

Figure 1. Location and general geology map illustrating the regional distribution of the members of the Onaping Formation. VD, ED = Vermilion and Errington Zn-Pb-Cu-Ag deposits. SRSZ = South Range shear zone.

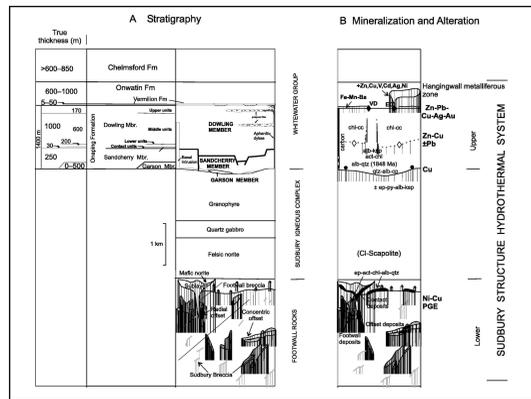


Figure 2. Schematic sections through the Sudbury structure showing: A) Stratigraphic terminology with member and unit thicknesses. The fragmental rocks are indicated by the grainy aphanitic dikes and the xenolithic basal intrusion; B) Distribution of mineralization and alteration, Sudbury structure hydrothermal system. VD, ED = Vermilion and Errington Zn-Pb-Cu-Ag deposits. (Modified after Ames et al., 2009).

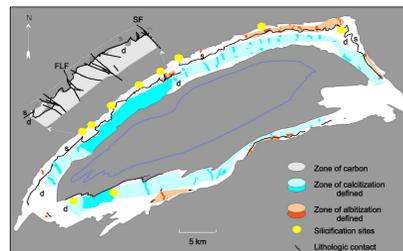


Figure 3. Simplified alteration map showing the distribution of regional semi-conformable alteration zones in the Onaping Formation, Sudbury Structure. Alteration zones are inferred (light shades) between defined mapped areas (dark shades). S = Sandcherry member; D = Dowling member. Note the transgressive nature of the carbon contact across the Sandcherry/Dowling member contact on inset map. Data compiled from this study, unpublished Passchrodt Ltd. Data, Gibbins, 1994, and Gray, 1999.

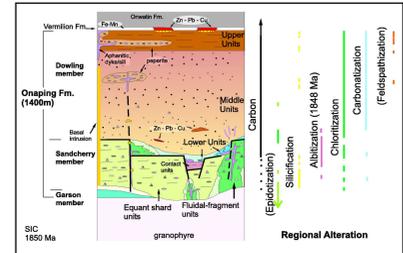


Figure 4. Simplified stratigraphic and alteration section for the Onaping Formation, Sudbury Structure showing the distribution and vertical stacking of regional basinwide hydrothermal alteration zones. Brackets denote alteration types with poorly constrained regional distribution patterns (modified from Ames et al., 1996).

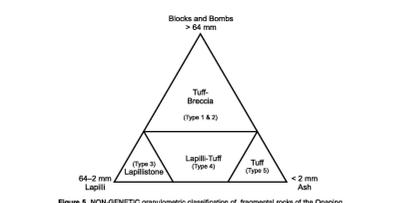


Figure 5. NON-GENETIC granuloblastic classification of fragmental rocks of the Onaping Formation adopted from Fisher (1966). Type 1-5 after Muir and Penney (1984).

