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REPORT AND MAP

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GEOLOGY OF THE

DUNPHY LAKES AREA

GRANVILLE LAKE DIVISION

Manitoba

by

M. S. Stanton

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GEOLOGY OF THE

DUNPHY LAKES AREA

INTRODUCTION

LOCATION AND ACCESS

The Dunphy Lakes area is a 15-minute topographic sheet in Northern Manitoba. It is bounded by latitudes 56° 30' and 56° 45' north, and by longitudes 101° 30' and 101° 45' west. The area comprises approximately 160 square miles. The centre of the area lies 105 miles north-northwest of Sherridon, 130 miles north of Flin Flon, and 26 miles southwest of the mining community of Lynn Lake. The western border of the area is 10 miles east of the Manitoba-Saskatchewan Interprovincial Boundary.

Closest rail approaches to the area are the northern termini of the Canadian National Railway at Sherridon and at Flin Flon. A float aircraft base for Sherridon is situated 1 mile to the west at the village of Kississing (Cold Lake), located on an arm of Kississing Lake. This base is the operating centre for major air transport to the general Lynn Lake region. The float aircraft base for Flin Flon is located on the northwest arm of Schist Lake, near the village of Channing, 3 miles southeast of Flin Flon.

The Dunphy Lakes area may be reached by canoe from Kississing, via Kississing Lake, Kississing River, Flatrock Lake, Churchill River, Granville Lake and the Laurie River. An alternative route from Flatrock Lake is via Churchill River, Sisipuk Lake, Loon Lake and Loon River. A description of the route to Granville Lake is given in a report obtainable from the Geological Survey of Canada, Ottawa.[1] Route and portages are shown on map sheets No. 63N and 64C of the National Topographic Series, published on a scale of 1 inch to 4 miles, and obtainable from the Topographical Survey of Canada, Ottawa.

TOPOGRAPHY AND DRAINAGE

The topography of the northern part of the area, largely underlain by granitic rocks, is subdued; relief within this part is generally less than 100 feet. The topography is locally more rugged

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1 Norman. G. W. H. : Granville Lake District, Northern Manitoba; Geol. Surv., Canada , Sum. Rept. 1933, pt. C.

in the southern part, particularly within the basic intrusive body of Pyta Lake, and in the gneisses south of the Laurie River, where elevational differences are estimated to reach 300 feet. No absolute elevation figures are available for the immediate area, but it is in the neighborhood of 1,200 feet above sea-level.

Entire drainage of the Dunphy Lakes area is to the Laurie River, which flows eastwards and southwards to Granville Lake on the Churchill River. Drainage from Dunphy Lakes is southwards through Snake and Pyta Lakes to Eager Lake on the Laurie River. The northwestern part of the area is drained westwards to Laurie Lake beyond the map-area. South of the Laurie River, within the map-area, drainage is northwards. Conglomerate Lake empties eastwards into McGavock Lake on the Laurie River, just outside the map boundary.

SURFACE CONDITIONS AND TREE GROWTH

The area is overlain extensively by muskeg and by boulder and sand deposits. In the northern half of the area, most rock outcrops are small and sparsely distributed. In the southern part, rock outcrops are numerous and more continuous, although several extensive low-lying regions containing few or no rock exposures are present. Sand and boulder deposits constitute much of the surficial overburden, and occur as flat plains or hummocky accumulations. Irregular and discontinuous boulder train deposits occur locally. A well-defined esker near Arc Lake trends approximately north 15 degrees west. The sand and boulder deposits are mostly outwash deposits of glacio-fluvial origin, and ground morainal debris. Glacial striae and grooving indicate the direction of the last ice advance was from 10 to 15 degrees east of north.

Trees are plentiful but most are small in stature. Stands of larger timber are restricted to creek valleys in protected topographic depressions. Spruce, jack pine, tamarac, birch and poplar occur, the latter two but sparsely. Spruce is the dominant growth throughout the area. Jack pine is plentiful in regions underlain by sand; tamarac occurs in wet muskeg areas;and birch and poplar are restricted generally to protected creek valleys. Fires have burned a large part of the area at various times in the recent past. The tangle of deadfall is severe locally, but overland travel throughout much of the area, particularly in the sandy regions, is good.

AIR PHOTOGRAPHS

The Dunphy Lakes map-area was photographed in 1947 by the Royal Canadian Air Force, and full coverage by vertical air photographs is available from the National Air Photographic Library, No. 8 Temporary Building, Ottawa. The following vertical photographs give full coverage for the Dunphy Lakes area, all photograph numbers being inclusive: A-10944, 9 to 14 and 76 to 80; A-10945, 215 to 219 and 281 to 286; A-11064, 150 to 155 and 219 to 224. The vertical air photographs are an invaluable aid in all types of mapping and exploration, reconnaissance or detailed, for the wealth of topographic detail revealed, the location and extent of rock outcrops and, locally, for major trends of geological structure.

MAPPING METHODS

At the time of preparation of the present map and report, no official base map compiled from the recent vertical air photographs is available. Existant topographic maps of the Dunphy Lakes area and immediate vicinity are based on earlier oblique air photographs, and although excellent for the purpose on the published scale of 1 inch to 4 miles, reveal numerous local discrepancies when enlarged to the present mapping scale of 2 inches to 1 mile. Accordingly, the topographic base for the accompanying geological map was prepared by the writer from the vertical air photographs. No ground control was available, the Twenty-third Base Line ending some 14 miles east of the map-area. East-west flight strips were prepared by overlays and these were enlarged or reduced photostatically to bring each strip to the uniform scale of 2 inches to 1 mile. Orientation of flight strips was controlled by the map-area boundaries as plotted on the existing 1 inch to 4 mile topographic map. The map is considered to be an improvement over current enlargements of the small-scale topographic map available at time of writing, but no high degree of accuracy is claimed.

Present geological mapping was done by pace and compass traverses spaced at intervals from one-quarter to one-third of a mile apart in sedimentary, volcanic, and basic intrusive rocks, and spaced somewhat wider apart in granitic rocks.

PREVIOUS WORK AND ACKNOWLEDGEMENTS

The Dunphy Lakes area is located in the west half of the Granville Lake Sheet, mapped geologically on a scale of 1 inch to 4 miles by D. L. Downie in 1935, and issued in 1936 as map 343A of the Geological Survey of Canada. A geological report by G. W. H. Norman, based primarily on detailed reconnaissance of the east half of the Granville Lake Sheet, is contained in the Geological Survey of Canada, Summary Report, 1933, Part C. This report also lists earlier work in the general region. Geological reports and semi-detailed geological maps of the Lynn Lake to Barrington Lake belt, northeast of the Dunphy Lakes area, are contained in Manitoba Mines Branch publications, and may be obtained on request from the Mines

Branch, Department of Mines and Natural Resources, Winnipeg, Manitoba. Detailed geological property mapping was done during 1947 by Falconbridge Nickel Mines Limited on the DC and HF block of claims north of Pyta Lake, and by Noranda Mines Limited on the TK group and the KZ group of claims located respectively at the north and south ends of Snake Lake.

The Dunphy Lakes area was mapped geologically by the writer during the summer of 1948 on a scale of 2 inches to 1 mile. In this work, very efficient and capable field assistance was rendered by C. K. Caldwell, G. J. R. Hanna, and D. S. Kerby, all students of geology at the University of Manitoba.

GENERAL GEOLOGY

GENERAL STATEMENT

All consolidated rocks within the Dunphy Lakes map-area are Precambrian in age. In the geological map and report by Norman[1] in 1933, and the geological map by Downie[2] in 1935, the rocks of the Granville Lake Sheet were subdivided into the Pre-Sickle group of volcanic rocks, the Sickle Series of sedimentary rocks unconformably overlying the Pre-Sickle, and a Post-Sickle assemblage of intrusive rocks. In a detailed map and report published in 1945, Bateman[3] introduced the term "Wasekwan" to cover the Pre-Sickle group, and further, made an eight-fold subdivision of this group for the rock assemblage in the Wasekwan-McVeigh Lakes region, including volcanic flows, breccia, tuff and sedimentary rocks, with metamorphic equivalents. Allan[4] extended the term "Wasekwan" from the above locality to include Pre-Sickle rocks of the Lynn Lake area. The Lynn Lake area lies some 20 miles northeast of the present map-area, and areal geological evidence strongly implies that the Pre-Sickle volcanic-sedimentary assemblage in the Dunphy Lakes area is continuous with the Wasekwan of Lynn Lake. Accordingly, the term "Wasekwan" is used

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1 Norman, G. W. H. : Granville Lake District, Northern Manitoba; Geol. Surv., Canada, Sum. Rept. 1933, pt. C.

2 Downie, D. L. : Granville Lake Sheet (West Half); map 343A, Geol. Surv., Canada, 1935; issued 1936.

3 Bateman, J. D. : McVeigh Lake Area, Manitoba; Geol. Surv., Canada, Paper 45-14, 1945, p. 3.

4 Allan, J. D. : Lynn Lake Area, Northern Manitoba; Manitoba Mines Branch Preliminary map and report 46-2, 1946.

in the present report. If long-range correlation is justified, the Wasekwan is probably correlative with the Amisk, and the Sickle with the Missi Series of the Flin Flon region, in view of their respective lithological and stratigraphic similarities. The use of the term "Kisseynew Gneiss" in this report is used solely in a lithological descriptive sense, and no time or stratigraphic significance is implied. Evidence suggests, however, that within the Dunphy Lakes area the Kisseynew-type gneisses are, in part at least, metamorphosed and "granitized" equivalents of Sickle rocks.

