandoned channels and terraces. Includes modern floodplain of the Mackenzie River where sediments are generally in excess of 150 ft.	Ice content generally moderate. Permafrost is generally absent in the unvegetated part of the floodplains; elsewhere to 10% segregated ice by volume as thin (<1") seams in upper 6-10 ft.; lakes and ponds are actively expanding through thermokarst collapse of banks in some areas.	Many areas are wet; small thaw pools, lakes and marshy areas are common. No integrated drainage system other than that inherited from the river.	Thermokarst subsidence; ground ice slumping and gullying on margins of lakes and channels, undercutting and bank collapse along channels during high water; flooding during breakup and autumn storms; channel shifts.	Poor[4] source of borrow material.
VI	RIVER DEPOSITS - COARSE	Gravel and sand in river channels, floodplains, low terraces adjoining rivers, and alluvial fans. Includes some silt, peat and organic silt.	Floodplains and terraces consisting of sand and gravel 3-20+ft. in thickness, commonly with a veneer of silt 1-6 ft. thick. Topography is level to gently sloping (0-3°) with local relief to 15 ft. due to the presence of former channels, bars, steep scarps etc. (slopes to 35°). Peat cover is largely restricted to former river channels, and ranges in thickness from 5-10 ft.	Ice content low in coarse-grained material: rare ice lenses in finer sediments. Moderate to high ice content in the silt veneer. Very shallow thermokarst ponds on low terraces.	Surfaces of coarser-grained materials are generally dry ponds and swamps in former river channels.	Minor thermokarst subsidence; undercutting and bank collapse along channels during high water; flooding during breakup and summer storms; channel shifts.	Includes much gravel and mixed sand and gravel; the unit contains much sandy material suitable for fill. Exploitation of sites adjoining rivers may lead to accelerated erosion of channel shifts.
VII	GRAVEL-SAND HILLS RIDGES AND TERRACES	Gravel, sand, and some silt. Includes eskers and other glaciofluvial deposits, and undifferentiated fluvial deposits.	Sand and gravel 5-50 ft.+ thick; veneer of sand or silt common on flat benches adjacent to Eskimo Lakes: local areas of Unit X may be present within this unit northeast of Eskimo Lakes, northeast of Noel Lake, and north of the Wolverine Lakes. Forms flat to gently sloping benches interrupted by shallow channels and low scarps (mainly in the Eskimo Lakes area), hummocky areas (relief to 150 ft.) and isolated esker ridges.	Typically cement ice only or no segregated ice in well-drained sites; locally high segregated ice in silt and below peat in channels or depressions; massive ice present at depths of 20-150 ft. in deposits north of 68°30'.	Ground surface relatively dry, except on large flat areas and in channel traces; drainage mainly subsurface.	Minor thermokarst subsidence on large flat areas if silt veneer or peat present. Ground ice slumping and possibly gullying on slopes where ground ice is present above the base of the slope: if mean annual ground temperature increases.	Major source of gravel and mixed gravel and sand; hummocky areas generally contain more gravel than flatter outwash terraces: generally suitable as borrow material.
VIII	SILT-CLAY HILLS AND RIDGES	Mainly silt and clay with minor sand and gravel in moraines; strata tilted and folded.	Not present.				
IX	TILL PLAINS	Till, occurring as ground moraine with low rolling relief or parallel drumlin ridges. Large areas are clayey to silty till as a thin veneer on shale; locally forms a thin veneer on other kinds of bedrock. Includes undifferentiated areas of Unit I.	Silty to clayey till, generally 0-20 ft. thick (locally to 60 ft.+) underlain by bedrock[2]. Forms a sloping rolling plain; relief generally bedrock controlled. Local relief (due to stream incision) up to 150 ft. Discontinuous peat cover (Unit I) in depressions and as irregular patches.	Ice content moderate in till; commonly up to 10% segregated ice as thin seams in upper 5-10 ft., locally thicker ice lenses (0,3-9 ft.) at depth. Generally little ice in underlying bedrock.	Ground surface commonly dry but may be moist on flat areas. No organized drainage with downslope seepage in shallow sub-parallel runs.	Minor to moderate susceptibility to thermokarst and gullying. Superficial mudflows on slopes.	Gravel deposits rare and small; usefulness of the silty till material as fill is limited by its ice content. Where bedrock is close to the surface, it is a source of low-ice borrow material.