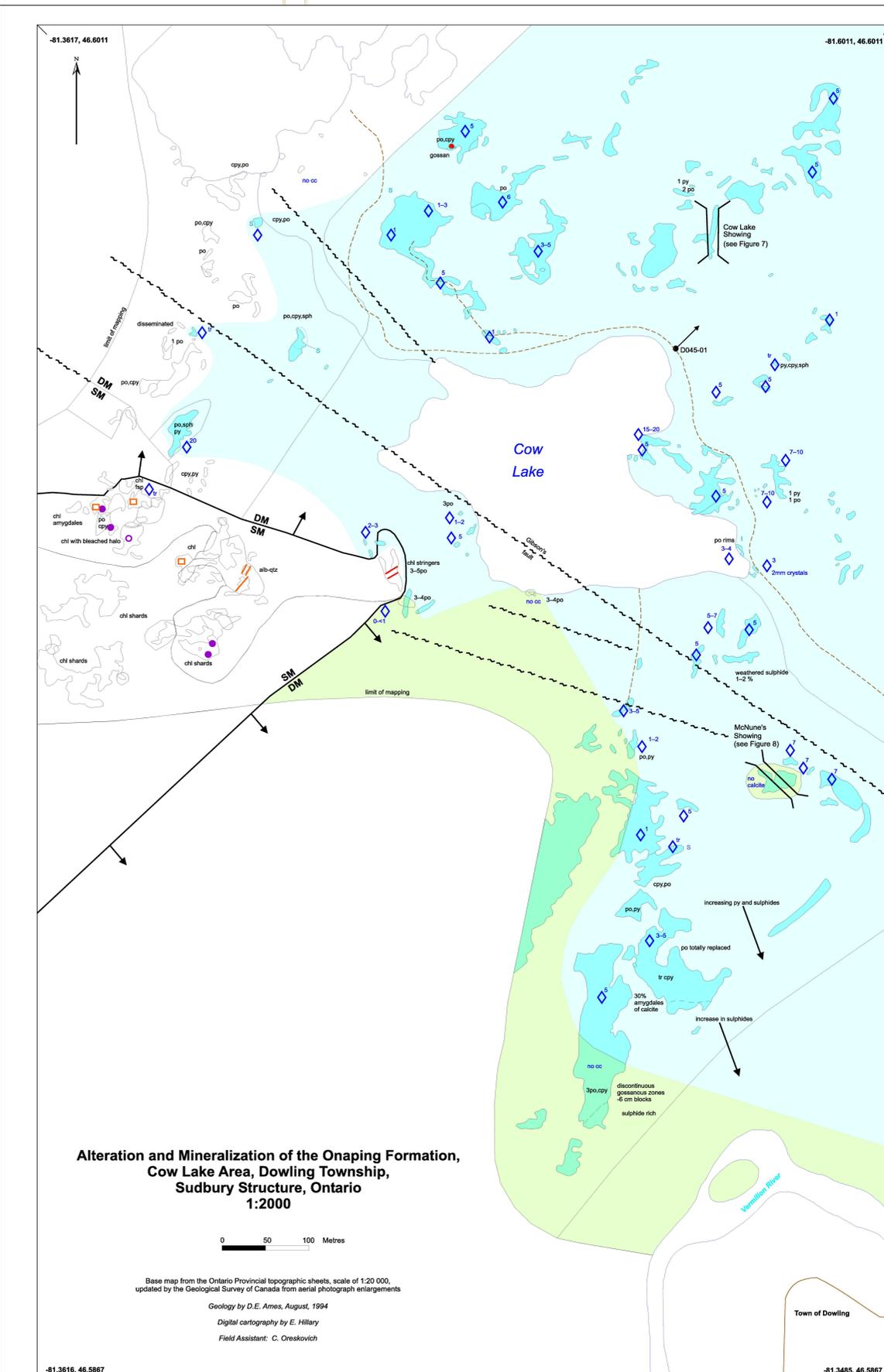


Figure 6. Detailed geology, alteration and mineralization of the Onaping Formation, Cow Lake Area, Dowling Township, Sudbury Structure, Ontario. The map shows the distribution of alteration zones, mineralization, and structural features. A legend defines the symbols for alteration zones, mineralization, and structural features.

AREA	SIGNIFICANCE	MAP SCALE	REFERENCE
Wagon Township North Range	Complete stratigraphic section through north range Onaping Fm. Type area. Stratigraphic correlation of basal sequence to 1000 m. Unconformable fault control of early block faulting. Limited to 1000 m. Unconformable fault control of early block faulting. Limited to 1000 m. Unconformable fault control of early block faulting. Limited to 1000 m.	1:5000	GSC OF4567 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through Dowling member base units and middle units, across beds. Alteration: regional carbonates, carbon and carbonate-silicates. Mineralization: Malpas and Cow Lake Cu-Zn-Ag-Au-Ag-Au in amygdales in basal intrusion near top of MLI.	1:5000	GSC OF4568 (Ames and Gibbins, 2004)
Joe Lake North Range	Stratigraphic section through DM and DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4569 (Ames and Gibbins, 2004)
Norman North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4570 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4571 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4572 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4573 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4574 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4575 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4576 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4577 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4578 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4579 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4580 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4581 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4582 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4583 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4584 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4585 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4586 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4587 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4588 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4589 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4590 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4591 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4592 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4593 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4594 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4595 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4596 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4597 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4598 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4599 (Ames and Gibbins, 2004)
Hammer North Range	Stratigraphic section through DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit. Alteration: Epidote-hydrated zone at DMU. DMU is a 100 m thick unit.	1:5000	GSC OF4600 (Ames and Gibbins, 2004)