No reliable textural or structural relationships from which formational tops could be determined were observed within the assemblage of rocks here classified as Wasekwan. As a consequence the base of the series within the map-area is not known. For the same reason it is not known whether the duplication of some of the lithologically similar units within the series is due to interbedding or to folding. Formational tops were determined locally in the Sickle sedimentary series, but in the vast majority of exposures the recrystallization and gneissic character of the rocks has effectively obliterated any determinative criteria. With one local exception, an extensive drift area occurs between formations mapped as Wasekwan and those mapped as Sickle within the map-area. An unconformity has been placed between these two rock series on the basis of more positive evidence reported from other areas.

The following table of formations lists the major rock types and summarizes the general geology of the map-area. A more detailed description of rock types, structural geology, and economic aspects are dealt with in the appropriate sections of this subsequent report.

TABLE OF FORMATIONS

ARCHAEAN or PROTEROZOIC	Intrusive Rocks	Lamprophyre (?) Pegmatite Biotite and biotite-hornblende granodiorite; granodiorite gneiss; syenite Hornblende-soda granite, quartz diorite (tonalite); quartz-rich biotite-soda granite, quartz diorite (leuco-tonalite) Hornblende-quartz diorite; hornblendite Gabbro; diorite; hornblendite; pyroxenite	
	Sickle Series	Stratiform granitoid paragneiss Hornblende-plagioclase gneiss, in part garnetiferous Quartz-biotite-plagioclase gneiss, in part garnetiferous; garnet-actinolite-cordierite-quartz-plagioclase gneiss	Kisseynew Type Gneisses
		Crystalline feldspathic quartzite; biotite, hornblende, and pyroxene granulite; stratiform granitoid paragneiss; minor pebble beds Conglomerate; minor pebble beds Feldspathic sandstone, quartzite; arkose; pebble beds; quartz-feldspar-muscovite-biotite schist and gneiss	
		Unconformity	
ARCHAEAN	Wasekwan Series	Quartz-feldspar-biotite schist, locally containing garnet and/or andalusite; quartz-feldspar-hornblende schist; argillite; grit; greywacke; impure quartzite; hornblende-biotite-epidote granulite; biotite, tremolite, actinolite, garnet, cordierite, staurolite, and sillimanite gneiss; agglomeratic (?) sedimentary rocks; minor pebble beds; minor basic flows, hornblende schist, and volcanic breccia Interbedded agglomerate, volcanic breccia, basic flows, tuff, and sedimentary schist, locally garnetiferous Andesite and basalt flows, massive, schistose, and recrystallized; hornblende schist; plagioclase amphibolite and pseudo-diorite derived from basic flows; minor interbedded tuff, sedimentary, and fragmental rocks	

WASEKWAN SERIES

Basic Volcanic Flows (1) [1]

The main belt of basic volcanic flows (greenstone) trends northeasterly from the north end of Tod Lake to the south end of Dunphy Lake, where it apparently narrows and becomes interbedded with agglomerate, breccia, and sedimentarly rocks, which are finally truncated by an intrusive granite mass. The greenstone belt likewise narrows abruptly towards the southwest. The greenstone belt south of Hatchet Lake includes some undifferentiated tuffaceous and sedimentary rocks. The wide expansion of the belt in this vicinity is probably due largely to folding, but details are lost in an extensive drift area. A second greenstone belt lies from half a mile to three miles north of the first, and is separated from it by a narrow sedimentary belt split by an intrusive body of granite. Lack of formational top evidence precludes any definite statement as to whether this belt represents an interbedded flow in a monoclinal series of volcanic or sedimentary rocks, or whether the duplication is due to isoclinal folding.

The fresher-appearing basic flows are fine-grained dark-green to black rocks having a sub-conchoidal fracture and commonly exhibiting a distinct tabularity. The weathered surface is variable with slight differences in composition and from dark grey or grey green, to buff and rusty. The basic volcanic flows have been altered mainly to dark-green and black hornblendic schists, and locally, to coarser plagioclase amphibolites and pseudo-diorite. In some flows the amphibole has developed as a coarse sub-radiate aggregate. Microscopic examination of this type shows that hornblende constitutes about 60 per cent of the rock, and is in the form of sub-oriented corroded crystals in a fine-grained granulate aggregate of andesine and some quartz. Accessory minerals are magnetite and apatite, together constituting less than 2 per cent of the section studied.

In the general vicinity of the north end of Snake Lake the basic flow assemblage is coarser and in many places very green. Minor interbeds of tuff and volcanic breccia reveal the volcanic origin in a few places, but it is locally difficult or impossible to distinguish between schistose coarse flows and a schistose altered phase of basic intrusive in the same vicinity.

Pillowed andesite (1a) was recognized only within the greenstone belt near the south shore of Dunphy Lake, but in no place were the pillows well enough formed for structural determinations.

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[1] Numbers, in parentheses, are those of the map units used on the accompanying geological map.

Specks of sulphide, largely pyrite, occur in small amounts sparsely disseminated throughout some of the basic volcanic rocks.

Included with the basic volcanic flows are minor interbedded bands and lenses of agglomerate, tuff, and sedimentary quartz-feldspar-biotite schist. Dense, fine-grained pale-yellow rhyolite was noted in one small outcrop half a mile northwest of Fox Lake, but its areal extent within the present map-area appears to be very restricted.

Interbedded Flows, Fragmental, and Sedimentary Rocks (2)

Rocks of this unit form a rather poorly defined zone in the volcanic belt south of Dunphy Lake, and consist of a series of interbedded basic volcanic flows, tuffs, breccia and agglomerate, and brown sugary quartz-feldspar-biotite schist and granulite, locally garnetiferous, of sedimentary origin. The sedimentary member of this unit resembles certain lithological types within the thicker series of sedimentary rocks grouped as upper Wasekwan.

Good exposures of agglomerate may be seen near the southeast end of Dunphy Lake, and in places consist of greyish lensy bodies about 6 inches in length, locally containing cigar-shaped amygdules of quartz or chalcedony, embedded in a greener andesitic or tuffaceous matrix. Finer agglomerate or lapilli zones occur, in which the fragments are half an inch to one inch in length. Some agglomerate beds consist of acid rhyolite fragments in a greener matrix. Garnets have developed locally within the sedimentary or tuffaceous matrix of the fragmental zones.

A variety of rock types are present in the small peninsula in the southeast bay of Dunphy Lake, where flows, agglomerates, and flow breccia are interbedded with sugary quartzitic sedimentary rocks. Locally, large blocks of basic volcanic material, up to six feet in length, lie in a brown sugary impure quartzitic matrix. Another zone is characterized by oval bodies, ranging from 3 inches to 30 inches in length, irregularly and sparsely distributed throughout a bedded impure quartzite. The bodies show concentric rim structures and commonly, a weathered hollow core, and possibly represent volcanic bombs dropped into an area of shallow sedimentary deposition. There is some doubt as to the origin of these rocks, however, and the possibilities are discussed in a later section. This area apparently reflects a period of explosive volcanic activity in the waning stages of volcanism preceding an extensive period of sedimentation. The closely interbedded and associated nature of volcanic and sedimentary rocks in this vicinity implies a continuous succession of depositional activity with no large intervening time break between the two lithological units, and is the basis for including the sedimentary series with the Wasekwan in this report.

Northwest of Fox Lake the unit consists of an assemblage of flows, tuffs, breccia, and sedimentary rocks, some of which have undergone a high degree of metamorphism to form garnet-actinolite gneisses. Pyrrhotite is disseminated throughout some of the volcanic material in this vicinity and may account wholly or partly for a magnetic anomaly noted.

Several small sill-like bodies of diorite and sills of granite or intrusive felsite are rather numerous throughout the belt, but have not been differentiated in the mapping.

Sedimentary Assemblage (3)

Two major belts of sedimentary rocks within the map-area are included in the Wasekwan Series in the present report. These lie south of the southeast bay of Dunphy Lake, and northwest of Hatchet Lake, and may represent limbs of a major anticlinal fold. The reason for including the sedimentary belt lying south of Dunphy Lake within the Wasekwan Series has already been discussed in the preceding section. The belt northwest of Hatchet Lake is included because of its apparent conformability with the greenstone belt, and because of the general lithological similarity to the sedimentary rocks of the other belt. It is not known whether the presence of certain smaller sedimentary belts within the main greenstone zone is due to interbedding or to folding.

A large variety of rock types are represented in the above belts, and include quartz-feldspar-biotite schist, locally containing garnet or andalusite; quartz-feldspar-hornblende schist; argillite; grit; greywacke; impure quartzite; hornblende, biotite, and epidote granulite; biotite, tremolite, cordierite, garnet, staurolite, and sillimanite gneiss; agglomeratic (?) sedimentary rocks; pebble and breccia beds; and minor basic flows, hornblende schist and volcanic breccia. For the most part the various rock types are intimately interbedded, and no detailed subdivision of the unit was attempted on the present scale of mapping. Wherever possible on the accompanying map, a letter subscript has been added to show either the location of areas consisting dominantly of one rock type, or the occurence of an unusual type.

