1341A

GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

LEGEND

PALEOZOIC

DEVONIAN

MIDDLE DEVONIAN AND (?) OLDER

5 — *Pink biotite granite, granodiorite, granite porphyry;* 5a, *gneissic granite to quartz diorite*

4 — *Diabasic gabbro, diorite;* 4a, *olivine-rich gabbro*

ORDOVICIAN

MIDDLE ORDOVICIAN

TETAGOUCHE GROUP (1-3) *(units not in stratigraphic order)*

3a, 3b — *Siliceous volcanic rocks:* 3a, *rhyolite tuff and rhyolite; derived quartz-sericite schist; minor rhyolite crystal tuff, phyllite;* $3a_1$, *locally abundant agglomerate and breccia with elongated fragments; minor sedimentary layers;* 3b, *rhyolite crystal tuff (mainly quartz-feldspar, quartz and feldspar augen-schists); rhyolite tuff, quartz-sericite schist, phyllite, rhyolite*

2 — *Mafic volcanic rocks: greenstone, some interbedded slate, graphitic schist, iron-formation;* 2a, *mafic tuff*

1 — *Sedimentary and metasedimentary rocks;* 1a, *grey, black, green and red slate, greywacke, graphitic schist, minor mafic volcanic rocks;* 1b, *feldspathic quartzite, quartz-chlorite and quartz-sericite schist, minor interbedded phyllite*

Drift-covered area
Biotite hornfels and quartz-biotite gneiss adjacent to granite (5)
Rock outcrop ×
Geological boundary (approximate, assumed)
Bedding, tops unknown (inclined, vertical)
Cleavage, schistosity, gneissosity (inclined, vertical, dip unknown)
Fault (assumed)
Glacial striae (direction of ice movement known)
Open pit
Mine (operating, abandoned)
Mineral prospect or occurrence ×
Diamond-drill hole DDH●
Rock type symbols: S, *sedimentary rock;* v, *mafic volcanic rock;* IF, *iron-formation;* D, *diabase;* P, *augen-schist;* r, *rhyolite*

MINERALS

Copper	Cu	*Nickel*	Ni	*Zinc*	Zn
Lead	Pb	*Silver*	Ag		

DESCRIPTIVE NOTES

The map-area lies 18 miles southwest of Bathurst and 26 miles northwest of Newcastle. It is underlain mainly by siliceous volcanic rocks which form the core of a large U-shaped structure of highly deformed Middle Ordovician eugeosynclinal volcanic and sedimentary rocks of the Tetagouche Group [1]. The rhyolitic rocks contain, or are closely associated with, the massive sulphide orebodies in the Bathurst-Newcastle district [2].

The Tetagouche Group (1-3) is subdivided on a lithological and partly on a structural basis [2,3,4,5]. It has yielded Middle Ordovician graptolites and trilobites in the adjacent Tetagouche Lakes and Bathurst map-areas [5].

Sedimentary rocks (1a) are chiefly argillaceous. The slates have a well developed cleavage and are crumpled, and locally contain quartz veins and disseminated pyrite. Electromagnetic surveys indicate that thin graphite beds are common. Mafic volcanic rocks (2) are interlayered with sedimentary rocks of unit 1a, but only the larger bodies are shown on the map. Lithologically similar sedimentary rocks also occur interlayered or infolded with the siliceous volcanic complex (3a, 3b). Sedimentary rocks (1b) are more quartzose than those of unit 1a and may be the oldest rocks in the map-area. They are grey to green-grey, commonly feldspathic quartzites and interbedded pelitic strata which grade westward into schists and gneiss.

Mafic volcanic rocks (2) are mainly brown-weathering, dark green, massive to schistose, fine-grained to aphanitic greenstones, which rarely display pillows or amygdules. They are composed of minerals of the greenschist facies: albite, actinolite, chlorite, epidote, calcite and magnetite. Intercalated beds of red and black graphitic slate are numerous, but these soft rocks rarely outcrop in interstream areas. Beds of jasper and magnetite-bearing chert occur with the mafic volcanic rocks and cause magnetic anomalies.

Siliceous volcanic rocks (3a) are grey- to white-weathering, blue, green, and buff aphanitic rhyolites that are generally schistose. In thin section, they consist of ragged feldspar phenocrysts with or without embayed, brecciated quartz phenocrysts, set in a fine, schistose groundmass of quartz, feldspar, chlorite, and sericite. In many places it is difficult to determine whether the schistose varieties are sheared flows or tuffs. Particularly large, abundant phenocrysts characterize the rhyolite crystal tuff (3b).

