Ministry of
Northern Development
and Mines
Ontario

Ontario Geological Survey
Open File Report 5892

Report of Activities 1993, Resident Geologists

1994

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Northern Development
and Mines
Ontario

ONTARIO GEOLOGICAL SURVEY

Open File Report 5892

Report of Activities 1993, Resident Geologists

edited by C.L. Baker, B.O. Dressler, J.K. Mason and J.W. Newsome

1994

RECOMMENDATIONS FOR EXPLORATION

Copper

Recent investigations in the South Shining Tree area indicate the potential for large tonnage, low-grade copper deposits in the Proterozoic sediments of the Huronian Supergroup (Asquith Resources Incorporated, personal communications, 1993). These rocks occur in the Cobalt Embayment, a sedimentary basin which extends northeast from Sudbury to Matachewan, and exhibit wide-spread disseminated chalcopyrite-chalcocite-bornite-pyrite mineralization within quartz arenite and quartz-pebble conglomerate of the upper Lorrain Formation. Late fractures in the sediments in many locations are filled with quartz and sulphides. To date, the copper and iron sulphides have not been found in economic concentrations, but values locally exceed 1% Cu (Asquith Resources Incorporated, personal communications, 1993).

There appears to be a strong spatial relationship between Nipissing Diabase dikes and sills, older basement granites and the sediment hosted copper enrichment (Ireland and Zalnieriunas, 1993). Sediments immediately underlying Nipissing Diabase sills are primary targets for investigation. Quartz arenite and conglomerates hosting copper and iron sulphides are usually silicified, bleached and variably hematite stained. This alteration assemblage is characteristic of large scale hydrothermal fluid movement through the sediments. Commonly the only visible sign of mineralization is malachite staining or dark grey patches within the bleached, hematite-stained rock.

The best areas to search for this style of mineralization are near the west margin of the Cobalt Embayment, where the sediments underlying the Nipissing Diabase sills and overlying the older basement rocks are relatively thin. Significant deformation has occurred, creating moderate- to steeply-dipping sequences of sediment, structure- and bedding-controlled passageways for mineralizing solutions and, most importantly, structural traps for localizing mineralization. Much of the Nipissing Diabase has been eroded away, exposing the most prospective rock types. Some recent encouragement has been reported in the area extending south from Shining Tree to the Sudbury basin.

Open File Report 5892

ERRATA

Enclosed are replacement pages (169, 170), as per author's request, for Open File Report 5892 titled *Report of Activities 1993, Resident Geologist's*; edited by C.L. Baker, B.O. Dressler, J.K. Mason and J.W. Newsome. We regret any inconvenience these errors may have caused.

Ontario Geological Survey

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900 Bay St.
Toronto, Ontario M7A 1C3

The office of the Resident Geologist whose district includes the area covered by this report.

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Southwestern, Box 5463, 659 Exeter Rd., London N6A 4L6
Timmins, 60 Wilson Ave., Timmins P4N 2S7
Red Lake, Box 324, Ontario Government Building, Red Lake P0V 2M0
Sault Ste. Marie, 60 Church St., Sault Ste. Marie P6A 3H3
Schreiber-Hemlo, Suite B002, 435 James St. S., Thunder Bay P7E 6E3
Sioux Lookout, Box 3000, Queen and Fourth, Sioux Lookout P0V 2T0
Southeastern, Bag Service 43, Old Troy Rd., Tweed K0K 3J0
Sudbury, Level B3, 933 Ramsey Lake Rd., Sudbury P3E 6B5
Thunder Bay, Suite B002, 435 James St. S., Thunder Bay P7E 6E3

FOREWORD

1993 REPORT OF ACTIVITIES - RESIDENT GEOLOGIST PROGRAM

John Wood, Director
Ontario Geological Survey
Mines and Minerals Division

Introduction

The Mines and Minerals Division of the Ministry of Northern Development and Mines underwent a significant reorganisation during the spring of 1993 in response to recent government cut-backs and fiscal constraints. One of the main challenges for the Division was to better define its key functions in order to maintain quality service to its clients without adversely affecting the delivery of core programs. These challenges resulted in a number of changes to the Ontario Geological Survey (OGS) and its provincial Resident Geologist Program (RGP).

One such change is the new format in which this year's Resident Geologists' Report of Activities is being presented to the public, i.e. in this Open File format. Due to costs involved in publishing this report in its previous format, the OGS has had to reconsider its presentation. However, we believe that this new format does not detract from the quality of information produced by our Resident Geologists and their staff to which you, our clients, have become accustomed.

Although some of the changes that have taken place within the Residents Geologist Program during the past year have not met with widespread approval, many may be considered to have been for the betterment of the organisation and ultimately for our clients as well. The following briefly outlines the major changes that have affected the RGP during 1993, and highlights the new structure of the Ontario Geological Survey/Resident Geologist Program.

As a result of the Division's reorganization during the spring of 1993, the Resident Geologist offices in Wawa and Dorset were closed, as well as the field office in Bancroft and the Bancroft drill core library. The RGP functions for Wawa area are now being provided by the Sault Ste. Marie Resident Geologist Office in a similar manner to that which existed prior to the creation of the Wawa Resident Geologist District in 1987. The boundaries of the Resident Geologist districts for Southeastern Ontario (Tweed), Sudbury and Cobalt have been expanded to encapsulate the area previously covered by the Algonquin (Dorset) Resident Geologist Office. This expansion also precipitated modifications to the boundary between the Southeastern and Southwestern Ontario (London) Resident Geologist districts.

As well as the closing of the Bancroft drill core library and the various offices noted above, the staff of the seven provincial drill core libraries (DCL) were also terminated. Fortunately, many of the staff affected by these cuts were placed in new positions, either within the Division or other government ministries, thus ensuring that their talents and skills have not been lost to the Ontario Public

Service.

The cuts that were made were the result of hard but necessary decisions, and were considered to be those which would have the least detrimental effect on the health and maintenance of the Division's core programs. Although these measures have somewhat adversely affected some of the prime functions of the Resident Geologist Program, other measures have been put in place to help off-set their impact.

The Government of Ontario has recently completed a jobsOntario initiative to create remote, outdoor drill core storage sites in all of the communities, apart from Bancroft, in which the drill core libraries are located. The drill core formerly stored at the Bancroft DCL was transferred to the drill core library in Tweed under this project.

As part of this same initiative, remote drill core storage sites have also been created in the communities of Red Lake, Sioux Lookout, Beardmore and Marathon to better afford clients local access to this resource material. Not only did the jobsOntario project offer temporary employment in these communities, but it has added to the exploration infrastructure by capturing new drill core donations at nearly all locations, as well as providing greater access to this resource data base. Overall, the capacity of the system has been increased.

Contrary to a popular misconception, the drill core libraries have not been closed to the public. Through an appointment basis, clients still have access to all DCL facilities, and the Division is still in the business of accepting new drill core submissions for assessment credit to build to the existing data base.

Programs and Structure

The Ontario Geological Survey has been restructured to provide greater cohesion to its programs and to provide better service to our clients. The OGS mandate is currently being rewitten and expanded to reflect these changes. A tentative draft for the new OGS mandate is as follows:

> "To provide current and objective earth science information on the geology and mineral endowment of Ontario for the effective management of Ontario's mineral resources, and to enhance the province's economic performance and environmental well-being."

The OGS mandate is presently delivered through two programs:

A - The Resident Geologist Program; and
B - The Geoscience Program.

The organisation of the OGS is structured around four sections:

- Precambrian Geoscience Section (PGS)
- Mineral Deposits & Field Services Section (MDFSS)
- Sedimentary and Environmental Geoscience Section (SEGS)
- Field Services Section (Northwest) (FSS-NW)

Although the four sections operate on a relatively autonomous basis, the two programs are inter-twined primarily through the management structure. The idea behind this arrangement is to provide for a more co-ordinated approach to program delivery while establishing greater linkages between head office staff in Sudbury and those in the district offices who deliver the Resident Geologist Program.

To this end, the Field Services component was added to the Mineral Deposits Section at the head office in Sudbury to co-ordinate and ensure a more consistent delivery of the Resident Geologist Program throughout the province. Similarly, to assist in the integration of the two programs, some of the supervisory and reporting functions of the Resident Geologist Program have been distributed amongst the various sections housed in the OGS head office in Sudbury.

Currently, the Resident Geologist Program is delivered through a network of 13 district offices, strategically located throughout the province to primarily service the mineral exploration and mining industry. They are in effect the "eyes" and "ears" for the Mines and Minerals Division, forming the first line of contact with most of our external clients. In addition to the 13 offices, the Mines and Minerals Information Centre (MMIC) in Toronto also acts as a centre for client services and information dissemination. The responsibility for program delivery and for reporting/supervisory purposes is subdivided geographically as follows:

- Northwestern Ontario FSS-NW
- Northeastern Ontario MDFSS
- Central Ontario PGS
- Southern Ontario SEGS

Staff of the Resident Geologist offices provide consultative and technology transfer services to the aforementioned client groups, conduct field examinations and field trips, maintain legally mandated assessment files and other data bases, provide prospector classes and other educational forums, input into local and provincial scale land use planning issues, and continue to maintain the provincial drill core library system.

In closing, and on behalf of all the authors and contributors, we sincerely hope that you find this year's Resident Geologist Program Report of Activities both informative and enlightening.

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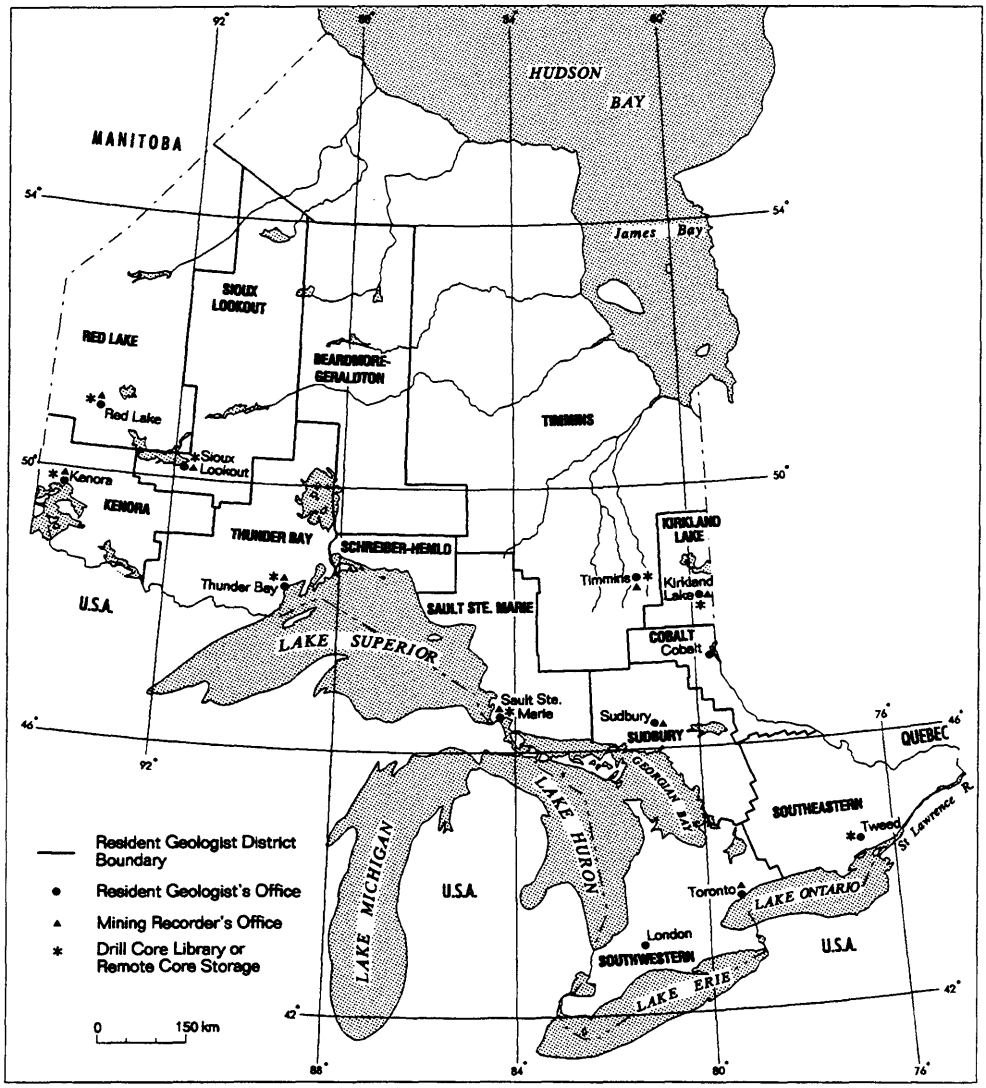

Mines and Minerals Division Regional Offices

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	▲	Box 5200, 808 Robertson St. P9N 3X9	(807) 468-2815	(807) 468-2823
Red Lake	●*	Box 324, Ont. Govt. Bldg. P0V 2M0	(807) 727-3272	(807) 727-3553
	▲	Box 324, Ont. Govt. Bldg. P0V 2M0	(807) 727-3284	(870) 727-3553
Sioux Lookout	●*	Box 3000, Queen & Fourth P8T 1C6	(807) 737-2037	(807) 737-3419
	▲	Box 3000, Queen & Fourth P8T 1C6	(807) 737-2034	(807) 737-1727
Thunder Bay	●* (3)	Suite B-002, 435 James St. S. P7E 6E3	(807) 475-1331	(807) 475-1112
	▲	Suite B-003, 435 James St. S. P7E 6E3	(807) 475-1311	(807) 475-1124
Sault Ste. Marie	●*	60 Church St. P6A 3H3	(705) 945-6931	(705) 945-6934
	▲	60 Church St. P6A 3H3	(705) 945-6925	(705) 945-6935
Timmins	●*	60 Wilson Ave. P4N 2S7	(705) 360-8350	(705) 360-2001
	▲	60 Wilson Ave. P4N 2S7	(705) 360-8330	(705) 360-2001
Kirkland Lake	●*	4 Government Rd. E. P2N 1A2	(705) 567-5242	(705) 567-5621
	▲	4 Government Rd. E. P2N 1A2	(705) 567-9242	(705) 567-5621
Cobalt	●	Box 230, Presley St. P0J 1C0	(705) 679-8558	(705) 679-5584
Sudbury	●	Level B3, 933 Ramsey Lk. Rd. P3E 6B5	(705) 670-5741	(705) 670-5681
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Tweed	●*	B.S. 43, Old Troy Rd. K0K 3J0	(613) 478-3161	(613) 478-2873
Toronto	▲	Rm. M2-17 900 Bay St. M7A 1C3	(416) 314-3781	(416) 314-3789
London	●	Box 5463, 659 Exeter Rd. N6A 4L6	(519) 661-2773	(519) 661-2809

1. Field Services Section, Northwestern Ontario: Introduction

J. K. Mason
Acting Section Chief, Field Services Section, Northwestern Ontario, Ontario Geological Survey

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The Field Services Section, northwestern Ontario, of the Mines and Minerals Division is made up of 6 Resident Geologists' districts and covers 4 Mining Divisions: the Thunder Bay, Red Lake, Patricia and Kenora mining divisions. This area is approximately 700 by 700 km in size.

The goal of the Field Services Section is to stimulate and monitor exploration, development and production of the mineral resources in northwestern Ontario. This is done through; the 6 Resident Geologists' programs which cover the Red Lake, Sioux Lookout, Kenora, Thunder Bay, Beardmore-Geraldton and Schreiber-Hemlo Resident Geologists' districts; the Canada-Ontario Northern Ontario Development Agreement (NODA) which funded the Northwestern Ontario Industrial Minerals project and the Manitouwadge Mineral Deposit Inventory project; and the Employment Equity Fund which provided funding for a Native Lecturer to give prospecting classes to the First Nations and a Parks Geologist to work with MNR park planners describing geological features within the park system.

The Resident Geologists' programs provide professional consultative services in the office and in the field. These services are made available to prospectors, exploration companies and the public on matters related to the geology, the mineral deposits and the exploration and mining activities conducted in northwestern Ontario. In 1993, over 9000 office and phone consultations were provided to clientele. The Mines and Minerals Division staff made over 150 property visits to exploration and mining sites. Staff conducted 30 field trips for mineral industry geologists and prospectors, OGS field parties and prospector class participants. In 1993, the Resident Geologists' duties also included the provision of technical information and recommendations to other government agencies (i.e., Ontario Ministry of Natural Resources, Ontario Ministry of The Environment, Ontario Ministry of Labour) on land-use matters.

Basic prospecting courses were conducted in Thunder Bay, Beardmore, Kenora, Wabsemoong First Nation, Ojibways of Pic River First Nation, Waubaskang First Nation, Rocky Bay First Nation and North Caribou First Nation. Posters depicting mineral exploration, mining and recommendations for

exploration in the 6 Resident Geologists' districts, the Manitouwadge Mineral Deposit Inventory (NODA) project and the Industrial Minerals in northwestern Ontario project (NODA) were put on display at the Mines and Minerals Symposium in Toronto and Thunder Bay. A corporate display, depicting mining and advanced exploration activities in northwestern Ontario, was presented at the Northeastern Ontario Mines and Minerals Symposium in Sudbury, at the 1993 Current Activities Forum in Chisholm, Minnesota, and at the Institute on Lake Superior Geology Annual Meeting in Eveleth, Minnesota.

Mineral deposit reports were started or continued by staff for the following areas: Kenora base metals, Red Lake base metals, Schreiber-Hemlo, Fort Hope, Central Uchi and the Central Wabigoon. Property directories and "mineral deposits not in production" compilations were completed for each district.

Remote drill core storage sites were established under the Jobs Ontario Capital Fund (JOCF) in: Kenora, Red Lake, Kakabeka Falls (west of Thunder Bay), Sioux Lookout, Marathon and Beardmore.

There were 255 active exploration programs in northwestern Ontario in 1993. Ninety exploration programs were funded by the Ontario Prospectors' Assistance Program (OPAP).

Gold production in northwestern Ontario from 7 mines - the Golden Giant, the David Bell, the Williams, the Golden Patricia, the Campbell, the Arthur W. White and the Dona Lake Mines - totalled 1.63 million ounces.

Two base metal mines - the Winston Lake Division and the Geco Division Mines were in production during the year.

Two granite dimension stone quarries - Nelson Granite Ltd. and Palin Granite Canada Inc. produced 7780 m^3 in 1993.

Eleven seasonal amethyst producers in the Thunder Bay area were active during the year. Other industrial minerals produced include quartz, peat, soapstone and crushed aggregate.

BEARDMORE-GERALDTON RESIDENT GEOLOGIST'S DISTRICT--1993

J.K. Mason[1] and G.D. White[2]

[1]Resident Geologist, Thunder Bay, Field Services Section, Northwestern Ontario, Ontario Geological Survey.
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INTRODUCTION

The Beardmore-Geraldton Resident Geologist's office operates within the Thunder Bay Mining Division. The communities of Beardmore, Jellicoe, Geraldton, Longlac, Nakina, Fort Hope, Lansdowne House, Summer Beaver and Webequie are located within the district.

The Ontario Prospectors Assistance Program (OPAP) funded 32 programs in the Beardmore-Geraldton District totalling $320 000 and representing 14% of the provincial total. This total includes 2 winter-funded Ontario Prospectors Assistance Program (OPAP) projects. The Beardmore-Geraldton District received the largest award of Ontario Mineral Incentive Program (OMIP) funds in the province totalling $450 342.

A remote core storage facility was constructed just north of the Beardmore townsite in 1993 to facilitate the collection of diamond drill core from the Beardmore-Geraldton District. This will provide an additional source of information for exploration companies and individual prospectors working in the immediate area.

RESIDENT GEOLOGIST'S STAFF ACTIVITIES

Staff of the Beardmore-Geraldton Resident Geologist's District includes: J. Mason, Resident Geologist; G. White, Staff Geologist; C. Komar, Secretary; S. Warren, Assessment File Clerk; and N. Baker, Acting Assessment File Clerk.

Twenty-nine property visits were conducted during the 1993 field season (Fig. 3). A basic week-long prospector's course was held in Beardmore during the month of April with 45 people in attendance. The Resident Geologist's Program also handled 871 personal consultations and 511 telephone inquiries in the Beardmore, Geraldton, and Thunder Bay offices. Assessment file inquiries for the Thunder Bay Mining Division totalled 562 inquiries and 117 phone calls.

EXPLORATION ACTIVITY

Exploration was conducted by prospectors, junior companies and major companies for gold, copper, zinc, nickel, diamonds and building stone (Fig. 1 & 2).

Beardmore - Geraldton Resident Geologist's District

(South Map)

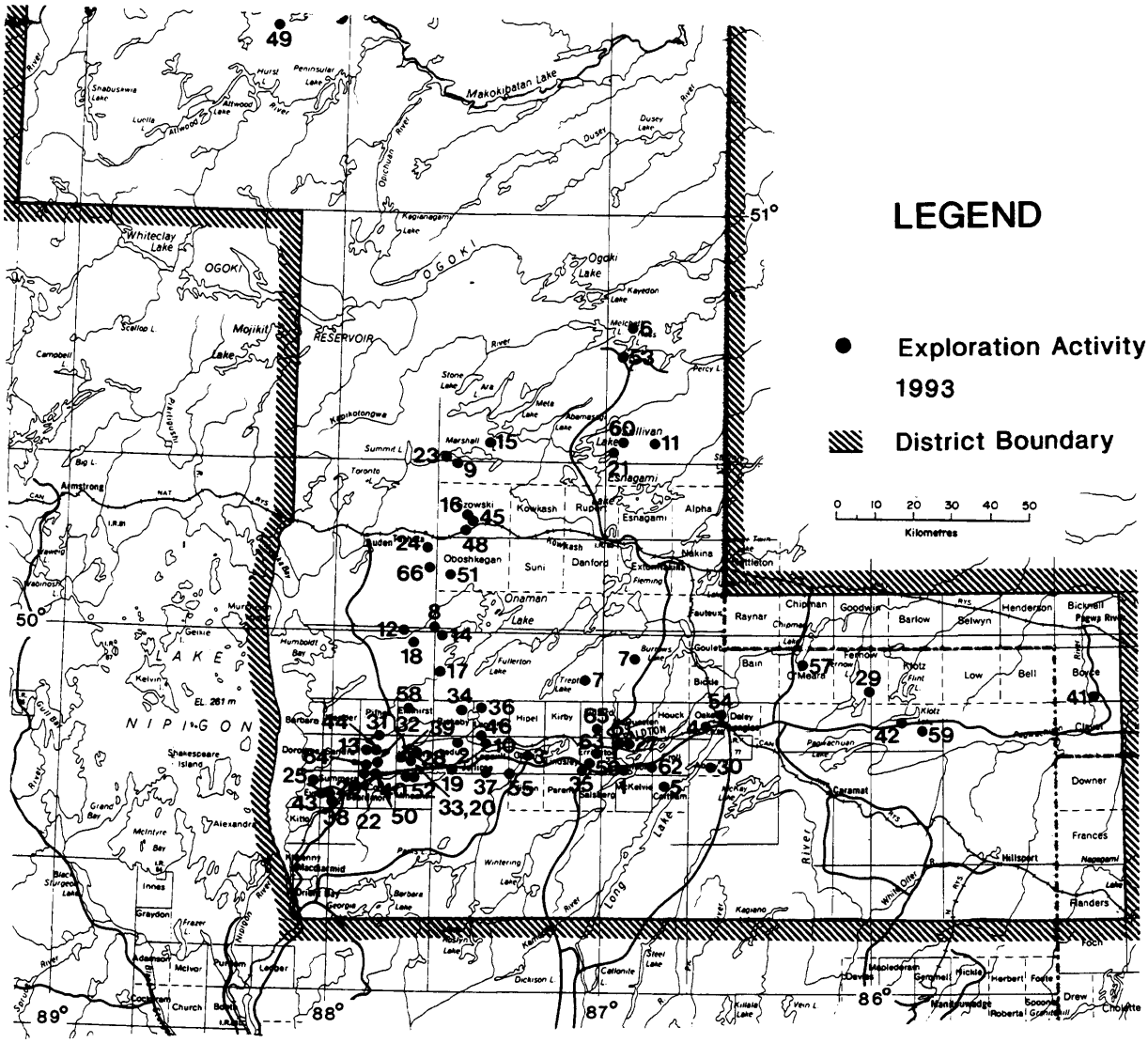

Fig.1

Beardmore-Geraldton

Resident Geologist District

(North Map)

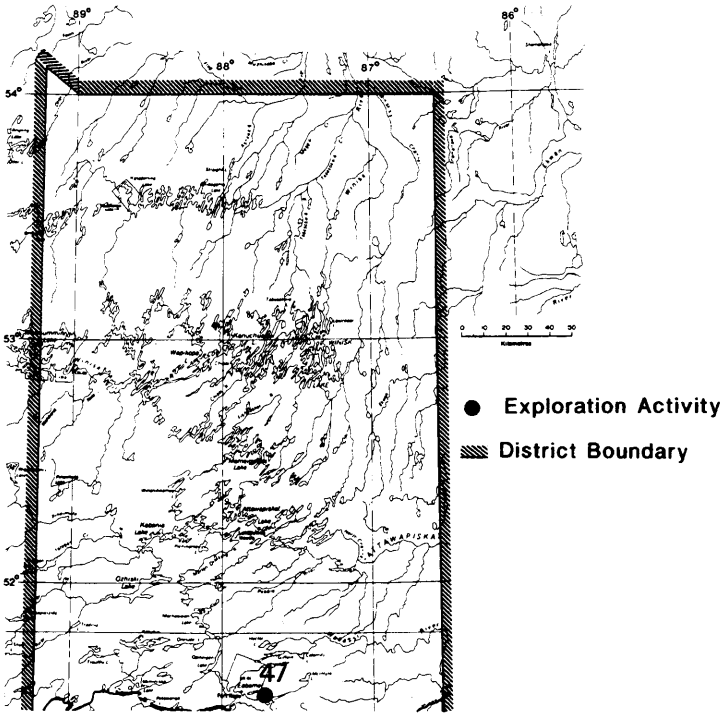

Fig. 2

TABLE 1. EXPLORATION PROGRAMS IN THE BEARDMORE-GERALDTON DISTRICT 1993

ABBREVIATIONS

AEM.....Airborne Electromagnetic Survey	HLEM.....Horizontal Loop Electromagnetic Survey
AM.....Airborne Magnetic Survey	IP.....Induced Polarization Survey
ARA.....Airborne Radiometric Survey	RES.....Resistivity Survey
DDH.....Diamond Drill Hole(s)	SP.....Self Potential Survey
GEM.....Ground Electromagnetic Survey	Str.....Stripping
GC.....Geochemical Survey	Tr.....Trenching
GL.....Geological Survey	UG.....Underground Development
GM.....Ground Magnetic Survey	VLEM.....Vertical Loop Electromagnetic Survey
GRA.....Ground Radiometric Survey	VLF-EM....Very Low Frequency Electromagnetic Survey

Company/Individual (Property Name)	Township/Area (Commodity)	Exploration Activity
1. Asarco Exploration Company of Canada Limited	Ashmore/Errington townships (Au)	DDH
2. Auger, T.	Leduc Township (Au, Cu, Zn)	Str, GEM, prospecting
3. Bain, H.	Colter Township (Au)	Str, GM, GEM
4. Barino Construction Limited	Longlac (stone)	Str
5. Brinklow, R. and B.	Coltham Township (Au, Cu, Zn)	Str, GC, prospecting
6. Bumbu, C. (Colpitts Lake property)	Briarcliffe Lake (Au)	prospecting
7. Burns, R.	Isobel/Greta lakes (building stone)	GL, prospecting
8. Castlewood Metals and Explorations Ltd.-Goldbrook Explorations Inc. Joint Venture (Onaman River property)	Onaman Lake (Cu, Zn, Pb, Mo, Ag, Au, Bi)	GM, HLEM, VLF-EM
9. Challenger Minerals Ltd. (Marshall Lake property)	Marshall Lake (Cu, Zn)	Str, Tr, GL, GC, GM, GEM, DDH
10. Checkley, F. and Nelson, B. (Sturgeon Bridge property)	Legault Township (Au)	GC, GL, Str, Tr prospecting
11. Clark, G. and Eveleigh, A. (Holland-Chellew occurrence)	Muriel Lake (Cu, Zn, Au)	GL, Str
12. Cote, R.	Conglomerate Lake (Cu, Zn, Au)	Str, Tr, prospecting
13. Cowan, M. and B. (Patter Lake occurrence)	Irwin Township (Au)	Str, DDH
14. Cox, N.	Onaman Lake (Au, Cu, Zn)	Str, GEM, prospecting
15. Dmitrovic, D.	Marshall Lake (Cu, Zn, Au)	GEM, prospecting
16. Douglas, A.	Gzowski Township (Au, Cu, Zn)	GEM, prospecting
17. Fayle, R.	Castlewood Lake (Cu, Zn, Au)	Tr, GC
18. Founder Resources Inc.	Conglomerate Lake (Cu, Au)	GL, GM, GEM
19. Founder Resources Inc. (Blackwater Lake property)	Leduc Township (Zn, Au)	GC
20. Freewest Resources Inc. (Houghton 801 occurrence)	Walters Township (Au)	GM, GEM
21. Gagnon, F.	O'Sullivan Lake (Au, Cu)	Str, prospecting
22. Goodman, D.	McComber Township (Au)	Str, Tr, prospecting
23. Goodman, F.	Gripp Lake (Cu)	Str, prospecting
24. Goodman, F.	Tashota (Au)	prospecting
25. Goodman, H. Jr.	Eva Township (Au)	prospecting
26. Goodman, H. Jr.	Summers Township (Au)	prospecting
26. Greenland, H.	Geraldton (Au)	prospecting
28. Harte Resources Corporation	Walters Township (Au)	Str, GC
29. Head, T.	Fernow Township (Au)	Str, Tr, prospecting

