GEOLOGICAL SURVEY OF CANADA — COMMISSION GÉOLOGIQUE DU CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES
MINISTÈRE DE L'ÉNERGIE, DES MINES ET DES RESSOURCES

EXPLANATION OF LANDFORM UNIT NOTATIONS

aDbl-R (with superscript 2): Compositional-Genetic Category; Age Modifier; Process or Form Modifier; Textural Modifier; Morphologic Modifier(s)

Aa/At — Stratigraphic relationships given where thickness of upper unit is irregular and where underlying unit is a known compositional-genetic unit other than bedrock.

Compositional-Genetic Categories[1]

- A- Alluvial Deposits: sand and gravel with veneer of fine sediment and organics; mainly Pleistocene; floodplain (Ap) modern.
- C- Colluvial Deposits: various materials, mainly rubble, includes landslides (C); undifferentiated age.
- D- Drift: undifferentiated till, sand, and gravel.
- E- Eolian Deposits: fine sand and silt; pre-Wisconsinan (pre-Reid).
- G- Glaciofluvial Deposits: sand and gravel with veneer of fine sediment.
- L- Lacustrine Deposits: mainly silt and clay with little fine sand; Late Wisconsin (McConnell).
- M- Morainal Deposits: till, silty/sandy diamicton; rock glaciers (MR), rubble; modern.
- R- Bedrock: various types; pre-Pleistocene.

Textural Modifiers

- a- sand or gravel
- b- boulders, blocks, bouldery
- f- fine sand, silt and clay; commonly with high organic content
- g- gravel, gravelly
- r- rubble, predominantly sand to boulder-sized fragments

Age Modifiers[2]

- 1- Late Wisconsin (McConnell)
- 2- Early Wisconsin or Illinoian (Reid)
- 2a- Early Wisconsin or Illinoian (Laurentide Glaciation)
- 3- Illinoian or pre-Illinoian (pre-Reid)

Morphologic Modifiers

- a- apron
- b- blanket[3]
- f- fan
- h- hummocky
- m- undulating, rolling
- n- nondescript slope, bedrock controlled
- p- plain, floodplain
- r- ridge, ridged
- s- steep slope (greater than 35°); cliff
- t- terrace, terraced
- v- veneer[4]
- 1- gentle to moderate slope (5-15°)
- 2- moderate to steep slope (15-35°)

Process or Form Modifiers

- A- active deposition
- R- thermokarst, modified by thermokarst
- R- rilled

[1] General descriptions of texture and age are given for each category; only where texture and age differ from the general description are textural and age modifiers used.

