



41110SE0039 2.11800 FALCONBRIDGE

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Bedrock Geology
of the
Sungold Resources Inc. Property
Falconbridge Township, Ont.

by

William O. Karvinen, Ph.D.

Sept. 22, 1988

Qual.

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TRAINING LANDS SECTION

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Summary

Rocks on the Sungold Resources Inc. property in Falconbridge Township near Sudbury consist of Proterozoic volcanics, sediments, and intrusives. The nearest outcrops of the Sudbury Igneous Complex in which typical Sudbury type ores are found, are some three thousand feet away, however, the rocks on the property have been intensely brecciated over large areas, particularly near the contacts of a gabbroic intrusion. In the Sudbury area, sulfide mineralization is often found in association with such breccias and one such showing of copper, nickel, gold, cobalt, silver and zinc has been located on the property. It is proposed that the extension of the showing as well as the poorly exposed breccia zones be further explored with depth-penetrating geophysical methods to locate sulfide zones with platinum group metal potential.



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Table of Contents

	page
Introduction.....	1
Location and Access.....	1
Property Description.....	1
Previous Exploration Work.....	2
Present Survey.....	2
Regional Geology.....	3
Local Geology.....	3
Mafic volcanics.....	3
Sediments.....	3
Syenite/granite.....	4
Mafic dikes.....	4
Gabbro.....	5
Olivine Diabase.....	5
Breccia.....	5
Alteration.....	5
Quartz veins.....	6
Glacial sediments.....	6
Mineralization.....	6
Discussion of Mineral Potential.....	7
Conclusions.....	7
Fig. 1: Property Location in Ontario	
Fig. 2: Detailed Location Map of Property	
Fig. 3: Claim Map	
Fig. 4: Generalized Geology Map in the Vicinity of the Property	
Map: Bedrock Geology Scale: 1" = 200'	

Introduction

In August of 1988, W. O. Karvinen and Associates Ltd. carried out geological mapping on the Sungold Resources Inc. property in Falconbridge Township east of Sudbury, Ontario. The actual field work was done by the writer.

The purpose of the survey was to acquire an accurate and detailed map of the property and to locate and sample any mineral showings. Combined with the previously-completed magnetic survey, a reliable map showing the surface distribution of the rock types could then be made.

The Sungold property was staked to assess the precious metal (gold and platinum group) potential of a previously-known showing and to explore for new mineralized zones in geologically important areas. Although the property is located some distance from the footwall of the Sudbury Igneous Complex, the proximity of two mines and the fact that deposits rich in precious metals are found far into the footwall around the Sudbury Basin, add considerably to the potential of this ground.

Location and Access

The Sungold property is located in the northern portion of Falconbridge Township about 10 miles northeast of the city of Sudbury (Fig. 1 & 2). The claims cover parts of lots 4 and 5 of concessions V and VI (Fig. 3). The closest town is Falconbridge which is the townsite for the Falconbridge Mine; it is located 4 miles to the southwest of the property.

The claims are easily accessible via a dirt road which leaves highway 541 just past the Sudbury airport and extends to the northern part of the group.

Property Description

The property comprises twelve contiguous unpatented claims numbered as follows: S985536, S985537, S985538, S985539, S985540, S985541, S985542, S985543, S985544, S985545, S985546, and S985547 (fig. 3). The claims are held in trust by Mr. Gordon Wilton for Sungold Resources Inc. through an option agreement with W. O. Karvinen & Associates Ltd.