30. Hogg, V.	Abrey Township (Industrial Minerals)	DDH
31. Holt, L.	Irwin and Pifher townships (Au)	prospecting
32. Houghton, F. and Lassila, P. (Nordic Lake occurrence)	Irwin Township (Au)	Str, GEM, prospecting
33. Houghton, F. and MacAdam, R. (Houghton 801 occurrence)	Walters Township (Au)	Str, prospecting
34. Houghton, P.	Rickaby Township (Au)	Str, GEM, prospecting
35. Johansen, T. (Johansen-Errington occurrence)	Errington Township (Au)	DDH
36. Kindla, D.	Lapierre Township (Cu)	GL, Str, prospecting
37. Kopystinski, D. and Johansen, T.	Legault Township (Au)	Str, Tr, prospecting
38. Lafontaine, A. (Lafontaine-Summers occurrence)	Summers Township (Au)	Str, GL, prospecting
39. MacAdam, R.	Walters Township (Au)	Str, GEM, prospecting
40. Maki, N. (Maki occurrences)	Vincent Township (Au)	Str, Tr, prospecting
41. McKinnon, D.	Boyce Township (Cu, Zn, Au)	DDH, GM, GEM, GC
42. McKinnon, D.	Klotz Lake (Au)	GL
43. McMahon, J. (Undersill property)	Summers Township (Au)	GEM, GM, prospecting
44. Metalore Resources Limited (Cherbourg prospect)	Irwin Township (Au)	Str, GC, DDH
45. Milks, G. (Royal Crown occurrence)	Gzowski Township (Zn, Au)	Str, Tr
46. Nelson, M.	Legault Township (Au, Cu)	GEM, GL, Str, Tr prospecting
47. Noranda Exploration Company Ltd.	Fort Hope (Au)	GEM, GM
48. Noranda Exploration Company Ltd. (Royal Crown occurrence)	Gzowski Township (Au)	GC
49. Parent, S.	Kawitos Lake (Cu, Zn)	Str, GEM, GL, prospecting
50. Petit, C.	McComber Township (Au)	DDH
51. Phelps Dodge Corp. of Canada Ltd.	Oboshkegan Township (Cu, Zn)	GL, GC
52. Pichette Mining Explorations (Pichette occurrence)	Vincent Township (Au)	Str, Tr, GC
53. Plexman, E.	Durer Lake (Au, Cu)	DDH
54. RJK Explorations	Oakes Township (Au)	DDH
55. Rentz, M.	Colter Township (Au)	GEM, GM, Str, prospecting
56. Roxmark Mines Limited (Magnet Mine)	Errington Township (Au)	DDH, Str
57. Royer, G.	O'Meara Township (Au, Cu, Nb)	GL, GEM, DDH, prospecting
58. SEG Exploration Inc. (Jacobus prospect)	Elmhirst Township (Cu, Ni, Pt, Pd, Au)	DDH
59. Shields, J. and Swereda, M.	Klotz Lake (Au)	Str, DDH, GC, GL, prospecting
60. Smith, M.	O'Sullivan Lake (Au, Cu)	GL, GEM, GM
61. Swereda, M.	Ashmore Township (Au)	DDH
62. Swereda, M.	Ashmore/Croll townships (Au)	DDH
63. Tenango Explorations Inc. (Portage Long Lac property)	Errington Township (Au)	DDH, GM, GEM, GC, prospecting
64. Twomey, T. (Gooseneck Lake property)	Irwin Township (Au)	GC, prospecting
65. W.N.W. Prospecting Syndicate (McLellan property)	Fulford Township (Au)	Str, prospecting
66. Yzerdraat, W.	Metcalfe Lake (Cu, Zn, Au)	GM, GEM, GRA

EXPLANATION - PROPERTY VISITS - 1993

1. Anaconda (Dofasco) Iron Deposit
2. Blackwater Lake Property (Founder Resources Inc.): Au
3. Brenbar Mine (Brenbar Mines Ltd): Au
4. Brennan Lake property (R. Cote): Cu, Zn
5. Camp 48 property (B. Burns): Building Stone
6. Colpitts Lake property (C. Bumbu): Au
7. Crib Road property (B. Burns): Building Stone
8. Gathering Lake area: Industrial Minerals
9. Gold Fields Road occurrence (T. Johansen): Au
10. Greer Road Granite occurrence: Building Stone
11. Jacobus Cu-Ni prospect (SEG Exploration Inc.): Cu, Ni
12. Lafontaine Summers property (A. Lafontaine): Au
13. Lake Helen granite occurrence: Building Stone
14. Leitch Mine (Teck Corporation): Au
15. Loudon-Daoust-McBurnie occurrence (WNW Prospecting Syndicate): Au
16. Marshall Lake property (Challenger Minerals Ltd.): Cu, Zn, Ag, Au
17. MacLeod-Cockshutt Mine (Asarco Exploration of Canada Ltd.): Au
18. McCambly Lake property (L. Holt): Au
19. McLellan property (WNW Prospecting Syndicate): Au
20. Missing Link Extension Property (M. Nelson): Au
21. Muriel Lake property (G. Clark, A. Eveleigh): Cu, Zn, Pb, Au, Ag
22. Nordic Lake occurrence (F. Houghton, P. Lassila): Au
23. Northern Empire Greenspar occurrence (Pan Continental Mining Limited-Ateba Mines Inc.): Ornamental Stone
24. Pifher Township Greenspar occurrence: Ornamental Stone
25. Pipeline Greenspar occurrence (A. Lafontaine): Ornamental Stone
26. Quebec Sturgeon River Mine (St. Andrew Goldfields Ltd.): Au
27. Sturgeon Bridge property (F. Checkley and B. Nelson): Au
28. Tombill Mine (Tombill Mines Ltd.): Au
29. Vivian Township Goodman property (H. Goodman Jr.): Au

Metalore Resources Limited has regained the right to earn a 100% interest in the Brookbank gold property, Irwin Township from Ontex Resources Ltd. on a reversal of a previous decision rendered by the Ontario Supreme Court. Subsequently in December of 1993, the Supreme Court of Canada rejected an attempt by Ontex to have a court case held for ownership of the gold deposit. Metalore Resources Limited retains control of the Brookbank gold deposit and approximately 700 surrounding claims. Currently, the deposit has a geological reserve of 1.3 million tons grading 0.26 ounce Au per ton (Canadian Mines Handbook, 1992-93, p.267).

Asarco Exploration of Canada Ltd. completed a major reverse circulation program consisting of 100 holes and a diamond drill program on the former MacLeod-Cockshutt, Mosher-Longlac and Hard Rock gold mine properties located at Geraldton.

Challenger Minerals Ltd. undertook ground geophysics, a lithogeochemical survey and geologic mapping on the Marshall Lake copper-zinc property. Diamond drilling on the main and south zones was initiated in December, with over 3000 m in seven holes planned as part of Phase 1. The property is composed of 90 leased and 20 staked claims and is located 68 km northwest of Nakina. "Previous work has outlined geological reserves of 2.2 million tons of 1.2% copper, 4.2% zinc, 2.45 ounces silver per ton and 0.012 ounce gold per ton in the Main Zone..." (Challenger Minerals Ltd., press release, August 17, 1992)

PROPERTY EXAMINATIONS

General Geology and Structure

The geology of the Beardmore-Geraldton area, the east part of the Wabigoon Subprovince, has been divided into 2 belts: 1) the Beardmore-Geraldton Belt; and 2) the Onaman-Tashota metavolcanic belt. The belts are separated by the Paint Lake fault, a major dextral transcurrent fault (Mason and White 1986; Mason, Hine et al. 1988; Mason, White et al. 1989; Mason and White 1993).

The Beardmore-Geraldton Belt is situated within an east-trending, isoclinally folded, metavolcanic-metasedimentary sequence. Lithologic units have been transposed into a series of alternating slices or interleaves of metavolcanic and metasedimentary rocks within a wrench fault or megashear zone.

The Beardmore-Geraldton Belt has been subdivided lithologically into: 1) the Southern metavolcanic subbelt and 2) the Southern metasedimentary subbelt.

The Onaman-Tashota metavolcanic belt is a felsic to mafic, calc-alkalic and tholeiitic metavolcanic sequence bounded to the south by the Paint Lake fault.

The following are summaries of 3 property examinations conducted in 1993.

Beardmore - Geraldton Resident Geologist's District

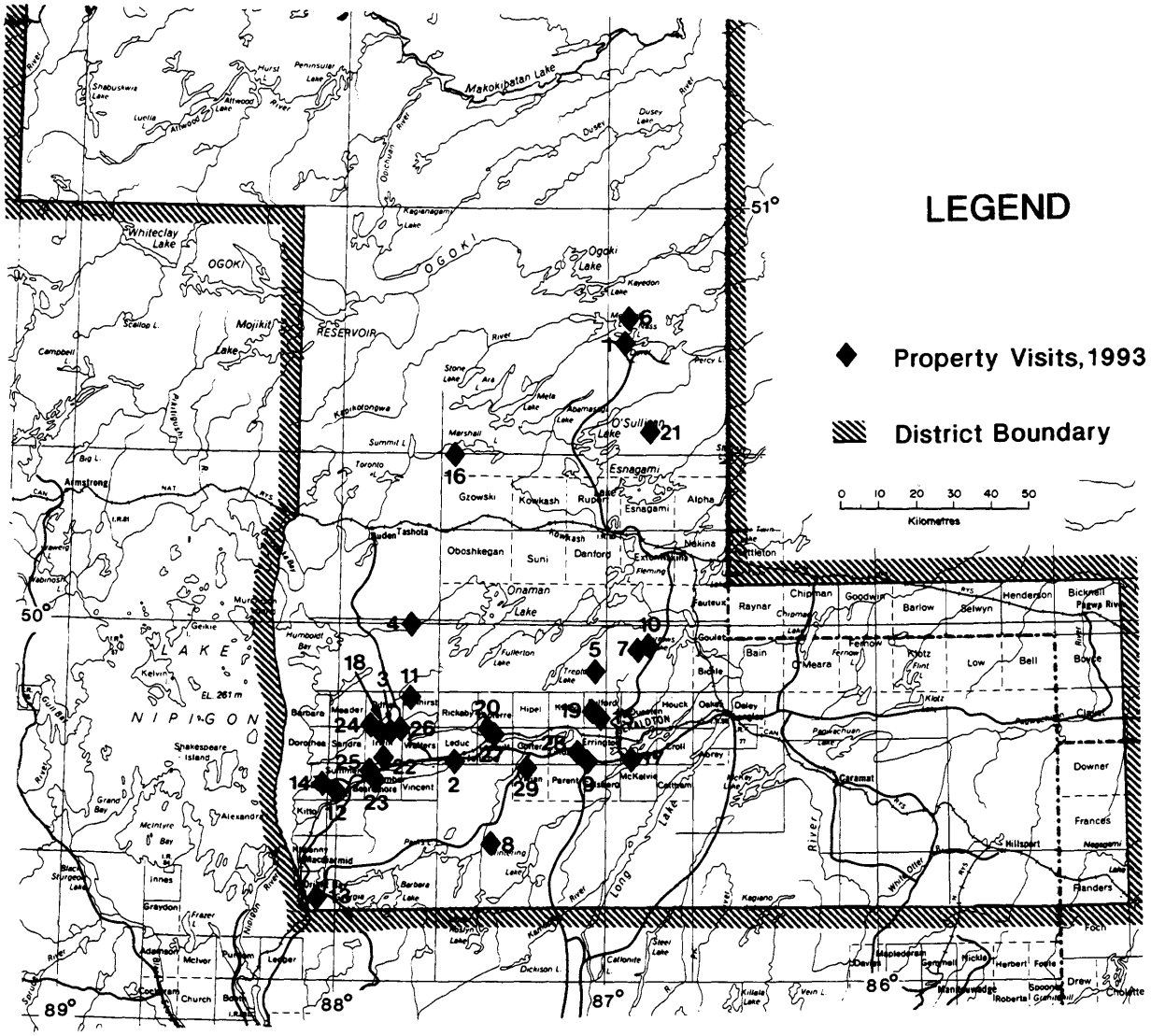

Fig. 3

Muriel Lake Property

The Muriel Lake copper-zinc property is located approximately 35 km north-northwest of Nakina, Ontario and approximately 6 km northeast of O' Sullivan Lake. The property is comprised of 2 mining claim groups: a west block of 5 claims (67 claim units) and an east block of 2 claims (23 claim units) held in joint partnership by Garry Clark and Aubrey Eveleigh (both of Thunder Bay). Access to the south portion of the claims can be gained by travelling north on Highway 643 and the Anaconda Road, a distance of 30.7 km from the intersection with Highway 584 (Nakina), to the Maun Lake Road (a Kimberly-Clark forest access road). From the Anaconda Road and Maun Lake Road intersection, travel northeast on the Maun Lake Road for 24.0 km to a skidder trail, which accesses the mineralized occurrences, a distance of 0.5 km to the north.

Mining claims in the west block are numbered TB 1183794 to TB 1183798 and claims in the east block are numbered TB 1183799 and TB 1183800. Stripping, trenching, prospecting and lithogeochemical programs were conducted on the property in 1992 and 1993 with aid from the Ontario Prospectors Assistance Program.

Exploration activity in the Muriel Lake area commenced in 1929. E.J. Holland and C. Chellew discovered chalcopyrite and pyrrhotite south of Muriel Lake on what is now termed the north zone. On mining claim KK 1895, Kindle (1932) of the Ontario Department of Mines reported a channel sample of 1.2 m assaying 12% Cu, 5.4 ounces Ag per ton and 0.05 ounce Au per ton. Goldhar Resources (1950) drilled 7 short "winkie" diamond drill holes. Three holes were drilled on the south zone while the other 4 drill locations are unknown. Texasgulf Inc. (1976) conducted an airborne geophysical survey south of Muriel Lake. Amax Minerals Exploration Limited (1980) contracted Questor Limited to fly an airborne geophysical survey over the metavolcanic belt from O' Sullivan Lake east and including the Muriel Lake area. Also in 1980, Amax Minerals Exploration Limited staked and geologically mapped 54 claims at Muriel Lake.

The Muriel Lake area is located in the Onaman-Tashota metavolcanic belt. Kindle (1932) mapped the Muriel Lake area as being underlain predominantly by a 4 to 6 km wide easterly trending unit of metavolcanics extending east of O' Sullivan Lake and consisting of mafic massive and pillowed mafic flows intruded by diorite and diabase. Kindle noted rhyolite and "quartz biotite and garnetiferous schists" within the metavolcanics. Regional foliation is 80 to 90°.

G. Clark and A. Eveleigh have conducted exploration in 1992 and 1993 on the J.J. Perry occurrence, the Galena Vein trench and the Kindle copper-zinc occurrence which are located on claim TB 1183797 and comprise the south zone, and the Holland-Chellew copper-zinc occurrence (north zone) located on claims TB 1183795

and TB 1183796 to the northeast. The J.J. Perry occurrence is hosted by a limestone (marble) unit striking 85° and dipping 86° north in contact with mafic to felsic metavolcanics and gabbro. The limestone unit is recrystallized and up to 2 m wide. Chalcopyrite occurs as massive patches and fracture fillings within the limestone and proximal to the limestone in gabbro and metavolcanics. Assay values up to 3.9% Cu and 576 ppb Zn were encountered by G. Clark and A. Eveleigh (Resident Geologist's files, Resident Geologist's office, Beardmore-Geraldton District, Thunder Bay).

The Galena Vein trench occurs northwest of the J.J. Perry occurrence. Mineralization at the Galena Vein trench is comprised of massive to disseminated pyrite, sphalerite and galena associated with a cherty exhalative unit hosted in metavolcanics. The mineralized zone is intensely folded, approximately 20 m wide, strikes 65° and dips vertically. Plunge of minor folds is vertical to 40°W. Pillowed mafic metavolcanics are in contact to the north and suggest younging to the south. Pillow selvages display silicification, carbonatization and pyrite mineralization. Felsic metavolcanics, represented as tuffs, lapilli tuffs and felsic breccia, occur hosting the chert unit in the Galena Vein trench and to the west of the occurrence. Assays up to 5.8% Zn and 0.86% Cu from grab samples were realized by the property owners (Resident Geologist's files, Beardmore-Geraldton District, Thunder Bay).

Old trenches and pits known as the Kindle occurrence are located 60 m west of the Galena Vein trench. It is believed that this is one of the trenches that Kindle (1932) sampled and obtained an assay of 12% Cu over 1.2 m. The heavily overgrown location was forgotten from 1929 to 1993 when it was rediscovered. Banded massive sulphides including chalcopyrite, pyrite, pyrrhotite, magnetite and sphalerite occur associated with felsic lapilli tuff and breccia rocks and a limestone unit. Assay values from grab samples submitted by property owners range up to 6.0% Cu (Resident Geologist's files, Beardmore-Geraldton District, Thunder Bay).

The original Holland-Chellew occurrence is located 1.0 km northeast of the J.J. Perry occurrence and on a northern zone of easterly trending formational conductors. Felsic tuff and/or rhyolite and mafic metavolcanics are intercalated at this site. Shear contacts of the 2 lithologies is the location of quartz-biotite schist, quartz veins, chalcopyrite and pyrrhotite (Kindle 1932). Assays of up to 0.24% Zn and 0.22% Cu from grab samples have been recorded by G. Clark and A. Eveleigh (Resident Geologist's files, Beardmore-Geraldton District, Thunder Bay).

Proximal to the eastern portion of the west block of claims, garnet and staurolite potentially related to hydrothermal volcanogenic massive sulphides have been noted in the matrix of felsic breccia rocks. A number of airborne geophysical

conductors, identified from the OGS-Aerodat airborne geophysical survey (OGS 1989) and occurring as isolated conductors or in clusters, will be prospected in 1994.

Missing Link Extension Occurrence

The Missing Link Extension property is located in the extreme northwest corner of Legault Township approximately 8.5 km northeast of Jellicoe. The property is accessible by travelling 7 km east of Jellicoe on Highway 11 to the Kinghorn Road and north for approximately 6.5 km. The main trench lies along the west side of the Kinghorn Road (claim TB 815364) just north of the Namewaminikan (Sturgeon) River and 1 km west of Jory Lake. The occurrence falls within the southern influence of the Paint Lake fault which hosts the Brookbank deposit in Irwin Township to the west. Originally discovered in 1989 by Beardmore prospector Myron Nelson, the occurrence has seen a limited amount of work under 1990 and 1993 OPAP (Ontario Prospectors Assistance Program) grants.

There is no record of exploration activity over the present day property prior to 1986 when Canadian Gold Resources conducted an airborne magnetic and radiometric survey over 2 selected portions of the claim group. From 1987 to 1992, junior companies Founder Resources Inc., Blue Falcon Mines Ltd. and Jamie Frontier Inc. completed geological mapping, ground magnetic and electromagnetic surveys and drilling on properties to the immediate south and southwest of the Missing Link Extension ground. Following the initial discovery and development of the main trench by prospector Myron Nelson, the 18-claim group was optioned by Freewest Resources Inc. in 1990. An exploration program consisting of ground magnetic and electromagnetic (VLF-EM) surveys, stripping, trenching and detailed mapping was completed. Both channel and grab samples were collected (Fekete 1990). Further trenching and prospecting by property owner Myron Nelson were undertaken during a 1993 OPAP grant.

The Missing Link Extension occurrence lies within the extreme north central portion of the main Beardmore-Geraldton belt just south of the eastern trace of the Paint Lake fault. It has been suggested by both Fekete (1990) of Freewest Resources Inc. and the authors that an east northeasterly splay of this prominent fault traverses the property. Mapping of Legault Township by Mackasey et al. (1976) and detailed ground work by Freewest Resources Inc. personnel (Fekete 1990) indicate that the fault contact separates the property into 2 basic lithologies: metasediments to the south and intermediate metavolcanics to the north. The metasediments exposed in the southern area of the claim group generally consist of poorly sorted polymictic conglomerates. The intermediate metavolcanics underlying the northern part of the property are described by Fekete (1990) of Freewest Resources Inc.: "Generally they are massive to pillowed, pale green andesite flows with weak but pervasive chlorite and carbonate alteration. Zones of intense shearing,

isoclinal folding, alteration and mineralization (exposed by stripping) parallel to the metasedimentary contact occur within the metavolcanics."

A description of the alteration and mineralization within the main shear zone exposed in a 12 m wide by 40 m long trench adjacent to the Kinghorn Road is given by Fekete (1990) as follows:

Variations in the degree and type of alteration and mineralization give this shear zone a banded appearance. Four distinct sub-zones were recognized: 1a, 1b, 1c and 1d.

Sub-zone 1a consists of weakly sheared, resistant andesite with weak to moderate chlorite/carbonate alteration. It is generally a pale green colour. The best result obtained from this sub-zone is .013 opt Au/0.9 m.

Sub-zone 1b consists of moderately sheared andesite with weak to moderate chlorite/carbonate/silica alteration which gives the rock a banded, bleached to rusty appearance. It averages about 4.0 metres wide. The best assay for this sub-zone unit is .11 opt Au/1.0 m. This value is unusually high and is probably related to the fault that cross-cuts the shear zone.

Sub-zone 1c is very similar to 1b in regard to alteration and appearance but is characterized by occasional quartz stringers with a general strike of 060°, conjugate to the direction of shearing. These stringers never exceed a width of 5.0 cm and are often pitted where ankerite or other carbonates have weathered out. Minor disseminated sulphides were noted in this sub-zone. Up to 0.52 opt Au/0.4 m was obtained from this sub-zone.

Sub-zone 1d consists of a stockwork of quartz veinlets in a very sheared, altered and mineralized andesite. Knobs of intense silica alteration containing up to 20% sulphide poke through at very rusty, weathered intervals. Fine, disseminated arsenopyrite, pyrite and chalcopyrite are the main sulphide minerals. intense sericite alteration and oxidation occur in the rusty intervals. The quartz veins within this sub-zone are contorted into minor drag-folds. The abundance of quartz increases towards the fold hinge where it occurs in knobs bearing up to 15% chalcopyrite in coarse blebs. The best assays from this sub-zone are from grab samples of the silica/sulphide, 0.144 opt Au, and quartz/chalcopyrite, 0.2 opt Au, knobs in the fold hinge.

This altered, sulphide-rich shear zone is also exposed in a smaller 3 m by 20 m long "north trench" approximately 120 m northeast of the main trench. The highest assay was obtained over the most intensely gossaned area and returned a value of .018 ounce Au per ton across 1.3 m (Fekete 1990).

The ground magnetometer survey conducted by Freewest Resources Inc. in 1990 indicates a coincident anomaly with the main trench that trends roughly 260° into the centre portion of the property. This may indicate the possible extension of the main shear zone and locate the contact of the metasedimentary-metavolcanic rocks. Further detailed prospecting, stripping and trenching in this area just north of the Sturgeon River should enhance the property. Additional significant anomalies were also detected by the company survey (Fekete 1990) in the extreme west and northwestern sections of the claim group.

Selected grab samples collected by the authors from the main trench along the Kinghorn Road ranged from 0.02 to .11 ounce Au per ton (Resident Geologist's files, Resident Geologist's office, Beardmore-Geraldton District, Thunder Bay).

Lafontaine-Summers Occurrence

The Lafontaine-Summers property is located immediately west of Beardmore in the southwestern portion of Summers Township. The property is accessible via the waste disposal road on the north edge of town which travels west for 4.5 km to the main occurrence in the central part of the claim group. Prospector Amede Lafontaine of Beardmore has conducted detailed prospecting and completed extensive stripping, trenching and sampling under a 1993 Ontario Prospector Assistance Program (OPAP) grant on the 52-claim property. Exploration work this past year was concentrated across 2 main shear and iron formation related gold-bearing zones.

The southwestern portion of Summers Township was the focus of extensive exploration activity during the 1930s. From 1935 to 1939, a considerable amount of surface work including sinking of a 24.4 m (80 foot) shaft and over 3048 m (10 000 feet) of diamond drilling were completed on the Buffalo-Beardmore Gold Mines Ltd. occurrence in the west central portion of the Lafontaine property (northeast corner of present claim TB 1194267). Gold values up to 0.42 ounce Au per ton across 2.64 m (8.69 feet) associated with quartz veins in heavily mineralized (pyrite and arsenopyrite) banded chert-magnetite iron formation were reported (Resident Geologist's files, Resident Geologist's office, Beardmore-Geraldton District, Thunder Bay). Numerous other vein related gold occurrences were discovered and worked during this early period (1935 to 1939) including the Anglo-Beardmore gold mine property (values up to 0.2 ounce Au per ton were reported) along the southern portion of the Lafontaine claims. Very little activity occurred in the area until 1981 when Gold Field Resources Canada Limited conducted an extensive ground magnetometer and EM survey over much of the northern and northwestern portions of the property. in 1984, Thorco Gold Finders Ltd. completed detailed geological mapping, stripping, trenching, diamond drilling and ground geophysics over the Anglo-Beardmore occurrences. Following an airborne magnetometer and EM survey conducted by Legion Resources Ltd. beginning in 1986, the property was subsequently optioned by Golden Dragon Resources Ltd. in 1989 as part of a larger package of ground extending westward across 2 townships into Lake Nipigon. Geological mapping, stripping, trenching and ground EM and IP geophysical surveys were completed. Since this time, prospector Amede Lafontaine has conducted an airborne magnetometer and EM survey and completed extensive ground work over what is now a 52-claim property in southwestern Summers Township.

The Lafontaine-Summers occurrence lies entirely within the thickest western portion of the southern metavolcanic sub-belt which is part of the main Beardmore-Geraldton belt. It is situated immediately southwest of the former Northern Empire Mine which produced over 149 000 ounces of gold from 1934 to 1941 along the same belt of iron tholeiites. Township mapping by both Mackasey (1970) and more recently by Shanks (1990) indicates the presence of 2 fault or shear zone systems trending east northeasterly across the property. These regional structures have been identified locally on the property and extensive work by the property owner has divided the area into 3 horizons: the central gold-bearing horizon, bounded to the south by the Blackwater River fault (southern horizon) and to the north by what has been named the Arsenopyrite fault (northern horizon).

The main gold occurrence is located in the central gold-bearing horizon within strongly sheared, and in places tightly folded, carbonatized mafic metavolcanic rocks. The occurrence is exposed in a stripped area 60 m by 50 m, striking 74° AZ and dipping 85° to the north. According to the property owner, strong shearing can be traced across strike in this area for over 160 m. The sheared metavolcanics contain rounded quartz knots averaging 1 cm in size as a result of a boudinaged fragmented quartz vein network prominent throughout the occurrence. Rusty carbonate alteration and highly altered sugary quartz is associated with fine disseminations and massive seams of pyrite up to 1 cm, coarse euhedral blades of arsenopyrite (up to 5 mm) and lesser amounts of pyrrhotite and chalcopyrite. The total sulphide content ranges from 7 to 10%. Horizons containing 2 to 3% euhedral magnetite phenocrysts were also noted. The mafic metavolcanic host rock is moderately silicified throughout the exposure.

Further exploration 2 km to the southwest of the main occurrence within the southern horizon uncovered a banded, tightly folded, sulphide magnetite iron formation. The zone is expressed as a highly weathered, strongly gossaned iron formation outcrop containing bands of recrystalized chert, massive to granular magnetite and disseminations, patches and massive seams of pyrrhotite and pyrite. Total sulphide content averages 10 to 15% but can be as high as 40%. The host mafic metavolcanic rock is strongly deformed into tight folds and sheared near the most heavily mineralized sections. Indications of extensive sulphide mineralization along an 800 m long stripped zone stretching north from this location was observed by the author.

Geochemical results for samples collected following a late 1993 trenching program conducted by the property owner along the iron formation zone were not available at the time of writing. Selected grab samples from the main zone in the central horizon assayed from 0.09 to 0.42 ounce Au per ton with one sample returning a value of 1.03 ounces Au per ton (A. Lafontaine, Prospector, personal communication, 1993).

RECOMMENDATIONS FOR EXPLORATION

Base Metal and Gold

Felsic metavolcanic terrains in the Onaman-Tashota metavolcanic belt should be re-examined for volcanogenic massive sulphides (VMS) including the following areas: Marshall-Toronto lakes, Metcalfe-Oboshkegan lakes, Melchett-Colpitts lakes, Elmhirst-Rickaby-Lapierre townships and O' Sullivan-Muriel lakes. Stratigraphy should be carefully mapped with any interflow marker horizons identified and the rocks should be prospected out for sulphides. Units immediately above and below interflow metasedimentary units may host VMS alteration and mineralization. Felsic intrusions should be re-examined to determine if they are subvolcanic (hypabyssal intrusions). Berger (1992) identified the Summit Lake batholith as a subvolcanic intrusion and likely source of magma for the intermediate to felsic metavolcanic rocks in the Toronto-Marshall lakes area.

A re-evaluation of the OGS-Aerodat airborne geophysical survey (OGS 1989) is recommended for potential VMS targets.

Recent exploration has included diamond drilling the eastern extensions of the Paint Lake fault in the Wildgoose Lake area for gold deposits. The fault has been intersected in areas of extensive overburden, but little mineralization has been encountered to date. Further detailed prospecting for gold is recommended between Geraldton and the Kinghorn Road on the Paint Lake fault and subsidiary faults and/or lineaments.

Feldspar and gabbro porphyry intrusions should be prospected for in fault zone and/or lineament environments. Gold mineralization can be associated with pyrite and/or arsenopyrite. Sulphide minerals are disseminated or occur with quartz carbonate veining and/or stockworks within the intrusions or at contacts with metasedimentary and metavolcanic rocks.

Industrial Minerals and Building Stone

Further research, staking and exploration for diamond targets (kimberlite pipes, lamproites) are recommended using the GSC Magnetic Anomaly (Residual Total Field) maps (GSC 1988) and the OGS-Aerodat airborne geophysical survey (OGS 1989) in conjunction with the 1993 GSC publication, Memoir 435, "Quaternary Geology and Drift Prospecting, Beardmore Geraldton Area, Ontario".

A general discussion of the granite dimension stone industry is given by Hinz and Landry (1993) in the Summary of Field Work:

> Forecasts indicate continued growth for the Canadian dimension stone industry (Vagt 1992). Colours which have experienced an increased demand include green, yellow, blue and variegated granite. The colours which have maintained a steady market demand included pink, grey, white, red and black.

With the release of the Bedrock Geology of Ontario map series in 1991, prospecting for granite deposits has been made easier. Units 14 (massive granodiorite to granite) and 15 (diorite-monzonite-granodiorite) have been recognized as having the potential to host quarriable granites. Prospectors should examine the maps and target these units for examination.

