Canada
Department of Mines
Hon. T. A. Crerar, Minister; Charles Camsell, Deputy Minister

BUREAU OF ECONOMIC GEOLOGY
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PHYSICAL FEATURES

The main body of Great Slave lake crosses the boundary between the Canadian shield and the bordering area of Palaeozoic rocks and the east arm of the lake extends at right angles to the contact for 176 miles into the Shield. The basin of the east arm owes its existence to deep erosion of a belt of mixed hard and soft rocks that is bordered on three sides by uniformly more resistant formations, generally granitic. Within the present map-area, which covers the east half of the east arm, the general level of bordering lands and of numerous islands and peninsulas in the lake rises gradually from 450 feet above the lake in the southwest corner of the area to 700 feet in the southeast part and 900 feet a few miles inland from the north shore of the lake. The granitic uplands bordering the lake basin present a monotonous succession of low rock hills and ridges like much of the surface elsewhere on the Canadian shield. The upland south of the basin rises abruptly along a high fault escarpment, whereas, north of the lake, rocky slopes rise gradually for 1 to 4 miles inland before the plateau level is reached. Rivers entering the lake below either poorly defined valleys or deep gorges and are unnavigable for 2 to 12 miles inland. The monotonous aspect of the bordering uplands contrasts sharply with the rugged and picturesque topography within the lake basin, where high cliffs of conglomerate and diabase rise nearly vertically from the water's edge and steep slopes of shale are protected by cappings of harder formations. Structure of underlying rocks is especially well reflected in the form of large peninsulas in the north part of the lake where gentle south slopes follow the dip of formations and steep north slopes form a series of steps eroded on the outcropping edges of alternating layers of hard and soft strata.

Glacial boulders are widely scattered over much of the country but thick deposits of moraine are rarely seen. Beaches occur here and there up to 540 feet above the present level of the lake and presumably formed on the shores of glacial lakes lying in front of the retreating ice sheet of Pleistocene time. Sheltered lowlands are locally well timbered but many of the rocky slopes and hill-tops are sparsely wooded.

GENERAL GEOLOGY

Two major unconformities are easily recognized within the succession of Precambrian rocks in the map-area and these naturally divide the formations into three main groups. Surficial rocks of each group were invaded by igneous intrusives, and those of the first two groups were highly folded, were probably mountain built, and were deeply eroded to a nearly level plain before subsequent formations were laid down.

The Point Lake-Wilson Island Group (1) of sediments and volcanics are the oldest rocks recognized. They are divided on the basis of marked differences in lithological character and structure into two parts, of unknown relation to one another and called the Point Lake phase and the Wilson Island phase.

Rocks of the Point Lake phase (1b) comprise highly metamorphosed, feldspathic, sedimentary gneiss and schist. Bedding planes strike northerly and dip steeply but the nature of the folding has not been determined. These sediments may be correlated with similar rocks on Yellowknife river, 85 miles to the west.

The Wilson Island phase (1a) consists of a great thickness of northeasterly striking strata of phyllite, schist, and cross-bedded quartzite. These rocks are correlated with the Tazin series as developed in several areas between Great Slave lake and Lake Athabaska.

Granitic Rocks (5) are widespread on uplands bordering the lake basin and underlie only a few small areas within the basin where they have been brought to their present position by anticlinal folding and by faulting. Large bodies of granite intrude sediments of the Point Lake phase and the sediments are locally much granitized and cut by many dykes and stringers of granite and pegmatite.

The Great Slave Group of sediments and volcanics was deposited on an old erosion surface crossing granitic intrusives and the upturned edges of older sediments. The younger rocks form, for the most part, a large asymmetrical synclinorium 150 miles long. Only the east half of this complex fold lies within the present map-area where it underlies almost the whole of the lake basin. The beds on the north limb commonly dip from 5 to 10 degrees south, whereas, the strata on the south limb are generally folded in a series of easterly trending anticlines and synclines with limbs commonly dipping from 30 to 70 degrees. The group is divided into two parts, a lower part and an upper part.

The lower part is divided into three formations, named, in ascending order, the Sosan, Kahochella, and Pethei formations and are best seen on the north limb of the synclinorium where the structure is simple. Here the Sosan formation (6) is perhaps 3,000 feet thick and consists of beds of sandstone and quartzite with partings of shale and with from 1 to 10 feet of arkose and conglomerate at the base. Where observed, the basal members rest on granite and are made up largely of detrital material derived from the granite. The Kahochella formation (7) consists of about 1,000 feet of shaly sediments with laminated, argillaceous limestone, jasper and oolitic iron formation. The iron formation is well developed 10 miles south of Taltheilei narrows where it is associated with lava flows, tuff, volcanic breccia, and agglomerate. The Pethei formation (8) comprises about 1,500 feet of limestone and dolomite characterized by algal structures in some horizons. On the south limb of the synclinorium the Pethei limestone and dolomite are generally missing and the rocks of the upper part of the Great Slave group apparently rest on the Kahochella formation, suggesting that the two parts may be separated by an erosional unconformity.

