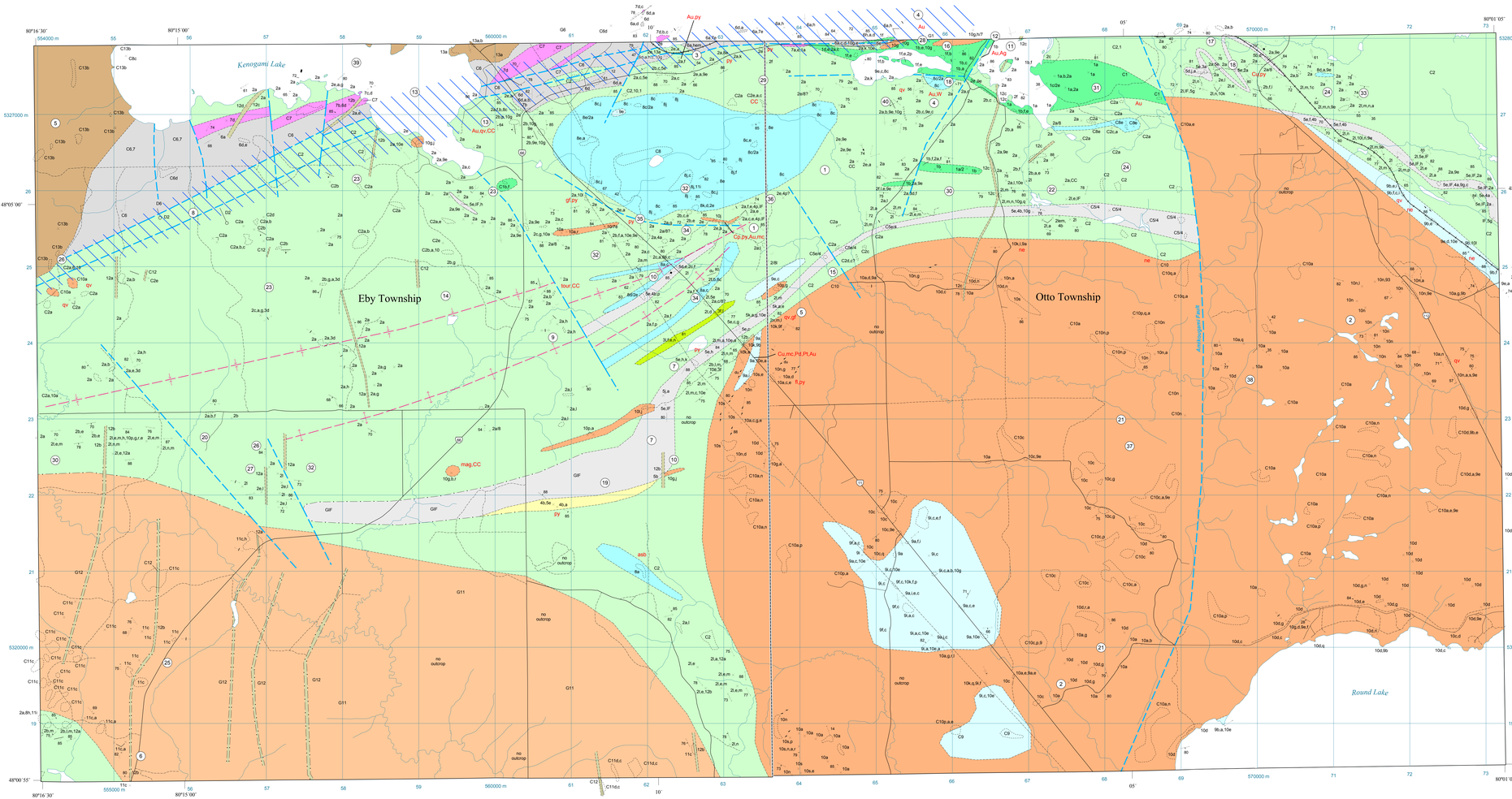



## LEGEND[#]

**PHANEROZOIC**

**CENOZOIC**

**QUATERNARY**

**RECENT**
Lake, stream, wetland deposits

**PLEISTOCENE**
Glacial, glaciofluvial and glaciolacustrine deposits; sand, gravel, clay, till

*UNCONFORMITY*

**PRECAMBRIAN**

**PROTEROZOIC**

**PALEOPROTEROZOIC**

**HURONIAN SUPERGROUP**

**Cobalt Group**

**13 Gowganda Formation**
13a Conglomerate
13b Sandstone and arkose

*UNCONFORMITY*

**12 Mafic Intrusive Rocks (Diabase Dikes)**
12a Diabase, <1% plagioclase phenocrysts (Matachewan swarm)
12b Diabase, >1% plagioclase phenocrysts (Matachewan swarm)
12c Diabase; medium grained, equigranular, unknown affinity