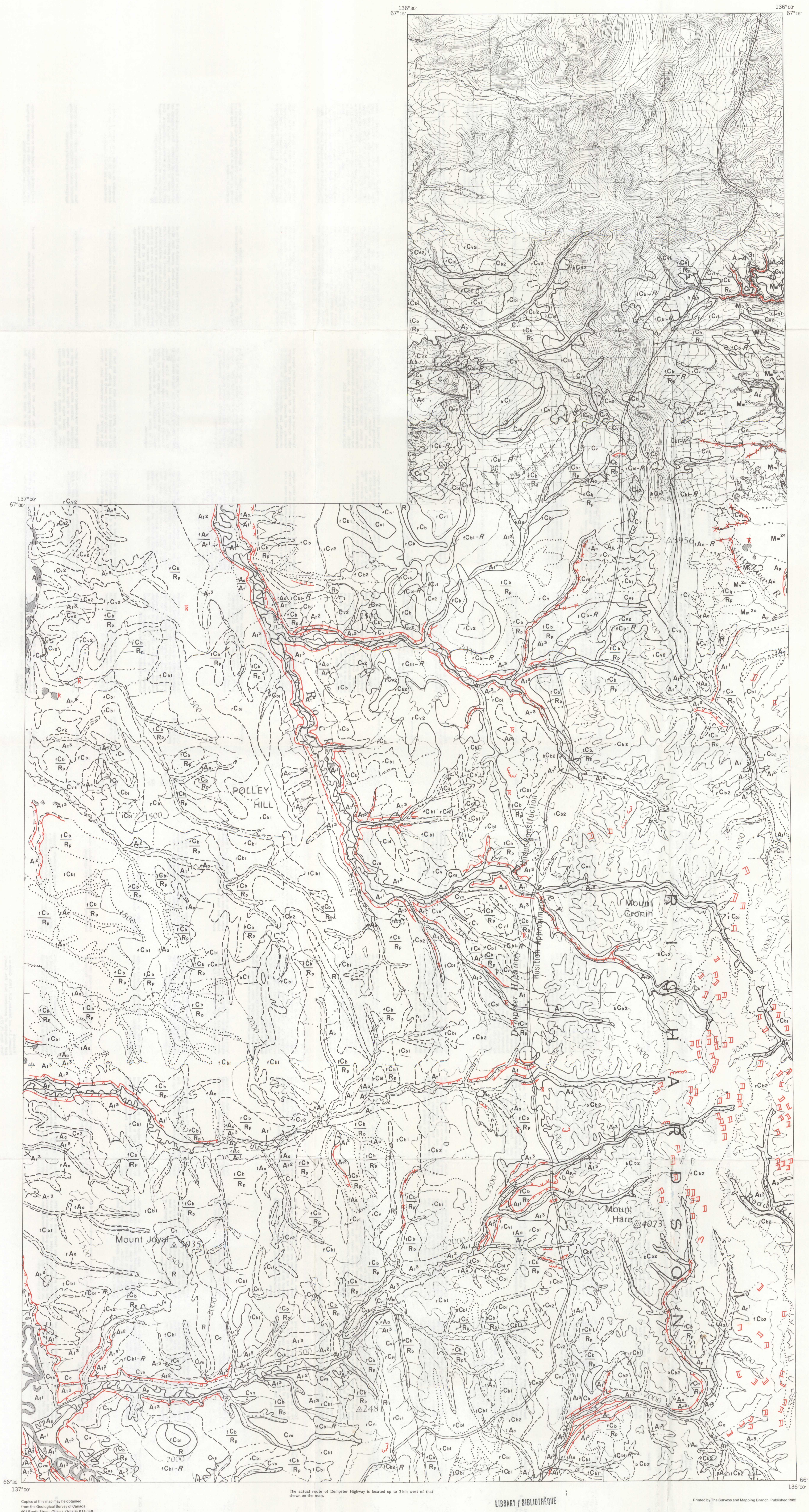
[2] The age modifier is used only where the deposit can be definitely ascribed to a single age, except for Ap which is modern.

[3] Blanket indicates category forms nearly continuous cover greater than 1 m thick, generally 0.5 to 3 m thick, over a unit, commonly rock.

[4] Veneer indicates category forms broken thin cover, generally less than 1 m thick, but averaging 0.5 m thick, over a unit, commonly rock.

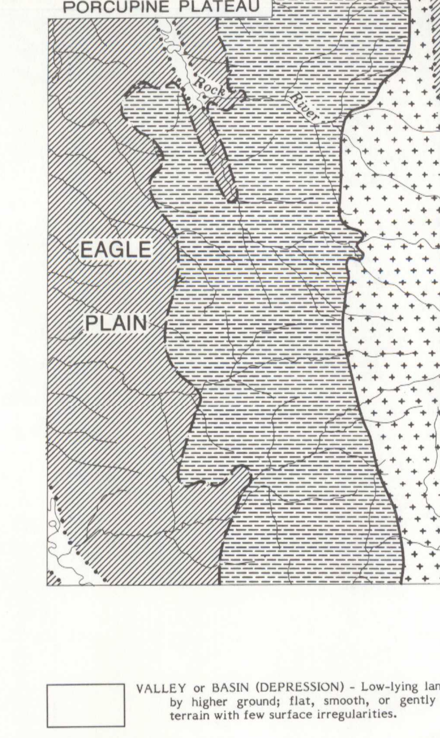
Geological boundary (defined, approximate, assumed)
Fault scarp, postglacial
Fluted bedrock
Fluted till
Morainic ridge (age as given by modifier)
Meltwater channel (age as given by modifier)
Nivation terrace
Pingo
Thermokarst depression
Landslide scar
Stream-trimmed scarp (unconsolidated material, bedrock in part)
Stream-cut ravines and canyons (unconsolidated material, bedrock in part)
Limit of mapping

Note: Not all units and symbols shown in the legend necessarily appear on this map.