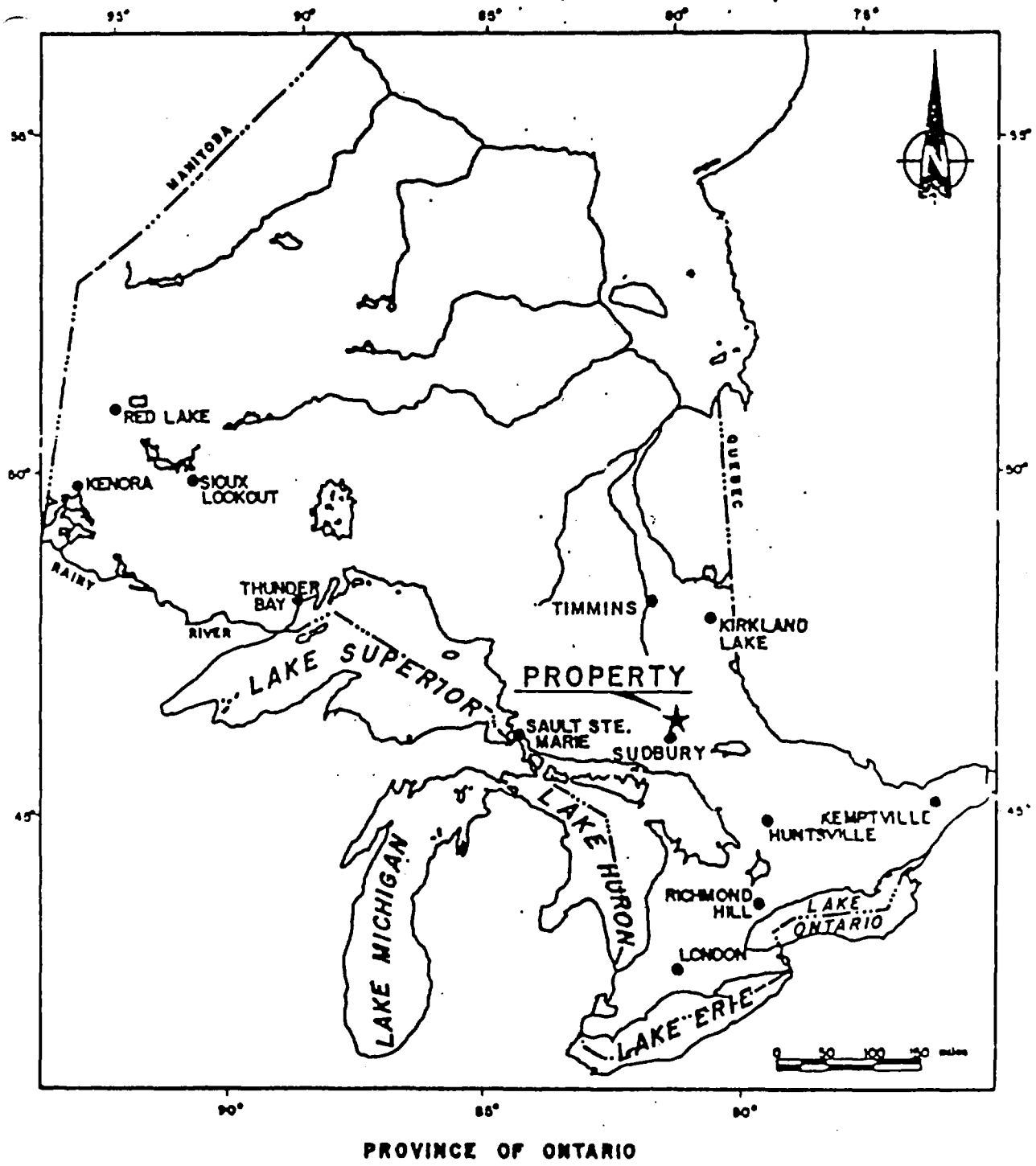
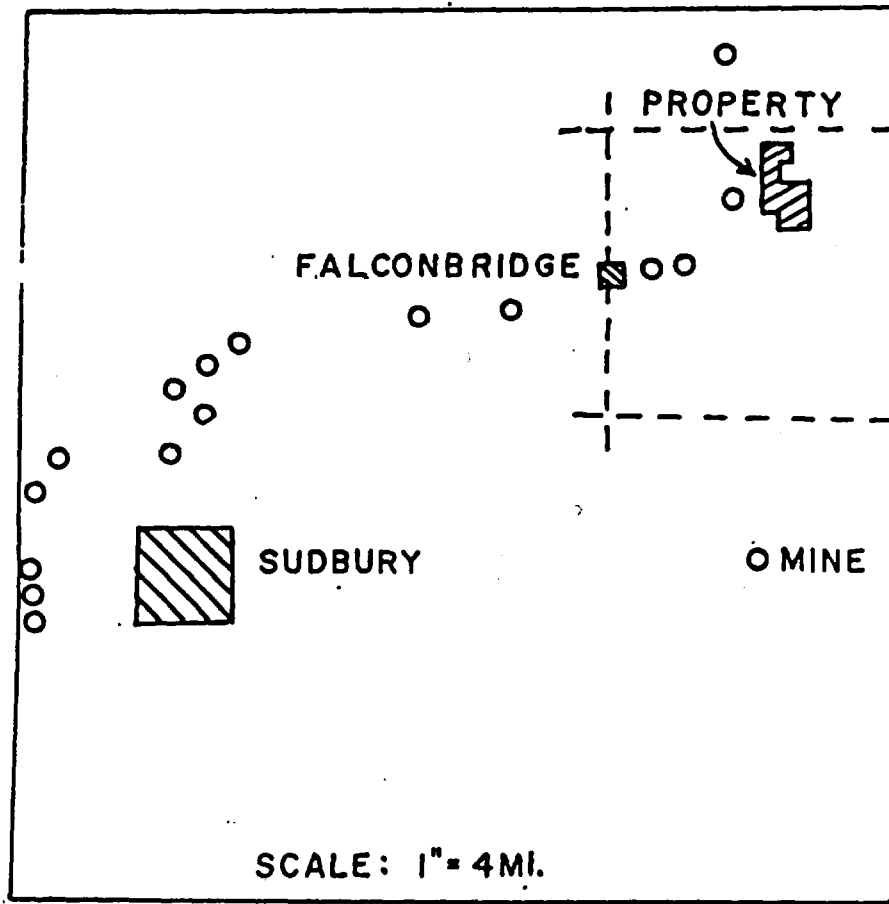