*INTRUSIVE CONTACT*

**ARCHEAN**

**NEOARCHEAN**

**11 Metamorphosed Calc-Alkalic Felsic and Intermediate Intrusive Rocks**
11a Massive to foliated tonalite
11c Massive to foliated granodiorite, granite
11d Gneiss, compositional mineral layering
11h Xenolith bearing, 1 to 10% generally small (<30 cm in size) country rock
11i Tonalite dikes

**10 Metamorphosed Alkalic Felsic and Intermediate Intrusive Rocks**
10a Syenite; equigranular, medium to coarse grained
10b Monzonite, quartz monzonite
10c Alkaline granite, quartz syenite
10d "Spotted" syenite, 1 to 10% ultramafic nodules from <1cm to 20 cm in diameter
10e Aplite dikes
10g Feldspar porphyry; syenitic composition
10j Albitite; white to pink, fine grained
10k Syenite gneiss
10l Aplitic syenite; fine grained, sugary textured
10n Coarse-grained to pegmatitic syenite
10p Mesocratic to melanocratic syenite
10q Xenolith bearing; 2 to 10% small (<30 cm in size) mafic country rock
10r Biotite bearing; trace to 15% biotite crystals, up to 7 mm in size
10s Potassium feldspar megacrystic syenite; crystals up to 6 cm in size, to 30% amphibole and biotite in groundmass

*INTRUSIVE CONTACT*

**9 Metamorphosed Alkalic Ultramafic and Mafic Intrusive Rocks**
9a Hornblendite and/or pyroxenite
9b Melasyenite
9c Xenolith bearing
9d Mafic syenitic schist
9e Phlogopite-amphibole lamprophyre
9f Alkalic gabbro/diorite
9g Amphibole ± mica lamprophyre
9i Mica-bearing gabbro to melagabbro
9j Megacrystic amphibole, crystals up to 3 cm in diameter

*INTRUSIVE CONTACT*

**8 Metamorphosed Tholeiitic Ultramafic and Mafic Intrusive Rocks**
8a Peridotite; massive, talc and serpentine bearing[#]
8c Gabbro
8d Schist
8e Diorite to quartz diorite
8h Intrusion breccia
8j Leucogabbro
8k "Knobby" gabbro; amphibole phenocrysts and oikocrysts display positive relief on weathered surface

*INTRUSIVE CONTACT*

**7 Alkalic Metavolcanic and Related Intrusive Rocks—Timiskaming Assemblage**
7a Massive mafic and intermediate flows with biotite ± amphibole phenocrysts
7b Intermediate to felsic tuff and lapilli tuff; heterolithic, epiclastic
7c Intermediate to felsic tuff breccia: heterolithic, epiclastic
7d Trachyte flows; feldspar phenocrysts to porphyritic
7e Intermediate to felsic alkalic dikes and sills

**6 Clastic and Chemical Metasedimentary Rocks—Timiskaming Assemblage**
6a Wacke, sandstone, arkose
6b Siltstone
6c Argillite
6d Conglomerate; polymictic, clast and matrix supported
6e Schist
6h Pebbly conglomerate and grit

**5 Clastic and Chemical Metasedimentary Rocks—Turbidite Related**
5a Wacke
5b Siltstone
5c Graphitic and pyritic ironstone ± chert
5e Chert
5f Schist
5g Garnetiferous
5h Tuffaceous; fine to medium grained, feldspathic
5j Conglomerate, metavolcanic and metasedimentary clasts from 1 to 40 cm in size
5k Amphibolitic metasedimentary rocks, recrystallized
IF Iron formation; magnetite-chert, laminated to thinly bedded

