GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF MINES AND TECHNICAL SURVEYS

PRELIMINARY SERIES

SHEET 54 D

LEGEND

CENOZOIC

PLEISTOCENE AND RECENT

10 Clay and sand, partly consolidated, commonly crossbedded

PALAEOZOIC

ORDOVICIAN
LOWER ORDOVICIAN (TRENTON)

9 Thin bedded dolomite, arenaceous dolomite; minor basal grit and conglomerate.

PRECAMBRIAN

5/ Gabbro and diabase dykes

7 Massive and sheeted granite, granodiorite, syenite; minor pegmatite and aplite dykes and sills

6 Biotite and hornblende granite-gneiss (less than 25 per cent metasedimentary or metavolcanic rocks)

5 Hybrid gneiss, migmatite, lit-par-lit gneiss (25-75 per cent composed of metasedimentary or metavolcanic rocks)

ASSEAN LAKE GROUP (4)

4 Greywacke, arkose, quartzite; minor interbeds of cherty material and limestone

3 Sheared and altered basic and ultrabasic dykes and sills

2 Quartz-biotite-plagioclase gneiss, commonly containing garnet, rarely containing staurolite, cordierite, kyanite; 2a, gneisses associated with (4); 2b, hornblendic gneisses

1 Greenstone, amphibolite; basic dykes and sills; minor cherty and slaty interbeds

Drift-covered area

Rock outcrop ×

Geological boundary (defined, approximate, assumed)

Limit of geological mapping

Bedding (inclined, overturned)

Bedding (dip known, top unknown)

Gneissosity, schistosity, foliation (inclined, vertical, dip unknown)

Drag-fold (direction of plunge known)

Fault (approximate, assumed)

Glacial striae

Old marine beach

Mineral occurrence (pyrite, py; pyrrhotite, po) ×po

Geology by H.A. Quinn, 1958

Geological compilation and marginal notes by K.L. Currie, 1961

Trail

Railway

Township or range (surveyed)

Intermittent stream

Esker

Marsh

Rapid Rap.

Rock or small island +

Height in feet above mean sea-level 425

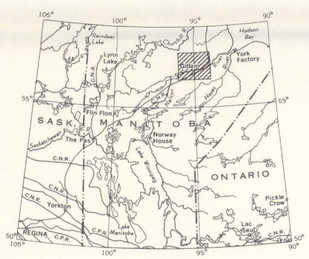
Cartography by the Geological Survey of Canada, 1961

Approximate magnetic declination, 7° 04' East

Geographical names subject to revision

Air photographs covering this area may be obtained through the National Air Photographic Library, Topographical Survey, Ottawa

In response to public demand for earlier publication, Preliminary Series maps are issued in this simplified form and will be clearer to read if all or some of the map-units are hand-coloured



INDEX MAP

Adjoins Map 10-1955 "Split Lake"

Adjoins Preliminary Map 55-8, "Knee Lake"

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MAP 9-1961
GEOLOGY
KETTLE RAPIDS
MANITOBA

Scale: One Inch to Four Miles = $\frac{1}{253,440}$

4 2 0 4 8 12
Miles

DESCRIPTIVE NOTES

The Hudson Bay line of Canadian National Railways gives easy access to the area. Charter aircraft are available at Ilford. Well-used canoe routes exist on the Aiken, Butnau, Nelson, and Little Churchill Rivers; canoe routes and portages within the area are described by McInnes[1]. Outcrops are rare except in the major river valleys and in the southwestern part of the area.

Metamorphosed basic volcanic rocks (1) are commonly compact, fine-grained, greenish black greenstones, rich in chlorite and epidote. Variations from coarse-grained amphibolite to recognizable pillow lava occur locally. Flow breccia outcrops near Moosenose Lake. Minor amounts of greywacke and cherty quartzite are interbedded with the volcanic rocks. The narrow linear form of the volcanic belts is noteworthy.

The gneisses (2) occur in two settings: as thin layers of hornblende-biotite gneiss (2b) interbedded with the metavolcanic rocks (1), or as considerable areas of gneisses (2a) associated with the Assean Lake group (4). The gneisses (2a) vary from white quartzite with partings of biotite, to contorted biotite schist. Most varieties are garnetiferous, and around Moose Lake staurolite, cordierite, and kyanite porphyroblasts occur. The rocks are strongly foliated and commonly contain ptygmatically folded pegmatite veinlets. All stages in the development of lit-par-lit and hybrid gneisses (5) may be seen.

Closely associated with the metavolcanic rocks (1) is an innumerable swarm of basic dykes and sills (3). These bodies range in width from a few inches to 1,500 feet, and in length from 10 feet to several miles. Only the largest bodies can be shown on the map. The masses presently consist largely of serpentine, chlorite, epidote, uralite, and minor plagioclase. They appear to be altered remnants of ultrabasic rocks. A few dykes contain large amounts of plagioclase and approach anorthosite in composition. The sills are sheared at N80°E and most of the dykes trend in this direction. The occurrence of these rocks is almost confined to the metavolcanic belts (1) and the two rock types are probably closely related.

