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Department of Mines
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BUREAU OF ECONOMIC GEOLOGY
GEOLOGICAL SURVEY

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LEGEND

PRECAMBRIAN

POST-CHIBOUGAMAU (?)

13 — *Olivine diabase, gabbro*

CHIBOUGAMAU SERIES

12 — *Conglomerate, arkose, quartzite, greywacke; 12a, conglomerate presumably younger than the other members*

PRE-CHIBOUGAMAU

10 — *Albite-oligoclase granite and gneissose granite; related, more basic, granitoid rocks*

9 — *Intrusive volcanic breccia*

(The relative ages of 3, 4, 5, and 7 are unknown)

7 — *Altered anorthosite*

5 — *Altered dioritic or diabasic rocks with local, coarse-grained quartz (and, or) amphibole-rich phases*

4 — *Altered gabbro (grading locally into pyroxenite), some highly altered dioritic or diabasic rocks*

3 — *Serpentine (derived in part from peridotite), pyroxenite, some gabbroic rocks*

2 — *Massive to well banded, medium to fine-grained, feldspathic sediments, some highly altered acid lavas; coarse to fine fragmentals and dark slate, in part pyroclastics but includes clastics*

1 — *Altered andesite, some rhyolite, trachyte, basalt, agglomerate and tuff; narrow bands of fine to coarse sediments, minor, mostly basic, intrusives, 1a, agglomerate*

11 — *Gabbroidal and dioritic rocks, in part related to the granite (10) but chiefly related to the anorthosite (7)*

8 — *Altered gabbroic and more basic rocks (8a, more basic) closely associated with anorthosite*

6 — *Complex of altered dioritic or diabasic rocks (5), minor amounts of altered gabbroic and more basic rocks (8), and probably basic phases of the granite (10)*

Carbonate zone

Observed rock outcrops

Drift covered with few or no rock outcrops

C = Carbonated rock; P = Granite, or feldspar porphyry, or quartz-feldspar porphyry dykes; D = Gabbro or diorite related to rocks of division 4; S = Sediments; V = Volcanics

Geological boundary (defined, approximate, assumed)
Bedding (inclined, vertical)
Schistosity (inclined, vertical)
Fault (defined, approximate, assumed) ..... trench
Glacial striae
Mineral property 2

INDEX TO MINERAL PROPERTIES

1. Gwillim Lake
2. Berrigan Lake

L. BOURBEAU AREA

3. North Shore
4. (Halleybury Mining Syndicate)
5. Northern Chibougamau Mines, Limited
6. Noranda Property
7. Sharpe
8. Bourbeau Lake Mines, Limited

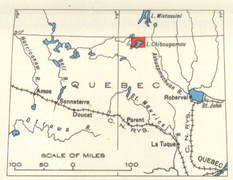
9. David Lake
10. Gilman Lake

L. AUX DORÉS AREA

11. Obalski
12. Merrill Island
13. Kokko Creek
14. McKenzie
15. Cedar Bay (Con. Min. Smelting Co.)
16. Cedar Bay (Chibougamau Prosp. Ltd.)
17. Dumortier
18. Knoll Island

19. Copper Point
20. (McKenzie Gold Mine)
21. Bear Bay
22. Taché Lake
23. Rapid River

Geology by J.B. Mawdsley, 1930, and by G.W.H. Norman, 1934.



Approximate magnetic declination, 20° West.

MAP 304A

CHIBOUGAMAU SHEET

ABITIBI TERRITORY

QUEBEC

Scale, 63360 or 1 Inch to 1 Mile

Miles

Kilometres

Legend

Trail or portage ..... *Cabin*
Township boundary ..... *Approximate lake and stream*
Mile post ..... *Fall or rapid*

Control surveys by Topographical Division, Bureau of Economic Geology, Department of Mines, 1929; and from plans and aerial photographs supplied by the Department of Lands and Forests, Quebec.

PHYSICAL FEATURES

The northern part of the area north of David, aux Dorés and Chibougamau lakes is a rocky region. The maximum relief is over 500 feet and is formed by steep-sided ridges and hills, that follow the structure in an easterly direction. Small drift-covered areas, either sand-plain or muskeg with few outcrops, are interspersed between the ridges and hills and are extensive along Rapid river, northeast of L. Bourbeau, northeast of Lake Gwillim and midway between David and Gwillim lakes. The southern part of the area is low and largely drift covered. A few rocky ridges occur in the unexplored territory southeast of Lake Chibougamau.