Specifically in the Beardmore-Geraldton district there are 24 bodies of units 14 and 15, most of which have not been examined for their dimension stone potential. Some of the more accessible of these include the Elmhirst and Coyle Lake stocks in Elmhirst Township, the Croll Lake stock north of Long Lake, and the Wee David Lake and Paglamin Lake stocks along Highway 11 east of Longlac, south of Fernow Township (within the eastern portion of the Beardmore-Geraldton belt).

Unit 10 (mafic and ultramafic rocks) on the Bedrock Geology of Ontario map series should also be examined. Five unit 10 bodies have been mapped in the district with 4 located in an area between Conglomerate Lake and Central Pifher Township. These stocks could host potential black "granite" deposits.

Other industrial minerals which should be prospected for include large high-purity quartz veins. The Gravel River fault trends northeast from Nipigon Bay, in Lake Superior, and extends from south of Longlac northeast into the James Bay Lowlands. Near Dickison Lake (Hinz and Lucas 1992) large quartz veins are known to occur, however, these are too isolated to be of economic interest. If large veins could be located east from Long Lake and near roads, they might be exploited.

Markets for flake graphite are expected to see continued growth (Boucher 1992). Four graphite occurrences have been located in the Quetico Subprovince north of Manitouwadge between Caramat and Hornepayne. Potential exists for economic deposits of flake graphite within the high-temperature metamorphic terranes present in the Quetico Subprovince. Ductile shear zones should be investigated for the development of flake graphite. Prospecting and outcrop examination are the most effective techniques in evaluating graphite occurrences.

In the case of the sites described above, transportation costs suggest exploration for industrial minerals should be focussed south of the CNR main line in the Beardmore-Geraldton district.

RESEARCH BY OTHER AGENCIES

Samples of pyritiferous gold ore from 3 mines, including 2 facies of the MacLeod-Cockshutt mine, requested by Carleton University were measured for their Pb isotopic composition. A barren pyrite sample was also measured as a control. The results are now being interpreted. Plans are to compare the Pb isotopic signature of the pyrite in the ore with the pyrite in heavy mineral suites from the area. The latter, collected by Thorleifson and

Kristjansson (1990, 1993), is being made available directly to the workers at Carleton University for the Pb isotopic ratio measurements to be made. In addition, more gold ore and barren pyrite samples are to be isotopically analyzed to increase the size of the data base.

The isotopic studies at the Beardmore-Geraldton area form part of a three-year university Strategic Grant project funded by the Natural Sciences and Engineering Research Council of Canada (NSERC). The principal investigator is K. Bell of Carleton University; J. Franklin, D. Sangster and W. Shilts of the Geological Survey of Canada are co-investigators. J. Card of Carleton University is acting as co-ordinator of the project.

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KENORA RESIDENT GEOLOGIST'S DISTRICT--1993

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INTRODUCTION

Dimension stone, crushed stone, high-purity quartz and peat were the commodities produced in the Kenora Resident Geologist's District in 1993.

Nelson Granite Ltd. continued to produce a pink granite dimension stone known as "Morning Rose" from their quarry west of Vermilion Bay. In October Palin Granite Canada Inc. suspended their quarry operation 35 km northeast of Kenora, awaiting improved market conditions for the 2300-2500 cubic meter of stockpiled material. Al Minor continued production of aggregate material from the Cygnet Lake Road Quarry 45 km northwest of Kenora. Crystal Quarries Ltd. continued production of high-purity quartz from their quarry, south of Vermilion Bay.

In the Rainy River District two peat operations are ongoing. Barwick Peat Ltd. continued production at their plant located in Barwick 40 km west of Fort Frances. In Miscampbell Township 16 km west northwest of Fort Frances, Normiska Peat Inc. cleared and drained a peat bog in preparation for production in 1994.

During the year three designated advanced exploration gold projects tested grade with small scale mills. Western Troy Capital Resources Inc. continued with their 500 ton bulk sampling program started the previous year on the Wagg gold prospect in Menary Township. Nipigon Gold Resources continued operation of their mill on the Mckenzie-Gray prospect 12 km south of Mine Centre. Kenora Prospectors and Miners Ltd. along with joint Venture partner Eastern Stone commenced a bulk sampling program on the Cedar Island extension zone at Shoal Lake. No advanced exploration activity was conducted at the following 3 underground development gold projects reported on in previous years: Nuinsco Resources Ltd. at Cameron Lake; Boise Cascade Canada Ltd. at the Scramble Mine near Kenora; Consolidated Professor Mines Limited at the Duport gold project at Shoal Lake.

Table 1 indicates that exploration activity has decreased again in 1993 although exploration expenditures are higher. The

apparent increase in expenditures reflects the assessment work filed during this year but does not necessarily reflect exploration expenditures during the current year. The new format for reporting exploration expenditures is introduced to concur with the reports from the automated Claims Client Services database introduced in December this year at the Kenora Mining Recorder's office. The number of active claims decreased 6% to 9844 units and the number of units staked decreased 62% to 1193 units from figures reported for the previous year.

Table 2 shows a decrease in the number of exploration projects to 35 from 47 reported the previous year. Nineteen mineral exploration projects were carried out by prospectors; 4 projects by major mining companies and 12 by junior mining companies. Gold was the target for 16 projects and 13 were directed at base metals. Industrial minerals were the target for 4 projects and 2 diamond exploration programs are reported.

A base metal study initiated by the Kenora Resident Geologist in 1992 was continued this year with studies on 7 base metal properties and other potential areas. Results and Recommendations for Exploration have been discussed in Summary of Field Work and Other Activities 1993 (Laderoute, 1993).

The 5 Ontario Geological Survey field projects in the Kenora District this year have been keyed to Figure 2. C.E. Blackburn, Mineral Deposits and Field Services Section, carried out 1:15 840 scale mapping in the eastern half of the Separation Lake area (A). G.P. Beakhouse, Mineral Deposits and Field Services Section, carried out 1:50 000 scale mapping of migmatite and granitoid rocks in the Umfreville Lake and Separation Lake areas (B). Tom Morris, Sedimentary and Environmental Geology Section, carried out surficial geology studies consisting of detailed sampling of surficial materials over known bedrock mineralization sites and 1:50 000 scale mapping and deposit examination in the Umfreville Lake and Separation Lake areas (C). Jack Parker, Mineral Deposits and Field Services Section, carried out mineral deposit studies on base metal occurrences in the Bug Lake area northwest of Kenora (D). Fred Breaks, Mineral Deposits and Field Services Section, examined rare element pegmatites in the Raleigh Lake and and Separation Lake areas (E). Publications released during the year by the Ontario Geological Survey are tabulated in Table 4.

During the year 11 individuals received Ontario Prospectors Assistance Program grants for a total of $104 274. No exploration projects were funded under Ontario Mineral Incentives Program. In 1993 six companies or individuals received project approval for a total of $286 400 from the Northern Ontario Heritage Fund Corporation under the Resource Diversification Program of NORFUND.

The Offsite Core Facility, located near the Kenora airport was

TABLE 1 Summary of claims recorded and assessment work credit

Year	Claim Units Recorded	Claim Units Cancelled	Claim Units Active	Diamond Drilling	Physical Sect. 18 & Other	Geotech-nical	Total
1993	1 193	1 825	9 844	$ 80 797	$631 632	$606 588	$1 319 017

Year	Claim Units Recorded	Claim Units Cancelled	Claim Units Active	Diamond Drilling	Geophysical Surveys	Geological Surveys	Total
1992	3 124	1 278	10 139	$657 218	$202 950	$174 598	$1 034 766
1991	1 678	2 816	8 293	$591 497	$163 560	$ 72 122	$ 987 196
1990	1 263	4 207	9 431	31 970	56 517	12 356	130 170
1989	2 875	3 370	12 375	56 599	103 573	11 359	205 619
1988	3 531	2 639	12 694	119 947	267 990	16 957	443 554
1987	5 211	2 578	12 496	86 321	153 077	12 067	251 465
1986	4 041	5 054	9 863	64 099	47 883	9 698	144 837
1985	2 216	5 195	10 875	55 090	185 148	29 765	292 729
1984	3 216	3 042	13 854	36 055	281 359	23 670	364 692
1983	11 061	1 472	13 635	35 746	42 221	12 006	106 397
1982	1 579	1 609	4 046	23 525	26 270	5 330	68 439
1981	2 121	846	4 076	26 127	37 624	3 383	72 732
1980	1 877	788	3 208	15 428	3 149	859	21 368
1979	984	1 357	2 119	9 992	10 658	1 420	24 182
1978	808	1 357	2 300	22 299	7 576	2 143	34 934
1977	1 495	1 585	2 820	15 405	11 366	1 760	33 838
1976	1 380	2 125	3 234	25 030	21 367	5 960	55 042
1975	1 677	2 452	3 975	23 584	31 509	940	57 266
1974	2 653	1 076	4 727	29 496	18 049	3 070	52 134

Assessment work credits are reported in man days up to 1990 and in dollar values following this date.

fenced and leveled in 1993. The outdoor site contains 40 593 m of core. from 2 sites. The core for the Offsite facility was collected this year by a contractor under the Jobs Ontario Capital Fund. Drill core collection sites for the year are tabulated in Table 5 and keyed to Figure 2.

Site inspections, and reports and plans for all abandoned mine and exploration sites in the Kenora Resident Geologist's District, were completed during the year by Dominion Soil Investigation Inc. as part of the Abandoned Mines Inventory System. This data will be added to the province wide AMIS data base.

ACKNOWLEDGEMENTS

C.C. Storey, M. Guderyan and M. Hailstone contributed to preparation of this report. D.G. Laderoute published a report entitled "Recommended Areas for Volcanogenic Massive Sulphide and Gold Exploration in the Kenora Resident Geologist's District - 1993" (Laderoute, 1993). Permission to publish the Rainy River Sonic Bedrock multi- element analyses was given by C. Baker and A. Bajc, Ontario Geological Survey, Sedimentary and Environmental Geoscience Section.

C.C. Storey, M. Hailstone and P. Hinz (NODA Industrial Minerals geologist, Thunder Bay) contributed to "Recommendations for Exploration and Development". C.C. Storey prepared all maps and tables for this report and discussed "Industrial Mineral Deposits not Being Developed" and "Exploration for Industrial Minerals". C.E. Blackburn provided suggestions and advice for this report. M.J. Guderyan organized, typed and printed the proofs for the manuscript.

Information on current and past exploration work included in this report is taken from the assessment files of the Kenora Resident Geologist's office unless otherwise indicated. Text is keyed to Figure 1.

MINING AND QUARRYING ACTIVITY

There was no major production of either base or precious metals in the Kenora Resident Geologist's District in 1993.

Granite

Palin Granite Canada Inc. (A) produced 1326 cubic metres of Pine Green and 705 cubic metres of Crystal Gold granite during the year, from their Pine Green quarry north of Kenora (G. Zebruck, Palin Granite Inc., personal communication, 1993)

Nelson Granite Ltd. (B) continued to produce pink granite dimension stone from their quarry in Docker Township. Nelson Granite Ltd. has a quarry and processing plant on the south side of the Highway 17 but currently produces most of its

TABLE 2 - Companies active in the Kenora Resident Geologist's District in 1993

Abbreviations:

BM	-	Base Metals	GP	-	Geophysical Survey	STr	- Stripping
DD	-	Diamond Drilling	OD	-	Overburden Drilling	Tr	- Trenching
DS	-	Dimension Stone Sampling	Prosp	-	Prospecting /General Exploration		
GC	-	Geochemical Survey					
GL	-	Geological Survey	SA	-	Sampling		

No. On Figure	Commodity	Individual or Company	Area/Township	Activity	Assessment Dollars	Number of Active Claim Units
1	DS	Anderson, Tom	Yellow Girl Bay and Manross Township	Prosp, DS	N/A	N/A
2	Cu	Ansil Resources Ltd.	Bad Vermilion Lake area	GP		53
3	Au	Armstrong, George	Bad Vermilion Lake area	DD		12
4	Zn	Barton, Bernard	Brooks Lake area	Prosp, SA		10
5	Cu	Bolen, J and McCormick, A.	Sandbeach Lake area	Prosp, STr, SA	976	181
6	Water	Canadian Azure Pure Water	Dogpaw Lake area	GC	N/A	N/A
7	Au	Champion Bear Resources Ltd.	Lobstick Bay area	GL, GP		24
8	BM, Au	Chute, Michael	Brooks Lake area	Prosp, SA		36
9	BM, Au	Chute, Michael	Dogpaw Lake area	Prosp, SA		12
10	BM	Cousineau, Ray, Cousineau, Louis	Bennett Lake area	Prosp, SA		58
11	Quartz	Crystal Quarries Ltd	Line Lake area	Prosp, GL, DD		2
12	Au	Etherington, Robert	Haycock Township	Prosp, SA	150	1
13	Cu, Zn	Etherington, Robert	Gundy Township	Prosp, SA	2144	1
14	BM	Ferreira, William	Rex Lake area	Prosp, S	1488	8
15	BM	Glatz,Alex	Bending Lake area	Prosp, SA		45
16	BM	Hood, William	Reynar Lake area, Werner Lake area	GL, GP	6467	23
17	Zn, Cu	INCO Exploration & Technical Services Inc.	Little Turtle Lake area	GP; DD		101
18	Au	Kenora Prospectors & Miners Ltd.	Shoal Lake area	Advanced Exploration		37
19	Diamonds	Marum Resources Inc.	Work Township	GL, SA		110
20	Au	Nipigon Gold Resources Ltd.	Bad Vermilion Lake area	Advanced Exploration	75000	65
21	BM, Au	Noranda Exploration Co. Ltd.	Bridges, Docker and Tustin Townships	GP, DD	36640	447
22	BM	Noranda Exploration Co. Ltd.	Wapageisi Lake area	GL		31
23	Au	Nuinsco Resources Ltd.	Richardson Township	GL, OD, SA	46567	104
24	DS	Palin Granite Canada Inc.	Wonderland Lake area Forgotten Lake area	Prosp, DS	4219	5
25	BM	Phelps-Dodge Corp. of Canada	Echo Bay area	GP		15
26	BM	Plomp, Fred	Aubrey Township	Prosp, SA		12
27*	Diamonds	Prior Resources Ltd./ Consolidated Newgate Resources Ltd.		GL, SA		
28	Au	Redden, Jim	Boyer Lake area	Str, Tr, SA	8057	5
29	Au	Roberecki, Anna	Bigstone Bay area	STr, SA	480	1
30	Zn	Ross, William	Bad Vermilion Lake area	Prosp, SA	3750	4
31	Au, Zn, Cu	Teck Exploration Ltd.	Hartman & Zealand Townships	DD		121
32	BM, Au	Twomey, Tim	Watten Township	Prosp, SA		16
33	Au	Western Troy Capital Resources Ltd.	Menary Township	Advanced Exploration	75000	29
34	Au	Willingdon Resources Ltd.	Willingdon Township	DD	41223	9
35	Au	Woitowicz, Mike	Boyer Lake area	STr	2085	5

* not shown on Figure 1 due to large area investigated

granite from a quarry on the north side of Highway 17. A second quarry, also on the north side of Highway 17 and formerly operated by Granite Quarriers Inc., was inactive.

J.A. Minor and Sons (Cygnet Lake Quarry) (C) did no new quarrying in 1993 but did ship 500 tons of crushed granite from their stockpile of 25 000 tons to precast concrete companies and landscapers in Winnipeg. The 500 tons consisted of 9/16 to 3/16 inch precast aggregate and 1 5/8 to 3/4 inch landscaping aggregate. The material was made into precast concrete panels and as well as planters and paving slabs for test marketing. The material was well received by the industry (J.A. Minor, J.A. Minor and Sons, personal communication, 1993).

Peat

Barwick Peat Ltd. (D) has a processing plant in Barwick where peat is harvested from a bog in Lot 6 Con 4 Carpenter Township. The plant has a capacity to produce 400 000 bales (60 pounds each) of horticultural peat per year. The plant started in March of 1993 but only produced 6000 bales of peat due to the extremely wet weather (E. Goodwin, Barwick Peat Ltd., personal communication, 1994).

Quartz

Crystal Quarries Ltd. (E) shipped 2000 tons of quartz from a stockpile of crushed material on site but did not quarry any new material (T. Hansen, Crystal Quarries Ltd., personal communication, 1993).

Soapstone

Approximately 20 tonnes of soapstone for carving and art purposes were removed from the Eagle Lake Soapstone Quarry (F) by Phil Thorgrimson (Labyrinth Bay Stoneworks) during 1993 (MNR, Quarry Permit, Dryden District, 1993).

Small-Scale Mining

A. Kozowy (Prospector, Dryden) continued to produce gold from a small mill at Flambeau Lake, about 13 km southwest of Dryden on Highway 502 (see Figure 1, location A). Mr Kozowy has been operating his small-scale mill since 1988 providing educational visits to the site for groups such as the Dryden High School Conservation Course. Feed for the mill is gold-bearing quartz vein material currently being extracted from an open cut near the old shaft at the Brockman prospect. The vein is located on the north shore of Brown Lake approximately 47 km southeast of Dryden and material is transported to the mill at Flambeau Lake (A. Kozowy, Prospector, personal communication, 1993).

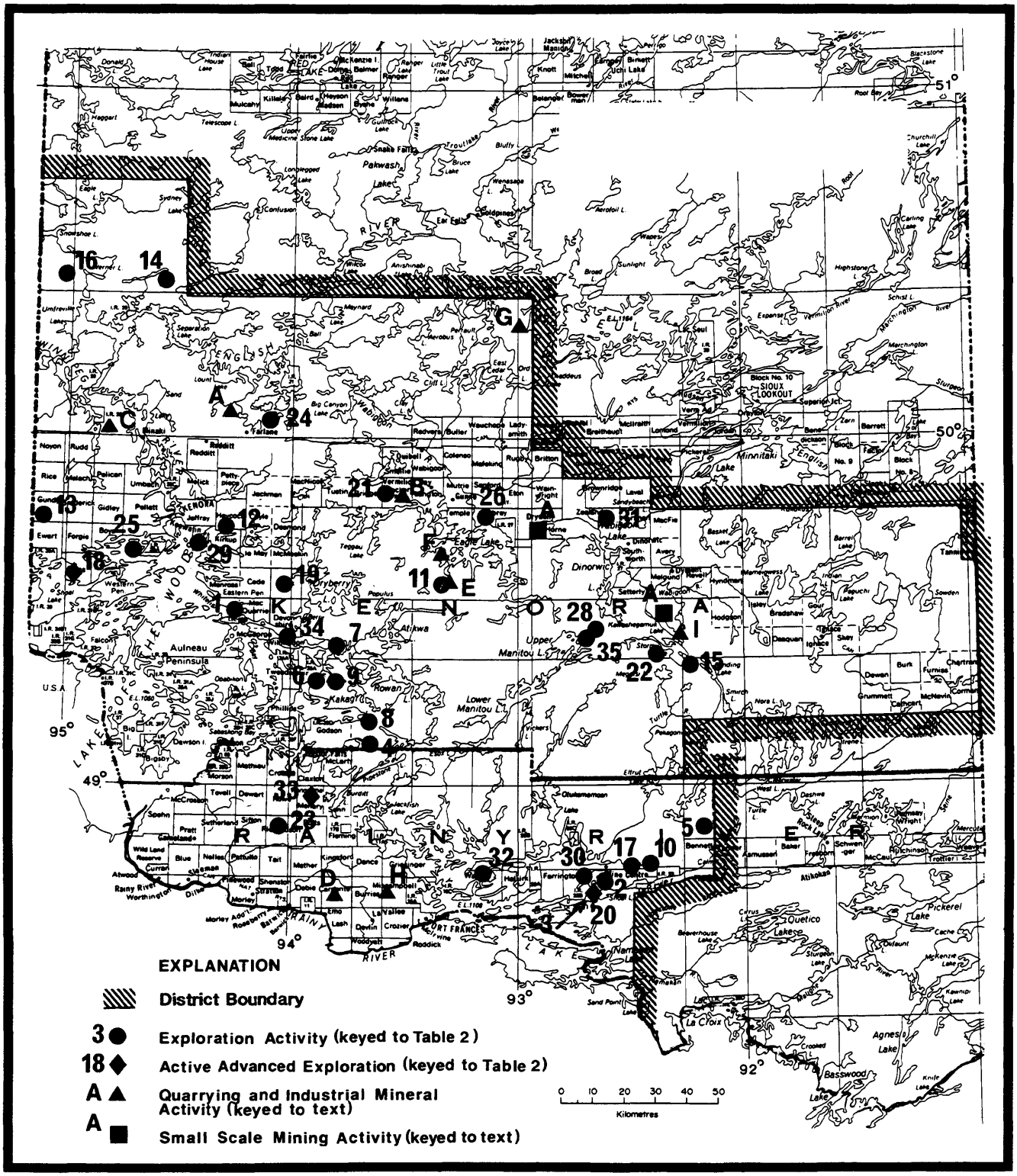

Figure 1. Kenora Resident Geologist's District: exploration activity, advanced exploration, quarrying, industrial mineral, and small scale mining activity.

ADVANCED EXPLORATION AND DEVELOPMENT

Western Troy Capital Resources Inc., Menary Township

Western Troy Capital Resources Inc. (33) continued with test milling of a 500 ton bulk sample. The bulk sample is being extracted from the Wagg gold prospect in Menary Township located 37 km north of Emo. The mill site is located at the A Vein and is accessible by four-wheel drive vehicle on a logging road 2.6 km west of Highway 71. A 45 x 92 m area has been exposed by stripping and the pit measures 30 x 15 x 3 m. During the year, 33 tons (yielding 15 ounces of gold) were test milled by a second autogenous, air-impact mill owned by Bill McNerny. The air-impact mill test was partially funded by a Resource Diversification and Development Program, Northern Ontario Heritage Fund Corporation grant. A total of 227 ounces of gold and 9.7 ounces of silver have been produced from the milling operation (W. Holmstead, Western Troy Capital Resources Inc., personal communication, 1994).

Kenora Prospectors and Miners Limited/Eastern Stone Products Ltd., Joint Venture, Shoal Lake

Operating under an advanced exploration permit Kenora Prospectors and Miners Limited (18) and their joint venture partner Eastern Stone Products Limited commenced a 50 000 ton bulk sampling project on the Cedar Island extension zone at Shoal Lake in March. In May, joint-venture partner Eastern Stone Products Ltd. reported that they were seeking additional funding to complete the bulk sample program (Northern Miner, May 17, 1993, p.3).

Consolidated Professor Mines Limited, Duport Mine

In January Consolidated Professor Mines Limited stated that it has made major changes to the project which address environmental concerns raised at the time of the initial submission in 1989 (Consolidated Professor Mines Limited, press release, 1994). The company has acquired rights to additional property for the processing plant and right-of-way has been acquired to permit access over private land between the new plant site and the mine site (Consolidated Professor Mines Limited, Press Release, 1994). The project has a defined geological mineral inventory of 1.8 million tonnes grading 0.35 ounce Au per short ton. Forecast production is 45 000 ounces per year (Consolidated Professor Mines Limited, press release, 1994).

Nipigon Gold Resources Ltd.

Nipigon Gold Resources Ltd. (20) carried out a bulk sampling program under an Advanced Exploration permit on the Mckenzie-Gray prospect in the Bad Vermilion Lake area.

Approximately 350 tons were test milled on the property during October and November with initial results showing a higher tenor than the drill indicated grades (C. Larouche, Nipigon Gold Resources Ltd., personal communication 1994). Recovery from the Wilfley table is approximately 70% suggesting that a flotation cell will have to be incorporated into the mill circuit (C. Larouche, Nipigon Gold Resources Ltd., personal communication, 1994). Drill indicated reserves on the property are 100 000 tons grading 0.17 ounce Au per ton, 1.13 ounce Ag per ton, 3.0% Zn, 0.25% Cu, and 0.05% Pb (C. Larouche, Nipigon Gold Resources Ltd., personal communication, 1994). The geological reserve is located within the northwest trending Mckenzie-Gray vein in an ore shoot that plunges 15 degrees to the northwest. On surface the vein has been traced for more than 300 feet varying in width from 0.5 feet to 7.0 feet. Favourable indications of additional reserves on the property are associated with the Finger Bay fault and are inferred from drilling on the Jolly Roger occurrence where 0.05 ounce Au per ton was intersected in sheared, silicified mafic dike material (C. Larouche, Nipigon Gold, personal communication, 1994).

EXPLORATION ACTIVITIES FOR GOLD AND BASE METALS

Exploration data for the Kenora Resident Geologist's District has been tabulated in Table 2. Descriptions of work that follows are based on significant exploration expenditures and/or significant results from exploration conveyed to the author. The reader is also referred to Table 8 for a list of properties available for option, Joint Venture or Sale in the Kenora Resident Geologist's District.

T.R. Twomey with partners, **D.J. Gliddon** and **A.J. Eveleigh** (32) prospected, sampled and carried out ground magnetometer and HEM surveys on their 16 unit claim block staked for base metals in Watten Township. Laboratory results from sampling of the area depict a VMS hydrothermal alteration zone trending northest through Beak Island (T.R. Twomey, Prospector, personal communication, 1994). Interpretation of the geophysical survey carried out this winter indicates the presence an HEM anomaly coincident with the projected alteration zone extending under Rice Bay (T.R. Twomey, Prospector, personal communication, 1994). These claims are in the Rice Bay Dome area described by J.R. Parker and D.G Laderoute as being, underlain by felsic metavolcanics and showing evidence of hydrothermal alteration associated with base metal mineralization (Parker et al. 1993).

Inco Exploration and Technical Services Inc. completed a 4 hole 1577 m diamond drill program on the Cousineau/Pidgeon Options (17) in the Little Turtle Lake area. The holes were surveyed with down hole pulse EM (B. Bell, INCO Exploration and Technical Services Inc., personal communication, 1994). The properties were returned to the owners in November and December. This Zn-Cu property is underlain by felsic metavolcanics ranging from massive to quartz- and

feldspar-phyric flows on the north end of the property and dominantly massive to pillowed mafic flows intercalated with minor units of intermediate to felsic tuff in the southern portion of the property.

Willingdon Resources Limited. (34) diamond drilled 5 holes for a total of 552.3 m to test for extensions of the quartz carbonate zone to the west, under the lake. Mineralization in this area occurs within mafic volcanics cut by west to northwest trending shears with quartz carbonate alteration and is spatially related to the Regina Bay stock, a quartz porphyry felsic intrusion. The company holds 7 claim units in Willingdon Township. Willingdon drilled 10 drill holes for a total of 957.7 m between 1988-90 with an intersection of .10 ounce per ton Au over 8.8' in diamond drill hole 90-5 (Willingdon Resources Limited, shareholders report, 1991).

Champion Bear Resources Ltd. (17) carried out stripping, trenching, sampling, and selective detailed mapping on their 24 claim units located in Lobstick Bay area (S. Sears, Champion Bear Resources Ltd., personal communication, 1994). This gold property is also known as the Grand Chibougamau prospect. In 1987-88 Tanqeray Resources, together with joint venture partner Abo Resources Corp., drilled 10 holes totalling 707.5 m with drill hole CAV-88-1 intersecting a 3.5 m quartz carbonate breccia zone containing 5% pyrite and trace chalcopyrite. This section of core assayed 0.170 ounce Au per ton and included a zone of 0.26 ounce Au per ton over 2.1 m.

In 1993 **Teck Exploration Ltd.** (31) together with joint venture partner **Cameco Corporation** carried out a 10 hole, 1849 m diamond drill program testing induced polarization anomalies on the Thunder Lake East property in Zealand Township. The Thunder Lake East and West gold properties have been explored since 1989 by magnetic, electromagnetic and induced polarization ground geophysical surveys, stripping, channel sampling, geological mapping and approximately 9144 m of diamond drilling from 48 drill holes (K. Thorsen, Teck Exploration Ltd., personal communication, 1994).

In February 1994 **Continental Caretech Corporation** and **Teck Exploration Ltd.** commenced a 16 000 foot diamond drill program on the Thunder Lake West property (K. Thorsen, Teck Exploration Ltd., personal communication, 1994). Continental Caretech has the right to earn a 50% interest in Teck Exploration's gold prospect by spending $1 million over the next three years (Canada Stockwatch, Dec. 14, 1993 p.7). Continental Caretech announced intersections of 0.89 ounces Au per ton over a true thickness of 26.2 feet including 3.84 ounces Au per ton over a true thickness of 6.2 feet from the 16 000-foot drill program commenced in January 1994 (Northern Miner, February 4, 1994, p.1). Results from the same section being drilled on 25 m centres include a true thickness intersection of 19.7 feet grading 0.43 ounces Au per ton (Northern Miner, February 4,

1994, p.1). The mineralization is spatially associated with sheared, silicified, sericitized and pyritic quartz-feldspar porphyry (Parker et al, 1993).

Noranda Exploration Company Limited (21) with joint venture partner **Major General Resources Ltd.** conducted geological mapping, sampling, ground geophysical surveys and diamond drilling on their copper zinc property in Docker and Bridges townships. Noranda carried out approximately 15 ground HLEM and magnetometer surveys to test airborne geophysical anomalies (R. Felix, Noranda Exploration Company Limited, personal communication, 1994). A 4 hole, 385 m diamond drill program tested HLEM targets with corresponding anomalous Cu-Zn soil geochemistry on the Fairservice option. Best intersections reported assayed 0.38% Zn over 6.2 m. An additional 4 hole, 347 m diamond drill program tested other targets in Docker Township later in the summer (R. Felix, Noranda Exploration Company Limited, personal communication, 1994). The copper-zinc zone has been reported as having a strike length of 1.5 km with widths up to 25 m (Canadian Mines Handbook 1993-94, p.222). Results from this years work have increased favourable horizon strike distance considerably (R Felix, Noranda Exploration Company Limited, personal communication, 1994).

Nuinsco Resources Ltd. (23) carried out a 9 hole Sonic drill program in Richardson Township and conducted sampling and mapping on approximately 830 claim units optioned from the Rainy River Syndicate in Potts, Menary and Senn Townships. In total Nuinsco has also acquired rights to 35 000 acres of patented and crown mining rights.