Fig. 1: Property Location in Ontario



Location Map

Fig. 2: Detailed Location Map of Property

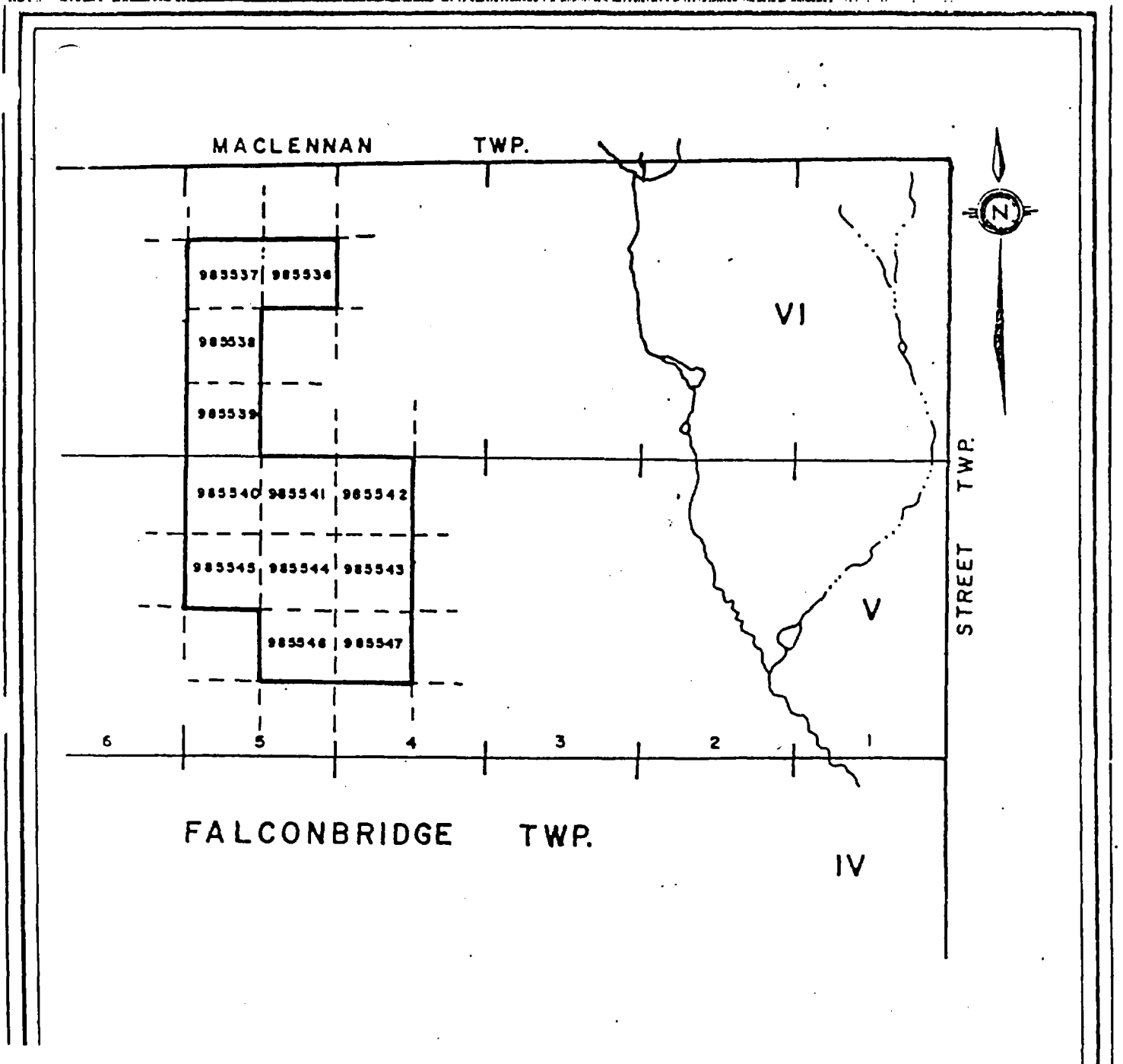


Fig. 3: Claim Map

Previous Exploration Work

The mining and exploration history of the Falconbridge area is summarized by McCombe in her prospectus report to Sungold Resources Inc. (McCombe, 1987). Despite its proximity to the Falconbridge mines which have produced a combined total of over 40 million tons of copper-nickel ore with precious metals since 1928, the Sungold property has seen very little exploration. This is probably due to the fact that it is located away from the surface exposure of the footwall contact of the Sudbury Igneous Complex which has been the focus of almost all previous exploration around* the Sudbury Basin. It should be noted that in recent years, copper mineralization particularly rich in precious metals (gold and platinum), have been found thousands of feet into the footwall gneisses on the north rim of the Basin. Also, the McLennan Mine located about 2 miles northwest of the Sungold property, was about 1800 feet into the footwall rocks.

Exploration records on the property date back to 1959, although there is little doubt that the ground was well covered by prospectors in the years following the discovery of the ores in Sudbury and Falconbridge. In 1959, A. E. Jerome carried out surface trenching and prospecting on the property from which some values in gold, silver, copper, zinc and nickel were obtained. This led to further work by Kerr Addison in 1960 who conducted a ground magnetic survey over part of the property. In 1984, the claims were covered by an Aerodat helicopter magnetic, electromagnetic and VLF survey for E. Jerome, R. Charron and R. J. Graham. The results indicated no obvious anomalies on the property.

Present Survey

Geologic mapping was done systematically along and in between grid lines spaced 400 feet apart with stations at 100ft. intervals. With the assistance of air photos, most of the outcrops were located with respect to the survey grid and carefully examined to determine rock types, and for the presence of alteration and mineralization. Samples were collected from the main showing and sent for analysis.