GEOLOGY

The oldest rocks (1) are mostly pale to deep green volcanics of massive to schistose greenstone types with good pillow structures, but they include more basic dark green types and white to grey acid flows. They also include occasional narrow bands of fine-grained well-bedded light to dark rocks of tuffaceous or, and sedimentary origin, and others consisting of acid volcanic fragments (in part, grey quartz prophyritic types) in a chloritic matrix. The light grey feldspathic group (2) is in apparent unbroken succession with the older volcanics. It is, in general, well-bedded and of sedimentary aspect but includes acid flows. It is composed of highly altered materials of acid volcanic character that were originally flows and pyroclastics and, in part, sediments derived largely from such rocks with little attrition due to transportation. The intrusives (3-8) are the main types of a related group that is younger than the feldspathic group (2) and older than the intrusive volcanic breccia (9) and granite (10). The types, as mapped, probably include similar rocks of more than one age, and their relative succession is not known. The feldspars in these rocks are altered to a fine grained aggregate of epidote, zoisite, etc., and, in part, to secondary albite; the pyroxenes are uralitized but those in some pyroxenites are fresh. In the quartz-bearing rocks quartz has an ophitic texture with partly enclosed long feldspar laths or if present in any amount is in micrographic intergrowths with feldspar. The pyroxenite occurs both as local phases of the gabbroic rocks and along the outer border of serpentine masses. Highly altered gabbroic types are present in the anorthosite and form a locally well banded phase along its northern margin. Between Bear and Bag bays the anorthosite is bordered by serpentine containing 30 per cent magnetite in small irregular veinlets and pods, and farther to the south and east is cut by small masses of these rocks. The intrusives (3-8) occur in parallel irregular sheets or sill-like masses. They (3-5) are very closely spaced in a belt 2 to 3 miles wide that extends in an easterly direction across the map-area from Lake Gwillim. Volcanic rocks (1 & 2) occur between the intrusives in this belt as narrow shreds that are in some cases persistent for considerable distances and are indicated where too small to map by symbol V.

The intrusive volcanic breccia (9) has a chloritic matrix that holds: fragments of grey cherty material with or without feldspar phenocrysts and amygdules; altered feldspar crystals one inch or more in diameter that resemble those in the anorthosite and associated gabbros; blocks of anorthositic gabbro up to six feet wide; and fragments of volcanics and dioritic-like rocks. Its intrusive nature is marked by breccia-filled apophyses that extend into the dark quartz bearing intrusive complex on its southern side. It has an irregular form and may fill a subterranean chamber or a volcanic neck.

The main mass of granite (10) lies along the south and southwestern sides of Lake Chibougamau. A tongue of the granite extends in a northwesterly direction toward Merrill island and is parallel to the strike of quartz porphyry dykes that cut the anorthosite north of L. aux Dorés. The granite has dark colored dioritic and quartz-poor syenitic phases. Granite dykes cut the dioritic phases, which are well displayed in Girard bay, on islands north of Granite island in the centre of Lake Chibougamau and on its Southwest arm. A syenitic phase is developed southwest of L. Bourbeau. The granite is light green, in places tinged with red, and is composed of acid plagioclase, quartz and biotite or secondary chlorite, microcline if present is rare. It has, in general, a granulated structure, is in part foliated and south of Portage bay and, in places, elsewhere is highly sheared. Feldspar or quartz-feldspar porphyry dykes probably related to the granite cut the rocks older than (10). Narrow "greenstone" dykes are fairly common. The oldest are related to the volcanics (1), the youngest cut the granite.

The Chibougamau sediments (12) consist of well-cemented conglomerate with ill-sorted boulders up to 18 inches or more in diameter, arkose, grit and greywacke. The conglomerate has local crossbedded gritty phases that in some cases fill water cut channels in the underlying strata. West of L. Bourbeau the sediments have a thickness of about 200 feet and a maximum southerly dip of 10 degrees, but at McKenzie bay are much thicker and dip from 30 degrees to vertical. South of Rapid bay the sediments consist of massive arkose that is converted to sericitic and quartzose schists in a wide belt along the northwest side of the McKenzie narrows fault. Conglomerate (12a) was observed along the fault near Rapid river only. South of Rapid river it has an arenaceous matrix with included fragments of red chert, specular hematite, and diorite, and of quartzose schist similar to and apparently derived from the sericitic quartzose schists (12) to the north. The freshness of the olivine diabase (13) dykes which cut the granite on either side of Gouin peninsula and their parallelism to the McKenzie narrows fault which cuts the Chibougamau sediments suggests that they are younger than the sediments. The gabbro (13) between Gladstone and Caché lakes is a similar fresh type.