In general, the sedimentary rocks classified as Wasekwan are characterized by a medium to dark grey colour, although local variations are common, as exemplified by the buff weathering granulites. Individual beds range in thickness from a fraction of an inch to 5 or 6 feet. Probably the most common lithological type is a quartz-feldspar-biotite, or quartz-feldspar-hornblende schist, with varietal phases. This rock is typically dark grey on both fresh and weathered surfaces and has developed a schistosity or tabularity which in most places reflects original bedding plane direction. In places the rock has developed a slaty parting and splits into slabs from one-eighth to one-quarter of an inch thick. The texture is fine granular to sugary, although metamorphic crystal growth locally imparts a coarser appearance to the rock. Microscopic examination of several thin sections shows the matrix to be a fine-grained mosaic of feldspar, largely untwinned, and quartz, together constituting about 50 per cent of the thin section. The feldspar is essentially plagioclase, although a minor amount of microcline was noted in one section. The plagioclase types probably differ, dependent on original composition and degree of metamorphism, but where determined, are oligoclase to andesine. Feldspar and quartz are approximately equal in abundance, though one or the other may be in excess. Biotite and hornblende are present in all specimens; relative proportions range from dominantly biotite to dominantly hornblende. Biotite occurs as small flakes oriented parallel to the bedding; hornblende occurs typically as small needles, similarly oriented. Either hornblende or biotite may locally transect the schistosity at small angles. Larger blades of hornblende commonly exhibit a poikiloblastic texture indicating their metamorphic development. Biotite and/or hornblende constitute from 30 to 55 per cent of the rock minerals in the sections examined. Original bedding within individual slides is shown by bands alternately rich and poor in ferromagnesian minerals. Minor minerals, together constituting less than 5 per cent of the section, are apatite, magnetite, zircon, titanite and epidote. Garnet has developed in some of the schists, and in one thin section studied constitutes 10 per cent of the rock minerals. The garnets are pale pink euhedral metacrysts, about one-tenth of an inch across, and contain small amounts of quartz. In a few places the schists contain poorly developed cigar-shaped nodules half an inch long which are believed to be andalusite, but positive identification by microscopic examination was not made. Most of the quartz-feldspar-biotite and quartz-feldspar-hornblende schists are believed to represent metamorphic facies of original argillites, argillaceous grits, greywackes and impure quartzites.

Pale-grey to buff granulites (3a) occur at several horizons throughout the main body of sedimentary rocks. Most show little evidence of bedding, and are massive dense rocks commonly resembling intrusive aplite or felsite, and it is probable that some intrusive felsites have been included in the mapping of this unit. In other places the granulites have developed a schistose or "pencil gneiss" structure. Probably the granulites represent purer, more feldspathic phases of the quartz-feldspar-biotite-hornblende schists. Microscopic examination of thin sections shows a fine-grained feldspar-quartz matrix, constituting as much as 75 per cent of the section. In most sections the feldspar component of the matrix is dominant, the quartz content being as low as 15 per cent. Untwinned plagioclase is the usual feldspar, but microcline is present in some sections. Hornblende needles are invariably present, and constitute 20 to 25 per cent of the section; biotite is seen in some sections. The granulites are characterized by a considerable development of epidote, as granular aggregates distributed throughout the matrix, and constituting as much as 10 per cent of the thin section. Minor minerals include carbonate and fine white mica. One or two small crystals of smoky tourmaline were noted in one section. It is believed that most of the rocks mapped as hornblende-epidote granulite are sedimentary in origin, but some igneous granulites may be included. The granulites northeast of the south end of Snake Lake are cut in places by sills and dykes of aplite.

Advanced grades of metamorphism are represented by biotite, tremolite, actinolite, garnet, staurolite and sillimanite gneisses (3b). Excellent exposures of gneiss occur on the islands in the central part of Snake Lake on the east mainland immediately opposite, and at a place half a mile farther south. The distribution of the gneisses is erratic; they do not appear to form any traceable, recognizable horizon. The tremolite gneiss is a medium-grey massive tough rock containing numerous fine radiate needles of pale bronz tremolite in a fine-grained matrix of quartz and feldspar. Tremolite constitutes about 30 per cent of the rock mass and the quartz-feldspar matrix about 50 per cent. Biotite makes up less than 8 per cent of the whole. Small quantities of a mineral, tentatively identified as cordierite, is present; accessory minerals include magnetite and sillimanite. The original rock may have been a feldspathic sandstone having a dolomitic or magnesian limestone cement. The place of tremolite has been taken in some of the gneisses by a coarse green radiating amphibole, probably actinolite, presumably produced by reaction of tremolite with ferruginous impurities under conditions of advancing metamorphism. Individual amphibole crystal clusters have attained lengths as much as two inches, and constitute about 60 per cent of the rock mass.

The garnet-biotite gneiss is a light-grey to brown sugary rock containing an abundance of flaky biotite and well-formed dodecahedral crystals of pink to red garnet distributed throughout a quartzose matrix. Most of the garnets are from one-eighth to one-quarter of an inch across but some are as much as one inch. All gradations from a garnet-biotite gneiss, through garnet-biotite-staurolite gneiss and staurolite- biotite gneiss, to sillimanite-biotite gneiss are present within very restricted areas. As all of these can be found within an area of a few hundred square feet, the type of metacryst developed probably reflects slight compositional differences in the original rock, rather than a differing degree of metamorphism. The staurolite-sillimanite gneiss is a light-grey, sugary rock containing abundant biotite oriented in parallel planes imparting a rough fissility. Numerous brown diamond-shaped staurolite metacrysts half an inch long, transect the gneissosity at all angles. Thin section examination shows that the matrix, which constitutes about 45 per cent of the rock section, is essentially all quartz. Staurolite is present as large poikiloblastic metacrysts containing quartz and biotite. Abundant biotite in oriented flakes and aggregates has been partly replaced by sillimanite which forms knots of felted matted fibres. Minor constituents include apatite, magnetite and chlorite. Chloritic (penninitic) alteration of the biotite probably represents retrogression following high grade thermal metamorphism. The sillimanite-biotite gneiss is similar in appearance to the staurolite gneiss described above, but the metacrysts are indefinite knots of bluish-grey sillimanite, one-quarter of an inch across. Thin section examination shows that the sillimanite, which constitutes about 15 to 20 per cent of the rock, consists of a central mass of felted fibres with a peripheral rim of needles projecting into the surrounding minerals. It is probably the fibrolite variety of sillimanite. Abundant biotite is present as medium-sized flakes containing numerous pleochroic haloes produced by radioactive emanations from small zircon crystals. Accessory and minor secondary minerals include magnetite, apatite, zircon, chlorite, and muscovite. The above gneisses have been derived by high grade metamorphism of argillaceous sandstones.

Pebble beds and breccia beds (3c) are local in extent, and were noted in two or three outcrops at the southeast part of Dunphy Lake. They are of two types. The first consists of closely spaced rounded to sub-angular and angular pebbles and fragments one-quarter to three-quarters of an inch long embedded in a sugary grey biotite-rich matrix. The fragments themselves, essentially all of one type, are fine-grained felsite or quartzite. Smaller, more basic fragments occur locally in the matrix. The second type of pebble bed may be seen at the extreme south tip of Dunphy Lake, and occurs as narrow six-inch beds containing numerous pebbles of quartz, from one-quarter to one-half of an inch long, interbedded with impure quartzites and garnetiferous quartz-feldspar-hornblende-biotite schists. Both types of pebble beds appear to be narrow, local, and lensy interbeds within the main sedimentary belt.

Agglomeratic (?) sedimentary rocks (3d) have already been discussed in a preceding section; as mentioned, there is some doubt as to their origin. In general they consist of round to oval inclusions, from 3 inches to 30 inches long, sparsely and irregularly distributed throughout fine-grained brown to grey sugary impure quartzites or quartz-feldspar-biotite schists. Most of the inclusions have a more resistant acidic rim and a less resistant central portion weathered to a hollow core. The general appearance resembles concretionary structures. The bedding however, bends around the structures, a feature suggestive of contemporaneous deposition with the sedimentary matrix. In the vicinity of the southeast part of Dunphy Lake these inclusion zones are in close proximity to interbedded sedimentary rocks, volcanic flows, and agglomerates. The structures may thus represent pyroclastic material blown out by explosive volcanism into an area of shallow sedimentation. A third alternative is that the zones represent true conglomerates. If so, it is an unusual type of conglomerate with the following features: (1) the inclusion material is uniform in type and appears to have a certain concentricity of mineral composition as exemplified by rim and hollowed core; (2) the distribution within the sedimentary matrix is sparse and erratic; (3) the enclosing sedimentary rock is uniformly fine-grained. A somewhat similar zone occurs about 1,000 feet south of Snake Lake, but at that point the inclusions consist entirely of buff to pink sugary material containing numerous small hornblende needles. The central portions of these inclusions have altered extensively to pistachio-green epidote. The inclusions are as much as 8 inches across, and have an erratic and sparse distribution throughout a grey sugary quartz-feldspar-biotite pencil-gneiss, presumably of sedimentary origin.

Narrow flows of basic volcanic rock (3e) are present to minor extent within the sedimentary belt. The volcanic material is represented largely by hornblende schists, and less commonly, by volcanic breccia.

Details of structure within the Wasekwan sedimentary belts are not known. In the rocks south of the southeast bay of Dunphy Lake, there is some suggestion that tops face to the south, but the evidence is not conclusive. Elsewhere, no positive reliable data on formational tops were obtained, and consequently the amount of isoclinal folding within the sedimentary belts, if any, is not known.

SICKLE SERIES

Within the present map-area, Sickle sedimentary rocks have been separated from Wasekwan largely by their differing lithological character. They are typically light, buff to pink feldspathic rocks as compared with the dark-grey impure arenaceous rocks of the Wasekwan. In no place were the two types seen in contact, owing to extensive intervening areas of overburden. An unconformity has been placed between them on the basis of more positive evidence reported from other areas. On an island in the north part of Tod Lake, an exposure of rather pure quartzite, arkose, and pebble beds containing vein quartz and pink granitic pebbles, has been mapped as Sickle. These rocks are in contact with volcanic greenstones mapped as Wasekwan, with an intervening drift depression 10 feet wide. At this locality the attitudes of both the volcanic and sedimentary formations are identical in strike and dip. The quartzites are sericitic and somewhat sheared, but not strongly so. The 10-foot wide drift area may, however, be underlain by a shear zone, and the apparent conformable contact between the formations may actually be a faulted contact between them.