Quartz-feldspar augen-schist (3b) has assumed great importance in the district because of its spatial relationship to ore deposits. Locally, these rocks are stratigraphic units, but regionally they occur at various stratigraphic levels, either above, below, or interbedded with the main body of rhyolitic rocks (3a) and consequently they cannot be directly correlated throughout the district. Quartz-feldspar augen-schist (3b) is closely associated with rhyolite tuff and rhyolite (3a) and consists of a light grey rock with quartz and/or feldspar phenocrysts up to ½ inch long in a microcrystalline or schistose matrix of quartz, feldspar, sericite, and chlorite. As the size and abundance of phenocrysts decrease, the rock grades into porphyritic rhyolite. East of California Lake in particular, a wide belt of augen-schist passes southward into an area of prophyritic rhyolite tuff. The augen-schist probably originated as tuff beds, sills, and flows, in conformable layers in the rhyolite tuff and rhyolite. All these rocks were derived from the same magma. The augen-schist is considered to be contemporaneous with the rhyolite tuff and rhyolite, in part because it is folded with them.

One rock type that resembles augen-schist is actually an arkose, or tuffaceous rock. This rock is found, for example, in the belt of augen-schist containing the Heath Steele ore deposits. In outcrop it resembles a sheared igneous porphyry with quartz and feldspar grains standing out in relief, but differs from a true prophyry in having occasional rock fragments and a fine-grained rather than microcrystalline groundmass. In thin section the clastic origin is apparent, for the quartz and feldspar grains are angular in contrast to the usual subhedral and embayed phenocrysts of the true porphyry.

A third rock type, rather rare, also resembles augen-schist. It contains blue quartz eyes in a groundmass of sedimentary origin. There is uncertainty as to whether the eyes are of primary sedimentary, or metasomatic derivation.

The mafic intrusive rocks (4) are grey and green, medium grained, and diabasic, and are composed of clinopyroxene, altered plagioclase, secondary ferromagnesian minerals, and magnetite. A distinctive olivine-rich gabbro (4a) occurs near the road northeast of Goodwin Lake and also north of Popple Depot. It is banded, contains some nickel-bearing sulphides, and resembles the mafic to ultramafic rocks near St. Stephen in southern New Brunswick. The mafic intrusions are most abundant near areas of mafic volcanic rocks. In places, these rocks are difficult to distinguish from the more altered flows, but commonly they have a coarser grain size, diabasic texture, and massive appearance. There may be mafic intrusions of two ages - some related to the Ordovician mafic volcanism and some related to Silurian-Devonian mafic volcanism in adjoining map-areas.

The granitic rocks (5) occur as two distinct types. A gneissic variety (5a) is present near South Little River Lake and north of Popple Depot, and was emplaced before or during deformation of the area. A massive variety (5) which occurs as stocks in the western and southwestern parts of the map-area, cuts across the folded rocks of the area and was emplaced after the major period of deformation. The latter cuts middle Silurian rocks west of the area and similar granite is overlain unconformably by Pennsylvanian conglomerate northeast of the area near Bathurst.

The granitic bodies are surrounded by a metamorphic aureole (hachured) characterized by the development of biotite in both sedimentary and volcanic host rocks as far as 3 miles from the nearest granite outcrop. Near the granite, the sedimentary rocks are altered to a fine-grained, rusty-weathering, purplish biotite hornfels with cordierite and andalusite, and in places, quartz-biotite gneiss.

The Tetagouche Group rocks have been deformed by several phases of deformation [4,6]. The regional structures shown by the map pattern are late in the sequence because they deform the earlier schistosities. Northeast of a north-northwesterly trending line through North Little River Lake, these late structures are characterized by steep to vertical plunges whereas to the southwest of this line the late folds have predominantly shallow plunges. Horizontal cleavage, more common in the west part of the map-area, may reflect recumbent folding and/or thrust faulting.

Large zinc-lead-copper deposits occur in sedimentary beds adjacent to or included in the siliceous volcanic rocks (3). The Heath Steele, Half Mile Lake and Wedge deposits occur within sedimentary beds and augen-schist; this association has been used successfully as a prospecting guide. The sulphide minerals are believed to be contemporaneous with the volcanic-sedimentary deposition.

The twelve sulphide deposits of Heath Steel Mines Limited occur in minor folds at or near the contact between quartz-feldspar augen-schist (3b), and a mixed assemblage of chlorite schist, quartz-sericite schist, iron-formation, and feldspathic sedimentary rocks (1b) in an east-trending belt about 5½ miles long. Pyrite-sphalerite-galena is the main sulphide mineral assemblage in most orebodies, although chalcopyrite-pyrrhotite is common in the north-central bodies and less so in the western orebodies. The most easterly orebody was covered by a gossan 45 feet thick, which was underlain by 2 to 6 inches of black mud rich in silver minerals. The mud in turn covered a zone up to 80 feet thick containing disseminated supergene chalcocite [7].