J. Redden (28) conducted mapping, stripping, trenching and sampling on his 86 claim unit property in the Boyer Lake area. The claims are underlain dominantly by mafic flows with minor mafic agglomerate and mafic tuffs and by minor gabbro and felsic intrusions. Felsic volcanic rocks are exposed in the core of an anticline on the southwestern portion of the property. Widespread carbonate alteration with local silicified zones is associated with shear zones on the property. Three zones of shearing 200 to 500 m wide have been recommended by Redden for an IP survey (J. Redden, Prospector, personal communication, 1994). Assay results reported from the property include 0.4 ounce per ton Au in a grab sample of fine to medium grained pyrite (greater than 60%) with a granular quartz matrix. A grab sample from a quartz vein on the north end of the property assayed 12 ounces Au per ton (J. Redden, Prospector, personal communication, 1994).

EXPLORATION FOR INDUSTRIAL MINERALS

BUILDING STONE

T. Anderson (1) carried out stripping and preliminary

investigation of flagstone in sheared siltsone and graphitic argillites on two sites in the Yellowgirl Bay area of Lake of the Woods.

The Town of Ear Falls continued reconnaissance exploration for potential granite deposits around Highway 105 (G) and the former CNR Right of Way north of Perrault Falls. Palin Granite Canada Inc. carried out preliminary exploration on a site on the Lount Lake Road east of Red Deer Lake.

DIAMONDS

Prior Resources Ltd./ Consolidated Newgate Resources Ltd. (27) carried out soil sampling and air photo interpretation over parts of the Western Wabigoon Subprovince in a joint venture diamond exploration project (D. DuPasquier, Consolidated Newgate Resources Ltd., personal communication, 1994). Kimberlite indicator minerals including chrome diopside and pyrope garnet were found in soil samples taken during preliminary exploration. The company is evaluating 23 sites discovered by air photo reconnaissance work (Canada Stockwatch, January 24, 1994, p.15).

Marum Resources Inc. (19) began a preliminary diamond exploration program in Work Township. Work in 1993 consisted of satellite image interpretation and field reconnaissance. The company has three claim blocks in Work Township (R. Boulay, Marum Resources Inc., personal communication, 1994).

PEAT

Normiska Peat Inc. (H) began initial development of a peat bog in Miscampbell and Burriss townships. The work consisted of drainage, field layout and road construction. The company intends to erect a modular plant to produce horticultural peat in 1994.

SILICA-FLUORITE-TUNGSTEN

A. Glatz and A. Kozowy continued to hold the silica-fluorite-tungsten occurrence in the Kawashegamuk Lake area (I). While they did no further work on the claims they have been looking into the potential for developing and marketing white quartz. The property has been described previously by Parker et al. (1993) as being underlain by mafic metavolcanic flows of the Kawashegamuk Lake group in a northwest-trending contact with the Revell Batholith. The contact between the granite and the metavolcanic units includes hybrid rocks resulting from assimilation of metavolcanic rocks by the batholith. Orientation of quartz veins and foliation along the contact is generally 300/90 (Parker et al 1993).

TABLE 3 - Property and other visits, Kenora Resident Geologist's District.

1 Anderson Slate (T. Anderson), Yellow Girl Bay and Manross Township area: Flagstone/slate
2 Bending Lake (A. Glatz), Bending Lake area: Cu, Zn
3 Bennett Creek (R. & L. Cousineau) Bennett Lake area: Zn, Cu, Au, Pb
4 Bridges-Docker Base metals (Noranda Exploration Co. Ltd.), Bridges and Docker Townships: Cu, Zn, Pb
5 CN #3/3A (C. Nelson, D. Miranda), Glider Lake area: Granite (dimension stone)
6 Crystal Quarry (Crystal Quarries Ltd.), Line Lake area: Quartz
7 Etherington (B. Etherington), Haycock Township: Au
8 Gold Insight Resources (R. Mori), Pellatt Township, Umbach Township: Granite (dimension stone)
9 Gundy Creek (B. Etherington), Gundy Township: Au, Cu
10 Gundy Township (B. Etherington), Gundy Township: Au, Cu, Zn (2 visits)
11 Hansson Sulphide Occurence (A. Glatz), Langton Township: Cu
12 INCO- Cousineau Opt. (INCO Exploration & Technical Services Inc.) Little Turtle Lake area: Zn, Cu
13 Little Stephen Lake (M. Chute), Dogpaw Lake area: Au
14 Mckenzie-Gray Prospect (Nipigon Gold Resources Ltd.), Bad Vermilion Lake area: Au
15 Pine Green Quarry (Palin Granite Canada Inc.) Forgotten Lake area: Granite (dimension stone)
16 Port Arthur Copper Mine (J. Corrigan estate) Little Turtle Lake area: Cu, Zn
17 Sandhill Creek (M. Chute), Brooks Lake area: Au, Cu
18 Wagg Prospect (Western Troy Capital Resources Inc.), Menary Township: Au

TABLE 4 - Maps and reports published by the Ontario Geological Survey in 1993 for the Kenora Resident Geoldoigst's District

Reports
GR 282 Precambrian Geology of the Vista Lake Area

Maps
Map 2566 Precambrian Geology Vista Lake Area, East Part
Map 2567 Precambrian Geology Vista Lake Area, West Part

Miscellaneous Papers
MP161 Report of Activities 1992 Resident Geologists
MP162 Summary of Field Work and Other Activities, 1993

Preliminary Maps
P3190 Compilation Map, English River Subprovince
P3234 Quaternary Geology of the Umfreville Lake Area

Open File Maps
OFM 228 Precambrian Geology of the Bug Lake Area

Open File Reports
OFR 5766 Industrial Minerals Project, Sioux Lookout-Dryden Area.
OFR 5846 The English River Subprovince - An Archean Gneiss Belt: Geology, Geochemistry and Associated Mineralization.
OFR 5855 PETROCH Lithogeochemical Data.
OFR 5860 PETROCH Lithogeochemistry Data Base: Geochemical Interpretive Tools and Data Base Expansion Review

Mineral Sector Analysis Branch
Ontario Mineral Score 1990-1991

TABLE 5 - Diamond drill core recovered in 1993 (letter indicates location on figure 2)

CORE RECOVERED BY MNDM PERSONNEL AND STORED IN CORE LIBRARY

(B) Moss-Power Resources Inc. Dryden Properties	1 164.3 m
(C) Willingdon Resources Ltd. Sioux Narrows property	1 063.7 m
Kenora core formerly stored in Thunder Bay (mineralized sections from various projects)	292.6 m
Total	2 520.6 m

CORE RECOVERED BY JOCF CONTRACTOR AND STORED AT KENORA OFFSITE FACILITY

(A) Minnova Inc. (and its predecessor Corporation Falconbridge Copper) properties in the Fort Frances - Mine Centre area	25 288.6 m
Core from many different properties moved from temporary storage to permanent offsite facility	15 304.4 m
Total	40 593.0 m

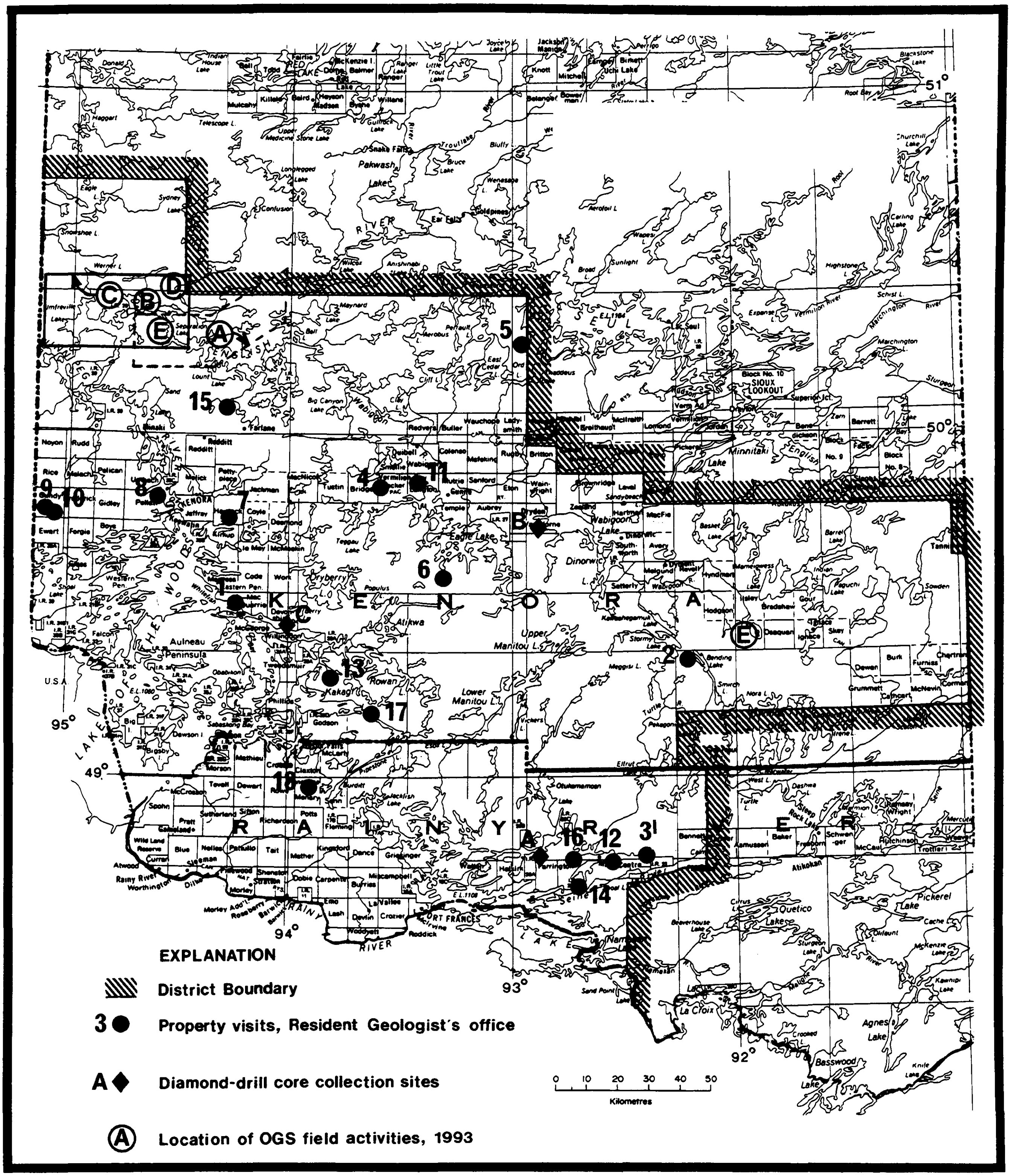

Figure 2. Kenora Resident Geologist's District: property visits, drill core collection sites, OGS field activities.

WATER

Canadian Azure Pure Water (6) continued evaluating a water source near Stephen Lake for the production of water for the bottled water trade. They carried out soil and water geochemical studies, constructed 2.5 km of pipe-line and constructed a truck transfer area (J. Hamill, Canadian Azure Pure Water, personal communication, 1994).

RECOMMENDATIONS FOR EXPLORATION AND DEVELOPMENT

RECOMMENDATIONS FOR BASE METALS AND GOLD

Reynar-Rex Lakes Area

Mineral development and extraction in the Reynar-Rex lakes belt includes past production of Ni, Cu, Co and Pt/Pd from the Gordon Lake and Werner Lake cobalt mines.

At the Bug Lake copper occurrence located in the Rex Lake area, **W. Ferreira** (14) holds 16 claim units covering mineralization hosted by migmatized metasedimentary rocks. Mineralization from the Bug Lake copper occurrence assayed up to 12% Cu and 0.97 ounce Ag per ton in grab sampling of existing trenches by Noranda in 1985. Mineralization at this occurrence has been documented as being spatially related to intense corderite+garnet hydrothermal alteration (Parker 1993). Parker (1993) has also noted the presence of minor molybdenite along with chalcopyrite, pyrite and pyrrhotite.

At Rex Lake **R.J. Fairservice** holds 4 claim units covering Cu-Au mineralization. Surface sampling produced an assay of 2045 ppb Au and 6890 ppm Cu from a grab sample of garnet biotite schist with 1-3% sulphides (R.J. Fairservice, Prospector, personal communication, 1993).

G.P. Beakhouse, Ontario Geological Survey, has examined mineralization in the western portion of the belt and has suggested a complex mineral genesis for sulphides and also observed a relationship between crosscutting, garnet-corderite alteration and sulphides (Beakhouse 1993).

W. Hood and partner **R. Knappett** (16) hold 8 claim units in the Reynar Lake area and 5 claim units in the Werner Lake area. The two claim blocks sandwich the Norpax deposit of 1 000 000 tons at 1.2% Ni 0.5% Cu and Pt-Pd values. The 2 claim blocks host numerous strong to weak magnetic anomalies with proximal weak to strong conductive anomalies that have never been drill tested. Furthermore geologic mapping has confirmed the presence of a garnetiferous gneiss on the east block of claims.

The dominantly nickel-copper and PGE mineralization at the west end of the Reynar-Rex Lakes belt and the copper dominated mineralization on the east end of the belt has a diversity of

TABLE 6. Mineral deposits not being mined in the Kenora Resident Geologist's District

ABBREVIATIONS

AFKRG - Assessment Files, Kenora Resident
CMH - Canadian Mines Handbook
GR - Geological Report
PCKRG - Personal Communication, Kenora Resident Geologist
MDC - Mineral Deposit Circular
MDIR - Mineral Deposit Inventory Record
NM - The Northern Miner
OFR - Open File Report

Deposit Name (NTS)	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership Referenced	Reserve References	G-Plan #	Status
Bad Vermilion Lake-Seine Bay Prospect (52C/10 NE)	Fe,Ti,V	1 270 000 tons of 15% TiO_2 and 45% Fe; there is potential for 177 800 tons of titanium sponge.	CMH,1990-91,p.69 (Barron Hunter Hargrave Strategic Resources Inc.)	NM 08/15/85,p.3 (Beaver Energy Resources)	G-2665	Inactive 30 leased claims
Bending Lake Prospect (52F/8SE)	Fe	Open pit reserves sufficient to maintain plant output of 2 million tons for 20 years. Main zone is 1500 m long by 300 m wide (grade of iron is unstated).	NM 22/03/79, p.3 (Steep Rock Iron Mines)	MDIR,K0133 AFKRG	G-2534	Inactive
Big Master (Kenwest) Mine (52F/7NE)	Au	Proven and Probable: 123 000 tons of 0.30 ounce Au per ton; Indicated: 600 000 tons of 0.22 ounce gold per ton.	CMH,1987-8,p.211 Kenwest Mines Ltd.	CMH,1988-89,p.92 (Canamerica Precious Metals Inc.)	G-2572	Inactive
Bonanza Mine (52F/10NW)	Au	5000 tons of 0.25 ounce Au per ton across an average width of 1-foot.	CMH,1993-94, p.375 (Wiscan Resources Inc.)	Van Horne Gold Expl. INC., AFKRG	G-839	Inactive 59 claims
Canadian Arrow (Dogpaw Lake)Prospect (52F/5SW)	Au	Indicated: 96 650 tons of 0.43 ounce Au per ton. in 3 veins	CMH,1992-93,p.81 (Canadian Arrow Mines Ltd.)	Canadian Arrow Mines Ltd., AFKRG	G-2613	Inactive 17 claims

Canamerica E Zone (52F/7NE)	Au	Indicated and Inferred: reserves range between 143 685 tonnes of 0.167 ounce Au per tonne to 529 650 tonnes of 0.103 ounce Au per tonne. Indicated and Inferred: reserves range from 163 800 tonnes of 0.194 ounce Au per tonne to 455 000 tonnes of 0.117 ounce Au per tonne.	CMH,1990-91, p.119(Co-Maxx Energy Group Inc.	Cochrane Oil and Gas Ltd., AFKRG NM 07/13/87,p.17 (Canamerica Precious Metals Inc.)	G-2572	Inactive 45 claims
Cameron Lake Prospect (52F/5SE)	Au	Proven, possible, probable: 3 150 000 tons of 0.168 ounce Au per ton.	CMH,1992-93, p.264 (Nuinsco Resources Ltd.)	Nuinsco Resources Ltd.	G-2639	Care and Maintenance 61 leased claims
Cedar Island (Cornucopia)-Mikado Mines(52E/10SW)	Au	Preliminary reserves: 1 234 069 tonnes of 9.62 g/t Au.	CMH,1992-93, p.210 (Kenora Prospectors and Miners Ltd.)	CMHC,1993-94 p.204	G-2642	Advanced Exploration Permit
Central Prospect (52L/7NW)	Cu,Ni	2 200 000 tons of 0.65% Cu and 0.45% Ni.	NM 05/28/53 (Quebec Nickel Corp.)	AFKRG	G-2654	Inactive
Duport Mine (52E/11SE)	Au	Total geological reserves: 2 000 000 tons of 0.35 ounce Au per ton; Proven and Probable: 944 000 tons of 0.39 ounce Au per ton. 450 tpd. Est pre-production cost $52.8 million.	CMH,1992-93, p.109 (Consolidated Professor Mines Ltd.)	CMHC,1993-94 p.106	G-2645	Environmental assessment in progress
Earngey-Lindburg Occurrence (52E/9NW)	Au	50 m long by 5 m wide quartz vein assaying 1.42 ounce Au per ton across 7.5 feet and 0.37 ounce Au per ton across 9.7 feet.	private patented claim K9333	OFR 5695,p.86	G-2665	Inactive
Electrum Lake Occurrence Arsenic Zone (52E/11NE)	Au	97.5 m long by 1.76 m wide by 39.6 m deep (minimum) zone averaging 0.36 ounce Au per ton.	unknown	OFR 5695,p.98	G-2623	Inactive
Electrum Prospect A-C Zones (Contact Zone) (52E/11NE)	Au,Cu	A Zone-30 m long by 1.5 m wide by 45 m deep averaging 0.34 ounce Au per ton and 0.14% Cu B Zone-45 m long by 0.9 m wide by 61 m deep averaging 0.27 ounce Au per ton and 1% Cu C Zone-45 m long by 1.5 m wide by 30 m deep averaging 0.32 ounce Au per ton and 0.94% Cu. 15 000 tons of 0.24 ounce Au per ton estimated in the C Zone.	unknown	OFR 5695,p.101 OFR 5695,p.101 OFR 5695,p.101 Sherritt Gordon Mines Ltd.,AFKRG	G-2623	Inactive

Electrum Prospect-P Zone (Electrum Fault Zone or Porphyry Zone) (52E/11NE)	Au	30.5 m long by 3.4 m wide by 30.5 m deep averaging 0.40 ounce Au per ton.	unknown	OFR 5695,p.106	G-2623	Inactive
Electrum Prospect-W Zone (Fault zone or West Zone) (52E/11NE)	Au	61 m long by 2.1 m wide by 19.8 m deep averaging 0.23 ounce Au per ton. 100 000 tons of 0.33 ounce Au per ton in the P and W zones combined.	unknown	OFR 5695,p.108 Laramide Resources Inc., Annual Report,1987	G-2623	Inactive
Errington Prospect (52F/6SW)	Au	24 000 tons of 0.73 ounce Au per ton in a zone 450 feet long by 32 inches wide by 240 feet deep.	private patented claim	MDC 16,p.16	G-2666	Inactive
Evenlode Prospect (Eco Occurrence)	Mo,Au	126 000 tons of 0.68% MoS_2 and 0.015 ounce Au per ton. Indicated: 200 000 tons of 0.63% MoS_2; Inferred: 550 000 tons estimated to a depth of 800 feet.	NM 11/11/65 (Evenlode Mines Ltd.)	OFR 5695,p.114	G-2623	Inactive
Flambeau Lake Prospect (52F/10NW)	Au	Diamond drilling partially outlined a zone with potential for 572 000 tonnes (gold grade unstated).	Alex Kozowy, Dryden, PCKRG	AFKRG	G-839	Inactive
Flint Lake Prospect (52F/5SW)	Au	60 000 tons of 0.30 ounce Au per ton.	P.Dubenski, Kenora, PCKRG	AFKRG	G-2613	Inactive
Foley Mine (52C/10NE)	Au	440 000 tons of 0.45 ounce Au per ton in several quartz vein systems.	private patented claim	NM 09/25/80 (Seaforth Mines Ltd.); OFR 5539, p.194	G-2665	Advanced Exploration in 1993 50-ton bulk sample taken Bonanza vein by Nipigon Gold
Gaffney Prospect (52F/7SW)	Au	300 000 tons of 0.15 ounce Au per ton.	CMH, 1990-91, p.393 (San Paulo Expl. Inc.)	Wright, R.J.(Teck Explorations Ltd.) AFKRG	G-2683	Inactive
Golden Star Mine (52C/10NE)	Au	10 000 tons of 0.45 ounce Au per ton. 20 000 tons of 0.42 ounce Au per ton and 35 000 tons of 0.15 ounce Au per ton in tailings dump.	PIRP Holdings Inc., AFKRG	OFR 5512,p.44 MDC 16,p.20	G-2665	Inactive

High Lake Prospect (52E/11NE)	Cu,Mo,Au	2000-foot long by 250-foot wide zone containing assay values of 0.10 to 1.35% Cu and 0.01 to 0.05 ounce Au per ton.	unknown	GR 41,p.46	G-2623	Inactive
Kenbridge Prospect (52F/5NE)	Ni,Cu	3 271 390 tons of 1.06% Ni and 0.54% Cu	CMH,1986-87, p.209,(Falconbridge Limited)	GR 111,p.44	G-2603	Inactive
Mavis Lake Prospect (52F/15SE)	Li,Ta	500 000 tons of 1% LiO_2.	CMH, 1983-84, p.245, (New Claymore Resources Ltd.)	OFR 5718,p.151	G-814	Inactive 6 claims to lease
Maybrun Mine (52F/5NE)	Cu,Au	2 824 825 tons of 1.18% Cu and 0.08 ounce Au per ton including 1 508 454 tons of 1.48% Cu and 0.11 ounce Au per ton.	CMH,1993-94, p.104(Consolidated Maybrun Mines Limited)	GR 111,p.36	G-2603	Inactive Care and Maintenance
Mironsky Prospect (52C/11NE)	Cu	800 feet long by 26 feet wide zone to a minimum depth of 300 feet averaging 1 to 1.5% Cu. 300 000 tons of 0.8% Cu (estimated).	Tim Towmey, Thunder Bay PCKRG	GR 115,p.59	G-3808	Staked in 1993 by Tim Towmey
New Campbell Island Mines (Richard Lake) Prospect (52F/13SW)	U	650 000 tons of 0.10% U_3O_8 in a zone 700 feet long by 10 feet wide and 1000 feet deep.	unknown	GR 130,p.46	G-1342	Inactive
Norpax (Reynar Lake) Prospect(52L/6NE)	Ni,Cu	1 010 000 tons of 1.2% Ni and 0.5% Cu.	CMH,1963,p.215 (Norpax Nickel Mines Ltd.)	Norpax Nickel Mines Ltd., AFKRG		G-2636
Northrock (South Grassy) Prospect - Beaver Pond Zone (52C/11NE)	Cu	1 020 458 tons of 1.17% Cu over a strike length of 400 m including 265 230 tons of 2.08% Cu over a length of 300 m (all estimates valid to a vertical depth of 91 m).	Noranda Mines Ltd.	OFR 5512,p.50	G-3839	Inactive
Olive (Preston) Mine (52C/15SE)	Au	12 500 tons of 0.34 ounce Au per ton in 2 mineralized shoots and 1100 tons of broken ore averaging 0.31 ounce Au per ton in the second level stope.	CMH,1993-94, p.250,(Noront Resources Inc.)	NM 05/18/87,p.6 NM 06/29/87,p.21 (HSK Minerals Ltd.), AFKRG	G-2682	Inactive 59 claims

Purdex Prospect (A-D Zones) (52E/11NE)	Au	76 500 tons of 0.308 ounce Au per ton (combined indicated tonnage in 4 zones). 241 000 tons at 0.226 ounce Au per ton in the P,A,B and C zones.	CMH.1993-94, p.217,(Locke Riche Minerals Ltd.)	OFR 5695,p.273	G-2623	Inactive
Redgut Bay Prospect (52C/11NE)	Cu	1000 m long zone with diamond drill intersections such as 0.31% Cu over 17 m, 0.3% Cu over 6 m, 1.04% Cu over 4 m and 0.83% Cu over 1.5 m.	Belacoma Mines Ltd., AFKRG	OFR 5512, p.71	G-3808	Inactive 2 leased claims
Regina Mine (52E/8NE)	Au	4000 tons of 0.43 ounce Au per ton. 30 000 tons at 0.106 ounce Au per ton in tailings.	Bob Erickson, Sioux Narrows PCKRG	Lodi Metals Inc. AFKRG; NM 07/25/88,p.7 (Sweaney Gold Corp.)	G-1359	Inactive
Scramble (Homestake) Mine (52E/16SW)	Au	1200- to 1500-foot long by 12-foot wide zone averaging 0.15 ounce Au per ton. 140,000 tons at 0.42 opt/270 000 at 0.18 opt 70,000 ounces (using co @ 0.05 opt.)drill indic.	Boise Cascade Corporation PCKRG	NM07/25/88 (Madeline Mines Ltd.). CIMM, Dist 4 field trip, 1990, p.44.	G-1338	Inactive underground development (1988-89)
Tabor Lake Mine (52F/9SW)	Au	13 300 tons of 0.34 ounce Au per ton.	Sulpetro Minerals Ltd., AFKRG	AFKRG	G-2592	Inactive
Vanlas Prospect (Kidd Zone)(52F/10NW)	Au	100 000 tons of 0.20 ounce Au per ton.	Power Expl. Inc. Annual Report, 1988	Power Expl. Inc. AFKRG	G-839	Inactive
Victor Island Prospect (52F/5SE)	Au	Drill indicated reserves: 300 000 tons at 0.12 ounce Au per ton to a depth of 700 feet.	CMHC,1993-94 p.256(Nuinsco Resources Ltd.)	MP 128,p.16	G-2639	Inactive
Virginia Prospect (52F/5NE)	Au	100-foot wide zone averaging 0.10 ounce Au per ton.		GR 111,p.40	G-2603	Inactive patented Mining Claim

Wind Bay Prospect (52C/10SW)	Zn,Cu	1300 m long by 50 m wide zone hosts several 10 m wide mineralized lenses. Typical diamond drill hole intersections assayed 1.5% Zn, 0.2% Cu and 1.1% Zn, 0.09% Cu across 7 m and 8.6 m, respectively.	George Armstrong, Fort Frances PCKRG	OFR 5512,p.89	G-3808	Inactive
Witch Bay Occurrence (52E/9SE)	Au	8.2 g/t Au to 29.5 g/t Au across 30 to 36 cm for a length of 240 m.	unknown	OFR 5695,p.370	G-1326	Inactive

Table 7 - Properties included in technical summary for option, joint venture or sale

No.	NTS	Name	Location/Township
1	52F/08 NW	DOHERTY, Bill	Kawashegamuk Lake
2	52E/09 SE	POISON, G. & CURRIE, D.	Code Township
3	52F/08 NW	GLATZ, A. & KOZOWY, A.	Kawashegamuk/Revell Lake
4	52F/14 SW	PLOMP, F.G.	Aubrey Township
5	52E/08 NE	KUEHNBAUM, R. & ZEBRUCK, G.	Whitefish Narrows
6	52G/05 NW	HEPP, J. & E.	Bradshaw Township
7	52L/07 SW	GOSSAN RESOURCES LIMITED	Paterson Lake
9	52E/09 NW	ONYSKO, R.	Kirkup Township
10	52E/10 NW	PERRY, Bruce J.	Echo Bay
11	52K/03 NE	JAYDEEMAR EXPLORATIONS LTD.	Cedar Lake
13	52F/09 SW	GLATZ, A.	Melgund Township
14	52F/11 NW	BARTON, Bernard	Higbee Lake, Garnet Bay
16	52F/07 NE & F/10 SE	REDDEN, Jim, Lundmark, H. and McAteer, W.	Boyer Lake/Turtlepond Lake
17	52F/11 NW	PERRY, Bruce J.	Garnet Bay
18	52F/08 SW	GLATZ, A.	Bending/Wapageisi Lakes
19	52E/16 SW	BOISE MINERALS	Jaffray Township
20	52C/10 NW	ARMSTRONG, George	Halkirk/Farrington Townships

metal associations including cobalt-molybdenum and vanadium-lead-zinc-silver (Beakhouse 1993). The mineralization on the R. Fairservice claims suggest that the belt may have some gold potential at the east end. Blackburn has described the belt previously with regards to its platinum group element potential (Blackburn et al 1988). Past exploration efforts have tended to focus on the presence of ultra-mafic intrusions associated with the Rex-Werner lake fault for copper-nickel and cobalt mineralization. D. Derry recognized the proximity of garnetiferous zones to sulphide mineralization as early as 1930 (Derry 1930).

The Reynar-Rex lakes belt is recommended as an area for exploration and development of poly-metallic mineralization with new potential for gold in the Rex Lake area. The granulite-amphibolite grade of metamorphism may have been a deterrent to zinc copper exploration in the belt however hydrothermal alteration mineral assemblages may prove to be a good indication of this type of mineralization.

MINERAL DEPOSIT CURRENTLY NOT BEING MINED

SCRAMBLE MINE

The Scramble Mine is located in Haycock Township 8 km east of Kenora. This gold property is accessible year round by road. The portal is located 400 m from the southwest end of the main Kenora airport runway. This has not been a hindrance to exploration and development in the past. **Boise Cascade Corporation** owns 4 patented claims covering the deposit and controls substantial acreage through claim units and private leases northeast and southwest of the main mineralized zone.

Geology:
Regionally the deposit is hosted by greenschist facies mafic flows within a northeast trending wedge of greenstones of the Lower Keewatin Supergroup, Wabigoon Subprovince. A northeast trending shear zone traced over 550 m is host to felsic quartz porphyry sills and dikes that inter-finger with biotite-chlorite schists (Parr and Kuehnbaum 1990). Structurally the area lies west of the northeast trending airport anticline fold axis (Davies and Smith 1988). Northwest facing fine grained pillowed and massive flows of theoleiitic basalt are intercalated with coarse grained gabbroic sills or flows (King 1983).

At the mine site, a northeast trending, 20 m wide shear zone dipping northwest 80 degrees defines the current ore zone. Spatially associated with the shear zone, quartz feldspar porphyries are intercalated with biotite chlorite schist and biotitized basalt (Parr and Kuehnbaum 1990). At the northeast end of the stripped area garnets can be observed in the basalt. Biotite content and amount of felsite dike material in the zone decrease to the northeast along with decreasing gold values.