Regional Geology

Rocks in the Sudbury area belong to three different structural provinces within the Precambrian Shield: the Superior Province of Archean age, the Southern Province of Early Proterozoic age and the Grenville Province of Late Proterozoic age. In the vicinity of the Sungold property, only rocks of the Early and Middle Proterozoic are present (Fig. 4). These include volcanics and sediments deposited between 2500 and 2150 million years ago. These are intruded by gabbroic rocks (Nipissing Diabases) having an age of about 2150 Ma. and the Sudbury Igneous Complex of norite, quartz gabbro and granophyre which is about 1850 Ma. old (Dressler, 1987). The youngest rocks are olivine diabase dikes dated at about 1250 Ma.

Known copper-nickel mineralization at the east end of the Sudbury Igneous Complex is closely associated with the footwall zone of the norite at the Falconbridge Mine, the East Mine, and the Norduna Mine, while the McLennan deposit is found in footwall rocks some 1800 feet from the norite contact. Outside the Complex, some gold mineralization has been developed at the Falcon Mine which is located about 2 miles south of the Sungold ground.

Local Geology

The main rock-types exposed on the Sungold claims are: mafic volcanics, arenaceous sediments, syenite/granite and gabbroic intrusives, and olivine diabase dikes (see map).

Mafic volcanics: all volcanic rocks on the property are mafic and consist mainly of massive, pillowed or amygdaloidal flows and thin fragmental units. They are exposed in the northern part of the property where, in places, they form large outcrops. These volcanics are part of the earliest group of volcanic rocks found at the base of the Proterozoic succession. They have been correlated with the Stobie Formation volcanics which are best exposed near the Stobie Mine at Sudbury (Dressler, 1987).

Sediments: the volcanics appear to be partly in facies contact with a thick sequence of arenaceous sediments consisting mainly of arkosic sandstones and wackes with some conglomerates and siltstones/argillites. These rocks form large outcrops in the

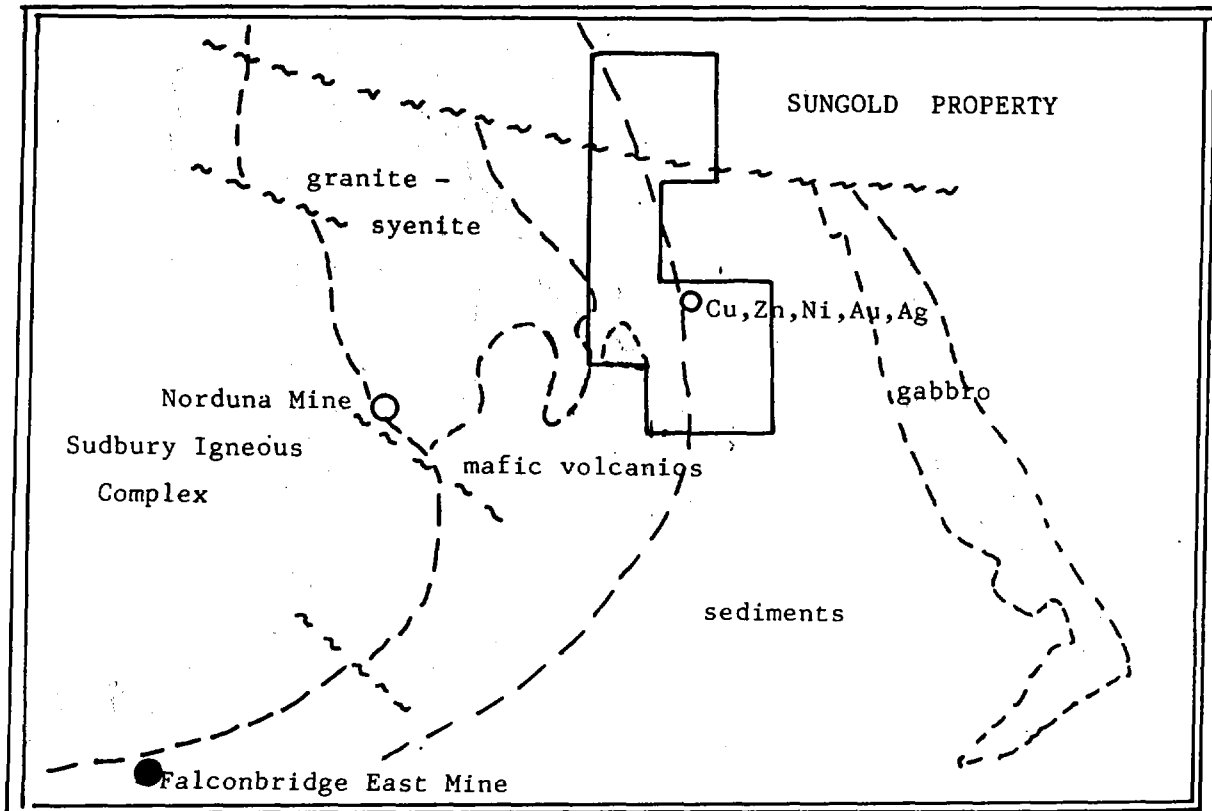


Fig. 4: Generalized Geology Map of Bedrock in the Vicinity of the Sungold Resources Inc. property, Falconbridge Township.