The Wedge sulphide orebody [8] lies conformably between porphyritic and non-porphyritic rhyolite tuff on the north (hanging wall). and an argillaceous fragmental rock on the south which in turn overlies graphitic schist. The ore consists of 95 to 100 per cent sulphides averaging 3 per cent copper and 1.75 per cent zinc. Pyrite is the main mineral with varying amounts of chalcopyrite, sphalerite and galena [8]. The mine was closed down in 1968 when the orebody became exhausted.

1 Smith, C.H.: Bathurst-Newcastle area, New Brunswick; Geol. Surv. Can., Map 1-1957 (1957).

2 Davies, J.L.: Geology of Bathurst-Newcastle area, N.B.; in Guidebook-Geology of Parts of Atlantic Provinces, W.H. Poole; Geol. Assoc. Can. and Mineralogical Assoc. Can., pp. 33-43 (1966).

3 Smith, C.H. and Skinner, R.: Geology of the Bathurst-Newcastle mineral district, New Brunswick; Bull. Can. Inst. Mining Met., vol. 51, pp. 150-155 (1958).

4 Skinner, R.: Geology of the Tetagouche Group, Bathurst, New Brunswick; McGill University Ph. D. thesis, unpubl. (1956).

5 Skinner, R.: Geology of the Tetagouche Lakes, Bathurst and Nepisiguit Falls map-areas, New Brunswick; Geol. Surv. Can., Memoir (in press).

6 Helmstaedt, H. and Skinner, R.: Tectonic hist. of Bathurst- Newcastle dist.; Can · J. Earth Sci. (in press)

7 McFarlane, P. and Gates, W.J.: Geology of the Heath Steele sulphide deposits; in Guidebook-Geology of Parts of Atlantic Provinces, W.H. Poole; Geol. Assoc. Can., and Mineralogical Assoc. Can., pp. 59-62 (1966).

8 Meyer, K.V.S.: Geology of Wedge mine; in Guidebook-Geology of Parts of Atlantic Provinces, W.H. Poole; Geol. Assoc. Can., and Mineralogical Assoc. Can., pp. 63-65 (1966).

The reader is referred to the following detailed geological maps prepared subsequent to the field study upon which this map has been prepared:

Fyffe, L.R.: Map-area N-7, Forty-four Mile Brook-Mount Fronsac; Mineral Resources Branch, New Brunswick Dept. Natural Resources, prelim. map, (1970).

Fyffe, L.R.: Map-area M-7, Upsalquitch Lake, Nepisiguit-Portage Brook; Mineral Resources Branch, New Brunswick Dept. Natural Resources, prelim. map, in preparation.

Fyffe, L.R.: Map-area M-8, Forks of Nepisiguit and South Branch; Mineral Resources Branch, New Brunswick Dept. Natural Resources, prelim. map, in preparation.

Helmstaedt, H.: Structural geology of Portage Lakes area, Bathurst-Newcastle district, New Brunswick; Geol. Surv. Can., Paper 70-28 (1971).

Jones, R.A.: Map area 0-7, Parts of Forty and Nine Mile Brooks; Mines Branch, New Brunswick Dept. Lands and Mines, prelim. map 61-1 (1962).

Jones, R.A.: Map area 0-8, Parts of Forty and Nine Mile Brooks (Nepisiguit River - Otter Brook): Mines Branch, New Brunswick Dept. Lands and Mines, prelim. map 62-1 (1964).

McNutt, J.R.A.: Map area N-9, Upper Parts North Big Sevogle and Northwest Miramichi Rivers: Mines Branch, New Brunswick Dept. Lands and Mines, prelim. map 61-2 (1962).