The actual route of Dempster Highway is located up to 3 km west of that shown on the map.

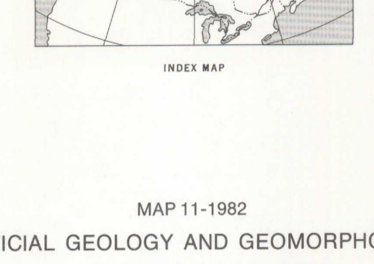
PHYSIOGRAPHY



- VALLEY or BASIN (DEPRESSION) - Low-lying land bordered by higher ground; flat, smooth, or gently undulating terrain with few surface irregularities.
- PLATEAU - Land standing well above valleys but below elevation of nearby mountains; flat, smooth, gently sloping to moderately hilly terrain; in places dissected by valleys, but major part of surface is near summit level.
- HILLS - Prominences that rise above surrounding terrain; relief less than 350 m; rounded summits.
- MOUNTAINS - Prominences that rise above surrounding terrain; relief more than 350 m; have restrictive summit area and steep slopes.

BOUNDARIES

Between physiographic systems.
Between major physiographic subdivisions.
Delineating minor physiographic subdivisions.



INDEX MAP

MAP 11-1982

SURFICIAL GEOLOGY AND GEOMORPHOLOGY

ROCK RIVER

YUKON TERRITORY

Scale 1:100 000

Kilometres 2 0 2 4 6 8 Kilometres
Miles 2 0 2 4 Miles

Universal Transverse Mercator Projection

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DESCRIPTIVE NOTES

Porcupine Plateau comprises Eagle Plain and an unnamed area to the east[1].

Eagle Plain is gently rolling area attaining 925 m elevation in the southwestern part of the map area and becoming progressively lower towards the north where the highlands reach 450 m. Long, broad, rounded ridge crests with gentle slopes forming broad valleys give the area local relief of 100 to 200 m. Streams show a well integrated dendritic drainage pattern and flow westward into Eagle River and ultimately to Porcupine River. The area is underlain by Devonian shale and sandstone; Carboniferous conglomerates, sandstones, and shales; and Cretaceous shale.[2]

The unnamed area east of Eagle Plain parallels the edge of the Richardson Mountains, away from which the plain slopes. The area is underlain by the westernmost zone of rocks deformed by tectonic events that formed the Richardson Mountains.[1] These rocks are exposed as a series of hogbacks to elongated ridges which stand 100 m above the general slope of Porcupine Plateau. Drainage is westward across this area from the Richardson Mountains, in a pattern that is basically dendritic, but becomes trellis as the effect of bedrock structure becomes more pronounced. Devonian to Carboniferous shales, sandstones, and siltstones underlie the area.[2]

In the east lies part of the first main ridge and valley of the Richardson Mountains. The north-south trending ridge has a broad, round to flat crest with moderate to steep sides. Numerous steep-sided gullies, which feed into low gradient, flat-floored streams, are deeply incised into the slopes. The drainage pattern is rectangular to trellis with only a few streams completely dissecting the ridge. The major valley, which lies to the east of the ridge, has a broad, gently undulating floor across which streams flow both east (Vittrekwa and Road rivers) and west (tributaries to Rock River). The valley floor lies at 760 m elevation in the north and becomes higher (900 m) towards the south. The ridge crest has a relatively uniform elevation of 1100 to 1200 m. The mountains are Cambrian to Devonian shales, sandstones, and conglomerates in the southern two-thirds of the map area and Devonian sandstones and shales, and Cretaceous and Jurassic sandstones and shales in the northern part.[2]

The map area lies within the zone of widespread discontinuous permafrost.[3,4] Permafrost is probably 100 to 200 m thick throughout the area.[5,6] Ground ice occurs as ice-wedge polygons in moderately to poorly drained, fine grained sediments; small ice wedges and ice lenses in peat; several metres of massive ice on parts of the bedrock surface, in rilled areas, and at the base of slopes; well bonded, nonvisible ice in the top few metres of bedrock, although in places small veins and lenses may occur.[7,8] Most small lakes have a thermokarst origin.