(Scale: 1:50,000 or 1" = 0.8 miles)

southern and northeastern parts of the property. Although direct contact with the volcanics is not present in outcrop, in areas near the contact, exposures of polymictic conglomerates with clasts ranging from a few inches to a foot or two along with grit units can be found. The clasts in the conglomerate consist mainly of quartzites, amygdaloidal volcanics, cherty rhyolite and argillites. These conglomerates have been assigned to the Ramsay Lake Formation (Dressler, 1987).

Because of metamorphism, the sandstones are actually quartzites, and therefore form high outcrops due to their resistance to erosion. These rocks comprise predominantly of quartz clasts with varying amounts of feldspars and some mafic minerals. They are well bedded, with bed thicknesses ranging from several inches to ten feet. Cross-bedding is very common.

Interbedded with the quartzites are thin beds (1 to 5 ft) of argillaceous siltstones. These units tend to weather darker and therefore are readily evident in outcrops.

Syenite/granite: intrusive felsic rocks are found in the northern and western parts of the claims. These rocks are predominantly syenitic in composition, but in some contact zones, particularly in the south near lines 44S and 48S, they can be classed as granites. The syenite is reddish to orange in color and generally coarse grained. It consists mainly of pink feldspars, small amounts of quartz and a varying amount of chlorite and/or hornblende. Fractures filled with quartz veinlets are common to abundant, particularly in the northern outcrops. The texture of the rock is that of a high level intrusive. This is supported by the fact that large blocks of mafic volcanic rocks are found as inclusions on most of the outcrops in the north, whereas, some quartzite rafts are present in the southern exposures.

These felsic intrusive rocks definitely post-date the mafic volcanics and therefore are younger than the Stobie Formation, but are in turn intruded by the Nipissing diabases. Although they have been recent assigned to the Archean (Dressler, 1987), it would appear that they may in fact be Early to Middle Proterozoic in age.

Mafic Dikes: narrow mafic dikes are found cutting the felsic intrusive rocks as well as the mafic volcanics. These rocks

are normally fine-grained and according to Thomson (1959) are dioritic in composition. The dikes are younger than the volcanics and felsic intrusives but older than the gabbros.

Gabbro: an irregular mafic intrusive is found in the central part of the property. This rock is generally medium to fine-grained and consists of altered mafic minerals (now hornblendes?) and plagioclase. In places they contain large rafts of mafic volcanic and quartzite inclusions. The rock weathers black and has a massive surface appearance. Although in composition it is similar to the norite of the Sudbury Igneous Complex, it is somewhat different in appearance from it. According to Thomson (1959), the two rocks are not in contact with each other in Falconbridge Township, however, age-dating measurements indicate the norite to be significantly younger (1850 Ma.) than the gabbro (2150 Ma.). The latter rocks have been termed Nipissing Gabbros.

Olivine Diabase: one outcrop of olivine diabase is found in the southwestern part of the property, although based on magnetic data and mapping by Thomson (1959) to the east, another dike also cuts across the northern part of the claims. Because of the olivine content, these rocks weather quickly and therefore their coarse is generally marked by a valley. The dikes trend northwesterly and represent the youngest rocks in the area.

Breccia: zones of brecciated rocks containing local wallrocks and exotic fragments are common on the property, particularly along the contacts of the gabbro intrusion. Historically, these have been termed Sudbury Breccias, because of their unique characteristics. They are localized around the Sudbury Basin and are often found in association with ore. The breccias contain rounded fragments in a pulverized matrix of fine rock powder. Their origin has been the centre of much debate (Dressler, 1987). On the Sungold ground, the best mineralization is found within this type of breccia.

Alteration: at the Norduna copper-nickel mine located some 3000 feet to the west, the characteristic footwall alteration is extreme silicification of the volcanic rocks. This type of alteration or any other type of intense alteration is not evident on outcrops of the Sungold property. At the main showing some silicification is present, but it is very localized.

Quartz veins: quartz veins and veinlets varying in width from less than an inch to over 8 inches are common in all rock types, but are particularly abundant in the syenite at the north end of the property. They are barren of any mineralization and appear to fill a fracture system trending about 110 degrees azimuth.

Glacial Sediments: approximately half of the bedrock of the property is covered by glacial sediments which vary from a few feet to over 10 feet in thickness. These consist predominantly of a bouldery basal till which is overlain by sands and in the swamps by organic deposits.

Structural Geology: Evidence of deformation is found in all rock types except for the olivine diabase. The most obvious deformation is present in the volcanics and sediments which are now dipping very steeply and have a strong penetrative foliation. Primary compositional layering is readily evident in the sediments, however, in the volcanics it is greatly obscured due to deformation. In general, the volcanics trend northwesterly while the strike of the sediments varies from northwest to north. Top directions as determined from cross-bedding is to the east. The main foliation direction is from northeast to east and dips steeply.

Evidence of deformation in the form of intense fracturing and shearing is common in the felsic intrusive rocks and to a certain extent in the gabbro.

A number of easterly-trending faults at the east end of the Sudbury Basin have been mapped by Thomson (1959) and others. None of these are obvious on this property, but from magnetic data, a north-trending fault probably exists along the contact between the volcanics and sediments at the north end of the claims.