The Assean Lake group (4)[2,3] consists of moderately metamorphosed clastic sediments. The relations of this group to the highly metamorphosed rocks (1,2) are not known, but the trend of the Assean Lake rocks is across that of the volcanic rocks, and the enveloping gneisses (2a) have a much higher grade of metamorphism. The Assean Lake group is therefore considered to be younger than either. Green or black greywacke, commonly showing graded bedding, and brightly coloured arkosic quartzite are the principal constituents of the Assean Lake group in this area. Thin interbeds of cherty material are common, and carbonate interbeds up to 10 feet thick occur around Wapicho Rapids. At Moose Lake a 20-foot volcanic flow is interbedded with greywacke.

Rocks of units 1 and 2 are veined by a network of quartz and pegmatite stringers. When the amount of this material exceeds 25 per cent, the rock is mapped as hybrid gneiss (5). Lit-par-lit gneisses are most common, but patchy migmatite occurs around Moose Lake. Most of the gneisses are highly contorted. As the percentage of granitic material increases, the veins change colour from white to pink, and the whole rock takes on a pinkish cast. Alteration carried a step farther leads to granite-gneiss (6). These rocks everywhere contain fragments and recognizable remnants of other rocks, but in minor amounts. The matrix is much more homogeneous than that of the hybrid gneisses (5), and in most places it is a medium-grained, pale pink, granite-gneiss.

Massive granitoid rocks (7) are less common than granite-gneiss. Around Butnau Lake and on Assaikwatamo River, masses of coarse grey granodiorite and diorite occur, commonly containing large phenocrysts of orthoclase. Along Limestone River, medium-grained red granite occurs. No pegmatite body of mappable size was observed. None of the contacts of the granitic bodies is exposed. A sub-horizontal sheeting in the Butnau Lake mass suggests that it is dome-shaped, and inclusions of basic dykes (3) in the same mass show that it incorporated substantial amounts of the surrounding rocks.

Younger basic rocks (8) occur as innumerable dykes, most of them unmappable. Some are diabasic in texture; most approximate olivine gabbro in composition. The rocks are fresh and unaltered in appearance, many having glassy borders. Most of the dykes trend northeast; a few trend northwest.

The Lower Ordovician rocks (9) rest directly on the Precambrian with great unconformity. The contact is marked by a few feet of rusty grit and conglomerate grading sharply upward into arenaceous dolomite and then into thin-bedded fossiliferous dolomite. On the eastern boundary of the area are a few outcrops of interbedded chert and dolomite. The distribution of the Palaeozoic rocks is problematic because of the sparsity of outcrops. That they are not thick at any point is shown by the presence of the Precambrian window in Limestone Rapids. Considerable parts of the area shown as Palaeozoic may in fact be underlain by Precambrian rocks. On the other hand, small outliers of Palaeozoic limestone occur as far west as Kettle Rapids.

Glacial and recent sediments (10) along Nelson River are in places more than 200 feet thick. The southern part of the area is covered by clay and sandy clay that commonly shows cross-bedding. The sediments are sufficiently consolidated to form 100-foot cliffs. In the northern part of the area, sand and gravel deposits predominate. Old marine beaches can be traced for 35 miles just west of the railway tracks. Other abandoned beaches farther west seem to have enclosed lagoons. Pronounced warping of the marine beaches suggests some crustal activity in this area at present.

The structure of the area is complex and cannot be determined from the amount of outcrop available. Folding along northwest-trending axes is suggested at Moose Lake, and in the greenstone belts around Ilford. A major fault crosses Nelson River at Gull Rapids, trending approximately N80°W. Offset of the Butnau and Kettle Rivers along this fault suggests that it may have been active in recent times. Outcrops of the older basic rocks (3) have not been found north of this fault. There is also a marked change in the trend of the rocks; those to the north have a general southeasterly strike and those to the south strike southerly. A strong linear feature along Aiken River is thought to represent a parallel fault.

Extensive sulphide mineralization has occurred in the southwestern quarter of the area. Fair copper-nickel assays are reported from several localities near Ilford. Mineralization occurs in three settings: as massive sulphides associated with dykes and sills of basic rocks (3) cutting greenstone (1) and associated gneisses (2b); as disseminated sulphides in greenstone and amphibolite (1); and as disseminated sulphides in gneisses (2). The massive sulphide deposits are the largest and richest. Pyrite, pyrrhotite, chalcopyrite, sphalerite, and magnetite, in that order of abundance, are the principal constituents. Small amounts of molybdenite occur in gneisses (2) northeast of Ilford. Graphite occurs in the same setting. All the greenstone belts appear to be favourable prospecting areas. No significant mineralization is known north of the Gull Rapids fault.

[1] McInnes, W.: The Basins of Nelson and Churchill Rivers; Geol. Surv., Canada, Mem. 30 (1913).
[2] Dawson, A.S.: Assean - Split Lake Areas; Manitoba Dept. Mines, Nat. Res., Geol. Rept. 39-1 (1941).
[3] Gill, J.C.: Geology of the Waskaiowaka Lake Area; Manitoba, Dept. Mines, Nat. Res., Pub. 50-5 (1951).