Within this area, as throughout Yukon Territory,[9,10] a high erosion surface or pediment stands well above present streams and their associated terraces. The pediment is best preserved on Eagle Plain, where it occurs as a gently sloping surface just below or forming the crests of interfluves. The pediment surface generally rises towards the Richardson Mountains and occurs within the mountains along major rivers. Pediments form by the parallel retreat of scarps in a semi-arid environment with material being eroded from the scarp and transported across the pediment. No evidence was found to confirm or disprove this mode of origin for the pediment in this region. It should be noted that the scarps here are formed in the Tuttle Formation (Carboniferous)[2] and probably owe their position more to the resistance of this rock unit than to the formation of the pediment. The age of the pediment is probably late Tertiary as, south of the map area, it overlies Tertiary (Eocene) sediments in Tintina Trench and is overlain by early Quaternary glacial deposits in Taiga Valley.

Along many streams, high terraces are slightly inset into the surface of the pediment, making it difficult in places to separate the two features. The high terraces are characterized by a gently undulating surface, which appears to have been formed by gullying, thermokarst activity, and other periglacial processes. Exotic lithologies do not occur in gravels on the high terraces as they were formed before the maximum extent of Laurentide Glaciation. These terraces have been incised by diverted streams and meltwater, which flowed down Eagle and Rock rivers and a few tributaries when the Laurentide glaciers were at their limit during the early Wisconsin or Illinoian. The high terraces extend downstream to underlie or merge with glaciolacustrine and nonglacial sediments in Bell Basin; the oldest sediments in this sequence are believed to have been deposited prior to 75 000 years ago.[11,12]

During the Illinoian or early Wisconsin, Laurentide ice flowing down Mackenzie valley flowed into the Richardson Mountains via Vittrekwa River valley and deposited till. The limit of the glaciation is not marked by moraines but by the limit of glacial erratics, principally granites, white sandstone, and Rapitan conglomeratic mudstone; possibly a glacial lake was dammed between the mountains and the ice front and some of the erratics were deposited by floating ice. Meltwater flowed across the divide and down the northern tributary of Rock River, incising the river channel and forming low-level terraces. Low-level terraces on other creeks in the map area are related to variations in discharge of Eagle River when it acted as a spillway for meltwater and diverted Peel River drainage during Wisconsin and possibly Illinoian Laurentide glaciations.[13]

During the Pleistocene, periglacial processes have affected much of the terrain. Sporadic solifluction and frost creep have probably moved large volumes of surficial materials downslope. At present, solifluction lobes occur only locally and are most abundant on the moderate to steep slopes of the Richardson Mountains. Below the area of solifluction, where the slope becomes more gentle, the soil surface shows signs of cryoturbation in the form of nonsorted circles (frost boils). The ground surface is patterned by ice-wedge polygons and vegetation tussocks where peat has accumulated to sufficient thickness (greater than 40 cm) on the gentle slopes. In areas where abundant overland flow of water occurs, particularly on slopes along the western flank of the Richardson Mountains and beneath scarps, the water is channelled into a parallel pattern of rills. The rills coalesce downslope into a horsetail drainage pattern and eventually form the headwaters of a stream. *The rilled* areas are typically broad theatre-shaped valley heads, mainly occurring behind a rock ridge which confines the lateral development of channels. The underlying material is ice rich when frozen and soft when thawed because of the large volume of water that flows across these units. Winter roads that parallel Dempster Highway show little subsidence or have caused little terrain disturbance, except where they cross rilled areas; in such places, the thaw settlement can be up to 2 m with thermokarst depressions and large areas of standing water along the roads.