Mineralization: although sulfides are common in several places, the only known showing of merit is located near the north boundary of claim 985541. Here, a zone of sulfides, consisting of pyrrhotite, chalcopyrite, and pyrite with some arsenopyrite, occurs in a zone about 10 feet wide and up to 30 feet long. The sulfides are irregularly distributed in disseminated form with some massive pods. Druzy quartz veining and some silicification is evident.

The mineralization is found in Sudbury breccia, about 200 feet from the gabbro contact with volcanics. The fragments in the breccia are both volcanics and graywacke sediments. Previous sampling of the showing indicates the presence of copper, nickel, cobalt, gold, silver and zinc.

This showing is similar to that found on the next claim to the north where a shallow shaft has been sunk into a mineralized breccia zone.

Discussion of Mineral Potential

Potential for economic mineralization on the property most likely exists in the breccia zones associated with the Nipissing gabbro. This zone is very intense and wide but it is almost totally buried by glacial sediments. The one showing that is exposed in it is of interest, particularly its strike extension where it passes under overburden to the southwest. Sudbury breccia zones associated with Nipissing gabbros has been the target of exploration around the Sudbury area for a long time, however, less obvious sulfide zones in them have not been examined for their platinum group potential.

It is interesting to note that along the southern parts of claims 985441 and 985442 there is an east-west trending magnetic anomaly which has no surface expression in the rock types except for the presence of Sudbury breccia. A similar situation exists on the two claims to the south of this (see report by Karvinen, 1988). These magnetic anomalies cross-cut the general magnetic trend of the sediments and volcanics and therefore are associated with some later event such as brecciation. Since mineralization is often associated with brecciation in this area, then these could be important targets for exploration.

Conclusions

The Sungold Resources property in Falconbridge Township is underlain by a variety of volcanic, sedimentary and intrusive rocks of Proterozoic age. No rocks related to the Sudbury Igneous Complex have been found, however, the presence of wide zones of Sudbury breccia along with one important showing associated with Nipissing Gabbro have been located and deserve follow-up work. Much of the potential rocks are covered with overburden and thus have not been accessible to surface prospecting. Cross-cutting magnetic anomalies associated with these zones may be of economic importance at depth.



William O. Karvinen, Ph.D.

Sept. 22, 1988

References

- Dressler, B. 1988: General Geology of the Sudbury Area in The Geology and Ore Deposits of the Sudbury Structure. Ont. Geol. Survey Special Vol. 1
- Karvinen, W. O. 1988: Total Field Magnetic Survey, Sungold Res. Property, Falconbridge Twp., Ont. unpub. assess. rept.
- McCombe, D.A. 1987: Report on Sungold Resources Inc. Falconbridge Property. unpub. prospectus rept.
- Thomson, J. E. 1959: Geology of Falconbridge Township Ont. Dept. Mines Ann. Rept. vol. 66 Pt. 6 36p.

Certificate

I, William Oliver Karvinen of 32 Lakeland Pt. Drive, Kingston, Ont., Geologist and President of W. O. Karvinen & Associates Ltd., do hereby certify that:

the information contained in this report is based on sound field work and reliable reports;

I hold a 1.5% Net Smelter Return interest in the property described herein;

I hold a Doctorate of Philosophy and an Honours B. Sc. in Geology from Queen's University in Kingston (1974 and 1968) and a Master of Science from the University of British Columbia (1970).

I am a fellow of the Geological Association of Canada;

I have been actively employed in my profession for 20 years and in private practice as a consultant and explorationist since 1978.

Kingston, Ontario
Sept. 22, 1988


William O. Karvinen

DOCUMENT
W8807



41110SE0039 2.11800 FALCONBRIDGE

2.11800

Mining Act

Type of Survey(s) Geological	Township or Area Falconbridge Twp.
Claim Holder(s) Sungold Resources Inc.	Prospector's Licence No. T-4967
Address 67 Richmond St. W., Suite 500, Toronto, Ont. M5H 1Z5	
Survey Company W.O. Karvinen & Associates Ltd.,	Date of Survey (from & to) 21 08 88 29 08 88 Day Mo. Yr. Day Mo. Yr.
Name and Address of Author (of Geo-Technical report) William O. Karvinen, 32 Lakeland Pt. Dr., Kingston, Ont. K7M 4E7	
Total Miles of line Cut 12.5	

Credits Requested per Each Claim in Columns at right			Mining Claims Traversed (List in numerical sequence)					
Special Provisions	Geophysical	Days per Claim	Mining Claim		Expend. Days Cr.	Mining Claim		Expend. Days Cr.
			Prefix	Number		Prefix	Number	
For first survey: Enter 40 days. (This includes line cutting)	- Electromagnetic		S	985536				
	- Magnetometer			985537				
	- Radiometric			985538				
	- Other			985539				
				985540				
For each additional survey: using the same grid: Enter 20 days (for each)	Geological	20		985541				
	Geochemical			985542				
				985543				
				985544				
				985545				
Man Days Complete reverse side and enter total(s) here	Geophysical	Days per Claim		985546				
	- Electromagnetic			985547				
	- Magnetometer							
	- Radiometric							
	- Other							
Airborne Credits Note: Special provisions credits do not apply to Airborne Surveys.	Geological							
	Geochemical							
	Electromagnetic							
	Magnetometer							
	Radiometric							

SUDBURY MINING DIV. RECEIVED
NOV 14 1988
A.M. 7:18 P.M. 11:11:12:13:14:15:16

RECEIVED

MINING LANDS SECTION

Expenditures (excludes power stripping) _____

Type of Work Performed _____

Performed on Claim(s) _____

Calculation of Expenditure Days Credits

Total Expenditures \$ _____ ÷ 15 = _____ Total Days Credits

Instructions
Total Days Credits may be apportioned at the claim holder's choice. Enter number of days credits per claim selected in columns at right.