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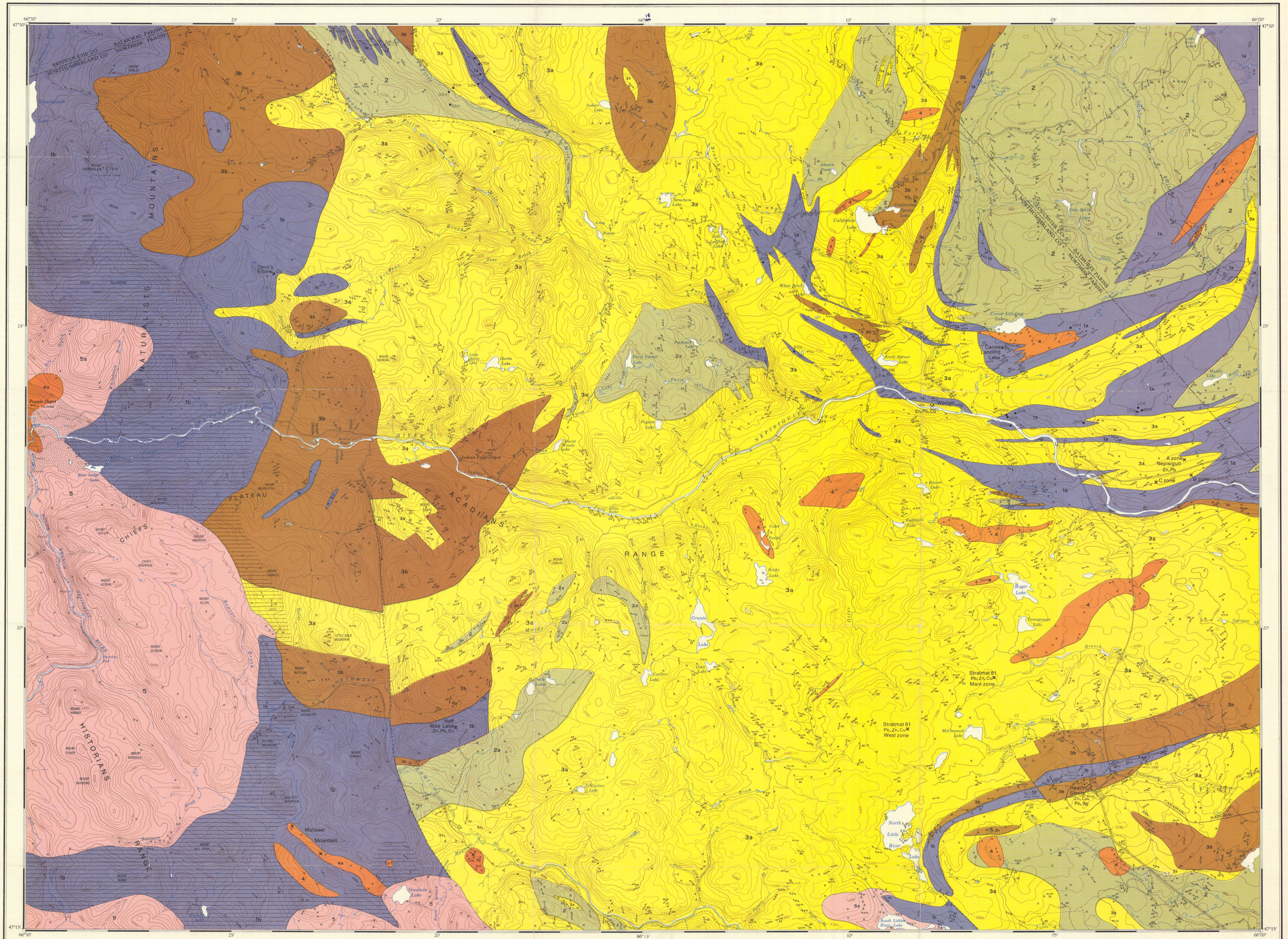

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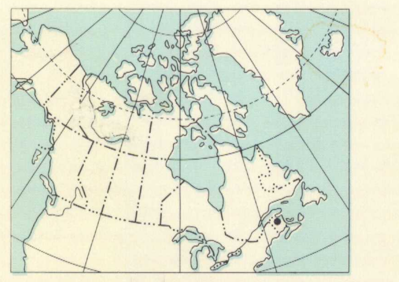

INDEX MAP

REFERENCE

Geology by C.H. Smith 1955-57

Compiled by C.H. Smith, R. Skinner and W.H. Poole, 1971

Geological cartography by the Geological Survey of Canada

MAP 1341A
GEOLOGY
CALIFORNIA LAKE
NEW BRUNSWICK

Scale 1:50,000

Miles 1 0 1 2 Miles
Metres 1000 0 1000 2000 3000 Metres

Universal Transverse Mercator Projection

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NEW BRUNSWICK. CALIFORNIA LAKE
1: 50,000

MAP 1341A

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REFERENCE

Base-map at the same scale published by Surveys and Mapping Branch in 1957, with road additions from New Brunswick Dept. of Lands and Mines, geographical names updated by the Canadian Permanent Committee on Geographical Names

Copies of the topographical edition of this map may be obtained from the Map Distribution Office, Department of Energy, Mines and Resources, Ottawa

Approximate magnetic declination 1972, 22°31′ East, decreasing 2.7′ annually

Elevations in feet above mean sea-level

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NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

MAP 1341A
CALIFORNIA LAKE
NEW BRUNSWICK

1341A

1341A

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