X	HUMMOCKY TILL	Clayey to gravelly-sandy till, local gravel, forming rolling to hilly moraine composed of individual and coalescent hummocks. Local contrasts in material and ground ice between well drained hills and poorly drained depressions. Includes small undifferentiated areas of Unit I.	Local relief in part due to bedrock control. Material immediately underlying till is generally sand or gravel in areas flanking the northern and eastern side of the Caribou Hills and north of Sitidgi Lake: generally bedrock in other areas, or estuarine silts and clay with occasional gravel. Peat (Unit I) occurs in depressions to thicknesses of 15 ft.	Up to 10% (locally up to 40%) ice as thin (<1"), irregular, discontinuous seams in upper 9 ft. Thicker ice lenses and massive ice present at depths of 10-150 ft.	Well-drained hills, poorly-drained depressions in places containing bogs or ponds.	Minor to moderate susceptibility to thermokarst subsidence, and ground ice slumps; ground ice slumping and possibly gullying on slopes where ground ice is present above the base of the slope: if major thermokarst subsidence if mean annual ground temperature increases.	Includes very minor sources of aggregate; usefulness of till material as fill is limited by its ice content.
XI	UPLAND AND PIEDMONT COMPLEX	Areas of moderate to low slope, in part hilly, surfaced by till, disintegrated bedrock, and local clay, silt, sand, or gravel. Unconsolidated deposits generally form a thin veneer over rock but in places they are thick (>100 ft.).	Clay and silty clay (generally weathered shale) with cobbles and boulders scattered on the surface; greater than 3 ft. in thickness. Forms hills with moderate to moderately steep slopes: may be unvegetated in some cases with abundant mud boils.	Low, little excess ice.	Slopes and hilltops are relatively dry. Seepage downslope.	Minor detachment slides. Minor to moderate susceptibility to gullying and mudflows.	Poor source of aggregate or fill: where shale is close to surface it is a source of low strength and low-ice borrow material.
XII	MOUNTAINOUS AND ROCKY AREAS	Flat or gently sloping except for local steep cliffs.	Resistant Paleozoic carbonates with a regolith of very coarse debris; a few peat bogs present in depressions.	No ice in bedrock; ice content negligible in rubble, scree, and other overburden. High ice in peat bogs.	Well drained.	Isolated rock falls on steep slopes.	Rubble and in-place rock can serve as sources of coarse granular material.
XIII	ERODED AND/OR ERODING RIVER BANKS, COASTAL CLIFFS, AND VALLEY WALLS (UNCONSOLIDATED MATERIAL)	Various unconsolidated materials on moderate to steep slopes; generally with surface veneer of slope debris; includes unstable areas.	Same as general description. Surface colluvial debris up to 15 ft. thick. Material on upper part of slope is same as adjacent map unit; different materials commonly occur lower on the slope; rotational slumps present where ground ice is melting out from below outwash. Slopes generally less than 150 ft. high: unit is not indicated in Eskimo Lake area where slopes have stabilized.	Quantity of ground ice as indicated for adjacent map unit. Ground ice visible in freshly slumped faces.	Surface of sandy and gravelly materials is generally dry; other materials commonly wet with local running water and active gullying.	Active stream erosion; major ground ice slumping and gullying. Flooding in valley bottoms.	Varied material; see description pertaining to adjoining unit.
XIIIR	ERODED AND/OR ERODING RIVER BANKS, COASTAL CLIFFS, AND VALLEY WALLS (BEDROCK)	Bedrock outcrops or bedrock partly covered by rock detritus or unconsolidated materials; slopes commonly steep; includes unstable areas.	Steep slopes and rock faces consisting of shale, sandstone or poorly consolidated Tertiary gravels, sands silts, clays, and coal in the northern half of the Caribou Hills. Slopes often covered by debris and colluvium. Unconsolidated material on upper part of slope same as adjacent map unit.	No observations of segregated ice in bedrock; possibility of ice in joints and in fracture zones. Ice in overlying unconsolidated materials as indicated for the appropriate unit, especially silty and clayey colluvium.	Locally water runs down gullies.	Rock falls, and superficial debris flows on steep eroded slopes; local susceptibility to gullying and slumping in areas of soft shale or Tertiary sediments where substantial thickness of overburden covers the rock. Flooding in valley bottoms.	Rubble and in-place rock from harder sandstone units and Tertiary gravels can serve as sources of coarse granular material. Less resistant sandstone, shale, and Tertiary sand are sources of low-ice borrow material.