All units show evidence of northeast plunging, "z" and "s" folding. The highest gold values are found in biotite schist units containing lenses of pale blue-grey quartz. Assays as high as 3.42 ounces Au per ton over 0.5 m are reported from diamond drilling (Parr and Kuehnbaum 1990).

Ore Zone Description:

Mineralization is spatially associated with a biotite schist containing lenses of pale blue-grey fine grained quartz averaging 3-5% sulphides. In the decline this unit was traced over a distance of 300 m. Quartz porphyry intrusive felsic units cut and dilute ore. Sulphides of pyrite and pyrrhotite occurs as disseminations and foliation-parallel veinlets with minor chalcopyrite, trace sphalerite and visible gold. No arsenopyrite has been observed and no arsenic is reported in the assays. The ore zone plunges to the southwest at a shallow angle.

Reserves:
Rudimentary reserve estimates vary from 140 000 tons at 0.42 ounce Au per ton to 270 000 tons at 0.18 ounce Au per ton. Approximately 50 drill holes and 1200 feet of decline (14' x 12') indicate 2 mineralized zones: a higher-grade narrow zone averages 0.42 ounce Au per ton over 5 feet; a lower grade, 9 foot wide zone averages 0.15 ounce Au per ton (E. Fields, Boise Cascade Corporation, information package on the Scramble Mine, 1993). From the longitudinal section the zones appear to plunge to the southwest at a shallow angle (E. Fields, Boise Cascade Corporation, information package on the Scramble Mine, 1993).

It has been estimated by Boise Cascade Corporation that the Development muck stockpile contains 4827 tons of ore and 1165 ounces of gold. The average grade of the high grade stock pile is estimated at 0.24 ounce Au per ton (E. Fields, Boise Cascade Corporation, information package, 1993). A 4 foot mining width could potentially average 0.4 ounce Au per ton when the decline passed through the ore zone according to Paul Jackson who worked on the project while it was active (P. Jackson, personal communication, 1993). Reportedly 60-70% of the gold would be recoverable on a table from a 150 ton per day mill. The remainder of the gold could be recovered from a 4-5 ton per day closed cyanide circuit according to Barry Dugal who worked as a consulting Mining Engineer on the property while it was active (B. Dugal, personal communication, 1993).

Work Summary:
Boise Cascade Corporation's estimated expenditures to date are approximately $2.5 million on the property including a total of 450 m of underground development including a sub-level driven 100 m to the southeast, 5200 m of diamond drilling (55 holes) and 300 m x 30 m of surface stripping. Significant drill core intersections are stored at the Kenora Drill Core Library. Boise has prepared an information package available for viewing

at the Kenora Resident Geologist office.

Development History:

-1894 July; Henry Benson and Andrew Norman discovered gold on lots 13 and 14 Concession IV in Jaffray Township.
- ? optioned by H. V. Halstead/a business partner from Detroit. A Shaft sunk to 65 feet. A 5 x 7 foot crosscut was started, struck a water seam and the workings flooded. A 2 1/2 ton bulk sample from the cross cut averaged 0.60 ounce per ton gold, hand-picked, bulk sample.
-1897 Scramble Gold Mining Company Ltd. was incorporated to raise funds.
-1911 Canadian Homestake Gold Mining Company Ltd. was formed.
-1960 Teck Exploration Limited drilled 5 holes on the property.
-1984 Boise Cascade Canada Ltd. conducted stripping mapping and sampling the Scramble mine shaft area. A test geophysical I.P. survey was carried out.
-1985 Joint Venture with Kennco Explorations (Canada) Limited. Geophysical surveys conducted over a grid extending 1.8 kilometres southwest of the shaft. Diamond Drilling tested geophysical anomalies over 900 m between the Electrogold shaft and the Scramble shaft.
-1986 Scramble Mining Ltd., in joint venture with Madeline Mines Ltd. conducted 2093 m of diamond drilling in 30 holes. Drilling tested 625 m of strike length but focused on the shaft area.
-1988 February 25th; first round into decline. Total of 350 m of decline and 100 m of a southwest trending sub-level was excavated.
-1989 workings allowed to flood. A total of 926 m of surface drilling in 6 holes.

RECOMMENDATIONS FOR INDUSTRIAL MINERAL EXPLORATION

Forecasts indicate continued growth for the Canadian dimension stone industry (Vagt 1992). Green, yellow, blue and variegated granites have experienced an increased market demand while pink, grey, white, red and black granites have maintained a steady market demand.

With the release of the Bedrock Geology of Ontario map series in 1991, prospecting for granite deposits has been made easier. Units 14 (massive granodiorite to granite) and 15 (diorite-monzonite-granodiorite) have been recognised as having the potential to host quarriable granites. Prospectors should examine the maps and target these units for exploration. Within the Kenora Resident Geologist District over 45 such bodies of granite are known to exist. Only a fraction of these have been examined for their dimension stone potential. The Lount Lake Batholith, north of Kenora, (Figure 4) currently hosts the Palin Granite Canada Inc. deposit and several significant occurrences with potential to host quarries. This body is probably the most significant granite area in

northwestern Ontario. Only a fraction of the batholith has been examined for its stone potential and warrants further investigation.

A granitoid body that is too fractured for quarrying as dimension stone could be an excellent source of decorative aggregate if it has the right colour. While not as valuable a product as dimension stone, decorative aggregate has a good market in the precast concrete industry.

Recently, Till Geochemical and Indicator Mineral Reconnaissance of South-eastern Manitoba, GSC Open File No.2750, by L. H. Thorleifson was released by the Geological Survey of Canada. Thorleifson states, "A total of 55 kimberlite indicator minerals were recovered. The occurrences are well distributed but seem to be non-random, hence suggesting sources within the study area." With the ice flow direction from the northeast, the potential for the kimberlitic indicator minerals originating in the Kenora Resident Geologist District is quite high. Samples collected include surface till and overburden drilling samples. Of particular interest are samples taken 20 km south-west of Shoal Lake which revealed diagnostic diamond-inclusion chromites, chrome diopsides and G9 garnets.

Rare element pegmatites are another exploration target that received renewed interest during 1993. Breaks (1993) investigated two areas with pegmatite deposits. He discovered petalite in two pegmatites in the Separation Rapids area north of Kenora. The presence of petalite indicates that the pegmatites have formed in an environment that is favourable for hosting rare element pegmatites such as the Tanco pegmatite at Bernic Lake, Manitoba. The Separation Lake metavolcanic belt and the ground adjacent to it forms an area favourable for pegmatite exploration. There are several other areas of known pegmatite mineralization that may warrant further exploration including the Raleigh Lake area (Breaks 1993), Graphic Lake area (Storey 1990) and Falcon Island area (Storey 1990 and Ayre et al 1989).

Soapstone or steatite, is a soft, massive, talc-bearing rock, generally grey in colour, formed during metamorphism and alteration of ultramafic rocks under low grade metamorphic conditions. Soapstone has long been a favourite medium for carving but the material has additional uses including architectural/building stone; refractory bricks; heating, cooking and sauna stoves; fireplaces; cooking utensils; sauna stone; metal workers crayons; laboratory tables, benches and sinks; and as electrical insulators. (Gerow et al. 1991). Numerous soapstone occurrences are located within the Kenora Resident Geologist's district. Most notable are the Eagle Lake, Wabigoon Lake, Pipestone Peninsula deposits, smaller but well known occurrences include the Little Turtle Lake, Mile Lake, and Trap Lake occurrences. Other occurrences of potential soapstone or talc-bearing rocks which merit

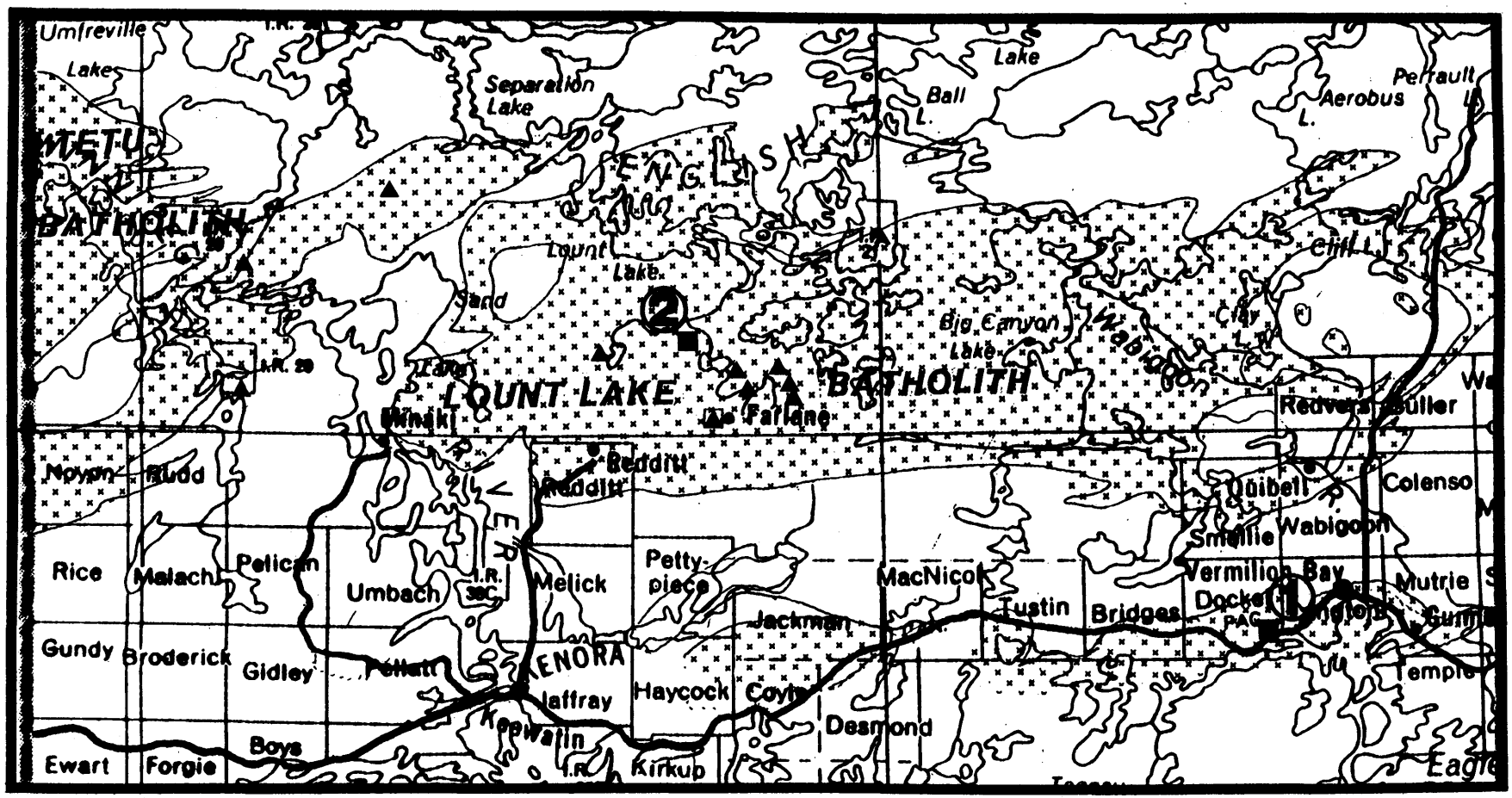

Figure 4. Massive granitoid rocks and granite deposit locations in the Winnipeg River Subprovince. Geology after Map 2542.

examination are located within the district and are described in Gerow et al. (1991) and Storey (1986). Many of these have had minimal exploration conducted on them.

Another industrial mineral worth prospecting for is high-purity quartz, or silica for precast concrete and landscaping aggregate and feed stock for silicon metal production and other chemical uses. Large (greater than 30 m wide) white quartz veins (bull quartz) are a prime target, the vein material should be free of impurities and depending on end-use, must meet stringent chemical specifications.

Peat is an important export commodity. Canada exported 620 000 tonnes of peat worth $155 million in the first 10 months of 1993 of which 550 000 tons worth $137 million went to the United States (The Globe and Mail, January 26, 1994, p.B1). Extensive peat deposits in the Kenora District have been investigated and horticultural peat has been produced from them at various times. Currently two companies are actively working on horticultural peat near Fort Frances. While not a conventional 'mineral' product peat should not be overlooked.

INDUSTRIAL MINERAL DEPOSITS NOT BEING DEVELOPED

Snook Lake Claims

A granite deposit near Snook Lake was staked in 1987 by **George Zebruck** of Kenora. The claim block is located 27 km due north of the town of Minaki, from where it can be reached via Highway 525 north for 23 km to the Sand Lake Road, then east for 15 km on the Sand Lake Road to the Snook Lake Road, and then north along this road for 8 km. Work to date consists of geological mapping, ground radiometric survey and sampling of the granite for American Society for Testing and Materials (ASTM) strength testing and production of polished samples.

The granite is exposed and has been sampled in an area 200 m by 200 m. Additional outcrop areas of similar granite are present in the claim group. Gneissic to migmatitic granitoid rocks with abundant melanocratic inclusions surround the deposit. The surrounding area has been mapped at reconnaissance scale only, by Breaks et al. (1975), and comprises syntectonic and late to post-tectonic granitoid rocks. This type of terrane commonly contains small bodies of uniform massive granite surrounded by less uniform rocks that show a variety of inclusions and migmatitic textures. The granite under evaluation is massive with a megacrystic texture. There is no foliation or preferred grain orientation. The rock body is well exposed and only lichen and a small amount of moss cover the surface. Sub-vertical joints are spaced wider than 10 m and trend roughly northwest, northeast and east. Horizontal joint spacing is 1 to 1.5 m at the surface and appears to increase with depth.

The author has observed subhedral potassium feldspar megacrysts 1 to 1.5 cm in size forming 40% of the rock. The remainder of the rock is a matrix of quartz (20%), sodic feldspar (35%), and biotite and magnetite (5%), all with a grain size of 1 to 2 mm. Fine hematite, distributed along grain boundaries in the matrix and along fractures in the megacrysts, lends a dark reddish-brown colour to the fresh rock. The matrix is darker than the megacrysts. The quartz is clear and colourless, and the feldspars translucent pinkish white to colourless except where tinted pink by hematite. Small biotite, quartz and sodic feldspar inclusions are present in many of the potassium feldspar megacrysts.

Storey (1986) indicated that this part of the English River Subprovince has significant potential for pink, red and brown granite deposits. The late stage potassic granitoid intrusive bodies commonly contain massive megacrystic units similar to those investigated at Snook Lake. Many of them are deep pinkish brown to reddish brown in colour.

Wabigoon Soapstone

The Wabigoon Soapstone deposit is located on Wabigoon Peninsula which extends southward into Wabigoon Lake approximately 1.6 km west of the village of Wabigoon. The deposit is covered by two patented mining claims held by Wabigoon Resources Ltd. of Montreal. The deposit was known for several years prior to 1920 but was first explored in 1921. No work was done from 1925 until 1983 when Wabigoon Resources Ltd. carried out a program of stripping, trenching, surface sampling and rotary drilling. The deposit has been described numerous times in government reports, the most documentation is by Storey (1986) and Gerow, et al (1991).

The area is underlain by a northwest trending elongate gabbroic intrusive within mafic to intermediate metavolcanics. Rock exposed on the property is predominantly massive, fine- to medium-grained, dark green to dark grey gabbro. Soapstone occurs in two units trending west-northwest separated by a gabbro unit up to 50 m wide. The north soapstone unit varies in width from 15 to 20 m., is greenish grey in colour and is bounded by a narrow shear zone on either side. The intervening gabbro unit varies in width and contains narrow talcose units; 50 m is the maximum width exposed on the property. The southern soapstone unit is approximately 25 m in width, dark blue-grey to greenish-grey in colour on the fresh surface and has numerous (2 to 20%) iron carbonate crystals that show up as rusty spots on the weathered surface. The southern unit is strongly magnetic. Numerous thin rusty weathering quartz-carbonate veinlets cut both the southern soapstone unit and the gabbro. Both the soapstone units examined are in gradational contact over a short distance with the gabbroic rocks.

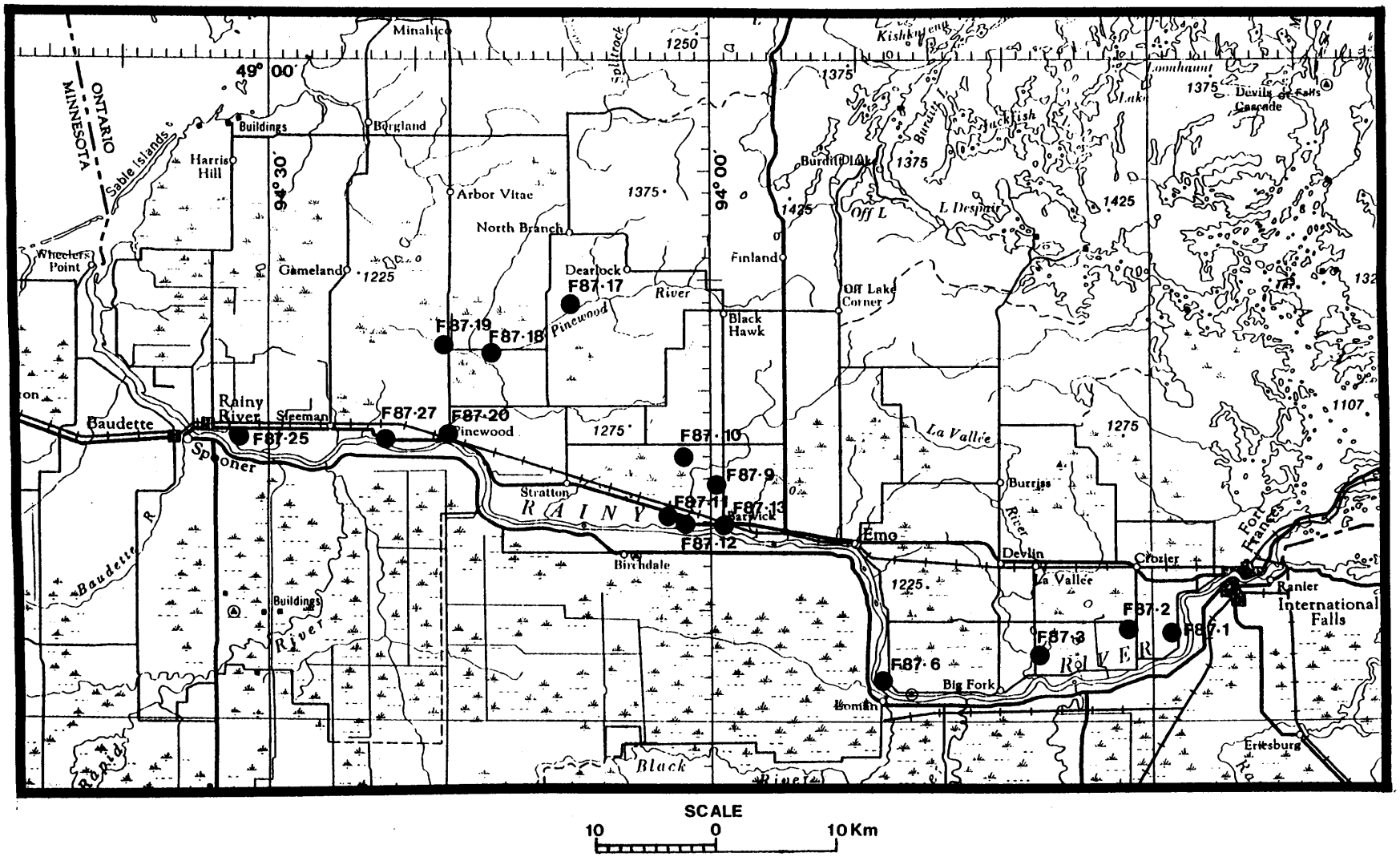

Figure 3. Rainy River rotasonic drilling program, locations of drill holes sampled.

TABLE 8 - Trace element analyses, Rainy River sonic drilling, bedrock intersections.

SAMPLE	Au	Cu	Zn	Ni	Pt	Pd	Co	V	Y	Sc	Sr	Rb	Zr	Be	Pb	Nb	ROCK TYPE
RRB-1 Hole F 87-1	23	160	555	89	1	1	25	115	16	14	301	79	149	2	19	5	Dark grey fine-grained metasediment
RRB-2 Hole F 87-2	-2	44	60	44	-	-	18	88	15	10	324	61	161	1	-10	6	Dark grey medium-grained metasediment
RRB-3 Hole F 87-3	7	158	103	65	<1	<1	29	114	14	15	238	27	158	1	-10	8	Dark green to black mafic to ultramafic extrusive/intrusive
RRB-4 Hole F 87-6	-2	55	63	50	-	-	21	85	9	10	341	27	107	-1	-10	-5	Dark grey fine-grained chloritic amphibole schist
RRB-5 Hole F 87-9	-2	38	91	28	-	-	16	61	9	7	424	51	147	1	-10	-5	Foliated thin bedded intermediate lapilli tuff to tuff
RRB-6 Hole F 87-10	5	70	148	67	-	-	30	119	18	16	405	32	134	1	-10	-5	Foliated to gneissose intermediate lapilli tuff
RRB-7 Hole F 87-11	-2	99	365	48	-	-	37	62	14	8	312	85	155	1	-10	-5	Black graphitic schist
RRB-8 Hole F 87-11	-2	83	390	47	-	-	26	74	39	9	848	72	182	2	19	-5	Black graphitic schist
RRB-9 Hole F 87-11	4	126	310	52	-	-	27	78	19	9	472	63	153	1	-10	-5	Black graphitic schist
RRB-10 Hole F 87-12	3	95	150	68	-	-	46	186	23	22	207	20	100	-1	-10	-5	Dark green mafic metavolcanic
RRB-11 Hole F 87-12	7	92	135	80	-	-	54	220	24	26	124	18	92	-1	-10	-5	Dark green mafic metavolcanic
RRB-12 Hole F 87-13	-2	32	85	27	-	-	15	60	8	7	355	46	142	-1	-10	-5	Grey intermediate to felsic lapilli tuff
RRB-13 Hole F 87-17	6	31	76	43	-	-	20	91	10	9	561	36	140	-1	-10	-5	Grey fine-grained quartz feldspar tuff
RRB-14 Hole F 87-18	-2	41	64	28	-	-	16	69	10	7	571	18	134	-1	-10	-5	Grey intermediate to felsic lapilli tuff
RRB-15 Hole F 87-19	15	46	73	54	-	-	20	104	9	12	330	40	124	-1	-10	-5	Dark green fine-grained mafic metavolcanic
RRB-16 Hole F 87-20	3	39	79	240	2	3	37	140	12	14	650	43	153	1	-10	-5	Dark green fine-grained mafic metavolcanic
RRB-17 Hole F 87-22	5	41	74	145	8	5	48	195	15	22	110	5	51	-1	-10	-5	Light green fine-grained amygdaloidal mafic metavolcanic
RRB-18 Hole F 87-22	15	57	70	127	7	4	46	177	16	22	112	5	48	-1	-10	-5	Light green fine-grained amygdaloidal mafic metavolcanic
RRB-19 Hole F 87-25	2	345	530	101	19	21	48	193	16	25	105	24	72	-1	15	-5	Dark green fine-grained mafic to ultramafic metavolcanic
RRB-20 Hole F 87-25	-2	135	205	110	26	37	59	326	24	29	30	11	61	-1	-10	6	Dark green fine-grained mafic to ultramafic metavolcanic
RRB-21 Hole F 87-25	-2	99	139	114	16	25	48	275	21	34	19	16	55	-1	-10	-5	Dark green fine-grained mafic to ultramafic metavolcanic
RRB-22 Hole F 87-25	3	230	120	113	28	37	50	351	28	38	13	6	54	-1	-10	-5	Dark green fine-grained mafic to ultramafic metavolcanic
RRB-23 Hole F 87-25	4	202	115	103	27	36	56	350	27	28	13	-5	55	-1	-10	-5	Dark green fine-grained mafic to ultramafic metavolcanic
RRB-1D Hole F 87-1	22	156	550	87	-	-	25	113	16	14	299	78	147	2	19	5	
RRB-23D Hole F 87-25	4	200	116	102	-	-	56	349	25	33	12	-5	53	-1	-10	-5	

Chemical analyses, physical test results and mineralogy published by Gerow et al (1991) and Storey (1986) indicate considerable variability in the composition of the stone. The full economic potential of this deposit has not yet been determined.

BEDROCK ANALYSES RAINY RIVER SONIC DRILL PROGRAM

In 1987 and 1988 the Ontario Geological Survey carried out sonic drilling to investigate thick Quaternary deposits in Fort Frances - Rainy River area. This work was part of the five year Canada/Ontario 1985 Mineral Development Agreement (COMDA). See Bajc (1988, 1991) for details of the drilling. The drilling provided a short bedrock intersection at the end of each hole. Twenty-three selected samples of this bedrock from the 1987 drilling (and two duplicates, RRB-1D and RRB-23D, selected by laboratory personnel) were submitted for trace element analysis by the Geoscience Laboratories Section, Ontario Geological Survey in 1988. Table 6 shows the results of this work. The original results are on file in the Resident Geologist's office in Kenora. In addition to the elements shown in the table all samples were analysed for Mo and Th but no samples gave results greater than the analytical detection limit. All results are parts per million except Au, Pt and Pd which are parts per billion. A minus sign in front of a number indicates results at or below the detection limit, "-" indicates no analysis for that element. The drill hole locations are shown on Figure 3.

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Red Lake Resident Geologist's District -- 1993

B.T. Atkinson[1] and C.C. Storey[2]

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Red Lake Resident Geologist's District -- 1993

INTRODUCTION

Exploration activity showed a moderate up-turn during the year with increases in the amount of diamond drilling, geotechnical surveys and total assessment work credits.

Table 1 summarizes exploration data for the Red Lake district over the past 20 years. Since 1991, figures are reported in dollar value and recast as "man days" to allow comparison to previous years. The conversion factor is a twenty-two dollar man day using current dollar value.

Table 1. Summary of claims recorded and assessment work credit.

Year	Claims Recorded (Units)	Claims Cancelled	Claims Active	Diamond Drilling Man Day ($ value)	Geophysical Surveys Man Day ($ value)	Geological* Surveys Man Day ($ value)	Total Man Days ($ value)
1993	133	1 086	8 355	36 880	28 015	-	67 700
	(787)			(811 336)	(616 330)		(1 489 392)
1992	111	766	7 038	30 340	24 037	-	61 380
	(763)			(667 486)	(528 825)	-	(1 350 363)
1991	1 146	2 248	8 106	18 398.8	46 796.8	1 871	71 591.46
1990	2 264	3 648	9 844	39 162	91 499	7 540	151 384
1989	1 841	1 548	11 228	61 422	39 814	8 510	132 620
1988	2 286	2 368	10 935	175 600	215 300	42 666	457 500
1987	4 512	1 708	11 017	81 854	138 443	23 440	261 741
1986	3 806	1 598	10 427	48 325	127 445	6 360	189 633
1985	2 693	2 260	8 212	42 000	201 052	16 642	269 262
1984	4 344	1 725	7 799	32 588	78 538	12 495	128 664
1983	2 407	1 204	5 180	18 637	22 035	3 468	53 207
1982	942	1 884	3 992	23 967	79 662	6 787	118 775
1981	1 719	1 249	4 889	28 771	66 000	8 182	107 430
1980	2 220	1 115	4 301	38 482	30 240	871	71 975
1979	1 068	1 763	3 221	21 108	38 380	3 154	62 949
1978	1 207	1 521	3 916	25 574	19 496	2 480	50 997
1977	2 324	2 395	4 261	12 994	45 080	620	59 196
1976	2 705	1 382	4 332	18 680	23 578	380	46 544
1975	1 368	2 059	2 957	29 377	12 714	960	44 717
1974	1 339	1 829	3 648	47 362	5 660	3 040	57 719
1973	1 616	3 157	4 009	60 027	20 474	NIL	83 019

* As of 1992, Geological and Geophysical Survey data are combined as Geotechnical Surveys.

Fifteen exploration companies were active in the district during the year, exploration emphasis was on gold and base metals with one company engaged in diamond exploration.

A summary of exploration activities reported in the district is presented in Table 2, project locations are indicated on Figures 1a and 1b.

Table 2. Exploration activity in the Red Lake Resident Geologist's District.