Date **Nov. 6/88** Recorded Holder or Agent (Signature) *W.O. Karvinen*

For Office Use Only

Total Days Cr. Recorded **240** Date Recorded **November 15 1988** Mining Recorder *OK*

Date Approved as Recorded **11/25** Search Director *tu*

Total number of mining claims covered by this report of work. **12**

Certification Verifying Report of Work
I hereby certify that I have a personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the work or witnessed same during and/or after its completion and the annexed report is true.

Name and Postal Address of Person Certifying
William O. Karvinen, 32 Lakeland Pt. Dr., Kingston, Ont. K7M 4E7

Date Certified **Nov. 6/88** Certified by (Signature) *W.O. Karvinen*

THE TOWNSHIP OF FALCONBRIDGE

DISTRICT OF SUDBURY

SUDBURY MINING DIVISION

SCALE: 1-INCH=40 CHAINS

LEGEND

- PATENTED LAND (P)
- CROWN LAND SALE (C.S.)
- LEASES (L)
- LOCATED LAND (Loc.)
- LICENSE OF OCCUPATION (L.O.)
- MINING RIGHTS ONLY (M.R.O.)
- SURFACE RIGHTS ONLY (S.R.O.)
- ROADS
- IMPROVED ROADS
- KING'S HIGHWAYS
- RAILWAYS
- POWER LINES
- MARSH OR MUSKOKAS
- MINES
- CANCELLED
- PATENTED FOR SURFACE RIGHTS ONLY

NOTES

400' Surface Rights Reservation, along the shores of all lakes & rivers

Sand & Gravel L.O. #1194 covering area shown thus

Administration and control of the Sand and Gravel on Lot II Concession 6, TRANSFERRED to the Minister of Transportation and Communications by Order-in-Council No OC-2704/71 on September 8, 1971.