The upper part of the group is developed in the central part of the synclinorium. In ascending order, the succession is as follows: Stark formation (9) of possibly 1,000 feet chiefly of interbedded vari-coloured dolomite, red shale and limestone, some layers being much brecciated; Tochatwi formation (10) comprising a thick assemblage of shaly sediments and sandstone; Pearson formation (11) of columnar-jointed lava flows with interbeds of argillite.

The majority of the clastic sediments of the Great Slave group are red or brown and many beds show ripple-marks, cross-bedding, and mud cracks. Concretions are locally developed in shale and argillite. The Great Slave group resembles the limestones and associated strata on Belcher islands in Hudson bay and may be about the same age as the Animikie rocks of the Lake Superior region.

Dioritic Intrusives (13). All members of the Great Slave group as well as granite and sediments older than granite are cut by dykes, sills, and stocks of dioritic and syenitic rocks. These intrusives outcrop here and there along the more highly folded, south limb of the synclinorium.

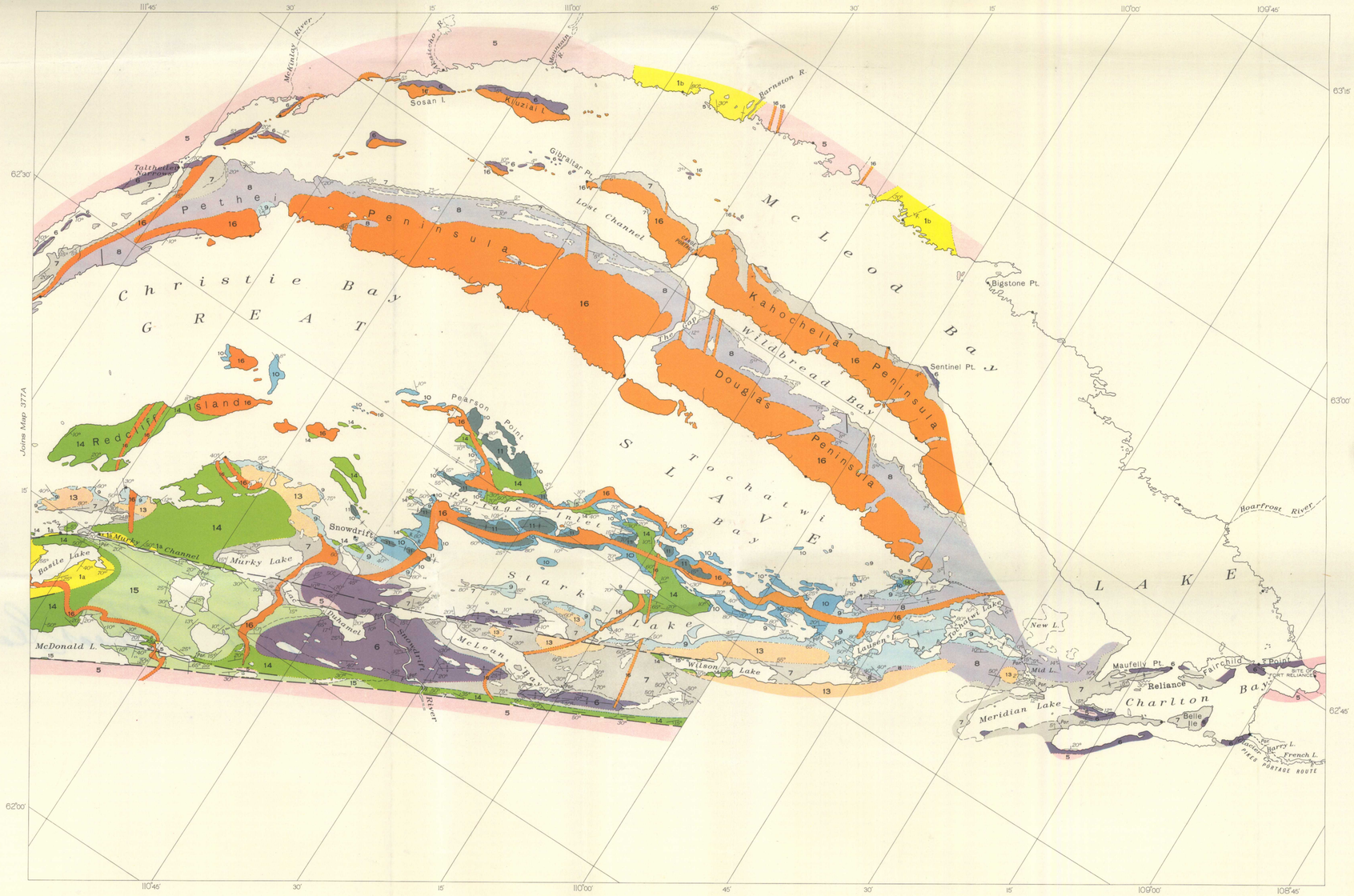
The Et-then Series of coarse clastic sediments were laid down on an old erosion surface crossing dioritic and older rocks. The Murky formation (14) of conglomerate makes up the base of the series and carries closely packed, round boulders of a great variety of rocks representing practically every member of the older groups. The conglomerate varies greatly in thickness up to several thousand feet, probably, and is locally missing, where sandstone and quartzite of the Preble formation (15), that normally overlie the conglomerate, are represented at the base. The sandstone and quartzite are coarse, feldspathic rocks exhibiting excellent cross-bedding and ripple-marks. The Et-then series is correlated with the Athabaska series as developed at Lake Athabaska and may be Keweenawan in age. The conglomerate and sandstone are nearly flat lying except in the vicinity of faults where dips are up to 70 degrees. These faults are of great magnitude, commonly strike northeasterly, and are confined to the southern, more complexly folded part of the area. They have displaced the Et-then series and all older rocks.