STRUCTURE

The volcanic and associated rocks (1 & 2) are steeply inclined, have a general easterly strike, and are inferred to lie in a synclinorial structure whose main axis lies in the vicinity of L. Bourbeau. The intrusives (3-7) are irregular tabular bodies and in general parallel the strike of the volcanics. The Chibougamau sediments rest unconformably with gentle dips on the older rocks, but where involved in latter faulting as at McKenzie bay they are highly tilted and deformed. Faulting in a northeasterly direction is an important feature of rock deformation in the area. At least two major faults—the McKenzie narrows and Taché lake faults—strike in this direction. Many other faults and zones of shearing probably occur. An alignment of depressions or scarps may indicate their possible location. The McKenzie narrows fault is a zone of faulting rather than a single break. It is probable that smaller subsidiary faults diverge in a northerly direction from the main fault zone. The location of the McKenzie narrows fault south of Portage bay is not known with any certainty. The presence of a zone of intense shearing and brecciation near the portage on the south side of Bateman bay and for 1½ miles to the west on the south side of L. aux Dorés suggests that the fault or a branch of it crosses L. aux Dorés in a southwesterly direction and links up with faulting present near the first portage from L. aux Dorés into L. Caché. The Taché lake fault is a thrust toward the northwest and is marked south of the lake by a deep narrow trench. The fault apparently dips about 45 to 65 degrees southeast at the surface. It probably extends across and beyond L. Taché.

ECONOMIC GEOLOGY

Sulphide, gold-quartz and gold-copper sulphide mineralization with accessory silver and in places zinc occurs in the district. Asbestos and iron ore are present but not in valuable concentrations.

The mineralization falls into two general classes consisting chiefly of (*1*) pyrrhotite, pyrite and chalcopyrite in varying proportions with usually little quartz; and to a lesser extent of (*2*) principally quartz with a little arsenopyrite and other sulphides. The sulphide rich types (*1*) form two subtypes. (a) Massive sulphide replacements in greenstones and associated rock and lying parallel to the schistosity and particularly along the borders of basic intrusives. (Examples Bear bay and north shore of L. Bourbeau.) South of Bear bay the mineralization is extensive and occurs along the contact of serpentine and volcanics. It consists largely of pyrrhotite, in places with considerable pyrite, a little chalcopyrite and sphalerite, and also quartz and actinolite. On the north shore of L. Bourbeau well-bedded tuffs or sediments along a "diorite" contact are replaced largely by pyrite. (b) Gold-bearing chalcopyrite-pyrrhotite-pyrite replacements with some quartz occurring along shear zones in anorthosite and other rocks. This subtype occurs particularly at L. aux Dorés, where three directions of shearing, northwesterly, easterly and northerly to north-northeasterly occur. Northwesterly shearing is most common and in many cases occurs where fine-grained quartz-porphyry dykes are present, (Kokko creek and Merrill Island). At Cedar bay all three directions of shearing are mineralized but particularly the eastern one. Where sheared and mineralized the anorthosite is converted to a dense green rock resembling "greenstone" dykes which also occur in the anorthosite. The alteration, where present, is a possible indicator of mineralization. Numerous mineral showings consisting either of sulphides or sulphides and quartz are present in the district particularly where the rocks are shattered or sheared near faults, (example: fault zone between Lake Line and the southwestern end of L. Bourbeau).

(*2*) Quartz veins with free gold, low in sulphides and with a little arsenopyrite occur on the Noranda and Sharpe properties south of L. Bourbeau. The Noranda vein strikes in a northeasterly direction along a carbonated shear zone crossing altered gabbro and "diorite". The Sharpe vein is in sheared "diorite", has an easterly strike, and contains arsenopyrite in well-formed crystals and fine bands. Free gold is visible in the western part of the Sharpe vein in the quartz and microscopically along fractures in brecciated arsenopyrite.

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RELATED PUBLICATION

MEMOIR 185; Chibougamau Lake map-area, Quebec; by J. B. Mawdsley and G. W. H. Norman.

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