The presumed basal member of the Sickle series within the Dunphy Lake area consists dominantly of pebble-bearing sericitic quartzites, pebble beds, and arkoses. The definite conglomerate horizon which wends across the area does not appear to be basal. The Sickle series has been subdivided in the present mapping into several lithological types. Two of these, namely units 4 and 7, in places pass rather gradually from one to the other, although type specimens are quite distinct. These units are variable in thickness from place to place, and as one unit narrows or lenses out rapidly, the other increases in thickness proportionately. Repetition of lithological types is probably due largely to this interfingering association, although a certain amount of isoclinal folding has occurred. With few exceptions, the area is devoid of structural or textural features reliable enough to use in the determination of formation tops. With increasing degree of recrystallization, the feldspathic quartzites of unit 7 south of the Laurie River approach a granitoid paragneiss lithologically quite similar to granite gneiss. The granitoid paragneiss of unit 10 is believed to consist largely of coarsely crystalline phases of units 7 and 4, intruded by varying amounts of granitic igneous material. Owing to the transitional nature of these rocks, designation as one or the other in certain areas is necessarily arbitary.

Feldspathic Sandstone, Quartzite, Arkose, Pebble Beds (4)

Rocks of this unit occur chiefly along a belt running through Crichton, Pyta and Arc Lakes, and lithologically similar rocks appear to both underlie and overlie a conglomerate horizon. Outcrops throughout this belt are few, the land being generally low-lying and covered with sand and boulder deposits. The exposures north of the conglomerate band are largely micaceous quartzite and pebble beds, with lesser feldspathic sandstone and quartzite; the exposures south of the conglomerate belt, in the vicinity of Crichton Lake, are dominantly micaceous feldspathic sandstone or quartzite. Good exposures of pebble beds and arkosic quartzite may be seen along the portage trail between Snake and Pyta Lakes, and on the island in the north part of Tod Lake. The rocks are grey- to pink-weathering schistose quartzites containing abundant muscovite and biotite. The arkose contains quartz and feldspar grains and fragments as much as one-quarter of an inch across. Pebbles of quartz and pink or buff felsite, mostly less than an inch across, are scattered sparsely throughout, and in places constitute pebble beds. On the island in Tod Lake the pebbly arkose in places contains pebbles of vein quartz some of which are 4 inches across, but the majority of pebbles are less than an inch across. Pebble beds, arkose, and quartzite are intimately interbedded. North of Arc Lake, and in the vicinity of Crichton Lake, the sedimentary rocks are generally finer grained and friable sugary grey to pink micaceous feldspathic quartzite schists, having a distinct tabularity parallel to micaceous layers. Thin section examination shows that from 65 to 70 per cent of the rock is a feldspar-quartz mosiac. In general, feldspar is slightly in excess of quartz. Both twinned plagioclase and microline are present, but the majority of the feldspar is untwinned. Mica constitutes from 25 to 30 per cent of the section. Both muscovite and biotite are invariably present, one variety locally assuming dominance over the other. Minor accessory minerals include magnetite and apatite. Magnetite is common as uniformly distributed grains throughout the matrix, and in one thin section, made up 5 to 7 per cent of the whole.

'Granitized' Arkose, Migmatite, etc. ([illegible])

This lithologic unit is not well defined and appears to be to some extent the effect of extensive granitization on original feldspathic quartzites and arkose, although much of the unit is believed to be dominantly recrystallized and sheared original arkosic quartzite. The rocks reflect a regional schistosity characterized by an extensive development of muscovite and biotite, which however, imparts only a weak laminar habit; locally a coarse tabularity resembling bedding has developed. Other points of evidence of sedimentary origin for much of the zone are the local development of knots up to 1½ inches across, composed largely of muscovite, and a few isolated pebbles. The unit has been intruded by considerable amounts of pegmatite in dykes, stringers and irregular bodies. The extensive permeation of the feldspathic quartzite and arkose by igneous emanations has given an igneous appearance to much of the sedimentary rocks, and it commonly proves difficult to distinguish rocks of sedimentary origin from those of igneous origin. Northwest of Kukri Lake much of the belt consists of highly contorted migmatite gneiss, an intimate admixture of sedimentary and intrusive material. Contacts between unit 5 and unit 4 in this vicinity are mostly gradational. The assymetric dome-like structure implied by the mapping probably represents the roof of an underlying granite plug which has caused the intense crenulation and shallow folded structures in the sedimentary rock roof pendant. Characteristically, rocks of this zone are grey to pink, and have a friable coarse sugary to granitoid texture. Microscopic examination shows that feldspar (both oligoclase and microcline) forms from 40 to 50 per cent of the rock, quartz about 35 per cent, muscovite and biotite about 15 per cent, and that magnetite and apatite occurs as accessory minerals. In some specimens, quartz is considerably more abundant than indicated above. The percentage of microcline is appreciably higher than in the feldspathic sandstones, but this may be due to later potash introduction from pegmatitic solutions. A fine disseminated red iron oxide accounts for the colour of the pink feldspathic quartzites.

Conglomerate (6)

A narrow sinuous belt of conglomerate winds across the area and appears to be remarkably continuous. There are a few sections in which outcrops are absent and along which the continuity is assumed, but for much of the belt outcrops are sufficiently numerous to justify the projection of the contacts. The apparently intense folding of the belt in the eastern part of the map-area is more apparent than real, and is caused by erosional truncation of relatively gentle fold structures plunging to the east.

The conglomerate typically consists of closely spaced pebbles and boulders, in a grey, greenish or pink, squeezed arkosic or pebbly matrix. In places the matrix has been recrystallized into a rock lithologically very similar to granite. Most of the pebbles and boulders are of pink to buff aplite, granite, quartz porphyry, and felsite. The granite boulders do not resemble closely any of the granitic bodies exposed in the area. Other pebbles and boulders include white pegmatitic and vein quartz, pink pegmatite, black quartz, hematitic iron formation, hornblende gneiss, and grey chert probably derived from iron formation. The conglomerate on Hatchet Lake is rather similar in appearance to that of the main belt farther south. Pebbles in the conglomerate at Hatchet Lake average half an inch by two inches, but some are as large as three inches by five inches. Most are pink and grey felsite, granite, and white quartz, embedded in a grey-green to pinkish matrix. At this locality the conglomerate passes northwards into a narrow belt of rather pure quartzite similar to the type found on the small island at the entrance of the Laurie River into Tod Lake, on the western extension of the above belt. This narrow conglomerate-quartzite belt lies between two volcanic greenstone belts, presumably Wasekwan in age. The repetition of formations has been interpreted as the result of faulting, on the evidence of a strong shear zone at the western end of a small bay half a mile west of the map-area.

Crystalline Feldspathic Quartzites and Granulites (7)

Rocks of this unit form a rather distinct lithological type, though, as already mentioned, they are in places interbedded with, or pass gradationally into, feldspathic sandstones and quartzites of unit 4. Where more completely recrystallized, they form granitoid paragneiss of the type included in unit 10, and are commonly difficult to distinguish from intrusive granitic gneiss.

Generally speaking, the degree of crystallinity in rocks of this unit increases to the south and towards the southeast. The less crystalline phases are very fine-grained grey brown or purplish feldspathic quartzite in most places showing bedding planes. Thin section examination shows them to consist largely (about 75 per cent) of a fine-grained granoblastic mosaic of feldspar and quartz. The feldspar is both microcline and oligoclase. Quartz is subordinate in amount to the combined feldspars, and constitutes about 20 to 30 per cent of the thin section. Mica, both biotite and muscovite, and some chlorite, constitute from 15 to 20 per cent. Biotite occurs both alone and in association with the other minerals. Muscovite in places is present to a greater extent than biotite. Magnetite is distributed as small grains throughout the matrix; minerals occurring in minor amounts are apatite, carbonate, and zircon. The fine-grained variety is interbedded with coarser, more crystalline feldspathic quartzites or granulites which are aplitic in appearance. Bedding within these latter rocks is not so distinct, although a coarse tabular bedding-plane parting has commonly developed. These rocks are pink to greenish and grey, and have a fine granitoid texture. Microscopic examination shows that the mineral content is essentially the same as in the finer quartzites, and consists of: feldspar-quartz mosaic, 65 to 75 per cent; mica (biotite, with or without muscovite and chlorite), 20 to 25 per cent; magnetite, about 4 to 8 per cent; minor minerals, including apatite, zircon, and carbonate, usually less than 2 per cent. Biotite is the characteristic mica, though locally muscovite is slightly in excess. In one section studied, hornblende is the only ferromagnesian mineral present, and constitutes 25 per cent of the section. The quartz content is subordinate to the combined feldspars, and forms 20 to 30 per cent of the rock. The feldspar consists of both microcline and oligoclase, one or the other being present in excess. In accordance with the crystalline nature and the common lack of gneissic or schistose structures, many of these rocks can be classified as biotite and hornblende granulites. Analysis[1] of a typical specimen of hornblende granulite from the belt south of Pyta Lake gave the following results:

H_2O-	0.05
H_2O+	0.3
SiO_2	65.7
Al_2O_3	15.8
TiO_2	0.8
Fe_2O_3	3.1
FeO	1.1
CaO	5.6
MgO	0.3
BaO	Nil
K_2O	5.1
Na_2O	1.5
P_2O_5	0.4
MnO	Trace
CO_2	$>$Trace
Cl	Nil
F	Nil
	99.75

The carbonate percentage given above is a qualitative estimate, and may be as great as 0.5 per cent, as some carbonate was noted in microscopic examination. Similarly, chlorine and fluorine will be present in minor amounts as apatite was also observed.

