GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF MINES AND TECHNICAL SURVEYS

PROVISIONAL EDITION

41 K/10 E, 41 K/9

LEGEND

PLEISTOCENE AND RECENT

15 — *SURFICIAL DEPOSITS:* glacial till, varved lake clays, sands and gravels

CAMBRIAN (?)

14 — Red mottled and grey sandstones and shales, basal conglomerate

KEWEENAWAN (13)

13 — Basic and acid lavas, porphyritic

12 — Quartz diabase, diabase, and olivine diabase, dykes, sills, and small stocks

HURONIAN

COBALT GROUP (10, 11)

11 — *LORRAIN FORMATION:* quartzite, siltstone, greywacke, pebble conglomerate

10 — *GOWGANDA FORMATION:* greywacke and argillite, commonly conglomeratic, polymictic conglomerate; subordinate quartzite and arkose

BRUCE GROUP (4-9)

7 — *SERPENT FORMATION:* mainly fine-grained quartzite, minor conglomerate, arkose, argillite, and grit

9 — *AVERES FORMATION:* arkose, arkosic quartzite, polymictic conglomerate, greywacke

6 — Limestone

8 — *DUNCAN GREENSTONE:* andesitic lavas, amygdaloidal, minor pillow

5 — Conglomerate; polymictic greywacke conglomerate, greywacke

4 — *MISSISSAGI FORMATION:* arkose and arkosic quartzite, minor argillite and quartz-pebble conglomerate

3 — Granite, minor syenite and pegmatite, inclusions of amphibolite and granite gneiss

2 — Granite gneiss, amphibolite and migmatite, minor granite, syenite, and pegmatite

1 — Amphibolite, tuffs, basic and acid lavas, minor conglomerate, greywacke, and iron formation

PALAEOZOIC CENOZOIC — PROTEROZOIC — ARCHAEAN

Geological boundary (approximate, assumed)
Bedding, tops known (inclined)
Bedding, tops unknown (inclined)
Schistosity (inclined, vertical, dip unknown)
Gneissosity (inclined, vertical, dip unknown)
Fault or shear zone (approximate, inclined)
Joint (inclined, vertical)
Anticline
Syncline
Glacial striae (direction of ice movement known, unknown)
Raised beach
Mine or mineral prospect

MINERAL SYMBOLS

Copper ..... Cu
Iron ..... Fe
Lead ..... Pb
Nickel ..... Ni
Uranium ..... U
Zinc ..... Zn

Geology by R. E. Hay, 1959-61

Geological cartography by the Geological Survey of Canada, 1964

Road, all weather ..... Route 17
Road, dry weather
Trail
Railway
Cutting, embankment
Power transmission line
Telephone line, along road
Post office
Lighthouse
Wharf
International boundary
Township boundary
Indian reserve boundary
Intermittent stream
Marsh
Quarry, sand and gravel pit
Contours (interval 25 feet)
Height in feet above mean sea-level 901

Base-map cartography by the Geological Survey of Canada from maps published by the Army Survey Establishment, R.C.E. 1954, with revisions by the Geological Survey of Canada, 1964

Approximate magnetic declination, 04° 07' West, increasing 0.3' annually

PUBLISHED, 1964
COPIES OF THIS MAP MAY BE OBTAINED FROM THE DIRECTOR, GEOLOGICAL SURVEY OF CANADA, OTTAWA

DESCRIPTIVE NOTES

The centre of the map-area lies about 10 miles north of Sault Ste. Marie, Ontario, and 15 miles east of Lake Superior. The south-eastern part is readily reached by motor road and bush road from points along Provincial Highway 17. The western part is also fairly accessible by road. Secondary roads from Highway 17 lead to the northern half. Except for a few cultivated areas near Sault Ste. Marie, the country is wooded and fairly rugged.

The rock formations of the Sault Ste. Marie area can be divided into three major groups: (a) highly metamorphosed and steeply tilted meta-volcanic, metasedimentary, and igneous rocks of the Archaean "basement series"; (b) relatively unmetamorphosed and slightly tilted, Proterozoic sedimentary and volcanic rocks; and (c) flat-lying, unmetamorphosed, early Palaeozoic sandstone.

The rocks of Huronian age and older have been intruded by dykes and small stocks. Most of the dykes are diabasic and the stocks are of a gabbroic composition. Granitic batholiths and gabbro dykes, of an earlier period, intrude the basement schists and sediments. In the Circa Cap area, about 11 miles west of the city of Sault Ste. Marie, basic and acidic lavas of Keweenawan age overlie, with angular unconformity, the granite-gneiss of the basement.

The highly metamorphosed, basement volcanic and sedimentary rocks are confined almost entirely to a steeply dipping, northerly striking belt of isoclinally folded rocks. This belt can be traced south from the Northland – Glendale area to Garden River, where it has been displaced by a major fault.