Abbreviations

AEM	Airborne electromagnetic survey	GRA	Ground radiometric survey
AM	Airborne magnetic survey	HLEM	Horizontal loop electromagnetic survey
ARA	Airborne radiometric survey	IP	Induced polarization survey
Au	Gold	PEM	Pulse electromagnetic survey
BM	Base Metals	RES	Resistivity survey
DD	Diamond drilling	SP	Self potential survey
DDH	Diamond drill-hole(s)	Str	Stripping
GC	Geochemical survey	Tr	Trenching
GEM	Ground Electromagnetic survey	UG	Underground development
GL	Geological survey	VLEM	Vertical loop electromagnetic survey
GM	Ground magnetic survey	VLFEM	Very low frequency electromagnetic survey

No	Company/Individual (Occurrence Name) or Property	Township/Area (Commodity)	Exploration Activity
1	Akiko Gold Resources Ltd./ Gold Canyon Resources Inc. (Springpole Project)	Casummit Lake map sheet (Au)	DDH(1)-762m
2	Asarco Exploration Co. of Canada Ltd.	Skinner and Goodall tps., and Shabu Lake map sheet (Au, BM)	DDH(3)-444m, GM, GL, GEM
3	Dickenson Mines Limited	Dome Tp. (Au)	Surface DD
4	English, P.	Bruce Lake map sheet (BM)	Str, Tr, prospecting
5	English, P./Huston, C.	Knott Tp. (BM)	Prospecting
6	Goldquest Exploration Inc. (Rowan, Chevron Zone)	Todd Tp. (Au) Dome Tp. (Au)	DDH(3)-995.26m DDH(2)-415m
7	Greystar Resources Ltd. (Berens River East Property)	Setting Net Lake area (Au)	GL
8	Hawke, D.R.	Joyce Lake map sheet (BM)	Prospecting
		Gerry Lake, South of Otter Lake map sheets, Mitchell Tp. (BM)	GL, GM, MaxMinII, DeepEM, prospecting

Table 2. Continued

No	Company/Individual (Occurrence Name) or Property	Township/Area (Commodity)	Exploration Activity
9	Hemlo Gold Mines Inc.	Willans Tp. (Au)	Line cutting, GL, GM, GC
10	Inco Limited (Trout Bay Property)	Mulcahy Tp. (BM)	DDH(4)-1293m, GL, geophysical surveys, Str, Line cutting
11	Maciejewski, A.J.	Ball, Mulcahy and Baird Tps. (Au, BM)	GL, Str, Tr, sampling, prospecting, assays
12	Major General Resources Ltd. /Noranda Exploration Company Ltd. (Joy Property)	Gerry Lake map sheet (BM)	DD
13	Minnova Inc./Metall Mining Corporation (Confederation Lake Property)	Mitchell Tp. (BM)	DDH(3)-1500m
14	Nabigon, E./Tetlock, I.	Heyson Tp. (Au)	Prospecting
15	Noranda Exploration Company Ltd.	Dixie Lake and Bruce Lake map sheets (BM)	GEM, GM
		Gerry Lake, Bruce Lake, and South of Otter Lake map sheets (BM)	DD, line cutting
		Belanger Tp. and Fredart Lake map sheet (BM)	DD, line cutting, GM, DeepEM, HLEM, PEM, GL, assays
16	Peterson, C. (Skookum Property)	Dome Tp. (Au)	DDH(1)-502', Str, Tr
17	Placer Dome Canada Ltd. (Gullrock Lake Property)	Willans Tp. (Au)	IP, DDH(6)-1250m, Str, Tr
	(Craibbe-Fletcher and Lassie properties)	Balmer and Dome Tps. (Au)	GM, GEM
	(Red Lake Greenstone Belt (East Part))	Bateman and Willans Tps. (Au)	AEM, AM
18	Rio Algom Exploration Inc. (Fly Lake Property)	Mitchell Tp. (BM)	GL

Table 2. Continued

No	Company/Individual (Occurrence Name) or Property	Township/Area (Commodity)	Exploration Activity
19	Rivard, O.	Bateman Tp. (Au)	DDH(1)-8.5m
20	Rosenthal, L. & A.	Belanger Tp. (Au, BM)	Prospecting and sampling
21	St. Jude Resources Ltd. (Uchi Lake Property)	Earngey Tp. (Au)	DD, Tr
22	Strilchuk, G.	Skinner Tp. (Au)	Prospecting, sampling, Str
23	Teryl Resources Corp./ Consolidated Newgate Resources Ltd. (Crater Property)	Sumach Lake map sheet (Diamonds)	DDH(2)

In the Red Lake district, 2 Ontario Mineral Incentive Programs (OMIP) with a value of $280 350 and 6 Ontario Prospectors Assistance Programs (OPAP) grants with a value of $60 000 were designated to companies and individuals engaged in mineral exploration.

MINING ACTIVITIES

Gold continued to be the only commodity mined in the district from Placer Dome Canada Ltd.'s Campbell Mine and Dickenson Mines Ltd.'s Arthur W. White Mine.

Historical gold production including the 2 operating mines and all past producers for the Red Lake greenstone belt is presented in Table 3.

Placer Dome Canada Ltd. - Campbell Mine

Campbell Mine produced 300 472 ounces of gold from 522 027 tons of ore milled, a record year for production. The mill operated at full design capacity of 1 500 tons per day and gold recovery was 93.88%.

During the year 7 636 tons of ore from the Cochenour Willans Mine in Dome Township was processed through the Campbell mill.

Approximately 55 000 m of underground drilling was completed at the Campbell Mine, comprised of 31 000 m of ore definition drilling and 24 000 m of exploration drilling.

The mine employs 384 people. T. Mann is the General Manager and T. Stubens is Chief Mine Geologist.

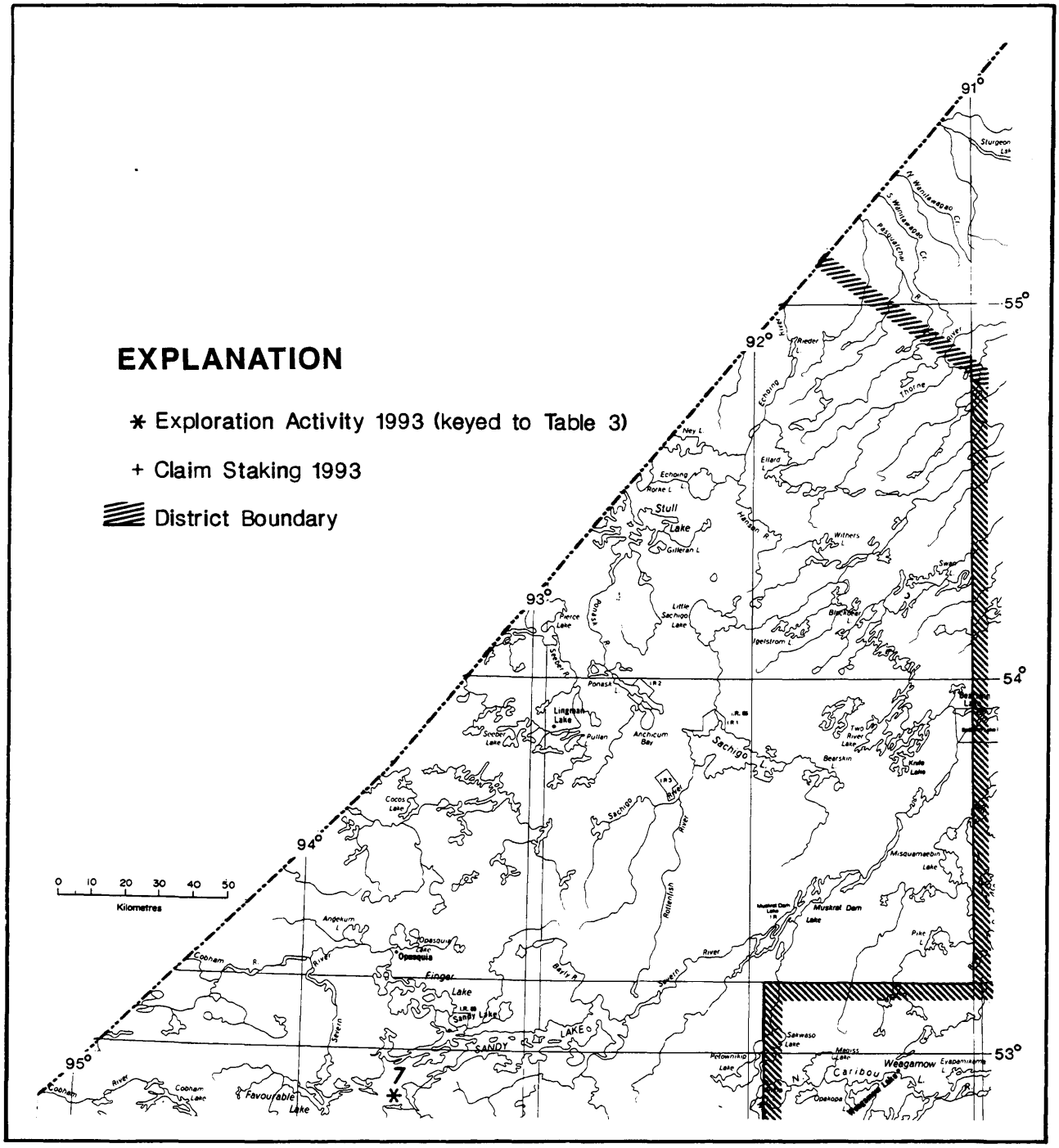

Figure 1a. Red Lake Resident Geologist's District, north part

EXPLANATION

* Exploration Activity 1993 (keyed to Table 3)

● Producing Mines, 1993
1. Placer Dome Canada Ltd. - Campbell Mine
2. Dickenson Mines Ltd. - Arthur W. White Mine

+ Claim Staking 1993

◆ Property Examinations, 1993

(1) OGS Field Party Locations, 1993 (keyed to text)

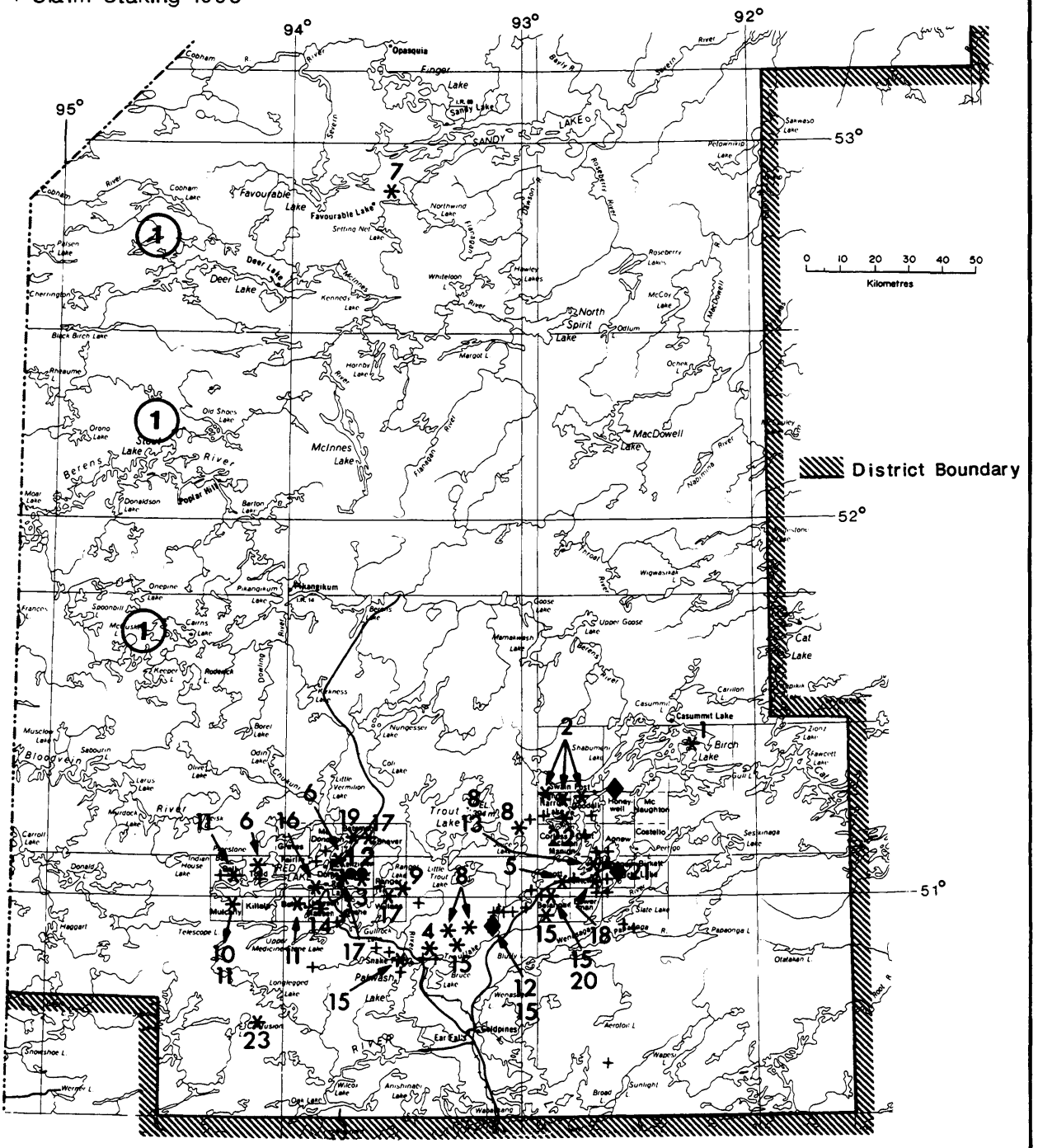

Figure 1b. Red Lake Resident Geologist's District, south part

Table 3. Red Lake Gold Production April 2, 1930 to December 31, 1993

Mine	Years of Production	Ore Milled Short Tons	Gold Produced Troy Ounces	Gold Produced Kilo-grams	Grade Ounces Per Ton	Grade Grams Per Ton
Howey	1930-1941; 1957 [1]	4 630 779 [2]	421 592	13 113	0.091 [2]	3.35
McKenzie Red Lake	1935-1966	2 353 833	651 156	20 253	0.277	9.50
Red Summit	1935-1936	591	277	8.6	0.469	16.08
Red Lake Gold Shore	1936-1938	86 333	21 100	656	0.244	8.37
Gold Eagle	1937-1941	180 095	40,204	1 250	0.223	7.65
Madsen	1938-1976	8 371 631	2 416 609	75 165	0.289	9.91
Hasaga	1938-1952	1 515 282	218 213	6 787	0.144	4.94
Cochenour-Willans[3]	1939-1971	2 311 165	1 244 279	38 701	0.538	18.45
McMarmac	1940-1948	152 978	45 246	1 407	0.296	10.15
A.W. White (Dickenson)[4]	1948-Present	7 655 669	3 004 641	93 455	0.392	13.44
Starratt Olsen	1948-1956	907 813	163 990	5 100	0.181	6.20
Campbell	1949-Present	13 495 681	8 069 538	250 990	0.598	20.50
H.G. Young	1960-1963	288 179	55 244	1 718	0.192	6.58
Mount Jamie	1976	552	265	8.2	0.480	16.46
Buffalo	1980-1982	31 986	1 656	52	0.052	1.78
Abino	1985-1986	2 733	1 397	44	0.51	17.49
Lake Rowan	1986-1988	13 023	1 298	40	0.10	3.42
Total		41 998 323	16 356 705	508 747.8		

Notes:
(1) Continuous production 1930 to 1941; includes 268 ounces recovered from clean up in 1957.
(2) From 1930 to 1941, the ore mined at Howey, before sorting, totalled 5 158 376 tons. The average production from run-of-mine ore was therefore 0.0817 ounce Au per ton (2.80 g/t).
(3) Includes production from Annco and Wilmar properties.
(4) From 1970, includes production from Robin Red Lake.

Dickenson Mines Ltd. - Arthur W. White Mine

For 1993, gold production at the Arthur W. White Mine was 73 600 ounces from 334 000 tons of ore milled. The recovery rate of the mill was 80.4% and the daily milling rate was 930 tons.

Underground working concentrated on ore production throughout the year with less emphasis on development and exploration.

The current work force is 247 employees.

Ore reserves at the mine include 1 257 484 tons at 0.32 ounce Au per ton in the proven category and 1 665 358 tons at 0.30 ounce Au per ton probable ore. Possible reserves amount to 1 066 365 tons grading 0.29 ounce Au per ton.

D. Bruce is Mine Manager and J. Rogers is Chief Mine Geologist.

EXPLORATION ACTIVITY

Akiko Gold Resources Ltd. and Gold Canyon Resources Inc. commenced a deep drilling program on the Portage Zone at Springpole Lake. Santa Fe Pacific Minerals Corp. acquired Gold Fields Canadian Mining Ltd.'s interest in the property during the year.

Asarco Exploration Co. of Canada Ltd. diamond drilled 3 geophysical targets in Skinner and Goodall Townships and Shabu Lake area. Minor pyrite, pyrrhotite and rare chalcopyrite and arsenopyrite mineralization in felsic volcanic rocks and metasediments was encountered in the drill core.

Goldquest Exploration Inc. drilled 3 holes on the Lake Rowan property in Todd Township and 2 holes on the Chevron Zone in Dome Township. The Chevron Zone drilling encountered 8.53 g/t Au over a width of 5.77 m hosted by biotite, carbonate and silica altered mafic and ultramafic rocks.

Inco Limited completed a surface exploration and small diamond drill program on the Trout Bay occurrence in Mulcahy Township in an attempt to extend previously delineated base metal mineralization. Drill indicated reserves on the property identified by Cochenour Willans Gold Mines Ltd. include 124 760 tons grading 7.86% Zn, 1.50% Cu, 0.24% Pb, 1.70 ounces Ag per ton and 0.0007 ounce Au per ton (Riley 1969).

Noranda Exploration Company Ltd. and Major General Resources Ltd. continued exploring for base metals in the Snake Falls and Dixie Lake areas. On the Joy property, diamond drilling intersected 2.25% Cu and 1.81% Zn mineralization over a width of 4.2 m at a vertical depth of 200 m. A second hole located 100 m east of the first hole intersected 2.02% Cu and 1.151% Zn over 2.9 m (*Canada Stockwatch*, October 22, 1993).

St. Jude Resources Ltd. completed a 23 hole diamond drill program on its Earngey Township property adjoining the Uchi Mine, a past gold producer. Exploration was directed toward the Woco Vein which occurs at the contact of mafic metavolcanic flows on the east and a narrow horizon of dacite on the west. The vein is reported to be mineralized with native gold and traces of pyrite and galena and attains a width up to 6.0 feet (*see* Property Reports).

Greystar Resources Ltd. conducted reconnaissance geological exploration on the Favourable Lake greenstone belt.

RESIDENT GEOLOGIST'S STAFF ACTIVITIES

The Resident Geologist's office was staffed by B.T. Atkinson, Resident Geologist and L. Kosloski, Administrative Assistant. The Staff Geologist position was contracted to C. Lormand from January to March but was vacant for the remainder of the year. R. Comber served as a summer field assistant. E.J. Nabigon continued as Lecturer to First Nations on a developmental program funded by the Ontario Human Resources Secretariat's Employment Equity Fund and the Ministry of Northern Development and Mines.

Through the Lecturer to First Nations program, E.J. Nabigon presented introductory prospecting courses to 5 First Nations including Ontario on Wabsemoong, Ojibways of Pic River, Waubaskang, Rocky Bay, and North Caribou First Nations. One prospecting course was presented at the Red Lake Community Centre. In addition to prospector training, E.J. Nabigon participated in numerous First Nation information sessions and resource development meetings.

Office staff completed 6 property visits and led 6 field trips for exploration and university personnel. Several information sessions and visits to local geological features were provided to area school students

and the general public.

B.T. Atkinson completed 1:12 000 scale re-mapping of Dome Township.

In commemoration of the 50th Anniversary of the Resident Geologist program, a self-guided field tour to points of interest of Red Lake geology was developed.

ACKNOWLEDGEMENTS

L. Kosloski typed the manuscript, compiled information and drafted several of the map figures. J. Mason (Acting Section Chief, Field Services Section) edited the text.

Information on past work included in this report is taken from assessment files of the Red Lake Resident Geologist's Office unless otherwise indicated.

PROPERTY REPORTS

Two active properties in the Red Lake district are the Woco Prospect and the Joy Prospect. The Woco Prospect in Earngey Township is being explored for gold mineralization by St. Jude Resources Ltd. The Joy Prospect is being explored by Noranda Exploration Company Ltd. and Major General Resources Ltd. for base metal mineralization. Both properties are described in this volume, along with the Gunnex occurrence, an inactive base metal property on Swain Lake.

Woco Prospect (St. Jude Resources Ltd.), Earngey Township

Location and Access

Located 84 km east of Red Lake, the Woco Prospect includes a group of 20 claims held by St. Jude Resources Ltd. in central Earngey Township. The property is 1.2 km south of the Uchi Mine, a past gold producer and can be reached by float plane to Uchi Lake. Winter access can be gained by a rough trail that follows the hydro-electric power line from the South Bay Mine Road to the Uchi Mine, then south to the property.

The Woco Prospect, also referred to as the Uchi Zone Extension, forms part of the Bohme occurrences previously described by Thurston (1985a) and Parker and Atkinson (1992). The Woco Prospect has been the site of a diamond drill program carried out by St. Jude Resources in 1993 on claim KRL 910547 (former claim KRL 15136), see Figure 2.

Previous Work:

The earliest claim records indicate E. Keefe staked the ground in 1936 and transferred it to G. Meech the following year. Two hundred and ninety days of work were reported on claim KRL 15136 in 1937 and 1938 prior to claim title being transferred to J.E. Hammell. Ontario Department of Mines Map 47c (Thomson 1938) indicates diamond drilling was completed on the property, but no records remain of the drilling. The claims lapsed in 1955.

In 1964, R. Voisine staked the property and transferred claim title to Salem Exploration Ltd. The company completed an airborne magnetic survey.

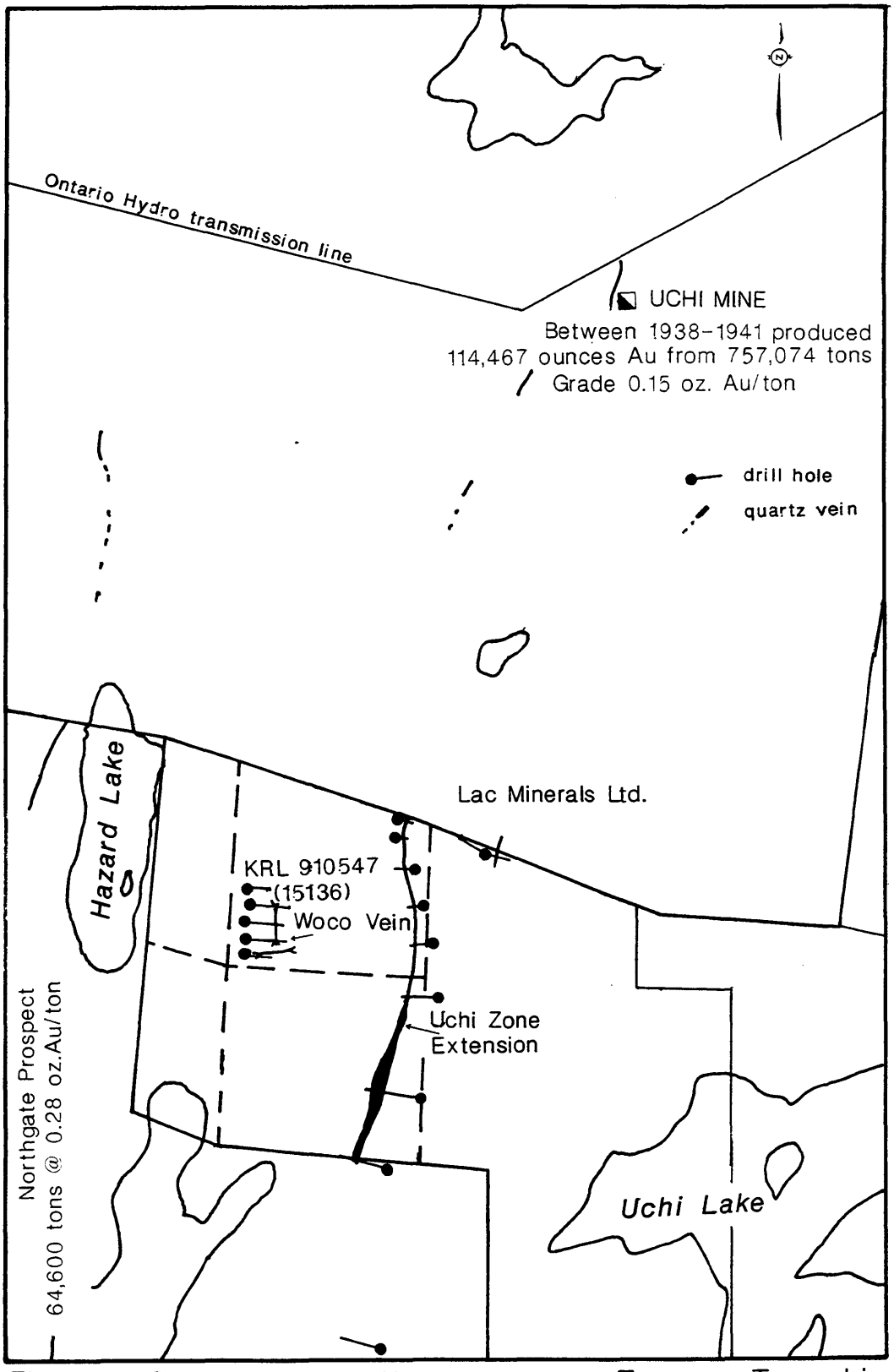

Figure 2 Sketch of the Woco prospect, Earngey Township

J.D.S. Bohme acquired the property in 1968. Tashota-Nipigon Mines Ltd. did geological and geophysical surveys, followed by diamond drilling on several areas but not including the Woco Prospect.

In 1984, M. Terrell completed a small drilling program near the shore of Uchi Lake.

Dollard Mines Ltd. did geological mapping on the property in 1987. Stripping, trenching and sampling were completed on the Woco Prospect.

In 1990, St. Jude Resources Ltd. performed geological mapping of the south part of the claim group and humus geochemical sampling on the north part of the claims.

St. Jude Resources Ltd. completed a 23 hole drill program on the Woco Prospect in 1993. Significant results of the program include the following:

Table 4. Results of drill hole intersections on the Woco Prospect by St. Jude Resources Ltd.:

Hole	Interval (ft)	Au (ounces per ton)/(ft)
93-JR-1	250	2.13/3.9
93-JR-2	40	0.14/2.0
93-JR-3	80	0.04/1.8
93-JR-4	202.0-213.9	1.89/4.0
93-JR-20	257.0-264.5	0.445/7.5
93-JR-21	291.6-295.5	0.472/3.9
93-JR-22	259.3-265.3	1.832/6.0

(*Canada Stockwatch*, March 30, 1993, *Canada Stockwatch*, September 23, 1993)

Geology and Mineralization

The Woco Prospect is underlain by north-trending mafic metavolcanic flows of the Birch-Uchi greenstone belt. The west part of the property includes massive to foliated spherulitic mafic flows and coarse-grained mafic intrusive rocks. The central part of the property includes pillowed mafic flows and the east part of the property is underlain by felsic to intermediate pyroclastic rocks. The geology is complicated by faulting and stratigraphic reversals (Thurston 1985a).

Diamond drilling indicates the Woco Vein occurs at the contact between a narrow zone of dacite in contact with pillowed mafic flows. The vein dips steeply westward and attains a width up to 6.0 feet. The Woco vein consists of white quartz with fine grains of visible gold, occasional galena and rare sphalerite, chalcopyrite, and pyrite. A cross-sectional sketch of the Woco vein geology is presented in Figure 3. Drill results as high as 6.71 ounces Au per ton over 2.9 feet are reported (*The Northern Miner*, April 12, 1993).

A 1959 diamond drill program on the Northgate Prospect, located 2 300 m southwest of the Woco Prospect was completed by Northgate Exploration Ltd. The drilling program outlined 64 600 tons of mineralization grading 0.28 ounce Au per ton (Parker and Atkinson 1992, p.208)

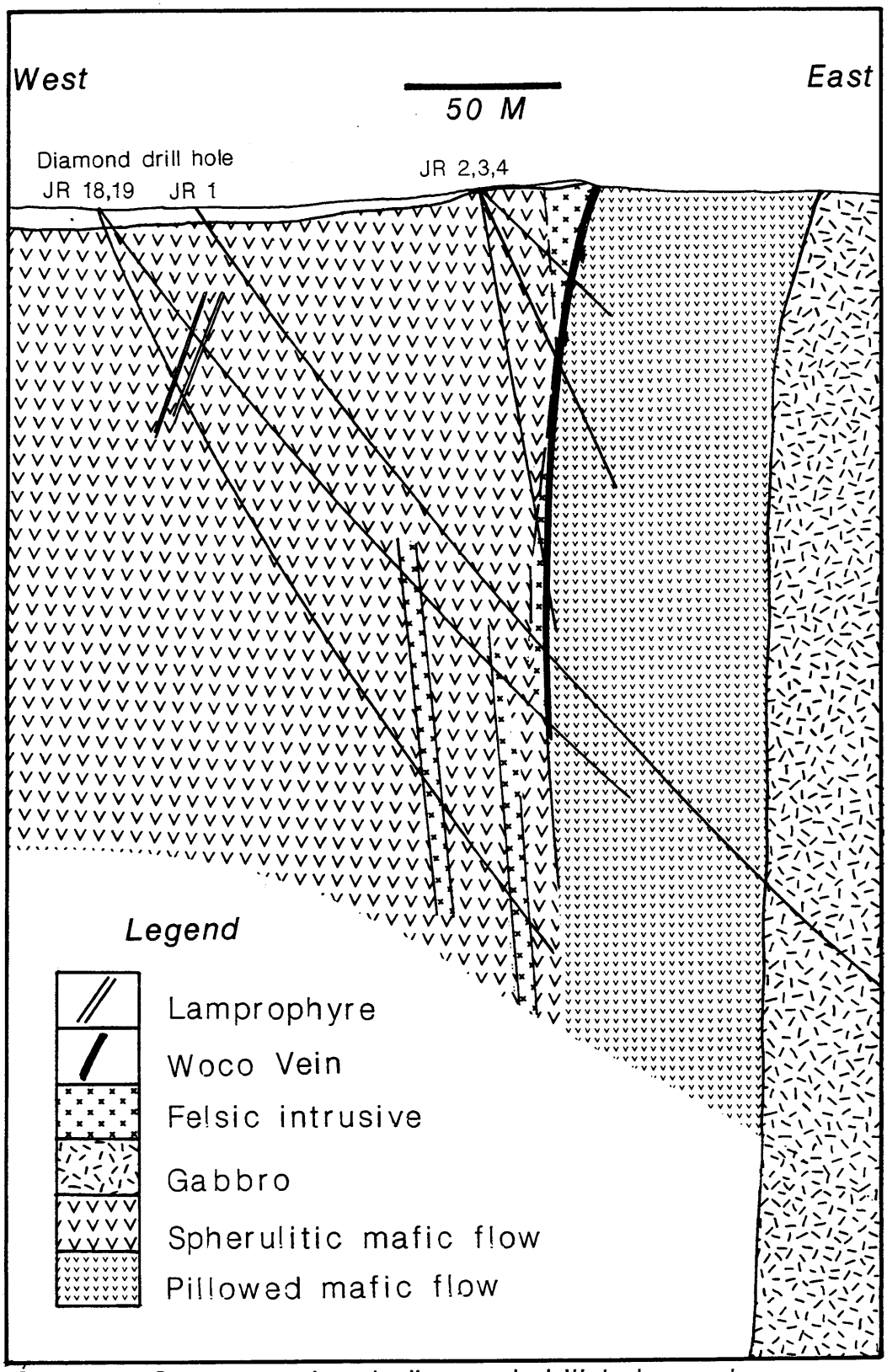

Figure 3 Cross-sectional diamond drill hole geology of the Woco Vein

Joy Prospect

Location and Access

The Joy prospect is located 50 km southeast of Red Lake and 30 km northeast of Ear Falls. Access to the east part of the property is by the South Bay Mine Road; the west part of the property can be reached from a drill trail that branches off the Snake Falls Road which intersects Hwy 105 35 km south of Red Lake.