**4 Felsic Metavolcanic Rocks**
4a Flows
4b Tuff and lapilli tuff
4p Quartz-feldspar tonalite dikes; rarely porphyritic, white weathering

**3 Intermediate Metavolcanic Rocks**
3a Flows, massive to flow laminated
3d Tuff and lapilli tuff
3e Schist
3f Tuff breccia and breccia, pyroclastic and epiclastic
3i Amphibolite with calc-silicate alteration ± feldspar porphyroblasts
3n Gneiss, banded with mineral segregation and extensive recrystallization

**2 Mafic Metavolcanic Rocks**
2a Flows, massive
2b Flows, pillowed
2c Pillow and/or flow top breccia
2d Tuff and lapilli tuff
2e Schist
2g Amygdaloidal
2h Plagioclase bearing; may be porphyritic
2k Leucoxene bearing
2l Amphibolite
2m Calc-silicate alteration, epidote-chlorite bands, veins, patches ± calcite veins
2n Gneiss, banded and recrystallized
2p Basaltic dikes

**1 Ultramafic and Mafic Metavolcanic Rocks (Komatiites)**
1a Flows, massive
1b Flows, spinifex textured
1c Schist
1d Komatiitic basalt; very soft, dark green
1e Flow breccia
1f Polyaulture-textured flows

[#] This is a field legend and may be changed as a result of subsequent laboratory investigations.

[#] These rocks may, in part, be extrusive.

The letter "C" preceding a code refers to data compiled from existing maps and from maps filed for assessment work credits, and are available for viewing at the Kirkland Lake Resident Geologist's Office and from ERMES. The letter "G" preceding a code refers to data interpreted from geophysical data. The letter "D" preceding a code refers to data compiled from diamond drill hole logs available for viewing at the Kirkland Lake Resident Geologist's Office and from ERMES.

Rock codes designated with a "/" (e.g., 2/3) indicate the lithology may contain both rock types but the first number code is inferred to predominate.

## ABBREVIATIONS

asb.....asbestos
Ag.....silver
Au.....gold
CC.....carbonate alteration
cp.....chalcopyrite
Cu.....copper
f.....fluorite
gl.....graphite
mag.....magnetite
mc.....malachite
ne.....nepheline
Pd.....palladium
Pt.....platinum
py.....pyrite
qv.....quartz vein
Sil.....silicification
Tour.....tourmaline
W.....tungsten

## PROPERTIES

1. Allsopp, A. (Au, Cu)
2. Argentex Resources Exploration Corporation (Au)
3. Baldwin Consolidated Mines Limited (Au)
4. Battle Mountain Canada Incorporated (Au)
5. Bernie, W. (Au)
6. Black, A. (industrial mineral)
7. Butte Canyon Resource Incorporated (Au, Cu, Zn)
8. Dominion Gulf Company (Au)
9. Dufresne, R. (Au)
10. Farkito, M. (Au, Cu)
11. Fenn-Gibbons Limited (Au, Ag)
12. Golden Crescent Resources Limited (Au, Ag)
13. Greater Lenora Resources Corporation (Au)
14. Hemlo Reef Resources (Au)
15. Horne, J. and Robinson, D. (Au)
16. HSK Minerals Limited (Au)
17. International Nickel Company of Canada Limited (Zn, Cu)
18. Joni Mining and Expediting Limited, Dyment, M. (Au, W)
19. Keevil Mining Group Limited (Au, Cu, Fe)
20. Lacana Mining Corporation (Au)
21. Lee, H. (Au)
22. Marcon, E. (Au)
23. Mary Ellen Resources Limited (Au)
24. Minorex Limited (Au)
25. Noranda Exploration Company Limited (Au)
26. Perrons, A. (Au)
27. Preston East Dome Mines Limited (Au)
28. Queenston Mining Limited (Au)
29. Reed, J. (Au)
30. Rio Tinto of Canada Exploration Limited (Au)
31. Ross, R. (Au)
32. Robinson, D. (Au)
33. St. Jean, J. (Au, base metals)
34. Sylvanite Gold Mines Limited (Au)
35. Taylor Gold Mines Limited (Au)
36. Todora Kirkland Prospecting Syndicate (Au, Cu)
37. Veisch, Z., and Horachek, L. (Au)
38. Wallis, J. (industrial minerals)
39. Westminer Canada Limited (Au)
40. Zabudskiy, D. (Au)

## SOURCES OF INFORMATION

Digital base map derived from Ontario Basic Mapping Program, Surveys, Mapping and Remote Sensing Branch, Ontario Ministry of Natural Resources, scale 1:20 000, with modifications by staff of the Ontario Ministry of Northern Development and Mines.

