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DENISON TOWNSHIP
DISTRICT OF SUBURRY

Scale 1 inch to 1 mile
N.T.S. Reference 41 I/6

LEGEND FOR DENISON AND GRAHAM TOWNSHIPS

- CENOZOIC**
- PLEISTOCENE AND RECENT**
- 10 Sand, gravel and clay.
 - Unconformity
- PRECAMBRIAN**
- LATE BASIC INTRUSIONS**
- 10a Olivine diabase.
 - 10b Trap.
- NICKEL IRRUPTIVE**
- Granophyre*
 - 9a Light granophyre.
 - 9b Dark granophyre.
- Transition Rocks***
- 8a Light transition rocks.
 - 8b Dark transition rocks.
- Norite**
- 7a Grey "norite".
 - 7b Dark "norite".
 - 7c "Quartz diorite".
 - 7d Altered "norite".
- GABBROIC ROCKS**
- 6a Metagabbro.
- METASEDIMENTS**
- Conglomerate**
- 5a Oligomitic quartz-pebble conglomerate.
 - 5b Polyimitic conglomerate.
- Pelitic Metasediments**
- 4a Argillite.
 - 4b Biotite metapelite.
 - 4c Chloritic metapelite, sericitic metapelite.
 - 4d Chloritoid metapelite.
 - 4e Staurolite metapelite.
 - 4f Garnet metapelite.
- Quartzite**
- 3a Feldspathic quartzite.
 - 3b Biotitic, chloritic quartzite.
- GRANITIC ROCKS**
- 2a Pink porphyritic "granite".
 - 2b Pink equigranular "granite".
 - 2c Grey porphyritic "granite".
 - 2d Grey equigranular "granite".
- METAVOLCANICS**
- 1a Porphyritic and amygdaloidal mafic metavolcanics.
 - 1b Garnet amphibolite.
 - 1c Acid metavolcanics: rhyolite, quartz-feldspar porphyry.
 - 1d Amphibolite, amphibolitic gneiss and schist.
- * Not present in Graham Township.

SYMBOLS FOR DENISON AND GRAHAM TOWNSHIPS

- Muskeg or swamp.
- River, creek, stream, R = rapids; F = falls.
- Bridge.
- Railway.
- Electric power transmission line.
- Highway.
- Wagon road.
- Glacial striae.
- Small rock outcrop.
- Boundary of rock outcrop.
- Geological boundary, defined.
- Geological boundary, assumed.
- Strike and dip; direction of top unknown.
- Strike and vertical dip; direction of top unknown.
- Direction (arrow) in which inclined beds face as indicated by gradation in grain size.
- Direction (arrow) in which vertical beds face as indicated by gradation in grain size.
- Direction (arrow) in which inclined beds face as indicated by cross bedding.
- Directions (arrow) in which overturned beds face as indicated by cross bedding.
- Direction in which lava flows face as indicated by shape of pillows.
- Strike and dip of schistosity.
- Strike of vertical schistosity.
- Strike and dip of gneissosity.
- Strike of vertical gneissosity.
- Lineation (plunge known, plunge unknown).
- Jointing, inclined.
- Drag-folds. (Arrow indicates direction of plunge).
- Fault, indicated or assumed.
- Location of mining property.
- Building.
- Shaft, vertical.
- Test pit.
- Open cut, quarry, gravel pit.
- Trench.
- Adit.
- Mine dump.
- Drillhole, inclination unknown.
- Drillhole.
- Veins.
- Network of quartz veins.
- Magnetic attraction.
- Gossan - sulphide mineralization.
- Breccia.

LIST OF MINES AND MINERAL OCCURRENCES

1. Arcadia Nickel Corp. Ltd., Aer mine	Lot 12, Con. II.
2. McIntyre mine	Ni, Cu, etc.
3. Worthington offset, Ni-Cu occurrence	Lot 12, Con. III.
4. Worthington offset, Ni-Cu occurrence	Lot 9, Con. IV.
5. Victoria mine	Lot 8, Con. IV.
6. Cu-Ni occurrence	Lot 9, Con. V.
7. Cu-Ni occurrence	Lot 9, Con. V.
8. Cu-Ni occurrence	Lot 11, Con. IV.
9. Cu-Ni occurrence	Lot 12, Con. IV.
10. Crean Hill mine	Lots 4 and 5, Con. V.
11. Ellen Pit	Lot 3, Con. V.
12. Sulphide occurrences	Lot 2, Con. V.
13. Sulphide occurrences	Lots 3 and 4, Con. V.
14. Sulphide occurrences	Lots 3 and 4, Con. IV.
15. Victoria mine	Lots 5 and 6, Con. IV.
16. Sulphide occurrences	Lots 6, 7 and 8, Con. III.
17. Sulphide occurrences	Lot 3, Con. III.
18. Sulphide occurrence	Lot 11, Con. III.

SOURCES OF INFORMATION

Base map from maps of Forest Resources Inventory, Ontario Department of Lands and Forests.
Map 292 A, Copper Cliff sheet, Geol. Surv. Canada.
Geological maps of parts of Denison and Graham townships by The International Nickel Company of Canada, Limited.
Geology by K.D. Card and assistants, 1962, 1963.
Location of lot and concession lines approximate only.
Issued 1963.

Location

The centre of Denison township is about 20 miles southwest of the city of Sudbury. Localities in the township can be reached by Highway No. 17, the Sudbury - Sault Ste. Marie branch of the Canadian Pacific Railway and numerous public and private roads.

Mineral Exploration

The area is in the southwestern part of the Sudbury mining camp; consequently there has been active exploration and development of the numerous sulphide occurrences in the township. Exploration has been concentrated along the Nickel Irruptive contact and the Worthington offset. Sulphide mineralization in other rock formations has also been tested by trenching and diamond-drilling.