The property is presently staked and operated as a joint venture by Noranda Exploration Company Ltd. and Major General Resources Ltd. The general features and geology of the property, including the mineralized zones referred to below are depicted in Figure 4. The Troutlake River bisects the Joy prospect.

Previous Work

Regional stratigraphic mapping at a scale of 1:50 000 in the area was completed by Thurston and Paktunc (1985). The area was covered by regional airborne geophysical surveys (OGS 1991).

In 1969, Caravelle Mines Ltd. did airborne geophysical surveys and acquired a large block of 278 claims covering volcanic stratigraphy similar to that hosting the South Bay Mine located 36 km to the northeast. Caravelle diamond drilled 8 holes for a combined length of 897 m on 3 separate electromagnetic conductors adjacent to the Troutlake River. The area drilled are referred to as the Caravelle Zone, the Group 6 Zone and the South Zone.

In 1977, Selco Mining Corp. acquired the property and completed ground geophysical surveys and diamond drilled 10 holes totalling 883 m on the west side of Troutlake River. Selco's drilling targeted both the Joy Zone and the South Zone.

In 1985, BP Resources Canada Ltd. acquired claims covering the Joy prospect and conducted additional geophysical surveys and drilled 2 holes the following year with a combined length of 225 m on the South Zone.

Noranda Exploration Company Ltd. flew regional airborne geophysical surveys of the area and acquired the Joy prospect in 1990. In joint venture with Major General Resources Ltd., Noranda completed ground geophysical surveys and drilled 4 holes with a combined length of 968.3 m in 1992. Follow-up drilling was undertaken in 1993 on the Joy Zone.

Geology

The regional geology of the Joy prospect includes metavolcanic and metasedimentary rocks of the Confederation assemblage (Stott and Corfu 1991). The metavolcanic rocks underlying the Joy prospect are the on-strike stratigraphic equivalent of Cycle III (Thurston 1985b) metavolcanic rocks that host the South Bay Mine massive sulphide deposit.

On the property scale, geology as derived from diamond drilling includes amphibolitized mafic metavolcanic rocks to the north of felsic metavolcanic rocks separated by a 3 m thick limestone horizon in the Group 6 Zone identified in Caravelle Mines diamond drill core.

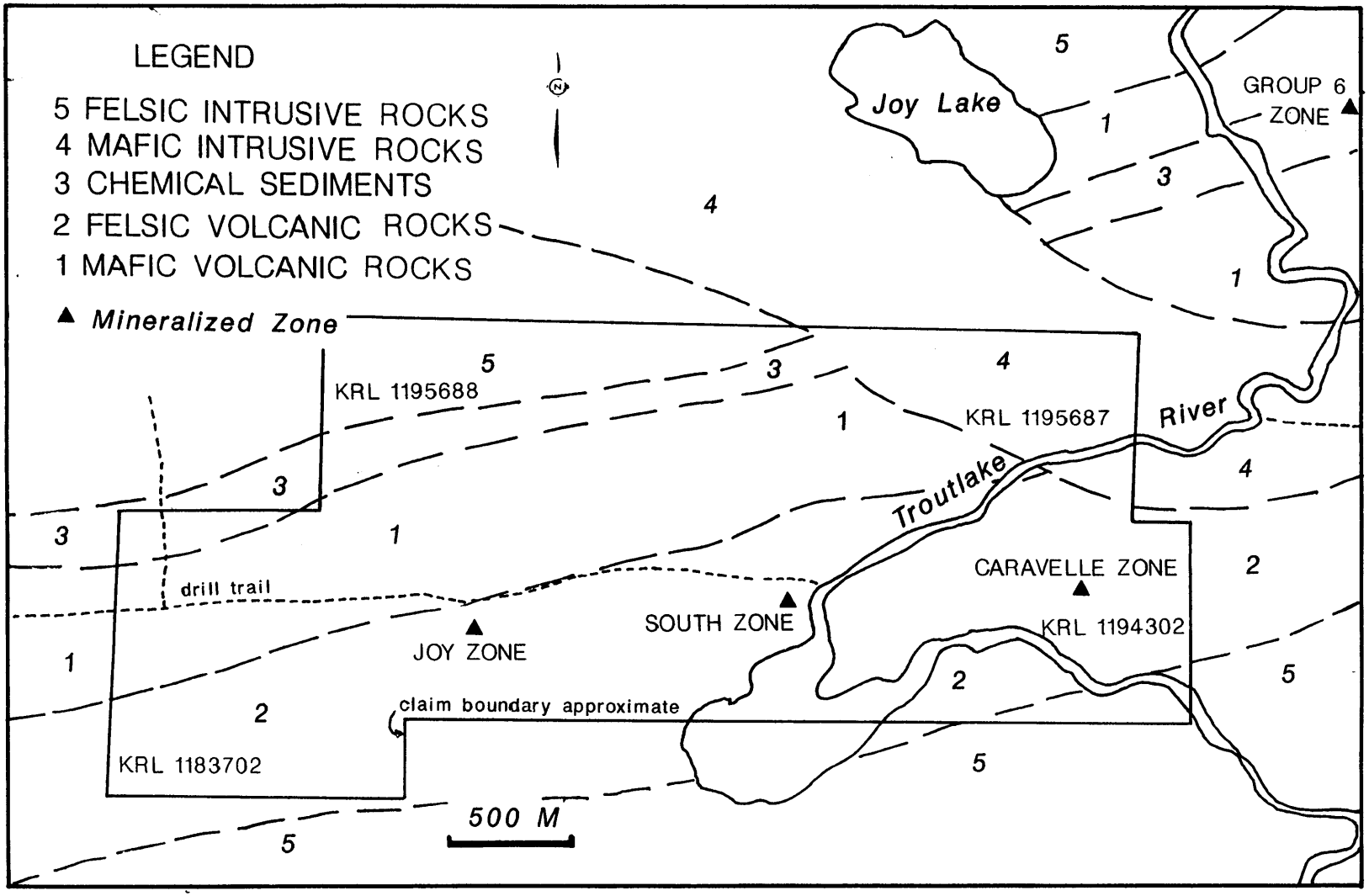

Figure 4 Generalized geology of the Joy prospect, Gerry Lake area

Diamond drilling of the Caravelle Zone encountered intermixed units of felsic and intermediate metavolcanic rocks with subordinate amounts of mafic amphibolitized volcanic rocks and dikes of aplite, gneissic to porphyritic granodiorite and rare carbonate altered gabbro. Massive sulphide mineralization occurs with the felsic metavolcanic rocks.

The South Zone includes amphibolite, felsic intrusive rocks and quartz, biotite, staurolite, garnet schists; this mineral assemblage suggests a possible sedimentary origin for the schistose rocks. Minor spherulitic flows and massive sulphide mineralization in quartz rich schistose rocks are reported in drill records.

The Joy Zone is underlain by felsic and intermediate metavolcanic rocks exhibiting chlorite and biotite alteration. Massive sulphide mineralization occurs within altered, felsic tuffs, lapilli tuffs and tuff breccia metavolcanic rocks. Narrow units of mafic flows interfingering with the felsic rocks are amphibolitized and garnet-bearing. Petrographic analysis of drill core by Noranda revealed a mineral assemblage including chlorite+biotite+garnet+cordierite and minor staurolite. Lithogeochemical analysis by Noranda indicated the rocks are Na depleted and Mg enriched.

BP Resources Canada Ltd. drill hole No. 150-24-4 between the Joy and South zones encountered 42 m of massive to schistose serpentinized peridotite and gabbro.

Mineralization

In the Caravelle Zone, diamond drilling intersected a zone of massive mineralization of sphalerite and disseminated pyrite associated with a quartz vein. A 10 inch wide zone analyzed 0.13% Cu and 21.60% Zn. Chalcopyrite and pyrrhotite mineralization was also intersected in drill core.

The South Zone includes massive sulphide mineralization grading up to 0.28% Cu and 17.17% Zn over 0.60 m.

On the Joy Zone, drilling by BP Resources in 1985 encountered sulphide mineralization grading 3.01% Cu and 0.20% Zn over 5.7 m. Follow up drilling by Noranda in 1992 intersected a 3.35 m wide zone of mineralization grading 4.01% Cu and 0.17% Zn.

Gunnex (Swain Lake) Occurrence

The Gunnex occurrence is located on the south side of Swain Lake approximately 1 km north of Honeywell Township, and 90 km east of Red Lake. Access to the site is by the South Bay Mine Road to Woman River, then by boat through Woman River and Woman Lake to Swain Lake.

Two areas of mineralization have been located; these are referred to as the Pond and Gunnex showings. The Pond showing is a trenched shoreline outcrop on the south side of a small pond, 450 m south of Swain Lake. The Gunnex showing consists of several bedrock trenches 700 m southeast of the Pond showing. The property is presently staked and held by Falconbridge Limited, see Figure 5.

Previous Work

Gunnex Ltd. completed geophysical surveys and diamond drilled 5 holes totalling 625 m in 1963.

Vanco Exploration of Ontario Ltd. completed geological and geophysical surveys in 1969.

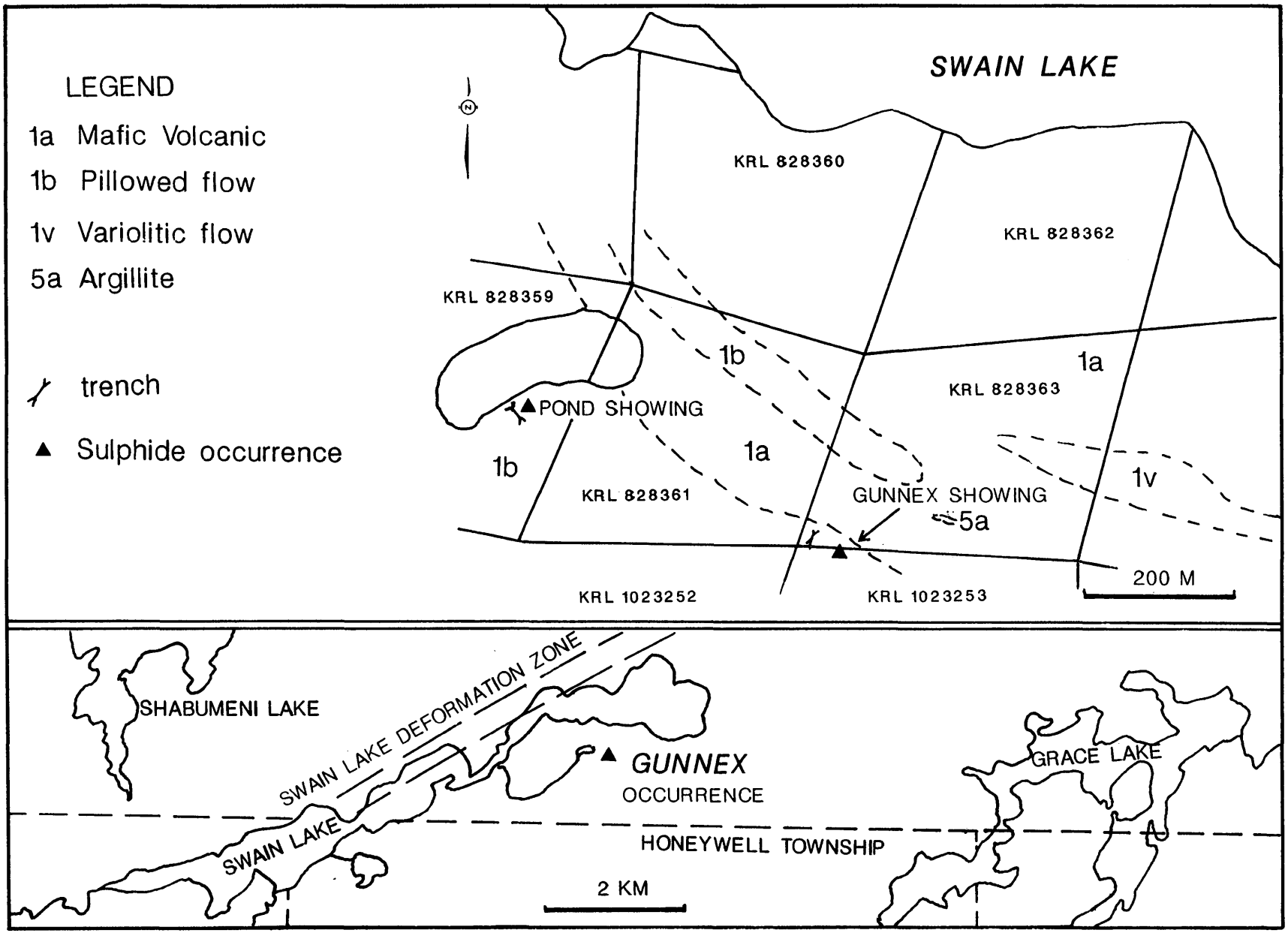

Figure 5 Sketch of the Gunnex Occurrence, Swain Lake

St. Joseph Explorations Ltd. completed geophysical and soil geochemical surveys and diamond drilled 4 holes totalling 705 m in 1972-73.

Sherritt Gordon Ltd. did a magnetic survey over the property in 1981.

In 1989, Falconbridge Limited drilled 2 holes for a combined length of 179 m on the Gunnex showing. Core from this drill program is archived in the Kenora Drill Core Library. Falconbridge completed geological, geophysical surveys and limited lithogeochemical sampling on the property. The following year, Milestone Resource Corporation drilled 3 additional holes totalling 369 m on the Gunnex showing.

Geology

The property is underlain by pillowed, amygdular and variolitic mafic flows that are assigned to the Confederation assemblage (Stott and Corfu 1991). The Swain Lake Deformation Zone (Beakhouse et. al. 1989) lies 800 m northwest of the occurrence. Argillaceous chert forms a thin interflow horizon within the mafic flows on the property. The alteration assemblage of the mafic rocks consists of epidote, sericite, calcite and minor iron carbonate and chlorite.

Mineralization

Some quartz veining is present and sulphide mineralization including chalcopyrite, pyrrhotite and pyrite occurs on pillow rims and as infillings between pillows. Chalcopyrite occurs as millimetre-wide veinlets invading the mafic flows at the Pond showing. Sulphide mineralization is accompanied by intense epidotization and calcite veining.

Analysis of an epidotized mafic volcanic rock from the Pond Showing gave the following results (Ministry of Northern Development and Mines, Geoscience Laboratories, Sudbury):

Table 5. Sample 93-BTA-18 Analysis

Oxide	%	Oxide	%
SiO_2	46.96	TiO_2	0.94
Al_2O_3	16.22	P_2O_5	0.09
MnO	0.20	CO_2	5.45
MgO	4.00	Fe_{TOT}	7.29
CaO	12.21	S	0.17
Na_2O	3.63	LO1	7.81
K_2O	0.38	TOTAL	99.75

Lithogeochemical sampling by Falconbridge Ltd. gave results up to 11 400 ppm Cu and 477 ppb Au from the Pond showing.

The following description of the Gunnex showing is taken from Moore (1974):

> Three separate trenches reveal disseminated pyrite, chalcopyrite and pyrrhotite along with calcite and minor talc and erthyrite *(sic)* in fractures and less distinguishable pillow selvages. The sulphides on surface are intensely oxidized to secondary copper minerals (malachite and azurite) and limonite. The basaltic host rock is darkened and amygdules have been completely replaced by hornblende.
>
> Drilling by Gunnex . . . failed to intersect any similar mineralization at depth below the showing.

Diamond drilling by Milestone Resource Corporation in 1990 intersected a mineralized zone grading 0.23% Cu, 0.205% Zn and 0.13 ounce Ag per ton over 0.8 m. Minor chalcopyrite, sphalerite and pyrrhotite was reported in the drill core.

DIAMOND DRILL CORE STORAGE PROGRAM

During 1993, a remote core storage compound was constructed 6 km south of Red Lake on Hwy 105. This storage facility consists of an outdoor fenced compound with drill core racks for the secure storage and preservation of diamond drill core acquired from mineral exploration programs. The core storage compound is operated as a self-serve facility administered by the Red Lake Resident Geologist office.

A total of 54 488.1 m of core from a number of exploration programs was collected and archived in the Red Lake core storage compound by a contractor funded through the Jobs Ontario Capital Fund. Core recoveries include the following:

Table 6. Summary of core accessions to the Red Lake Resident Geologist's District Remote Drill Core Compound

Asarco Exploration Co. of Canada Ltd.	444.0 m
Canadian Industrial Minerals Corp.	2 029.2 m
Noramco Explorations Inc.	31 268.6 m
Noranda Exploration Company Ltd.	1 638.2 m
Pure Gold Resources Inc.	1 762.4 m
Teck Exploration Ltd.	7 255.5 m
United Reef Petroleums Limited	8 154.0 m
Western Pacific Energy Corp.	1 936.2 m
TOTAL	54 488.1 m

The Kenora Drill core library houses an additional 14 592.9 m of diamond drill core from the Red Lake district.

RECOMMENDATIONS FOR EXPLORATION

Gold

The recent exploration success by St. Jude Resources Ltd. on the Woco Prospect emphasizes the importance of exploring for gold where it has already been found. The Woco Prospect was explored as early as 1936, and adjoins the past gold producer, the Uchi Mine, but has remained virtually untested until the present year. Significant gold mineralization has been encountered in the Woco vein by St. Jude (*see* Property Reports).

Many other prospects, both in Birch-Uchi and Red Lake greenstone belts hold similar possibilities for re-discovery. Despite the perception of these areas as being mature exploration camps with all the "easy" discoveries already made, most properties have not had rigorous exploration testing and many have had only minimal work prior to being patented. Prime gold properties have received little or no exploration attention since their original discovery by early prospectors.

Geological mapping of Dome Township (Atkinson 1993) has identified intense iron carbonate and fuchsite alteration and structural complexity on the McCuaig Red Lake Gold Mines Ltd. property at the north end of McKenzie Island. Geological aspects of the McCuaig property are similar to ore zones at the nearby Cochenour Willans Mine, and merit exploration attention.

A Pb isotope study of mineralization in the Red Lake greenstone belt has demonstrated the applicability of this technique as an exploration tool (Gulson et. al. *in press*). As a result of the Pb isotope study, it is noted that sulphide mineralization from the Miles Red Lake Mine property in Ball Township has similar Pb isotope characteristics to sulphides from Campbell and Dickenson mines in Balmer Township; hence, the Miles Red Lake Mine warrants re-evaluation as a prime exploration target.

Base Metals

The Confederation assemblage between the South Bay Mine and Red Lake has received concerted base metal exploration attention by a number of companies in recent years. A stratigraphic framework is slowly emerging of the area on the basis of diamond drilling. Of significance in developing the stratigraphy of the area is a diagnostic limestone marker which has been identified in drill core on the Dixie 18 Prospect and the Group 6 Zone of the Joy Prospect. A diopside skarn outcropping on the west side of Gerry Lake and on the Copperlode A Prospect may be the metamorphosed stratigraphic continuation of the limestone. The limestone unit is the product of sea-floor sedimentation during a period of volcanic quiescence, and is spatially associated with possible exhalative base metal mineralization at several of these prospects. Forming a distinct stratigraphic horizon, the limestone may serve as a lead to base metal mineralization.

Base metal mineralization occurs at the Gunnex Prospect south of Swain lake in submarine mafic metavolcanic rocks. To the north of Swain Lake, separated by the Swain Lake Deformation Zone is a thick accumulation of felsic rocks comprising the Western Peninsula metavolcanic assemblage of Birch Lake (Beakhouse 1989). The felsic rocks are comprised of aphanitic and flow banded flows, quartz and feldspar phyric flows and minor pyroclastic rocks. Although the felsic rocks are largely devoid of electromagnetic conductors, (OGS 1991) a combined lithogeochemical and deep penetrating electromagnetic exploration approach may assist the detection and discovery of deeply buried volcanogenic massive sulphide mineralization in the west part of Birch Lake.

ONTARIO GEOLOGICAL SURVEY ACTIVITIES

D. Stone completed the fifth and final year of 1:50 000 scale mapping of the Berens River subprovince. Mapping during the 1993 field season was completed on the Namiwan, Apps, Stout, Old Shoes, Onepine, Pikangikum, Spoonbill, Roderick, Sabourin, Bigshell and Murdock lakes map sheets.

Table 7. Maps and reports pertaining to the Red Lake Resident Geologist's District issued by the Ontario Geological Survey, 1993

Open File Reports	
OFR 5846	The English River Subprovince - An Archean Gneiss Belt: Geology, Geochemistry and Associated Mineralization; by F.W. Breaks and W.D. Bond, 884p. in two volumes. Accompanied by map P.3091
OFR 5870	Precambrian Geology of the East Part of Baird Township and Heyson Township; by B.T. Atkinson, 25p. Accompanied by maps P.3196 and P.3197.
OFR 5878	Precambrian Geology of Dome Township; B.T. Atkinson. Accompanied by OFM 231
Miscellaneous Papers	
MP161	Report of Activities 1992, Resident Geologists
Preliminary Maps	
Map P.3091	Compilation Map, English River Subprovince; by F.W. Breaks and W.D. Bond, scale 1:253 440
Map P.3196	Precambrian Geology, Baird Township. East Part; by H. Wallace and B.T. Atkinson, scale 1:12 000.
Map P.3197	Precambrian Geology, Heyson Township; by B.T. Atkinson, scale 1:12 000
Map P.3217	Precambrian Geology, McInnes Lake Area; by D. Stone, scale 1:50 000
Map P.3218	Precambrian Geology, Berens Lake Area; by D. Stone and J. Crawford, scale 1:50 000
Map P.3219	Precambrian Geology, Critchell Lake Area; by D. Stone, B. Atkinson, J. Crawford and J. Halstead, scale 1:50 000
Map P.3220	Precambrian Geology, Kember Lake Area; D. Stone, J. Crawford and J. Halstead, scale 1:50 000
Map P. 3221	Precambrian Geology, McIntosh Bay Area; by D. Stone, J. Crawford and J. Halstead, scale 1:50 000
Map P.3222	Precambrian Geology, Cherrington Lake Area; by D. Stone, scale 1:50 000

Table 7. Continued

Preliminary Maps (Cont.)	
Map P.3223	Precambrian Geology, Pipestone Bay Area; by D. Stone, B.T. Atkinson and R. Fogal, scale 1:50 000
Map P.3224	Precambrian Geology, Whiteloon Lake Area; by D. Stone, scale 1:50 000
Map P.3225	Precambrian Geology, Azure-Varveclay Lake Area; by D. Stone, scale 1:50 000
Map P.3226	Precambrian Geology, Favourable Lake Area; by D. Stone, scale 1:50 000
Map P.3227	Precambrian Geology, Red Lake Area; by B.T. Atkinson and D. Stone, scale 1:50 000
Open File Maps	
OFM 231	Precambrian Geology, Dome Township; by B. T. Atkinson, scale 1:12 000

RESEARCH BY OTHER AGENCIES

The Ear Falls Economic Development Office examined intrusive rocks in the Ear Falls area to assess their building stone potential.

R. Penczak, Queen's University, Ontario, examined patterns of hydrothermal alteration associated with pre-ore fault structures at the Campbell Mine, Balmer Township.

M. Lange, University of Munster, Germany, continued geological investigations of the Frame Lake Stock, Berens River subprovince, located 150 km north of Red Lake. Results of that work appear in Summary of Field Work, 1993 (Lange 1993).

C. Tarnocai continued a mineralogical study of alteration in the Campbell Mine, Balmer Township as an MSc. research topic at the University of Ottawa.

K. Tomlinson, University of Portsmouth, England, did lithogeochemical sampling of mafic and ultramafic volcanic rocks at Red Lake and Woman Lake to compare their geochemical characteristics with mafic rocks from other greenstone belts at Beardmore-Geraldton and Atikokan.

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SCHREIBER-HEMLO RESIDENT GEOLOGIST'S DISTRICT--1993

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INTRODUCTION

The Schreiber-Hemlo District covers an area from the Nipigon River east to White River, and from the United States-Canada border north to Upper Roslyn Lake and Kagiano Lake. The district includes the communities of Rossport, Schreiber, Terrace Bay, Marathon, Heron Bay, Manitouwadge, as well as Pic Heron Reserve #50, Pic Mobert Reserve #82, Pays Plat Reserve #51 and Lake Helen Reserve #53A. The communities of Nipigon and White River are immediately adjacent to the district boundaries.

ACKNOWLEDGEMENTS

Technical support and assistance for this report were provided by D. B. McKay and P. Hinz. Typesetting and formatting were done by C. Komar. J. K. Mason reviewed and edited this report. As always, numerous prospectors, geologists and other individuals from the exploration and mining sector provided valuable information and discussion during 1993 and many are referred to throughout the text.

MINING ACTIVITY

Geco Division (Noranda Inc.)

Production from the Geco Division mine, Manitouwadge, from January 1, 1993 to December 31, 1993, involved milling 1 262 193 tons (short) of ore at a grade of 1.70% Cu, 2.15% Zn and 1.11 ounces Ag per ton (H. Lockwood, Geco Division, personal communication, 1994).

The mineral inventory as of January 1, 1994 is estimated at 2 940 000 tons (short) at 1.8% Cu, 2.8% Zn and 1.35 ounces Ag per ton (H. Lockwood, Geco Division, personal communication, 1994). The Geco Mine is forecast to produce until the third quarter of 1995 (H. Lockwood, Geco Division, personal communication, 1994).

Winston Lake Division (Metall Mining Corporation)

Production from the Winston Lake Division Mine from January 1, 1993 to December 31, 1993 involved milling 365 094 t at a head grade of 1.22% Cu, 15.45% Zn, 36.893 g/t Ag and 1.625 g/t Au (G. Doiron, Winston Lake Division, personal communication, 1994).

Reserve estimates as of January 1, 1994, which include proven, probable, possible and potential ore with a 20% dilution at 0% grade, are indicated at 1 132 163 t at a grade of 0.90% Cu, 12.98% Zn, 25.21 g/t Ag and 1.05 g/t Au (G. Doiron, Winston Lake Division, personal communication, 1994).

Hemlo Area Mines

David Bell Mine (Teck-Corona Operating Corporation)

Production from the David Bell Mine [Teck Corporation (50%)/Homestake Canada Inc. (50%)] from January 1, 1993 through December 31, 1993 consisted of 215 188 recovered ounces of gold (225 523 feed ounces) from 491 654 t milled at a feed grade of 0.459 ounce Au per tonne (P. Desautels, David Bell Mine, personal communication, 1994).

Mineable and diluted ore reserve estimates as of December 31, 1993 were 5 850 935 t at 0.349 ounce Au per tonne representing 2 040 792 ounces Au (P. Desautels, David Bell Mine, 1994).

Golden Giant Mine (Hemlo Gold Mines Inc.)

Production from the Golden Giant Mine from January 1, 1993 through December 31, 1993 was 422 528 bullion ounces Au from 1 103 290 t milled at a grade of 12.277 g/t (B. Kusins, Golden Giant Mine, personal communication, 1994).

Total ore reserves as of December 31, 1993 were 11 789 000 t at a grade of 11.4 g/t (B. Kusins, Golden Giant Mine, personal communication, 1994). This figure includes tonnages from the Golden Giant deposit No. 1 of 10 536 848 t at a grade of 11.75 g/t and 1 252 048 t at a grade of 8.79 g/t from the Quarter claim.

Williams Mine (Williams Operating Corporation)

Production from the Williams Mine [Teck Corporation (50%)/Homestake Canada Inc. (50%)] from January 1, 1993 to December 31, 1993 was 492 251 ounces Au from 2 319 688 t milled at a grade of 0.223 ounce Au per tonne (J. Gray, Williams Mine, personal communication, 1994).

Total proven and probable diluted ore reserves for the Williams Mine as of December 31, 1993 are estimated at 31 665 000 t at a grade of 0.187 ounce Au per tonne representing 5 934 400 ounces Au (J. Gray, Williams Mine, personal communication, 1994).

ADVANCED EXPLORATION AND DEVELOPMENT

Pick Lake Deposit (Metall Mining Corporation)

Metall Mining Corporation began drifting from the 615 m level of their Winston Lake Division Mine in August 1993 in order to access the Pick Lake deposit. As of year-end, 1993, 290 m of lateral drifting had been completed. A total of 2 km of drifting will ultimately be carried out over 1.5 years (G. Doiron, Metall Mining Corporation, personal communication, 1994). Economic evaluation of the deposit will test the geological inventory of the 1.6 million tonne deposit which grades 1.1% Cu and 17.7% Zn (The Northern Miner, November 18, 1991, p. 3).

EXPLORATION ACTIVITY

Exploration activity declined again in 1993; there were 44 active programs in the Schreiber-Hemlo District (see Table 2). Major mining companies and individual prospectors accounted for the vast majority of these projects. Junior mining companies were involved in only 3 of these projects. The Ontario Prospector Assistance Program assisted in funding 7 programs including 2 winter programs that were initiated late in the year. There were no Ontario Mineral Incentive Program (OMIP) grants designated in the Schreiber-Hemlo District.

As shown in Table 1, exploration for gold accounted for the majority of programs (48%) while copper-zinc-silver exploration placed second with (36%). Copper-nickel-platinum-group element and industrial mineral exploration accounted for 2% and 14%, respectively.

Table 1. Exploration activity in the Schreiber-Hemlo District (expressed by commodity as a percentage of total programs)

	YEAR						
Commodity	1987	1988	1989	1990	1991	1992	1993
Au, Ag	70%	61%	45%	55%	47%	45%	48%
Cu, Zn ± Ag	14%	18%	34%	35%	38%	45%	36%
Cu, Ni ± PGE	14%	9%	3%	3%	5%	4%	2%
Indust. Minerals	2%	12%	18%	7%	10%	6%	14%
Total Number of Active Programs	51	60	56	75	59	51	44

Gold Exploration

Gold exploration focused on the Hemlo area in 1993, led by majors Hemlo Gold Mines Inc., Homestake Canada Inc. and Placer Dome Canada Limited. The flurry of claim staking and exploration activity in the Dayohessarah Lake area, 60 km east of Hemlo, spilled into the Schreiber-Hemlo District, resulting in additional claim staking and renewed interest in the eastern part of the Hemlo greenstone belt.