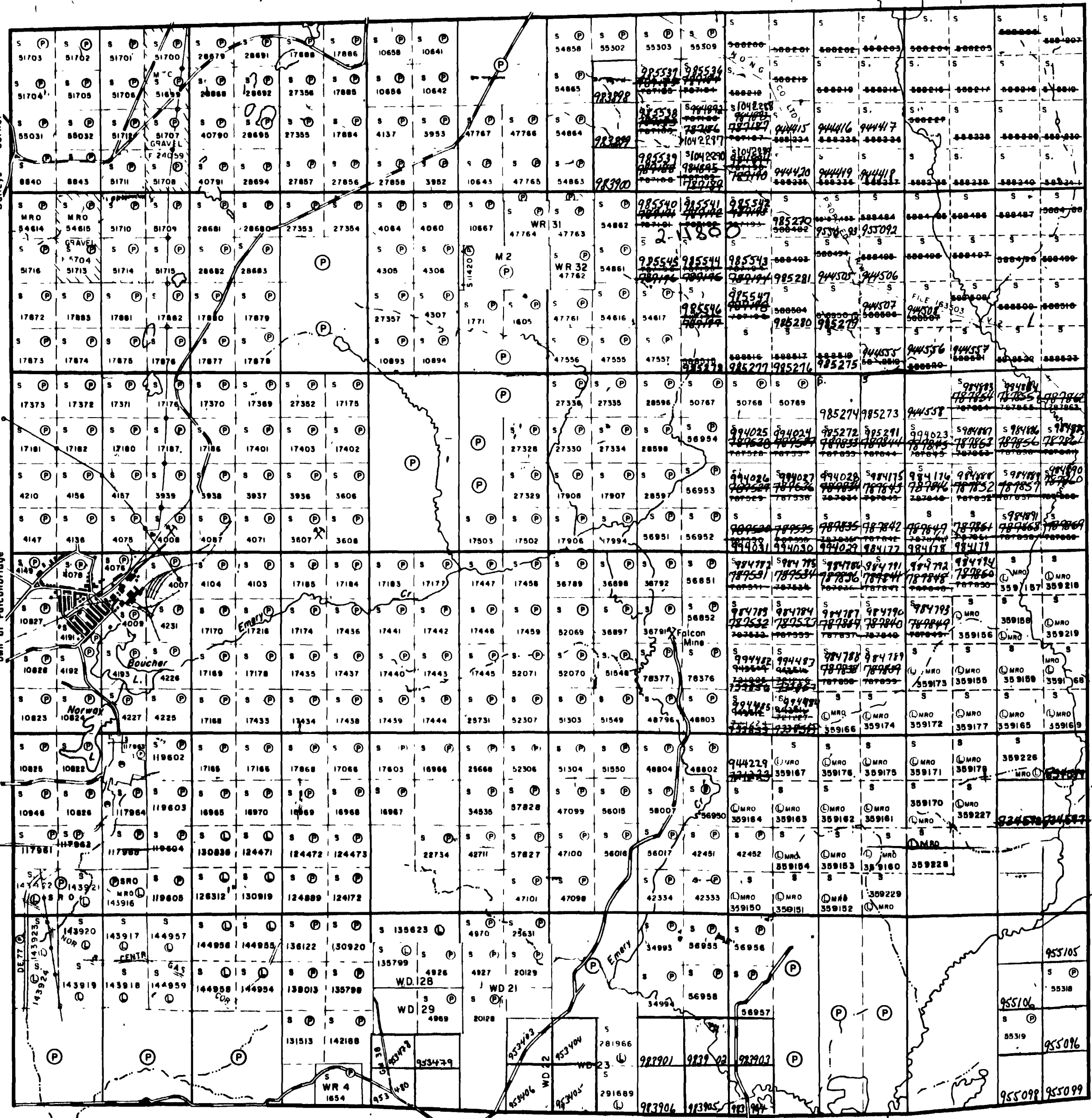
FALCONBRIDGE PLAN NO. M-799

ONTARIO MINISTRY OF NATURAL RESOURCES SURVEYS AND MAPPING BRANCH

GARSON TWP. M. 831

STREET TWP. M. 1145

VI
V
IV
III
II
I

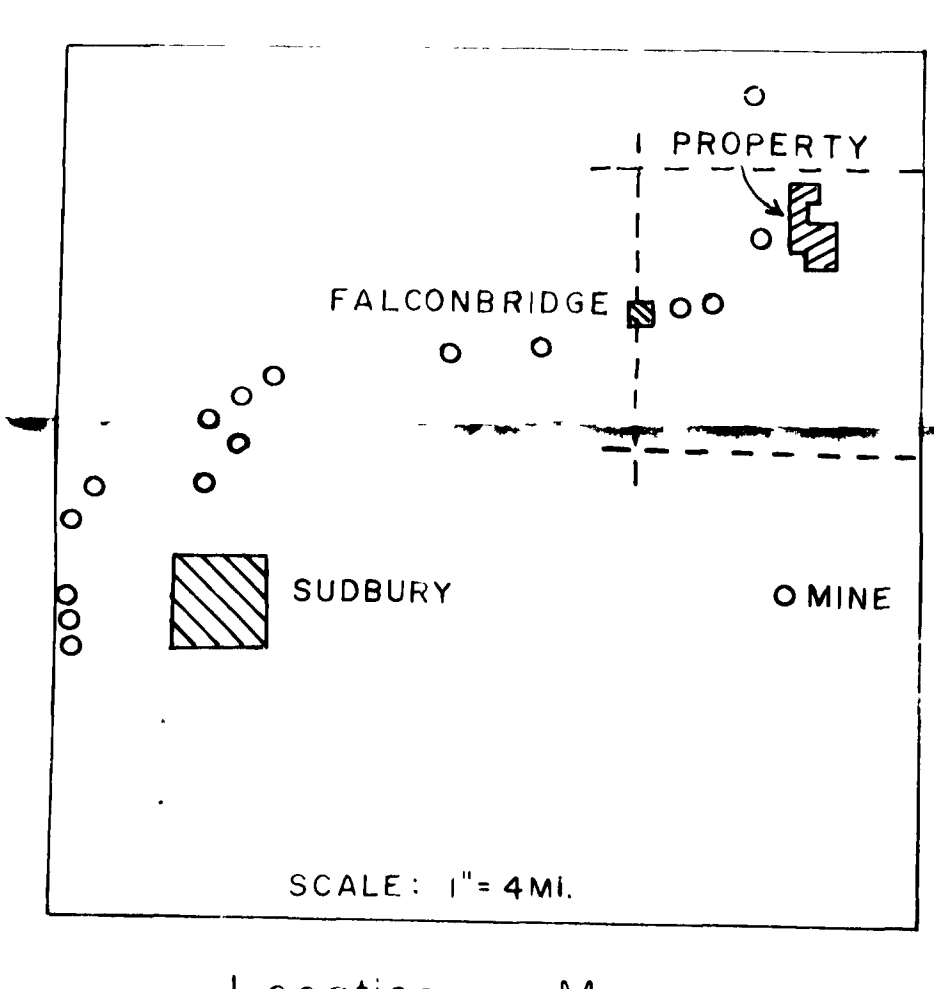


AET



LEGEND

- 6 Olivine Diabase
- 5 Gabbro
- 4 Mafic Dike
- 3 Felsic Intrusive
a. syenite
b. granite
- 2 Sediments
a. arkosic sandstone
b. siltstone
c. conglomerate
- 1 Mafic Volcanics
a. massive, pilloid
b. amygdaloidal
c. fragmental
- outcrop
- geologic contact
- fault
- compositional layering (tops)
- foliation
- quartz veins
- breccia



Location Map

BEDROCK GEOLOGY	<i>Williams</i> Nov. 6/88
FALCONBRIDGE TOWNSHIP PROPERTY	
SUNGOLD RESOURCES INC. 2.11800	
Survey By: W. O. Karvinen & Associates Ltd. Sept. 1988	

B.L. 156°azm.