Other periglacial processes of denudation which are presently active within the area are active-layer detachment sliding, nivation, and altiplanation. Active-layer detachment slides occur along steep slopes, particularly in shale-derived colluvium. They are 100 to 500 m² in area and are too small to be shown on the map. The slides move along the base of the active layer and may occur at any time during the thaw season but most frequently after heavy rains. In places it appears that landsliding is active at the heads of gullies and that it may be the principal agent for gully development. Nivation occurs along the ridge crests of the Richardson Mountains as indicated by the presence of numerous nivation hollows. Although significant depressions may be formed, the result of this process is probably limited to the formation of benches and rounding of ridge crests. Altiplanation terraces are restricted to the north side of Mount Joyal and a ridge in the extreme north. These areas are characterized by stepped morphology comprising smooth, gently sloping "treads", up to 20 m across, and 1 m-high "risers". The tread areas consist of scattered flat boulders (flagstones) lying in a matrix of silty rubble; the risers are formed of rubble. Water issues from the base of the risers and flows across the tread, eventually percolating down into it. The back portion of the tread is soft, almost in a quick condition, due to the high water content and the loose structure of the material.

The main hazards to development are moderate soil creep and solifluction on most slopes; active-layer detachment slides on steep slopes particularly in the Richardson Mountains; altiplanation and nivation, where active; and thermokarst subsidence in low-lying areas particularly on fine grained material and in rilled areas. Streams have variable discharge and flooding may be a hazard in their proximity. Very few sources of granular material other than bedrock exist in the map area.

References

1. Bostock, H.S., 1961: Physiography and resources of the northern Yukon; Canadian Geographical Journal, v. 63, no. 4, p. 112-119.
2. Norris, D.K., 1980: Geology of northern Yukon Territory and northwestern District of Mackenzie; Geological Survey of Canada, Open File 715.
3. Brown, R.J.E., 1967: Permafrost in Canada; Geological Survey of Canada, Map 1246A.
4. Brown, R.J.E., 1967: Permafrost investigatons in British Columbia and Yukon Territory; National Research Council of Canada, Division of Building Research, Technical Paper 253.
5. Judge, A., 1973: The prediction of permafrost thickness; Canadian Geotechnical Journal, v. 10, no. 1, p. 1-11.
6. Judge, A., 1973: Deep temperature observations in the Canadian north; in Permafrost, North American Contribution, Second International Conference (Yakutsk, USSR), 1973, National Academy of Sciences, p. 35-40.
7. Foothills Pipe Line (Yukon) Ltd., 1979: The Dempster Lateral Gas Pipeline Project; v. 3, Alignment sheets.
8. Public Works Canada, 1980: Unpublished reports on Dempster Highway construction, Whitehorse Office, Yukon.
9. Hughes, O.L., 1972: Surficial geology of northern Yukon Territory and northwestern District of Mackenzie, Northwest Territories; Geological Survey of Canada, Paper 69-36.
10. Cairnes, D.D., 1912: Differential erosion and equiplanation in portions of Yukon and Alaska; Geological Society of America, Bulletin 22, p. 333-338.
11. Hughes, O.L., 1969: Pleistocene stratigraphy, Porcupine and Old Crow Rivers, Yukon Territory; in Report of Activities, Part A; Geological Survey of Canada, Paper 69-1, Part A, p. 209-212.
12. Matthews, J.V., Jr., 1980: Personal communication; Geological Survey of Canada, Ottawa.
13. Thomas, R.D. and Rampton, V.N., in press: Surficial geology and geomorphology, Moose Lake; Geological Survey of Canada, Map 10-1982.

Geology by R.D. Thomas and V.N. Rampton, 1980

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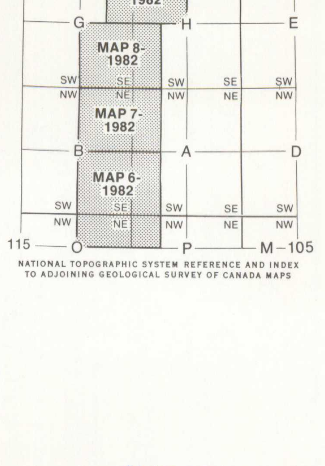
Approximate magnetic declination, 1982, 36°32' East decreasing 6.4' annually

Elevations in feet above mean sea level



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