Rocks of this unit in the vicinity of Talon Lake and south of the Laurie River become generally more crystalline and coarser grained owing to advancing metamorphism. Higher grade metamorphism in the feldspathic quartzites has resulted primarily in an increase in grain size of the original constituent minerals rather than in the development of typically metamorphic minerals by chemical interaction. The grade of metamorphism is at least in the garnet zone as shown by associated garnetiferous hornblende-plagioclase gneiss. These highly crystalline granulites and paragneisses are pinkish

1 Analysis performed by Vladimir Mackiw, Mines Branch, Department of Mines and Natural Resources, Winnipeg, Manitoba.

to greenish medium-grained crystalline rocks, commonly very granitoid in appearance. Distinct gneissic banding is more common in these biotite and hornblende granulites and paragneisses than in the less recrystallized types. There is no distinct change from granulite and paragneiss of unit 7 to paragneiss of unit 10. The differentiation is one based primarily on degree of metamorphism, and the geological designation as one or the other is necessarily arbitrary over quite extensive areas. Microscopic examination of a thin section of a specimen from the west shore of Talon Lake, lithologically very similar in appearance to the other gneisses, shows the development of small, pale-green, blocky pyroxene crystals, believed to be diopside, which form about 8 to 10 per cent of the section. The rock is a pyroxene granulite probably derived from a calcareous feldspathic quartzite.

The feldspathic quartzites and granulites have been intruded by numerous pegmatite dykes. The pegmatites in a small area southeast of Conglomerate Lake have been mapped in detail to show the complexity of pegmatite intrusion.

A rather extensive, but poorly defined, lensy pebble-bearing zone (7a) occurs within the feldspathic quartzites at or near the south shore of the Laurie River in the western half of the map-area. Most of the pebbles are from one-half to one inch across, commonly closely spaced, and consist of quartz and pinkish aplite in a pink to greenish matrix. The pebble zone is associated with a fine-grained purplish feldspathic quartzite. The appearance and association is very similar to the narrow pebbly zone near the contact of feldspathic quartzite and conglomerate in the vicinity of Arc and Conglomerate Lakes. This pebble zone may thus represent the conglomerate zone in this vicinity, thereby indicating the other limb of a major fold, but the evidence is not strong enough to establish this presumption. It may represent a pebble-bearing zone well up in the sedimentary sequence.

Quartz-Biotite-Plagioclase Gneiss (8)

Quartz-biotite-plagioclase gneiss occurs as beds associated with hornblende-plagioclase gneiss and interbedded with a series of stratiform granitoid gneiss and igneous gneiss in the southeast corner of the map-area. The whole assemblage constitutes a series of gneisses of Kisseynew type.

Quartz-biotite-plagioclase gneiss is typically a light- to medium-grey sugary-textured rock, the mineral grains of which are about one-tenth of an inch across. The relative amount of quartz is variable. Some specimens are obviously a bedded feldspathic quartzite, in which quartz constitutes 50 to 60 per cent of the rock mass; in most specimens the quartz content is lower. Microscopic examination of a specimen considered to be typical, gave the following estimated mineral content: feldspar (oligoclase), 45 per cent; biotite, 30 per cent; quartz 24 per cent; and magnetite, 1 per cent.

Much of the feldspar is untwinned basic oligoclase. Biotite occurs as dark brown strongly pleochroic sub-oriented flakes throughout the rock. A minor amount of magnetite has developed along cleavage planes in the biotite. The rock appears to have been originally an impure feldspathic quartzite. The gneiss grades in places into a quartz-biotite schist. Small red garnets have formed in places.

In at least one locality the quartz-biotite-plagioclase gneiss is associated with a pale green recrystallized rock consisting largely of carbonate and pale green diopside (?), presumably derived from an impure limestone. The occurrence of the pyroxene-carbonate rock is limited in extent, and could not be traced for any distance.

Garnet-actinolite-cordierite-quartz-plagioclase gneiss (8a) has been mapped as a phase of the quartz-biotite-plagioclase gneiss, though it may be more closely allied to the hornblende-plagioclase gneiss (9). It is typically a coarse streaky gneiss containing abundant coarse garnet and radiating amphibole crystals. Some poorly formed red garnet crystals are as much as an inch across, others are in clusters as much as two inches in diameter. The abundance of garnet gives a distinctive red colour to the rock in places. Radiating actinolite crystals in clusters as much as one and one-half inches long in a matrix of quartz and plagioclase are common. Microscopic examination of a somewhat finer-grained type gave the following approximate mineral percentages; garnet, 35 per cent; quartz, 35 per cent; amphibole (actinolite) with minor biotite, 18 per cent; plagioclase (oligoclase), 8 per cent; magnetite, 3 per cent; minor minerals(chiefly apatite), 1 per cent. The garnet is pale pink in thin section, and occurs as irregular grains with a poikiloblastic texture, commonly clustered around magnetite grains and aggregates. The biotite appears to be an alteration of the amphibole, and in some specimens is abundant. Amphibole locally forms up to 60 per cent of the rock mass, and such a rock closely resembles the actinolite gneiss described under Wasekwan sedimentary rocks. In one or two localities a clear deep blue to violet cordierite occurs, which shows, in chip fragments, a well-pronounced dichroism from deep blue to straw yellow. This garnet-actinolite-cordierite-quartz-plagioclase gneiss forms an excellent horizon marker in the southeast part of the map-area, which helps to delineate the major drag-fold structure.

Hornblende-Plagioclase-(Garnet) Gneiss (9)

Hornblende-plagioclase gneiss and hornblende-plagioclase-garnet gneiss occur individually and in association with the quartz-biotite -plagioclase gneiss described above. They are typically medium-grained, black and white rocks having a salt-and-pepper appearance, and consisting essentially of glistening crystals of hornblende and granular plagioclase and minor quartz. Some phases of this unit are strongly garnetiferous and may or may not show banding suggestive of bedding. In places, the banded garnetiferous hornblende-plagioclase gneiss contains ovoid concentric structures about 12 inches by 7 inches, which may represent pillow structures in a volcanic flow or concretionary structures in a sedimentary rock. The original nature of the structures has been obliterated by metamorphism. In places recrystallization has advanced to the point where the rock has assumed a dioritic appearance. It is possible that some basic intrusive material has been included in the mapping, but it is believed that the majority of the basic material is a metamorphic pseudo-diorite. Thin section examination of a garnetiferous phase, somewhat lower in hornblende than the average, gave the following estimated mineral percentage plagioclase (oligoclase) and minor quartz, 45 per cent; hornblende, 33 per cent; garnet, 17 per cent; magnetite and minor apatite, 5 per cent. The garnet occurs as numerous well-formed metacrysts one-eighth of an inch in diameter, in places containing plagioclase, chloritic material, quartz and magnetite. Magnetite is abundant both as inclusions within the garnet and as grains associated with the amphibole.

Stratiform Granitoid Paragneiss and Associated Igneous Gneiss (10)

Rocks of this unit have been described to some extent under the description of the granitoid paragneiss of unit 7. It was noted that in certain areas, the designation of the rock formation as paragneiss of unit 7 or unit 10 is purely arbitary, as the differentiation between the two is based largely on the degree of metamorphism. Some areas within the paragneiss of unit 10 more closely resemble typical recrystallized feldspathic quartzite of type 7, and vice versa. More detailed mapping would be necessary to differentiate the types. In general, the paragneisses of unit 10 appear to be recrystallized, "granitized", and injected equivalents of the less metamorphosed feldspathic sandstone, feldspathic quartzites, and granulites of units 4 and 7, intruded by considerable igneous granitic material as injection, lit-par-lit, and migmatite gneisses. No differentiation was attempted on the present scale of mapping, and in many places it is almost impossible to distinguish between an intrusive gneiss and a granitoid paragneiss. Pegmatite intrusives are numerous throughout this area. The gneisses of unit 10, both igneous and sedimentary, are characteristically medium-grained pink to greyish rocks having a granitoid texture. Both biotite- and hornblende-bearing phases occur. From thin sections examined, some of the granitoid gneisses are seen to be essentially the same in mineral composition and amount as the specimen described under granitoid paragneiss of unit 7. Chemical analyses[1] of two

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1 Analyses performed by Vladimir Mackiw, Mines Branch, Department of Mines and Natural Resources, Winnipeg, Manitoba.

specimens lithologically resembling paragneiss of unit 7 gave the following results:

H_2O-	0.00	0.05
H_2O+	0.40	0.30
SiO_2	60.5	62.7
Al_2O_3	18.4	13.7
TiO_2	0.7	0.7
Fe_2O_3	3.4	4.3
FeO	2.5	1.1
CaO	5.4	4.6
MgO	0.5	0.2
BaO	Nil	2.1
K_2O	5.4	8.6
Na_2O	1.9	0.8
P_2O_5	0.4	Nil
MnO	Trace	Trace
CO_2	Trace	0.5
Cl	Nil	Nil
F	Nil	Nil
	99.5	99.65

Remarks made about CO_2, Cl, and F, for the analysis of the specimen of feldspathic quartzite described in a previous section apply also to these analyses. The general similarity between the chemical composition of these two rocks and the one tabulated previously, indicate a close genetic relationship. The chemical differences are chiefly in the amount of Al_2O_3 and SiO_2, both of which probably reflect the original proportion of feldspar in the feldspathic quartzite. The higher percentage of K_2O in one specimen may be due to a higher original potash feldspar content of the sedimentary rock, or it may be due to potash introduction by igneous emanations. The relatively high BaO content of one specimen is believed to reflect the presence of barite in the cement of the original sedimentary rock.

Microscopic examination of several thin sections of more granitic-appearing paragneiss gave the following ranges of mineral content: feldspar (oligoclase and microcline), 45 to 55 per cent; quartz, 20 to 45 per cent; hornblende and/or biotite, up to 25 per cent; minor minerals, including magnetite, titanite, apatite, and zircon, up to 5 per cent. The rock is commonly high in microcline. Both oligoclase and microcline are invariably present, either one of which may be the predominant mineral. Minor minerals are more coarsely crystallized than in the feldspathic quartzites.

As already mentioned, undifferentiated granitic gneisses, lit-par-lit gneisses, and migmatite are included with the above granitoid paragneisses.