Granite and granite-gneiss are the most common rocks in the Sault Ste. Marie area. Granites of two ages have been identified: an older granite, which has been transformed, generally to granite-gneiss, and a younger granite of a more massive nature. This younger granite was identified by McConnell[1] as of Killarney age, but current mapping shows it to be part of the basement rocks.

The Huronian rocks have been divided into two groups: an older, Bruce Group (4-9), and a younger, Cobalt Group (10-11). The Cobalt Group extends beyond the Bruce Group, where it overlies the basement directly, and overlies the Bruce Group with slight angular unconformity. In the Sault Ste. Marie area, the Bruce Group can be divided into a western section and an eastern section. The eastern section outcrops southeast of Garden River, and the western section outcrops in a northerly striking belt from Garden River to the Bellevue Ridge. The western section, which forms the "Soo Series" of McConnell[1], is differentiated by the presence of volcanic strata and of coarse, clastic material, and by the absence of carbonate rocks. McConnell[1] classified these in a series older than the Bruce Group, but current mapping indicates that the western section is a facies of the eastern section.

The Mississagi quartzite (4) is the basal formation in both the eastern and western sections. It includes quartzite, arkose, greywacke, and polymictic conglomerate, all of varying thickness. Good exposures of the conglomerate occur southeast of Maud Lake. Towards the east, the formation is more quartzitic. The total thickness does not exceed 3,000 feet.

In the east the Mississagi Formation is overlain by a siliceous conglomerate known as the Bruce conglomerate (5). In the west, the Mississagi is overlain by an amygdaloidal, greenstone rock, 200 to 300 feet thick, which McConnell[1] named the Duncan greenstone (6). At the south end of the Duncan greenstone belt the Averes Formation (9) appears to overlie the Mississagi Formation directly. The Bruce conglomerate and the overlying, siliceous, Bruce limestone (6) appear to have been deposited in depressions in the eroded, upper surface of the Mississagi, and therefore are of a local nature.

Near Echo Lake the Bruce limestone is overlain by a siliceous, polymictic conglomerate that contains angular fragments of the Bruce limestone and lower Huronian formations. The erosion surface on the Bruce limestone shows a relief of about 25 feet. This polymictic conglomerate is the basal unit of the Serpent Formation (7). The Serpent Formation, in general, consists of a thick series of feldspathic quartzites. In the west the Duncan greenstone (8) is overlain by the Averes Formation (9), which appears to be a coarser facies of the Serpent. The contact between the Averes and the Duncan varies from erosional in the south, to interbedded greenstone and conglomerate in the north.

The Serpent and Averes Formations are the upper units of the Bruce Group, and are overlain, with slight angular unconformity, by the Gowganda Formation (10), the lowest unit of the Cobalt Group. West of Echo Lake, the lower Gowganda conglomerate rests upon eroded Serpent rocks, the surface of which, at one time, had a relief of possibly as much as 500 feet. In the map-area, argillite is the most characteristic rock type in the Gowganda Formation. Conglomerate occurs northwest of Bellevue Ridge and in local depressions in the Serpent rocks west of Echo Lake. The upper part of the Gowganda Formation is a thin-bedded, pinkish quartzite, which is followed conformably by the lower Lorrain impure quartzite (11). The thick upper part of the Lorrain consists mainly of pure, white quartzite with occasional quartz-pebble layers. The central part of the formation contains jasper pebble-conglomerate, which is a characteristic feature of the Lorrain in this district.

Sheet-like intrusions and small stocks of gabbro and related rocks (13) cut the Huronian sediments in many places. Red, mottled, and grey sandstone (13) of Cambrian(?) age underlie much of the lowland along St. Marys River.

The map-area is marked by several large and distinctive faults, which appear as prominent lineaments. The Garden River fault is the best example. Others include the Goulais River fault, the Mahel Lake fault, Reserve Lake fault, and the Trout Lake fault.

Dips in the Huronian rocks are moderate, rarely exceeding 35 degrees, and in some places southeast of Echo Lake they approach horizontal. Foliation in the granite and granite-gneiss generally strikes northwest with steep dips.

The district has been known for some time for its iron and lead occurrences. Quartz-specularite veins have been reported from west of Northland Lake and near Bellevue Ridge. The Bruning Iron Mine operated for several years on the west side of Northland Lake. Lead and zinc have been mined intermittently since 1873 at Jordan Mines, 10 miles north of Garden River. Radioactive quartz-pebble conglomerate occurs along the east shore of Maud Lake.

[1] McConnell, R. G.: Sault Ste. Marie area, District of Algoma; Ont. Dept. Mines, vol. 35, pt. 2, pp. 1-35 (1926).

MAP 1181A

GEOLOGY

SAULT STE. MARIE - ILE PARISIENNE

ONTARIO

Scale 1:63,360
1 inch to 1 mile

Miles 1 0 1 2 3 Miles
Kilometres 1 0 1 2 3 4 5 Kilometres

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