Diabase (16) dykes and sills cut the Et-then series and all older rocks and are later than the large faults. The sills are up to 500 feet or more thick, up to 95 miles long and occur in the gently dipping rocks of the north part of the area. In the more complexly folded rocks of the south part of the area, the diabase characteristically takes the form of moderately dipping dykes of irregular trend. Other dykes dip vertically, strike slightly west of north and cut both gently dipping and complexly folded strata as well as bordering granitic rocks. In all forms of intrusive the diabase shows excellent columnar jointing. The sills and moderately dipping dykes form prominent topographical features.

ECONOMIC GEOLOGY

Areas underlain by sediments of the Wilson Island phase are considered to be favourable prospecting territory, particularly for gold, as also are those areas of sediments of the Point Lake phase where not much injected by granitic material. Quartz veins carrying sulphides are locally seen in these rocks. The granite bodies are also cut by veins of quartz but these are not known to carry gold.

Veins of quartz cut the Great Slave group, the dioritic intrusives, and the Et-then series. Although these veins are not known to carry gold or more than a trace of silver, they should not be neglected by prospectors. Iron deposits in the Great Slave sediments are not known to be of economic value. Since the large faults, as well as the Et-then rocks are later than both the granitic and dioritic intrusives any mineral deposits that they might contain would likely originate in still later intrusives, of which only diabase is known. The diabase is like that at Cobalt and Thunder Bay where deposits of silver have been mined in and near diabase.



LEGEND

- 16 — Diabase (sills and dykes)
- ET-THEN SERIES
- 15 — PREBLE FORMATION: sandstone, quartzite
- 14 — MURKY FORMATION: conglomerate
- 13 — Diorite, quartz diorite, granodiorite, syenite
- 11 — PEARSON FORMATION: andesite, basalt, trachyte
- 10 — TOCHATWI FORMATION: shale, argillite, sandstone
- 9 — STARK FORMATION: dolomite, limestone, breccia, shale
- 8 — PETHEI FORMATION: limestone, dolomite
- 7 — KAHOCHELLA FORMATION: shale, slate, argillite, iron formation, limestone, tuff, breccia, agglomerate; andesite
- 6 — SOSAN FORMATION: conglomerate, sandstone, quartzite
- 5 — Granite, granodiorite, quartz diorite
- 1 — 1a: WILSON ISLAND PHASE, rhyolite, trachyte, conglomerate, arkose, quartzite, iron formation, dolomite, phyllite, sedimentary gneiss and schist
- 1b: POINT LAKE PHASE, sedimentary gneiss and schist

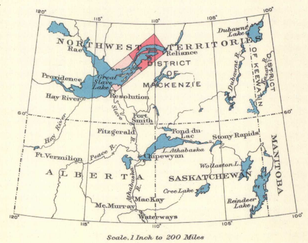
PROTEROZOIC (LATE PRECAMBRIAN) — GREAT SLAVE GROUP (UPPER PART); GREAT SLAVE GROUP (LOWER PART)
ARCHEAN (?) (EARLY PRECAMBRIAN) — POINT LAKE – WILSON ISLAND GROUP

Geological boundary (approximate, assumed)
Bedding (inclined, vertical, overturned)
Bedding contorted (inclined, vertical)
Synclinal axis (approximate)
Anticlinal axis (approximate)
Fault (approximate)
Glacial striæ
Survey monument

Geology by C.H. Stockwell, 1929, 1930, and 1931.

Base-map prepared from information supplied by the Topographical and Air Survey Bureau, Department of the Interior.

Approximate magnetic declination, 37° to 38° East.



Scale, 1 Inch to 200 Miles

MAP 378A

EASTERN PORTION OF
GREAT SLAVE LAKE
(EAST HALF)
DISTRICT OF MACKENZIE
NORTHWEST TERRITORIES

Scale, ~~253,440~~ or 1 Inch to 4 Miles
Miles 4 0 4 8
Kilometres 5 0 5 10

378A