INTRUSIVE ROCKS

Gabbro, Diorite, Hornblendite, Pyroxenite (11)

The basic intrusives within the present map-area have been grouped together as one unit, although the possibility of more than one age of basic intrusive is not overlooked. There is no positive evidence that more than one age exists, although the lithology is variable. Several lithologic types have been noted in a basic body without obvious cutting relationships, and these types are assumed to be phasal variations of a single intrusive. One body may include gabbro, diorite, and hornblendite. Some exposures are of fresh-appearing crystalline basic rocks, others are of highly altered material. It is not known whether this reflects an age difference or merely varying degrees of metamorphism or hydrothermal alteration within the same body.

The main body of basic intrusive lies north of Pyta Lake. Various sills and stocks lie mainly within the region mapped as Wasekwan sedimentary rocks, from Pyta and Snake Lakes northeastwards to the eastern boundary of the map-area.

Outcrops of the basic rock having the freshest appearance may be seen at the southeast end of Dunphy Lake. Similar rock forms a large part of the main body north of Pyta Lake, and elsewhere. It is typically a compact medium-grained rock consisting essentially of hornblende and plagioclase. The surface weathers a mottled black and white or green and white. Microscopic examination shows that although the rock is fresh in appearance, actually it is considerably altered. Study of two thin sections indicated the following mineral content: in the one: hornblende, 65 per cent; andesine-labradorite, 20 per cent; epidote and magnetite, 15 per cent; in the other: hornblende, 60 per cent; labradorite, 35 per cent; titanite and magnetite (or titaniferous magnetite), 5 per cent. The amphibole is present as green, frayed to bladed crystals in which varying degrees of chloritization have occurred. Granular epidote have developed from the plagioclase. Titanite forms blocky areas composed of granular aggregates. The above rocks are slightly altered hornblende gabbro.

Several textures and various degrees of alteration have occurred even within the same intrusive body. A common type is a somewhat sugary more altered black and white diorite or gabbro, locally schistose. A garnetiferous phase of this altered diorite or gabbro occurs near the southwest shore of Wolf Lake. A development of coarse secondary amphibole may be seen in a basic intrusive body about 3,000 feet southeast of the southeast end of Dunphy Lake. In this body, feathery amphibole crystals as much as half an inch long produce a typical rough weathered surface.

A more basic and more highly altered phase is exposed north of Wolf Lake, and at the northern part of Snake Lake. This rock is typically a squeezed to massive, green and white or black and white, medium-grained rock, and is commonly difficult to distinguish from a squeezed recrystallized basic flow. In places this body contains a pale green pyroxene. Thin section examination shows this rock to be a pyroxenite or augite gabbro (11a), in various stages of alteration. Examination of a specimen from the northern part of Snake Lake gave the following mineral content: pyroxene (augite), 50 per cent; biotite, 35 per cent; feldspar and quartz and minor carbonate, sericite and magnetite, 15 per cent. The pyroxene forms large crystals fractured into lensy areas by crushing and shearing. Biotite is present as numerous fine-grained dark-red flakes concentrated in lensy zones alternating with pyroxene-rich zones. A minor amount of microcline is present. A more highly altered specimen from north of Wolf Lake gave the following approximate mineral composition: augite, 30 per cent; amphibole, 45 per cent; alteration products (carbonate, quartz, chlorite, magnetite, and a shimmer aggregate possibly tremolite and talc), 25 per cent. In this specimen the augite occurs as optically oriented remnants of original larger crystals lying in a mass of alteration products consisting of a confused aggregate of green amphibole or a fine-grained mass of chlorite, carbonate, tremolite, and talc. This rock represents a pyroxenite or augite gabbro in which hydrothermal alteration has been extensive.

Extreme reconversion of the pyroxenite has occurred in one or two narrow zones between Wolf Lake and the lake lying immediately to the north. In these zones the rock is grey very tough and massive, and consists largely of a felted mass of fine neutral-coloured amphibole needles (11b). Microscopic examination gave the following mineral content: tremolite with talc, 90 per cent; minor minerals (including magnetite, epidote, sulphide and labradorite), 10 per cent. The major portion of the rock consists of a felted aggregate of radiating tremolite needles, with which is associated flaky talc. Grains or octahedra of magnetite and grains of epidote occur throughout the rock section. It is believed this tremolite-talc rock represents extreme hydrothermal alteration of the ultrabasic pyroxenite or augite gabbro, along zones of fracturing or shearing.

Most of the basic intrusives are high in hornblende. Locally the hornblende content increases to the stage where the rock is a hornblendite or a plagioclase hornblendite (11c). Hornblendite is well exposed on a small island in the northeast part of Dunphy Lake. The rock is massive dark green to black, and consists essentially of closely spaced blocky hornblende crystals in a matrix largely hornblende, but with varying amounts of plagioclase. Microscopic examination gave the following mineral content: hornblende, 90 per cent; minor minerals(including labradorite, quartz, carbonate, biotite, epidote, sulphide, magnetite, and titanite), 10 per cent. Locally, the labradorite content increases to 20 per cent. A few of the hornblende crystals show internal relict structures probably originally pyroxene, and the hornblendite may thus represent a pyroxenite or pyroxene gabbro in which the pyroxene has been converted almost entirely to hornblende.

Few sulphide minerals were seen in the basic intrusive rocks, although small amounts of fine disseminated pyrrhotite do occur in places. An assay made on some of this material failed to reveal the presence of nickel.

The basic intrusive rocks within the Dunphy Lake map-area lie almost entirely within the Wasekwan greenstone-sedimentary belt. It is thus difficult to tell whether the intrusive is earlier or later than the Sickle sedimentary rocks. The contact between gabbro and Sickle sediments north of Pyta Lake is based on a few isolated outcrops,and no contact relationship was seen. A small basic body east of Pyta Lake does cut Sickle sedimentary rocks, and lithologically, is very similar in appearance to certain phases of the main body of basic rock. From this information, and from the lack of boulders of basic intrusive rock in the Sickle conglomerate, the basic intrusives are here classified as post-Sickle. However, as has been pointed out, lithological differences within the gabbroic and dioritic rocks represent either phasal varieties of a composite body or intrusives of more than one age. If the latter concept is true, then some of the intrusive rocks may be pre-Sickle in age, but no positive evidence was found to support or deny this within the map-area.

Hornblende-Quartz Diorite (12)

The largest body of quartz diorite exposed within the area lies north of Dunphy Lake, where it appears to form the more basic marginal zone of an extensive body of hornblende-soda granite or quartz diorite lying to the west. Contacts between these two rock types are gradational, and have been based largely on lithological appearance and relative amounts of hornblende. The quartz diorite is characteristically a medium-grained grey granitoid rock, with an appreciable hornblende content. In general the quartz content is rather low. Thin section examination of a typical specimen indicated the following mineral content: plagioclase (andesine), 60 per cent; hornblende, 24 per cent; biotite, 5 per cent; quartz, 8 per cent; minor minerals, consisting largely of magnetite or titaniferous magnetite, and titanite, apatite, and epidote, 3 per cent. Zoning is seen in the plagioclase. The andesine is present both as large twinned crystals and as smaller fractured crystal fragments, indicating a certain amount of crushing of the rock. A slight to moderate degree of crushing gneissosity is a common characteristic of this body. Granular titanite is present clustered around central cores of titaniferous magnetite. In altered phases of the quartz diorite, varying amounts of chlorite and epidote have developed from the hornblende and plagioclase.

The plug of quartz diorite west of Snake Lake is similar to the rock described above but is generally more altered, and the quartz content is commonly higher. Small sparsely distributed red garnets have been noted in one or two exposures of this body.

The western tip of the body of granodiorite exposed at the southern end of Dunphy Lake is quartz diorite. The change of composition is probably due partly to assimilation and partly to earlier crystallization of the more basic marginal phase of the granodiorite. The lithological similarity of the quartz diorite to the quarts diorite described above may indicate a genetic relationship between the white soda granite and the buff to pink grandiorite, however the lithological similarity may prove to be more apparent than real.

Exposures of a black hornblendite (12a) or plagioclase hornblendite are associated with a body of quartz diorite lying west of Caldwell Lake. The rock is massive, and has a blocky development of black glistening hornblende crystals with a minor amount of interstitial rusty feldspar. It is possible this hornblendite, although blacker, may be related to the hornblendite described above (11c).

Granitic Rocks (13)

A variety of lithological types have been grouped together under the general classification of granitic rocks, although it is doubtful if any true granite occurs within the map-area. Wherever possible an approximate or assumed contact has been drawn to delineate major areas consisting predominantly of one or another lithological type although several of these defined contacts represent approximate mid-points on gradational zones. With the exception of small bodies and sills of granite and granite gneiss within the Sickle sedimentary rocks and paragneisses, most of the acid intrusive rocks lie within the northern half of the map-area. The main lithological variations are described below.

White hornblende-soda granite or quartz diorite (13a) is the predominant granitic rock type within the area. It underlies an extensive part of the area northwest of Dunphy Lake, and also forms a body in the vicinity of Hanna Lake. It is uniform, characteristically a massive medium- to coarse-grained white hornblende-soda granite or quartz diorite, with a varying, but usually subordinate, amount of biotite. Microscopic examination of a typical specimen gave as constituent minerals: plagioclase (acid andesine), 60 per cent; quartz, 18 per cent; hornblende, 13 per cent; magnetite, 4 per cent; biotite and chlorite, 3 per cent; minor minerals, (largely apatite and titanite) 2 per cent. The plagioclase probably varies within the body from oligoclase to andesine. Etching with hydrofluoric acid fumes and staining with sodium cobaltinitrite failed to reveal the presence of potassium within the feldspar. The hornblende is dark green and strongly pleochroic. Magnetite is associated chiefly with the hornblende, and is quite abundant. Granular aggregates of titanite are sparsely distributed, and are commonly clustered around the magnetite which is probably titaniferous. The above rock, classified here as a soda granite, is actually closer to a quartz diorite or tonalite.