DM - Sandcherry member; ED - Equant sherd units; FL - Fluidal fragment units; DM - Dowling member; CT - Contact units; LU - Lower units; MU - Middle units; UU - Upper units

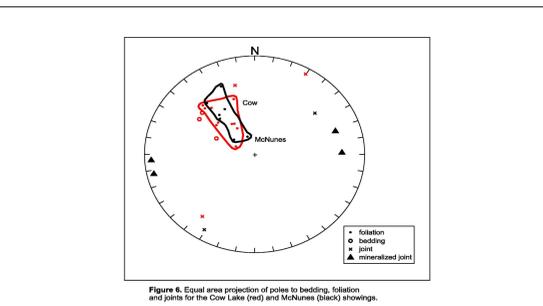


Figure 7. Equal area projection of poles to bedding, foliation and joints for the Cow Lake (red) and McMurres (black) showings.

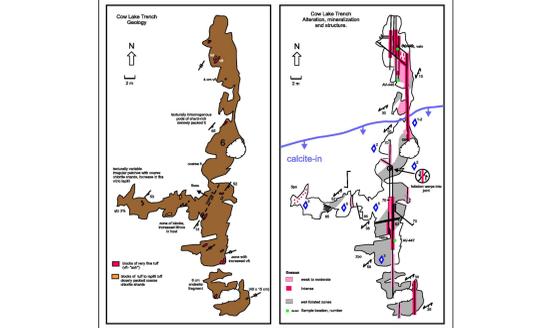


Figure 8. Detailed geology, alteration and mineralization of the Cow Lake Cu-Zn showing.

LEGEND

ALTERATION ZONES (outcrop shown in darker colour, regional context see Figure 3.4)

- Carbonate-calcite
- Carbonate-absent

Carbon boundary (arrow indicates carbon-bearing)

Bleached shard rims, albization

Fracture-controlled alteration

Silicification

Altered mafic fragments and clots

Chlorite

Chlorite with bleached rim

Modal estimates

Trace amounts

Vein

Drill hole

SULPHIDES

Gossan

Vein

MINERALS

Pyrrhotite.....po

Pyrite.....py

Chalcocypite.....cpy

Sphalerite.....sph

Chlorite.....chl

Actinolite.....act

Albite.....alb

Calcite.....cc

Sericite.....ser

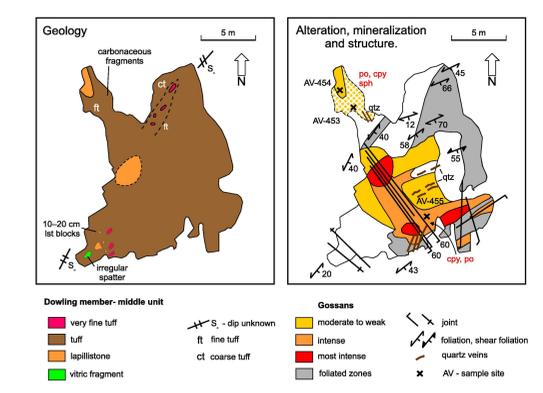


Figure 9. Detailed geology, alteration and mineralization of the McMurres Cu-Zn showing.

### Alteration and Mineralization of the Onaping Formation, Cow Lake Area, Dowling Township, Sudbury Structure, Ontario 1:2000

Base map from the Ontario Provincial topographic sheets, scale of 1:20,000, updated by the Geological Survey of Canada from aerial photograph enlargements

Geology by D.E. Ames, August, 1994

Digital cartography by E. Hillary

Field Assistant: C. Oreskovich