Fast producers in the township include the Crean Hill mine, the Ellen pit, the Victoria mine, and the Vermilion mine of the International Nickel Company of Canada, Ltd. The Aer mine of Arcadia Nickel Corp. Ltd., located on the Worthington offset, is also developed by underground workings.

In October, 1963 the International Nickel Company of Canada, Ltd. was drilling along the Nickel Irruptive contact in western Denison township and Falconbridge Nickel Mines, Ltd. was along this contact in eastern Denison township.

General Geology

The main rock units in the township, in order of decreasing age, are as follows:

Metavolcanics: The metavolcanics consist mainly of fine- to medium-grained amphibolite and amphibolitic gneiss or schist. Amygdules, phenocrysts and pillows occur in the more basic rocks, demonstrating their volcanic origin. Rhyolite and quartz-feldspar porphyry in the forms of lenses and plug-like bodies are also present.

There are also many elongate conformable lenses of sedimentary material. Many of the lenses contain disseminated sulphides. The sedimentary rocks are commonly well-bedded, fine- to medium-grained, light-coloured and quartzose. They are probably tuffaceous in part. Metamorphic minerals such as biotite and staurolite are developed in some horizons.

Granitic Rocks: The Creighton "granite" batholith consists of grey and pink porphyritic "granite" with minor amounts of equigranular "granite". These intrude metavolcanic rocks in the northern part of the area. Inclusions of metavolcanic and metasedimentary rocks are very numerous throughout the batholith. Good foliations are developed in the body near granite - metavolcanic contacts and in fault zones.

Metasediments: The main group of metasediments lies south of the metavolcanics. In western and central Denison township, the basal sedimentary rocks are quartzite. To the east, these give way largely to pelitic rocks.

The pelites are fine-grained, thin-bedded chlorite-sericite-biotite- and chloritoid-bearing metasedimentary rocks.

A conglomerate formation (Ramsay Lake Conglomerate), lies stratigraphically above the pelitic rocks. This is a polyimitic conglomerate with a buff-weathering, quartzose matrix.

A thick sequence of quartzite constitutes the uppermost formation. This medium-grained feldspathic quartzite displays excellent bedding and cross-bedding.

Gabbroic Rocks: Hornblende metagabbro and amphibolite dikes and sills intrude the above-mentioned rocks. Minor remnants of the original pyroxene gabbro occur in the central parts of some bodies.

Nickel Irruptive: The Nickel Irruptive is divisible into three major units which are in turn divisible into several lithologic units. These are as follows:

- (1) Norite; the basal mafic portion of the irruptive consists of dark and light gabbroic phases and quartz diorite.
- (2) Transition Zone; this is a narrow irregular zone of mafic and felsic rocks lying above the norite.
- (3) Granophyre; this consists of light and dark rocks of intermediate composition characterized by an abundance of micropegmatite.

The contacts of the major and minor lithologic units are, in general, parallel to the outer contact of the irruptive.

Worthington offset: the Worthington offset, a dike-like body, extends southwestward from the Nickel Irruptive through Denison township. This body is composed mainly of quartz diorite and contains sulphide mineralization.

Late Basic Intrusions: Northwest-trending diabase dikes intrude the foregoing rocks. They are medium-grained and have an excellent diabasic texture.

Numerous dikes of fine-grained mafic "trap" cut the Nickel Irruptive. Most of these are only a few feet wide.

Structural Geology

Faults: The Creighton Fault and the Worthington Fault strike north of east and dip steeply south. The direction of displacement on each has probably been south side up and to the west with respect to the north side.

The apparent horizontal displacement on the Creighton Fault, as determined from displacement of the Creighton "granite" contact, is about 1,300 feet; the displacement of the Worthington Fault, as determined by offset of a quartzite-argillite contact is approximately 5,600 feet. A system of minor faults strikes east of north. The apparent displacement on these has been northwest side to the south-west for a few hundred to a few thousand feet with respect to the southeast side.

Folds: No major folds were recognized. Top determinations by grain gradation and cross-bedding in the metasediments show that the beds are facing southward.

Minor folds occur, particularly along the metasediments-metavolcanics contact, around the Creighton granite and near faults.

Schistosity, gneissosity, mineral lineations, later slip cleavages and crinkle lineations are well developed.

The mineral lineations and minor folds plunge steeply east in the western part of the township, are approximately vertical in the central part, and plunge steeply west in the eastern part of the township.

Economic Geology

Nickel and copper, in the form of pentlandite, pyrrhotite, and chalcopyrite are found throughout the area. Numerous deposits of gravel and sand are also being worked periodically. Clay occurs near the Creighton "granite" but the size and potential value of these deposits have not been assessed.

There are numerous sulphide occurrences in and around the Nickel Irruptive and along the Worthington offset. There appears to be an association between sulphide mineralization, quartz diorite, faulting, and the outer contact of the irruptive. Quartz-diorite also occurs above this contact and some bodies contain minor amounts of sulphides.

Sulphide mineralization is also found in the metavolcanics. Long narrow zones contain minor amounts of disseminated pyrite, pyrrhotite and chalcopyrite. Some of these mineralized zones appear to be stratigraphic horizons; others are shear zones. Sulphide mineralization also occurs in brecciated, contorted amphibolite around rhyolitic bodies.

Zones of sulphide mineralization in the metavolcanics should be investigated carefully by numerous assays of fresh material. Any mineralized zones carrying significant amounts of copper and nickel would be of interest because of their large size.

The Nickel Irruptive contact is of course, the most important locus of sulphide mineralization. However, there are bodies of quartz diorite, faults and areas of minor sulphide mineralization within the "norite" above the lower contact which are worth investigating.