Metric conversion factor: 1 foot = 0.3048 m.

Geology not tied to survey lines.

Magnetic declination approximately 8°10' W in 2002. Map coordinates are UTM zone 17, NAD 83.

Gernie, W. and Thomson, J.E. 1946. Kenogami Lake area, District of Timiskaming, Ontario; Ontario Department of Mines, Map 1946-1, scale 1:12 000.

Lovell, H.L. 1972. Eby–Otto area, Timiskaming District; Ontario Geological Survey, Map 2239, scale 1:31 680.

Ontario Geological Survey 2000. Ontario airborne geophysical surveys, magnetic and electromagnetic data, grid and vector data, Kirkland Lake; Ontario Geological Survey, Geophysical Data Set 1102.

Files of the Resident Geologist's Office, Kirkland Lake and ERMES

Ontario

**Ontario Geological Survey**

**MAP P.3534**

**PRECAMBRIAN GEOLOGY**

# OTTO AND EBY TOWNSHIPS

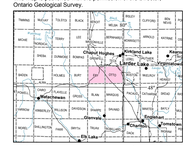
**Scale 1:20 000**

500 m 0 0.5 1 km

NTS Reference: 42 A/1

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Location Map 1 cm equals 10 km

## SYMBOLS

- crossbedding, inclined, with facing
- graded bedding, with facing (vertical, overturned)
- sedimentary bedding, inclined, facing known from other than grading or crossbedding
- pillowed flow, with facing (inclined, vertical, overturned)
- pillowed flow, no facing (trend only, magnitude of dip uncertain)
- bedding, unsubdivided, no facing (inclined, vertical, trend only)
- bedding, volcanic structures other than pillows and flow tops, no facing (inclined, vertical)
- general cleavage, unknown generation (inclined, vertical)
- compositional layering and parallel foliation, unknown generation (inclined, vertical, trend only)
- mineral foliation, 1st generation (inclined, magnitude of dip uncertain)
- mineral foliation, 2nd generation (inclined, vertical, magnitude of dip uncertain)
- mineral foliation, unknown generation (inclined, vertical, magnitude of dip uncertain, trend only)
- fracture, inclined, unknown separation, unknown generation
- Property
- igneous foliation, primary (inclined, vertical; trend only)
- igneous layering, unsubdivided, no facing (inclined, vertical, trend only)
- unconformity, inclined, no facing
- crenulation lineation, M-asymmetry, 2nd generation
- elongation lineation (stretch), unknown generation
- fold axis lineation, U-asymmetry, unknown generation
- mineral lineation, unknown generation
- slickenside lineation, unknown generation
- schistosity (inclined, vertical)
- glacial striae
- vein (quartz ± carbonate ± epidote ± sulphides), a-type, unknown generation (inclined, vertical)
- vein (carbonate ± epidote), c-type, unknown generation, inclined
- geological contact (interpreted, observed, interpreted from geophysical data)
- fault and/or lineament
- anticline, unknown generation, trend only
- syncline, unknown generation, trend only
- outcrop area
- small outcrop
- Hachured area Cadillac–Larder Lake deformation zone
- Diamond drill hole, inclined

## CREDITS

Geology by L. Pigeon, B.R. Berger and assistants, 2003.

To enable the rapid dissemination of information, this map has not received a technical edit. Discrepancies may occur for which the Ontario Ministry of Northern Development and Mines does not assume liability. Users should verify critical information; sources include both the references listed here, and information on file at the Resident Geologist's Office and the Mining Recorder's Office nearest the map area.

Issued 2004.

Information from this publication may be quoted if credit is given. It is recommended that reference to this map be made in the following form:

Pigeon, L. and Berger, B.R. 2004. Precambrian geology, Otto and Eby townships; Ontario Geological Survey, Preliminary Map P.3534, scale 1:20 000.