A distinctive white, quartz-rich soda granite (13b) underlies a part of the area in the vicinity of Kerby Lake. It is characteristically white, rich in quartz and low in ferromagnesian minerals. Biotite is essentially the only ferromagnesian mineral present, although hornblende appears in places. Microscopic examination of a typical specimen indicates a mineral content of: plagioclase (oligoclase), 53 per cent; quartz, 42 per cent; biotite, 3 per cent; minor minerals(essentially epidote and magnetite) 2 per cent. The plagioclase occurs as crystals as much as one-quarter of an inch long, showing Carlsbad, albite, and pericline twinning. Staining with sodium cobaltinitrite solution did not reveal any appreciable potassium content of the feldspar. Quartz is present as grains about one-quarter of an inch across, and is locally reddish owing to a dissemination of fine iron oxide. The quartz content of the rock in most places is high. This rock is undoubtedly a quartz-rich phase of the white hornblende-soda granite or tonalite described above, although change from one type to the other is commonly more abrupt than would be expected. Using Johannsen's classification, the rock falls within the range of a (quartz-rich) leuco-tonalite.

Buff to pinkish granodiorite (13c) forms the larger part of the granitic plug at the southern end of Dunphy Lake. A somewhat similar lithological type occurs in the vicinity of Caldwell and Hanna Lakes. The Dunphy Lake plug is a medium-grained buff to pinkish granitic rock typically rather low in quartz. The feldspar commonly forms lath-like crystals. Thin section examination gave the following estimated mineral content: feldspar, 60 per cent, of which it is estimated that oligoclase forms about 45 per cent and microcline 15 per cent; quartz, 15 per cent; hornblende, 10 per cent; biotite, 10 per cent; minor minerals, (including zircon, titanite, and sericite), 5 per cent. Microcline is present as small grains interstitial to the other mineral constituents. Staining with sodium cobaltinitrite suggests that in addition to the potash feldspar present, there is a certain potassium content held in solid solution in the oligoclase. From mineral composition, the rock falls under the classification of hornblende-biotite granodiorite, or more specifically according to Johannsen's classification, a monzotonalite. There are also minor syenitic phases of the granodiorite.

Microscopic examination of a specimen from the body in the vicinity of Caldwell and Hanna Lakes gave a mineral composition of: feldspar, 70 per cent, estimated to consist of oligoclase 65 per cent and microcline 5 per cent; quartz, 22 per cent; biotite and muscovite, 6 per cent; minor minerals (epidote, magnetite, apatite), 2 per cent. This rock falls within the classification of a granodiorite (monzotonalite) as defined by Johannsen, or a quartz diorite as defined by several other authorities. The term "quartz diorite" has been used in the present report to indicate a medium- to dark-grey, medium-grained rock containing andesine plagioclase and having a quartz content usually less than 10 per cent. As the rock here described is lithologically quite distinct from this quartz diorite (12), the terms granodiorite or microcline-bearing oligoclase granite are believed preferable to describe the rock mentioned in this paragraph.

Pink granite and granite gneiss (13d) (or granodiorite and granodiorite gneiss) occur as poorly defined bodies within the stratiform granitoid paragneisses of the southeast part of the map-area. The difficulty in locating contacts is due to the strong lithological similarity between many of the igneous and sedimentary gneisses. The zones mapped as granite and granite gneiss within the southeast part of the map-area commonly indicates nothing more than areas in which igneous character appears to be dominant over sedimentary. Some of the areas mapped as granite and granite gneiss undoubtedly include considerable granitoid paragneiss; others appear to be essentially igneous. The rocks are characteristically medium grained and distinctly pink. Microscopic examination of a specimen from the small granitic nose near the extreme southeastern corner of the map-area, indicated the following mineral content: feldspar, 50 per cent, dominantly oligoclase with a minor amount of microcline probably not exceeding 3 to 5 per cent; quartz, 40 per cent; biotite, 10 per cent. An appreciable amount of fine red iron oxide is disseminated throughout, and gives the distinctive pink colour to the rock. From mineral content this rock again falls into a granodioritic or quartz dioritic group depending on the classification authority chosen. For the reasons already given in the preceding paragraph, the terms granodiorite or microcline-bearing oligoclase granite are believed preferable to differentiate these rocks from the more typical quartz diorite (12) in this report.

Age relationships between the various granitic bodies are not known with assurance. At the south end of Hanna Lake a pink aplitic biotite granite definitely cuts the white hornblende-soda granite or tonalite. This pink aplitic granite is probably related to the granodiorites, though this could not be proven. From areal distribution and lithology, the white hornblende-soda granite or tonalite (13a), the white quartz-rich soda granite or leucotonalite (13b), and the hornblende quartz diorite (12) appear to be related genetically. The pink or buff granodiorites (13c,d) may be more acid phases of the same intrusive or may belong to a later intrusive period.

Pegmatite (14)

Large and small bodies, dykes, and sills of pegmatite are numerous, particularly within the southern half of the area.

Only in a few places have the pegmatites been mapped individually, as the complexity of their intrusion prohibits mapping on any but a detailed scale. A small area near the southeast part of Conglomate Lake was mapped in greater detail to show the abundance and complex pattern of the pegmatites. Such complexity is typical of much of the southern part of the map-area. The dykes vary greatly in width; most are less than 10 feet wide, some are 300 to 400 feet wide. The possibility that some or much of the rock included with unit 5 in the region along the Laurie River may be sheared to stratiform pegmatitic granite has already been discussed.

Most of the pegmatites are pink and coarse grained, consisting almost entirely of pink feldspar (microcline) and white to glassy quartz. Rare-element minerals were not seen. Rarely the pink pegmatite contains crystal clusters of black tourmaline; crystals of magnetite as much as an inch across are present locally. Within the gneisses in the extreme southeast part of the map-area, rose quartz occurs in close association with some of the pegmatites. In several places, the pegmatite seems to represent a composite intrusion; a later phase has enclosed and partly replaced an earlier phase. In these places, large and small irregular areas of a deep salmon-pink pegmatite are enclosed in a pale-pink variety within the same tabular dyke. It is believed that the second mineralizing period closely followed emplacement of the first dyke. Well-developed coarse to fine graphic texture is present in some of the dykes. This texture may be seen in the pegmatite near the Laurie River at the extreme western edge of the map-area. Pale-pink to white pegmatite is present, but is subordinate in amount to the deeper pink variety.

Lamprophyre (LMP)

The occurrence of late lamprophyre within the area is very minor and somewhat problematical. From lack of corroboratory evidence elsewhere in the area, lamprophyre has been omitted from the map-legend, but has been shown on the map as a tabular body with the designation "LMP". In only one place was a probable post-granite lamprophyre dyke observed. This dyke is exposed on the western shoreline of the largest island in the west part of Dunphy Lake, where a roughly tabular basic body, 3 feet wide, cuts pink granite and appears to cut off a 2 inch wide pegmatite dyke. The lamprophyre is dark grey and squeezed, and contains much biotite; it appears to be chilled for one-quarter to one-half of an inch at the contact with the granite. Although the evidence strongly points towards a late dyke, there remains the possibility that the lamprophyre body may be a tabular basic inclusion within the granite.

HYBRID ROCKS (A)

In the northern part of the map-area are several belts and remnants of original sedimentary and volcanic rock. In general, however, the rocks have been so intimately impregnated by granitic material or cut by granitic stringers that they have lost their identity. Locally the original character of the rock can be determined, and the hybrid belts appear to include sedimentary, volcanic, and basic intrusive material. In the northeast part of the map-area the belt more closely resembles an impure grey biotite granite gneiss. The hybrid rocks one mile south and southeast of Hanna Lake are largely sugary impure hornblende-feldspar gneisses and quartz-feldspar-hornblende gneisses, usually cut by considerable granite as dykes, irregular and lenticular bodies, and stringers. An identifiable narrow zone of coarse garnet-actinolite-cordierite-chlorite rock, shown as (3b), lies within the hybrid rocks in this vicinity. It resembles lithologically both the garnet-actinolite gneiss (3b) in the vicinity of Snake Lake, and the garnet-actinolite-cordierite-quartz-plagioclase gneiss (8a) south of the Laurie River.

STRUCTURAL GEOLOGY

Structural relationships between the Wasekwan and Sickle Series has been discussed briefly in the general statement under "Sickle Series", and no further statement need be made here other than to repeat that evidence for a major unconformity between the two series within the map-area is not strong. That a major unconformity does exist is shown by the evidence of pronounced angular unconformity between the two series as reported from other areas.

FOLDING

Determination of structure within the map-area is limited by the scarcity of textural or structural criteria reliable enough to use in the determination of formational tops.

From distribution of lithological types it is believed that the Wasekwan rocks in the area have been folded into a major isoclinal anticline, overturned to the south, having an axis trending 20 to 30 degrees north of east. This major fold has been greatly modified and distorted by later intrusions of gabbro, diorite, and quartz diorite, which partly account for the greater apparent width of the belt in the vicinity of Snake Lake. It is not known whether the alternation of sedimentary and greenstone belts in certain parts of this zone represent interbedding or minor isoclinal folding superimposed on the major fold.

With local exceptions, most of the strikes and trends within the Wasekwan rocks are northeast to east and dip steeply to the northwest and north. If the anticline proposed for the Wasekwan is present, the shallower dips in the southwestern part of the belt indicate a greater degree of overturning to the south in this vicinity.