[1] Segregated ice: ice as distinct lenses, layers, veins, and masses in soils, commonly, but not always, oriented normal to direction of heat loss.

[2] Thermokarst: Heat from water in thaw pits, sinks and ponds results in melting of ground ice in areas of saturated peat and underlying mineral soils. The thaw basins may enlarge to the point of coalescing. They are usually steep-sided and flat-bottomed.

[3] Excess ice: ice in excess of the quantity that would be retained as water in the soil voids upon thawing.

[4] Clay, silt, and fine sand are commonly poor borrow materials under permafrost conditions because of their instability under the high moisture conditions that result from thawing of contained ground ice. Some improvement in properties for use as fill could be achieved by artificial drying.

[5] See bedrock map insert and legend on individual map sheets.

GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

TERRAIN SENSITIVITY AND PERFORMANCE RATING TABLE

To accompany map sheet 107B east half (Aklavik).

Map Unit	Permafrost Terrain: Occurrence	Permafrost Terrain: Degradation following disturbance of ground surface: flat ground (<3° slope)	Permafrost Terrain: Degradation following disturbance of ground surface: sloping ground (>3° slope)	Permafrost Terrain: Performance of newly thawed material	Non-Permafrost Terrain: Occurrence	Non-Permafrost Terrain: Performance of unfrozen material	Flooding Hazard
I	general	3K	(2S,2G)	3	N	N	2(low coastal areas, drainage ways)
II	general	2K, 2G	(2S,2G)	3	N	N	N
III	general	1-3K, 2G	(2S,2G)	3	N	N	2(low coastal areas only)
IV	general	1 (2K)	N	1 (2)	active beaches	1	3
V	general	2K	(2S, 2-3G)	3-2	active river deposits	2-3	3-2(flood plain & low coastal areas)
VI	general	1	1 (2G)	1	active river deposits	1	3-2(flood plain & low coastal areas)
VII	general	1	(1-2G)	1 (2)	N	N	N
VIII	N	N	N	N	N	N	N
IX	general	2K	2S, 2G	2	N	N	N
X	general	2K (3K)	2-3S, 2G	2	N	N	N
XI	general	1-2K	2S, 2G	2-3	N	N	N
XII	general	1	1	1	N	N	N
XIII	general	N	2-3S, 2G	3-1	N	N	3-2 (valley bottoms)
	general	N	1-3S, 1-3G	3-1	N	N	3-2 (valley bottoms)
		(as for unit XIII where overburden is present)					
1	2	3	4	5	6	7	8

KEY TO PERFORMANCE RATING TABLE - EXPLANATORY NOTES

Sensitivity - Performance Scale

Rating Number	General	Columns 3 and 4	Columns 5 and 7	Column 8
1	good sites	low frequency, and/or low intensity	least troublesome materials	----------
2	fair sites	moderate frequency and intensity	moderately troublesome materials	flooding under extreme conditions
3	poor sites	high frequency and/or high intensity	highly troublesome materials	flooding a common occurrence
N	not applicable or not represented			no flood hazard

Degradation following disturbance of ground surface (Columns 3 and 4)

Rating applies to changes resulting from man-induced disturbance such as stripping of the surface down to mineral soil, long term ponding of water on surface, or re-routing of flowing water for substantial periods. Degradation of somewhat lesser intensity and/or frequency results from compaction or mechanical disturbance of the surface vegetation mat or peat. Earthflows may develop in sloping sites following fire on units rated as 2 or 3.

K - thermokarst depressions or ground subsidence from melting of ground ice.

S - slope failures such as ground ice slumps, earth flows, landslides, block collapse (minor sloping sites in brackets)

G - gully erosion (minor sloping sites in brackets)

Sloping ground includes:

- eroded banks in gullies, along rivers, valley walls, and eroded coasts (Note: major eroded areas mapped as unit XIII)
- slumped banks around thermokarst lakes or thermokarst depressions
- sloping hillsides (units VII, VIII, X, XI, XII, XIII)
- mountainside and escarpments (Units XII, XI)

Performance of newly thawed material (Column 5)

The rating is for performance of thawed materials under worst conditions (i.e. immediately after melting of constituent ice) when subjected to load in place, when used as fill, or when exposed on a cut slope. Rating also applies to "normal" active layer materials under the same conditions.

Performance of normal unfrozen material (Column 7)

The rating is for performance of materials under typical field moisture conditions when subjected to load in place, when used as fill, or when exposed on a cut slope.

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TERRAIN CLASSIFICATION AND SENSITIVITY SERIES
Produced for
Indian and Northern Affairs
by
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To accompany map 107B east half (Aklavik). Terrain sensitivity and performance rating is provisional and subject to revision and correction.