The structure of the portion of the Sickle sedimentary rocks in the neighbourhood of Arc, Conglomerate, and Kukri Lakes is fairly well defined by a conglomerate zone, by local determinations of formational tops, and by shallow dips reflecting the nature of the folding. As stated in a previous section, the apparently intense folding of the belt in this vicinity is more apparent than real. The structure as shown on the horizontal surface reflects erosional truncation of relatively gentle folds generally plunging to the east. The Sickle Series has been buckled into a number of shallow plunging synclines and anticlines. The deep embayments shown by the conglomerate zone merely represent a horizontal section of this folding. The structure north of Kukri Lake is more in the nature of an assymetrical dome, and as interpreted here, does not show full closure to the west. Most of the northern limbs of synclines, as shown by the conglomerate zone, dip from 45 to 70 degrees to the north; some dip locally as low as 30 degrees. Most of the southern limbs of the synclines also dip to the north at angles from 20 to 40 degrees. These observations indicate that the folds have been strongly overturned to the south. The overturning extends to the Sickle series in the western part of the map-area where folds are not as well defined. A pebble-bearing zone along the Laurie River may represent the same zone as the conglomerate belt. In general there is a rather uniform shallow dip to the north, which, if the sedimentary strata to the south of the conglomerate bed represent continuous sedimentary deposition, would indicate a high degree of overturning of the entire sequence. It is believed however that the structure here is actually a series of almost recumbent isoclinal folds with axes trending east, and overturned to the south. It is proposed that the conglomerate zone exposed at the north, although involved in this isoclinal folding, does not reach the surface in the folds to the south, unless it is represented by the pebble-bearing zone. This concept is in accordance with the more deeply eroded structure to the east, where erosion has exposed the conglomerate horizon and revealed the nature of the overturned folds. The contorted and shallow dipping folds within the wide exposure of feldspathic quartzites and granulites (7) between Talon Lake and the Laurie River thus represent an erosional section near the buckled crest of one of these folds. Measurements on several small bedding fold-troughs in this vicinity indicate a dominant plunge of from 25 to 30 degrees to the east. In conformity with this structure, the quartz-biotite-plagioclase gneiss (8), hornblende-plagioclase gneiss (9), and associated stratiform granitoid paragneisses (10), all of which are Kisseynew in type, are the youngest members of the Sickle Series exposed within the map-area.

The "older" appearance of these rocks is due to their presence in a zone of higher metamorphism and more intimate igneous intrusion. The structure within these Kisseynew-type gneisses is complex, and appears to be that of both open and closed folding, with fold axes trending slightly north of east, on which has been superimposed large scale drag-folding.

FAULTING

Several nearly straight topographic lineaments can be seen on aerial photographs of the area, but investigation of most of these failed to reveal any significant displacement by faulting. Most of the lineaments are represented by drift-filled depressions, and evidence of shearing could thus be hidden. Some of these lineaments undoubtedly represent zones of weakness or loci of fracturing or faulting, but in most places geological mapping on the present scale failed to reveal any appreciable offsetting of formations. Several strike shears occur within the Wasekwan volcanic and sedimentary rocks, but displacement, if any, was not determined. The fault along the north-south portion of the creek joining Snake and Pyta Lakes has been placed there purely from the evidence of the distribution of rock types, but such distribution could well be fortuitous, and for this reason it is stressed that the fault is located only tentatively. If valid, the displacement is left-handed, with the east block having moved north with respect to the west block. It is possible that a fault trends north parallel with the west shoreline of the north central arm of Pyta Lake, producing a left-hand displacement. However, no continuation of such a fault could be found to the south. Elsewhere, wherever faults have been shown, evidence for direction or amount of displacement is meager owing primarily to insufficient rock exposure, and thus the displacement must be considered tentative. The fault between Hatchet Lake and the north end of Tod Lake has been placed there to explain the duplication of rock formations, on the evidence of a strong zone of shearing located at the western end of a small bay half a mile west of the map-area. If this shear zone is projected northeastwards on its line of strike, it coincides with the fault as shown on the present map. A strong shear zone parallels the eastern part of the Laurie River, but it is a strike shear and no displacement could be determined.

ECONOMIC GEOLOGY

GENERAL REMARKS

Extensive exploration by several large mining companies in the Dunphy Lakes map-area was done during the summer of 1947, under the stimulus provided by the discovery of nickel-copper ore deposits in the nearby Lynn Lake area. However, very little activity was observed during the summer season of 1948. Exploration in 1947 was directed chiefly towards the search for nickel-copper bearing deposits of the type associated with the Lynn Lake basic intrusive bodies. Accordingly, the search was centred about the basic intrusives known within the present map-area. Although gabbroic rocks are present, some of which are lithologically very similar to those at Lynn Lake, no nickeliferous deposits have been discovered.

Sulphide minerals were noted locally (a) in basic intrusive rocks, (b) in Wasekwan volcanic and sedimentary rocks, and (c) in Kisseynew-type gneisses. All the observed mineralized zones appear to be small and restricted, and the sulphide minerals are sparsely disseminated.

Sulphide minerals observed within the basic intrusive rocks are chiefly fine pyrrhotite and pyrite sparsely disseminated throughout the rock. An assay made on mineralized material did not reveal any nickel.

Wasekwan sedimentary and volcanic rocks are considered less favourable hosts for nickeliferous deposits, but more favourable hosts for gold-bearing quartz veins or base metal sulphide replacement deposits, although neither were observed. Several small mineralized zones were seen, but none appeared to be of economic importance.

Known economic ore deposits within Kisseynew-type gneisses are uncommon, but this may indicate merely that less intensive prospecting has been conducted in areas underlain by Kisseynew-type gneiss than in areas underlain by rock types considered to be more favourable hosts. The Sherritt Gordon copper-zinc ore deposit at Sherridon, Manitoba, is the outstanding example of a commercial base metal deposit located within Kisseynew gneisses. It is possible that similar ore deposits may occur within the large areas of Kisseynew-type gneisses known to exist, and it is suggested that these gneisses should be more thoroughly prospected than in the past. Investigation should be intensified, wherever possible, at or near the contacts of basic and acidic gneisses, and in the vicinity of abrupt folding. Two zones, sparsely mineralized with pyrite and pyrrhotite, were observed within the gneisses of the present map-area. An assay of these however, gave only a trace of gold, with no nickel, copper, or zinc.

Brief descriptions of the mineralized zones observed during the course of field mapping are given in the section "Description of Properties".

The pegmatites of the area appear to be essentially barren of important non-metallic minerals. No minerals of lithium, tungsten, beryllium, tin, molybdenum or the rarer metals were recognized in the pegmatites studied. The pegmatites are composed almost entirely of feldspar and quartz; black tourmaline and magnetite occur locally.

Lenses and veinlets of rose quartz, usually associated with a white pegmatite, are numerous within the belt of quartz-biotite-plagioclase gneiss (8) in the extreme southeastern part of the map-area. The rose quartz has been noted both as discontinuous lenses in the gneiss or pegmatite, and as a more continuous vein occupying a medial position within a pegmatite dyke.

Blue crystalline cordierite, exhibiting pronounced dichroism from blue to straw yellow in chip fragments, is present very sparsely within the garnet-actinolite-cordierite-quartz-plagioclase gneiss (8a), about 1½ miles south of the Laurie River. Although some of the cordierite is probably of semi-precious gem quality, most appears to be rather badly fractured. The best crystal development seems to be localized at or near small pegmatite lenses cutting the gneiss.

DESCRIPTION OF PROPERTIES

Very little rock work has been done within the Dunphy Lakes map-area. In the following brief description of properties or of mineralized zones, the names of claims and company control or option of properties are those existing during 1947.

DC and HF Groups

During 1947, Falconbridge Nickel Mines Limited conducted a detailed geological and geophysical survey of a block of 61 claims, the DC and HF groups, located on, and north of Pyta Lake. The claims cover a large part of the basic intrusive body lying north of the lake. Surveying was done on a scale of 1 inch to 400 feet.

TK and KZ Groups

During 1947, Noranda Mines Limited conducted detailed geological mapping on a scale of 1 inch to 200 feet on the TK group of 11 claims at the northern end of Snake Lake, and on the KZ group of 15 claims at the southern end of Snake Lake. The southern boundary of this latter group is in part contiguous with the northern boundary of the HF group mapped by Falconbridge Nickel Mines Limited. The TK group is underlain largely by basic volcanic flows and interbedded tuffs and sedimentary rocks. The KZ group is underlain by Wasekwan sedimentary rocks and a basic intrusive body. One or two small rusty zones containing sparsely disseminated pyrite were observed within the sedimentary rocks.

LD Group

A very rusty mineralized zone occurs on the peninsula in the southeastern part of Dunphy Lake, in an assemblage of interbedded sedimentary, volcanic, and fragmental rocks. The zone has been explored by several small pits. The mineralization consists of fine pyrite and pyrrhotite disseminated throughout dark-grey to brown quartzitic rocks. A minor amount of chalcopyrite is present. Finely disseminated pyrrhotite is also associated in the near vicinity with narrow interbedded greenstone flows or fine-grained basic sills. The mineralized zone trends north 50 degrees east and dips about 87 degrees to the north.

Ace Group

A small mineralized zone is located on the south shore of a lake 1,500 feet south of the southeast arm of Dunphy Lake. The zone is very narrow and has been exposed by stripping for a length of 20 feet. Mineralization consists of disseminated grains and narrow seams of pyrite and chalcopyrite within dark grey quartzite. Both the bedding and the mineralized zone strike north 50 degrees east and dip 85 degrees to the south.

ATH Group

A small rusty zone was observed on the ATH group of claims about 1,000 feet south of the south shore of Dunphy Lake. It consists of a rusty lens, having a length of 25 feet and a maximum width of 4 feet, lying within dark-grey to brown impure quartzites, and cut by aplite and white sugary quartz. Coarsely crystalline amphibole is present, the weathering of which accounts for the large amount of rust. No sulphide minerals were seen. The zone has been explored by a small prospect pit.

Fox Group

About 1,000 feet northwest of Fox Lake, a sparse dissemination of fine pyrrhotite occurs in a small exposure of recrystallized dark-grey very impure garnetiferous quartzite. A magnetic anomaly was also noted in the immediate vicinity. No surface workings were observed.