TABLE 2. EXPLORATION PROGRAMS IN THE SCHREIBER-HEMLO DISTRICT 1993

ABBREVIATIONS

AEM.....Airborne Electromagnetic Survey	HLEM.....Horizontal Loop Electromagnetic Survey
AM.....Airborne Magnetic Survey	IP.....Induced Polarization Survey
ARA.....Airborne Radiometric Survey	RES.....Resistivity Survey
DDH.....Diamond Drill Hole(s)	SP.....Self Potential Survey
GEM.....Ground Electromagnetic Survey	Str.....Stripping
GC.....Geochemical Survey	Tr.....Trenching
GL.....Geological Survey	UG.....Underground Development
GM.....Ground Magnetic Survey	VLEM.....Vertical Loop Electromagnetic Survey
GRA.....Ground Radiometric Survey	VLF-EM....Very Low Frequency Electromagnetic Survey

Company/Individual (Property Name)	Township/Area (Commodity)	Exploration Activity
1. Bliss, M. (Middleton property)	Walsh Tp. (Cu, Zn, Au)	GM, GC
2. Doiron, D. (Kabamichigama Lake property)	Kabamichigama Lake (amethyst)	Tr, Str
3. Falconbridge Limited (Nipigon Bay property)	McAllister Tp. (Cu, Ni, PGE)	Linecutting
4. Fowler, B., Shuman, M. (Armand Lake property)	Wabikoba Lake (Au, Cu, Zn)	GL, prospecting
5. Fowler, B., Shuman, M. (Little Steel Lake property)	Tuuri Tp. (Au, Cu, Zn)	Prospecting, sampling
6. Fowler, B., Shuman, M. (Phil Lake property)	Wabikoba Lake (Au, Cu, Zn)	Prospecting, sampling
7. Fowler, B., Shuman, M. (Spruce Bay property)	Wabikoba Lake (Au, Cu, Zn)	Prospecting, Str
8. Gionet, G. (Cecil Township property)	Cecil Tp. (Cu, Zn)	Prospecting, sampling
9. Gregor Goldfields (Wire Lake property)	Lorna Lake (Au)	DDH
10. Hamel, J.R. (Beaver Creek property)	Syine Tp. (Au)	DDH, Tr, prospecting
11. Hemlo Gold Mines Inc. (Armand Lake property)	Wabikoba Lake (Au)	Linecutting
12. Hemlo Gold Mines Inc. (Golden Giant Mine property)	Bomby Tp. (Au)	DDH
13. Hemlo Gold Mines Inc. (Golden Sceptre property)	Bomby Tp. (Au)	DDH, GL
14. Hemlo Gold Mines Inc. (Hemlo West property)	Pic Tp. (Au)	DDH
15. Hemlo Gold Mines Inc. (Newjay property)	Wabikoba Lake (Au)	Linecutting, GL, prospecting, sampling
16. Homestake Canada Inc. (Bel Air property)	Bomby, Lecours tps. (Au)	GL, sampling
17. Homestake Canada Inc. (Enterprise property)	Wabikoba Lake (Au)	GM, GC, sampling
18. Homestake Canada Inc. (Rous Lake property)	Lecours, Bomby tps. (Au)	GM, VLF-EM, sampling

19. Kakeeway, D. (Spruce Bay property)	White Lake (North) (Au, Cu, Zn)	DDH, prospecting
20. Komarechka, R. (Killala Lake Complex)	Islington Lake, Vein Lake (Ind. Min.)	Reconnaissance, sampling
21. Metall Mining Corporation (Pick Lake Zone; Winston Lake Mine)	Pays Plat Lake (Cu, Zn)	UG, DDH
22. Metall Mining Corporation, Rusty Lake Resources Ltd. (Big Duck Lake property)	Pays Plat Lake, Rope Lake (Au)	DDH
23. Michano, D. (Glory Lake property)	Foxtrap Lake (Au, Cu, Zn)	Prospecting, sampling
24. Middaugh, R. (Phillips Creek property)	Bomby Tp. (Au)	GC, GM, linecutting
25. Noranda Exploration Company, Limited (Geco East property)	Herbert Tp. (Cu, Zn)	GM, GC
26. Noranda Exploration Company, Limited (Spider Lake property)	Tuuri Tp. (Cu, Zn)	GL, GC
27. Noranda Inc. (Geco Division) (Banana Lake property)	Herbert Tp. (Cu, Zn)	GL, GC, HLEM
28. Noranda Inc. (Geco Division) (Geco Mine property)	Gemmell Tp. (Cu, Zn)	DDH
29. Noranda Inc. (Geco Division) (Pinegrove Lake property)	Black River (Cu, Zn)	DDH
30. Noranda Inc. (Geco Division) (Straight Lake property)	Nickle, Herbert tps. (Cu, Zn)	GL, HLEM, GC
31. Noront Resources Ltd. (Prairie Lake property)	Cairngorm Lake, Killala Lake (diamonds)	GM, reconnaissance
32. Placer Dome Canada Limited (White River property)	Brothers, Laberge tps. (Au)	Linecutting, GM
33. Secobel Exploration Inc., Ferguson, J. & A. (Shack Lake property)	Pic Tp. (industrial minerals)	DDH, sampling
34. Simoneau, P. (Ihnatko-Kusins property)	Wabikoba Lake (Pb, Zn)	Prospecting
35. Simoneau, P. (Summers Lake property)	Wabikoba Lake (Au, Cu, Zn)	Prospecting
36. Teck-Corona Operating Corporation (David Bell Mine property)	Bomby Tp. (Au)	DDH
37. Thibault, D. and Miron, B. (Barbara Lake Property)	Barbara Lake (Cu, Au)	Str, sampling, Tr, VLF-EM, GM
38. Turner, A. (Dotted Lake property)	Wabikoba Lake, White Lake (North) (dimension stone)	Str, GL, DDH
39. Turner, A. (Pinegrove Lake property)	Wabikoba Lake, Black River (Au, Cu, Zn)	DDH
40. Turner, A. (Swill Lake property)	Leslie Tp. (Cu, Zn)	DDH
41. Vaudrin, R. (Lampson Road property)	Black River (Cu, Zn, Au)	Prospecting
42. Vos, C. (Quoits Lake property)	Kabamichigama Lake (amethyst)	Tr, Str, prospecting
43. Wahl, R. and Kakeeway, D. (Dead Horse Property)	Foxtrap Lake (Cu, Zn, Au)	Prospecting, sampling
44. Williams Operating Corporation (Williams Mine property)	Bomby Tp. (Au)	DDH, UG

Williams Operating Corporation's exploration of the western end of the Williams Mine involved 63 drill holes totalling 11 352 m that were collared from exploration drifts on the 9975 and 9450 levels. Approximately 400 m of additional drifting was needed to accommodate the drilling. The main ore zone was extended 200 m west of last year's limits and other mineralized lenses were also intersected. Exploration on the 9975 level has resulted in the addition of 436 000 t (diluted) to possible reserves and 9450 level exploration has added 378 000 t (diluted) to probable reserves and 865 000 t (diluted) to possible reserves for the B-Zone (Main Zone) (A. Guthrie, Williams Mine, personal communication, 1994). The additional reserves are the net gains after accounting for reserve category changes and are not directly attributable to the exploratory drilling results.

Hemlo Gold Mines Inc. conducted surface exploration in addition to underground work at the Golden Giant Mine. Several drill holes in excess of 2000 m were drilled from surface in Bomby Township. Geological mapping and surface drilling were carried out on the Golden Sceptre property and deep drilling is ongoing to the north of the mine to test for down-dip extensions of the main ore zone and other mineralized zones.

Teck-Corona Operating Corporation carried out exploratory drilling underground at its David Bell Mine.

Metall Mining Corporation and Rusty Lake Resources Ltd. completed a 10-hole, 2163 m, drill program on the Big Duck Lake property east of the Winston Lake Mine. Two holes were completed on the Coco-Estelle zone west of an area containing 53 700 t grading 10.7 g/t Au. The best intersection was 11.65 m averaging 1.23 g/t Au including a 3.4 m interval of 2.3 g/t Au. Four holes were drilled on the Nelson Pit zone, returning significant intersections: 2.47 g/t Au over 1.5 m and 1.4 g/t Au over 9 m. Rusty Lake Resources can earn a half-interest in the property by funding $1.5 million in exploration by February 1997 (The Northern Miner, November 15, 1993, p.3).

Gregor Goldfields intersected near-surface gold values during a recent drilling program on its Wire Lake property northeast of Marathon. Two holes intersected 5.7 g/t Au over 0.9 m within a 7.7 m wide mineralized zone and 7.45 g/t Au over 1.0 m within a 6.7 m wide mineralized zone. Other holes will be drilled to test the structure at depth (The Northern Miner, January 17, 1994, p.16).

Prospectors B. Fowler and M. Shuman optioned their Armand Lake property to Hemlo Gold Mines Inc. Hemlo Gold was interested in examining green mica-rich, felsic metavolcanic rocks with which anomalous gold values are associated (see Property Examinations, this report).

Base Metal Exploration

Although no underground exploration has been undertaken by Noranda Inc. at its Geco Division Mine since 1990, reblocking of stopes to higher grade outlines throughout 1993 has resulted in a 4% increase in the copper grade, a 7% increase in the zinc grade and an 11% increase in the silver grade over the corresponding 1992 figures (H. Lockwood, Geco Division, personal communication, 1994). The emphasis has been shifted entirely to surface exploration as a means of locating new ore for the Geco Mine. The main thrust of this program is the completion (probably in March 1994) of an 8000 foot (2438 m) drill hole, collared about 2.5 km northwest of Geco's No. 4 shaft, which will probe the deepest, untested part of the Geco mine horizon. A minimum of 25 million tonnes is the threshold target for an economically minable deposit (The Northern Miner, August 9, 1993, p. 1). Geco is also active on other properties in the vicinity of Manitouwadge (see also Property Examinations, this report).

Exploration at Metall Mining Corporation's Winston Lake Division Mine included drifting over to the Pick Lake Deposit (see Advanced Exploration, this report) and some exploratory drilling.

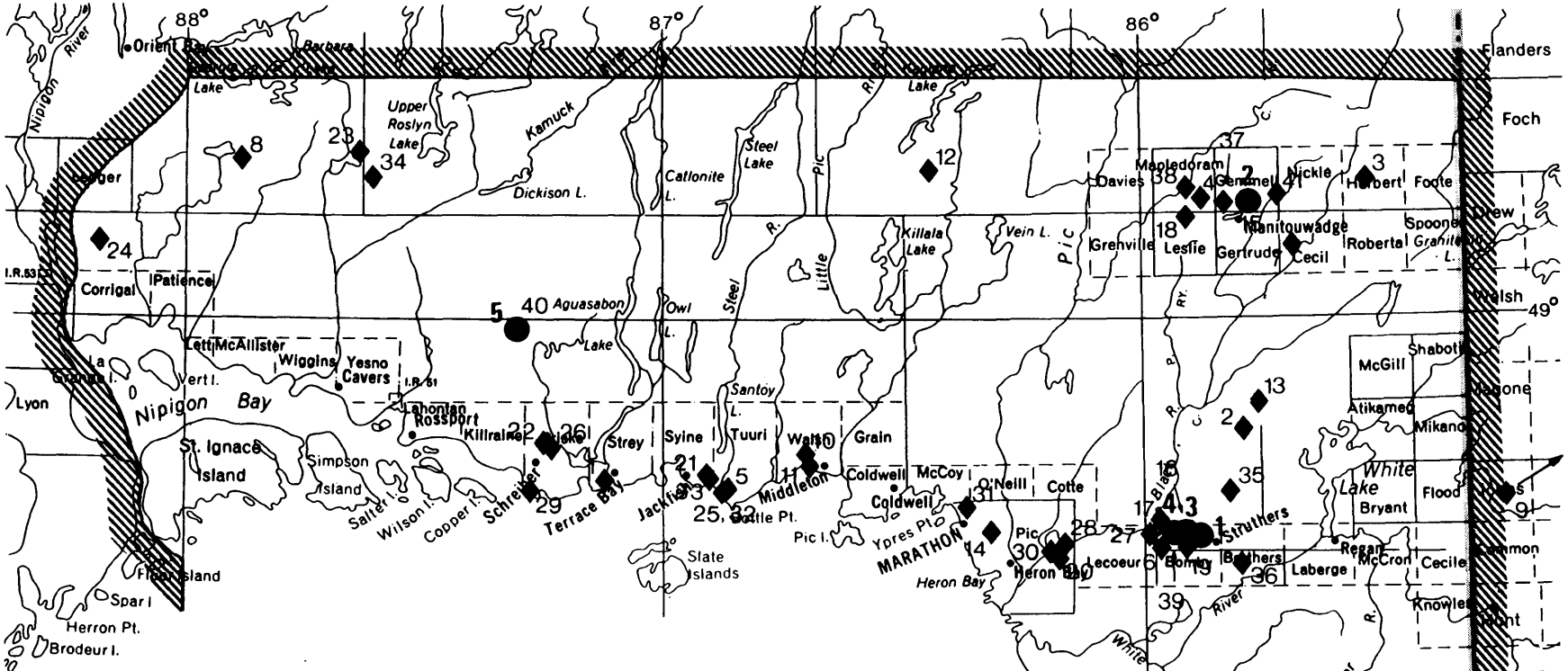
Local prospectors have utilized the newly acquired Beep Mat, a portable instrument that detects near-surface, magnetic and/or conductive sources. Beep Mat prospecting has resulted in the discovery of several sulphide occurrences, some of which will be further investigated in 1994.

Industrial Minerals Exploration

There were 6 industrial mineral exploration programs in 1993. C. Vos and D. Doiron carried out their respective activities in the search of amethyst northeast of Nipigon. A. Turner stripped and mapped his dimension stone prospect. Noront Resources Ltd. did some preliminary work on its property at Prairie Lake in its search for diamonds. R. Komarechka investigated the dimension stone potential of the Killala Lake complex. Secobel Explorations Inc., in conjunction with J. and A. Ferguson, explored the Shack Lake property near Marathon for spectrolite, a semiprecious variety of feldspar, and for ornamental stone. Financing was provided through a NORFUND grant.

RESIDENT GEOLOGIST'S STAFF ACTIVITIES

The Schreiber-Hemlo Resident Geologist office is staffed by B. R. Schnieders, Resident Geologist; M. C. Smyk, Staff Geologist; Cyndee Komar, Secretary; Susan Warren, Assessment File Clerk; and Nancy Baker Acting Assessment File Clerk. D. B. McKay, Resource Geologist, initiated the Manitouwadge Mineral Resource Geologist Program in January 1991, funded under the Canada-Ontario Northern Ontario Development Agreement (NODA). The Resident's program



● **Producing Mines 1993**

1. David Bell Mine, Teck-Corona Operating Corporation
2. Geco Division, Noranda Inc.
3. Golden Giant Mine, Hemlo Gold Mines Inc.
4. Williams Mine, Williams Operating Corporation
5. Winston Lake Division, Metall Mining Corporation

◆ **Property Visits 1993** (keyed to Table 3)

Figure 1. Schreiber-Hemlo Resident Geologist's District

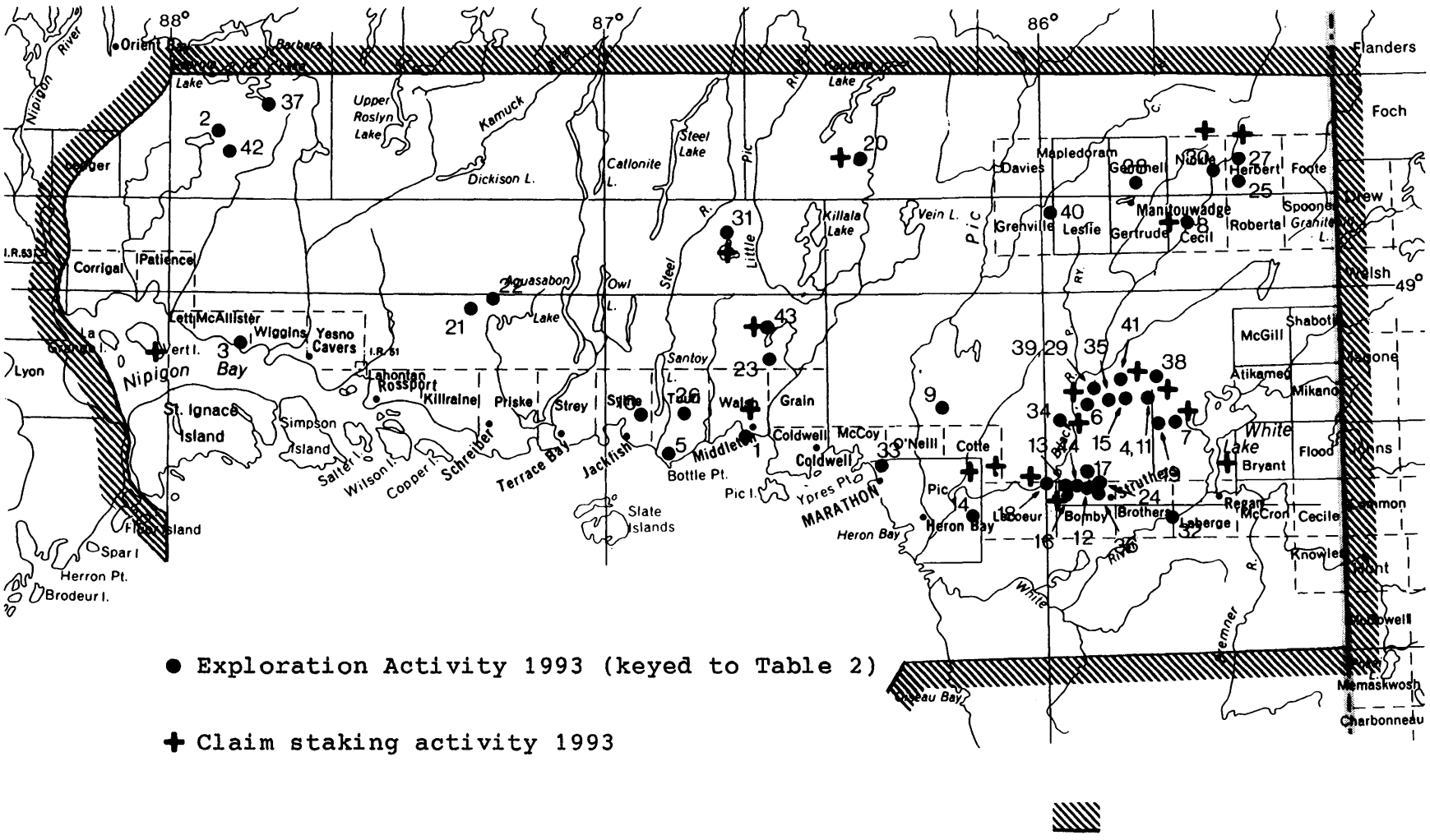


Figure 2. Exploration and claim staking activity in the Schreiber-Hemlo Resident Geologist's District 1993

Table 3. Property Examinations 1993 (keyed to Figure 1).

1. Aguasabon Gorge
2. Armand Lake[1,5]
3. Banana Lake[1,5]
4. Big Nama Mine[3,4]
5. Black Fox Lake
6. Cache Lake
7. Cecil Township (Gionet)[1,5]
8. Cosgrave Lake
9. Dayohessarah Lake
10. Dead Horse Creek North
11. Dead Horse Creek South
12. Dead Horse Road/Killala Lake complex
13. Dotted Lake[2]
14. Dunlop[3]
15. Geco Mine[3]
16. Golden Giant Mine[3]
17. Golden Sceptre[3]
18. Gaug Lake[4]
19. Hemlo Highway Section[3]
20. Hemlo West (Black River)
21. Jackfish[3]
22. Johnston-McKenna
23. Kabamichigama Lake
24. Limestone Lake Recon
25. Little Steel Lake
26. McKenna-McCann
27. Muir Zone[3]
28. Northern Eagle[3]
29. North Shores Mine
30. Rideau Resources
31. Shack Lake[2]
32. Simard-Swetz
33. Steel River[3]
34. Vos Amethyst
35. Wabikoba Road Recon
36. White River Prospect
37. Willroy Mine[3,4]
38. Willecho Mine[3,4]
39. Williams Mine[3]
40. Winston Lake Mine[3]
41. Wowun Lake[4]

[1]Visited in conjunction with the Manitouwadge Mineral Resource Geologist Program

[2]Visited in conjunction with the Northwestern Ontario Industrial Minerals Program

[3]Visited during the course of a field trip conducted in 1993

[4]Visited in conjunction with the Geological Survey of Canada

[5]Described in "Property Examinations--1993" section, this report

operated from the Mines and Minerals Division office in Thunder Bay. A field office was maintained at the office of the Northern Development Officer (NDO), Ministry of Northern Development of Mines, in Marathon from May through October 1993. This field office operated every Tuesday afternoon between 1:00 and 5:00 p.m.

During 1993, the Schreiber-Hemlo Program dealt with approximately 1560 inquiries from the mining sector and general public including 760 visitations and 800 phone inquiries. Included in the total were 90 visitations and 60 phone inquiries at the Marathon field office.

Staff of the Schreiber-Hemlo Resident Geologist Program conducted 48 property visits to 41 separate properties (Table 3, Figure 1). Fifteen field trips were delivered or attended. Prospector's information sessions were presented in Terrace Bay and Heron Bay. Displays were manned for Mining Week in Marathon, Hemlo '93 trade show in Manitouwadge, and at Mines and Minerals Symposia in Thunder Bay and Toronto. Nine technical talks were given throughout the district. Support and field assistance were given to field parties of the Geological Survey of Canada and university groups. M.C. Smyk co-authored a paper on the Dead Horse Creek diatremes (Smyk et al. 1993).

D.B. McKay was active in the field as part of his Manitouwadge Mineral Resource Geologist Program, funded under the Canada-Ontario Northern Development Agreement (NODA). Most of the approximately 170 mineral occurrences in the vicinity of Manitouwadge will be described in his Open File Report (in preparation), slated for release in 1994.

PROPERTY EXAMINATIONS--1993

Armand Lake Property

This property is situated approximately 16 km northeast of the Hemlo mines and is accessed via the Twist Lake logging road that extends east from Highway 614 15 km north of Highway 17. The property was staked by prospectors B. Fowler and M. Shuman of Marathon in 1990. It was optioned by Newmont Exploration of Canada Ltd. in 1992 but has subsequently been optioned by Hemlo Gold Mines Inc.

The property is situated on what has been termed the "north limb" of the Hemlo greenstone belt. It is underlain mainly by a roughly east-southeast-trending sequence of mafic to felsic metavolcanic and lesser metasedimentary rocks that wrap around the northern contact of the Musher Lake granodiorite pluton. Mafic volcanic rocks predominate to the north and clastic sedimentary rocks flank the southern contact of the Musher Lake pluton (Milne 1968; Siragusa 1985). The area has experienced a sporadic exploration history culminating in a series of programs following the Hemlo staking rush of the early 1980s. Although

exploration has focused on gold targets, local base metal occurrences have also drawn interest.

Prospecting and trenching carried out in 1990 and 1991 by Fowler and Shuman led to the discovery of several gold and base metal showings. The majority of the showings are hosted by felsic volcanic rocks that are intercalated with mafic volcanic rocks. Although protolith determination is difficult because of deformation and alteration, it appears as though fragmental felsic rocks may be pyroclastic while more massive, quartz-phyric units could either be flows or intrusions. These rocks are commonly altered to a quartz eye-bearing, sericite schist in the vicinity of pyrite-rich sulphide mineralization. Initial prospecting in the northwest portion of the claim group delineated a 25 m wide zone of felsic tuff which returned assay values of up to 2280 ppm Cu and 0.093 ounce Au per ton. Southeast of this zone, float samples, presumably of local derivation, assayed 0.54% Zn and 0.086 ounce Au per ton within a 150 m wide zone corresponding with an induced polarization (IP) anomaly (B. Fowler, Prospector, personal communication, 1993). Field observations by D. McKay (Resident Geologist's files, Resident Geologist's office, Schreiber-Hemlo District, Thunder Bay) suggest that gold and base metals in this locality are hosted by pyritic, banded iron formation.

Another felsic unit, parallel to that hosting the aforementioned mineralization, is locally altered to sericite schist that contains green mica. Green mica-bearing rocks have been noted over a strike length of 3.5 km and are most extensively developed at the northwestern end of the property. Recent logging activity has revealed outcrops of massive to foliated, quartz- and quartz-feldspar-phyric rocks with thin seams and lenses of green mica. Locally, green mica may comprise up to 40% of the rock. The felsic rocks are also variably mineralized with pyrite and sericite. Although chemical analyses have not been conducted on this green mica, its colour, habit and mode of occurrence is remarkably similar to that of the vanadium- and chromium-bearing muscovite that is a key component of the alteration mineral assemblage at Hemlo.

Although gold values are negligible (typically less than 0.01 ounce Au per ton) in these rocks, the Hemlo-like mineralogy and style of alteration has prompted Hemlo Gold Mines Inc. to option the property. At Hemlo, the similarly altered Moose Lake porphyry, with which the ore bodies are spatially associated, is by and large not auriferous either. It is important to note, however, that such alteration is considered to be important in characterizing potential exploration targets in the immediate vicinity of these altered rocks. Lithogeochemical sampling and detailed mapping is planned to delineate alteration zones on the property.

Banana Lake and Cecil Township Occurrences

Two occurrences of hydrothermally altered rocks were discovered and subsequently visited in 1993. The occurrences are situated on 2 properties held by Noranda Inc., Geco Division. The Banana Lake property is located approximately 23 km northeast of Manitouwadge in Herbert Township. The other occurrence is located on the Faries-Rawluk Lake property in Cecil Township, approximately 10 km east-southeast of Manitouwadge. These occurrences are significant in that they are mineralogically and geochemically similar to hydrothermally altered rocks that stratigraphically underlie the volcanogenic base metal deposits in the Manitouwadge camp. They therefore represent viable exploration targets, far-removed from the known base metal deposits and have dramatically expanded the prospective search area for other such deposits.

East of Banana and One Otter lakes, semicontinuous screens of orthoamphibole-garnet gneisses, mafic rocks and iron formation define complex folding. Much of the enclosing rock is foliated, quartz-rich tonalite similar to a synvolcanic intrusion to the west. The supracrustal rocks have been tentatively correlated with the Geco Mine series rocks, separated by an inferred sinistral shear zone (Zaleski and Peterson 1993).

The area of most interest on the Banana Lake property was discovered by E. Zaleski of the Geological Survey of Canada as part of her field work in the area. The "Zaleski Zone" consists of coarse-grained garnet (up to 5 cm in diameter) and orthoamphibole (anthophyllite or gedrite) in a mafic volcanic host. These 2 alteration minerals may comprise up to 100% of the rock and typically comprise over 50%. The mafic volcanic rocks occur as enclaves in magnetic, quartz tonalite to granodiorite. This alteration zone may be a continuation of a similar, folded zone at the neighbouring One Otter Lake East property to the north. The One Otter Lake East zone contains only trace amounts of sulphides but has returned up to 0.7% Zn. The zinc spinel, gahnite, has been identified and probably accounts for the zinc values (H. Lockwood, Noranda Inc. Geco Division, personal communication, 1993). A sulphide-free, grab sample of garnet-orthoamphibole gneiss from the Zaleski zone returned the following (partial) assays:

Cu (ppm)	Zn (ppm)	Pb (ppm)	Au (ppb)	SiO_2 (%)	TiO_2 (%)	MgO (%)	Na_2O (%)	K_2O (%)
8	17	5	<5	59.98	0.85	8.17	0.59	<0.05

(Resident Geologist's files, Resident Geologist's office, Schreiber-Hemlo District, Thunder Bay)

Cecil Township

The showings consist of a number of float and bedrock occurrences of garnet-biotite-altered, mafic metavolcanic rocks. The initial discovery of large, angular, gossanous boulders focused prospecting activity in the area aided by the fact that the area had been recently logged. Several of the boulders appear to have been pushed up in the sandy till during road construction.

The boulders vary in size up to 1 m and are quite angular. Based on these observations, it appears as though they were derived from a nearby bedrock source. The boulders are weakly magnetic to non-magnetic, rusty, schistose and friable. They are mineralized locally with $\leq$2% pyrite $\pm$ chalcopyrite as disseminated, fine-grained sulphides or narrow seams. Alteration is manifested in the development of large ($\leq$3 cm), subhedral garnet porphyroblasts in a biotite-rich matrix. The majority of the boulders consist of amphibolite or plagioclase-amphibole gneiss presumably of mafic volcanic origin. Coarser-grained, knobbly-textured rocks have been tentatively identified as gabbroic units within the volcanics.

Outcrops are limited to small ridge exposures located east and northeast of the boulders. Gabbroic rocks contain chalky plagioclase subhedra and are lineated at 15/25N. Approximately 130 m northeast of the float occurrence, a northwest-trending ridge provides exposures of altered and unaltered metavolcanic rocks. Smaller ($\leq$1 cm) porphyroblasts of garnet ($\pm$ quartz) may locally comprise $\leq$50% of the rock. The garnets protrude from outcrops to produce a characteristic knobby, weathered surface. Garnets appear to be preferentially developed in the more mafic portions of breccia-textured rocks such as in mafic clasts in a plagioclase-rich matrix. Unaltered rocks in the vicinity are typically amphibolite/amphibole schist. Some rocks are notably more leucocratic and contain abundant muscovite, plagioclase and perhaps sillimanite.

Grab sampling of well-mineralized, orthoamphibole-biotite schist by prospector G. Gionet returned assay values up to 0.9545% Cu and 134 ppm Zn. Major oxide values (%) are as follows

SiO_2	Al_2O_3	Na_2O	K_2O	MgO	CaO
47.78	11.78	1.39	0.54	4.62	9.59 %

(G. Gionet, Prospector, personal communication, 1993)

A grab sample of sulphide-bearing, garnetiferous, amphibole-biotite-quartz-feldspar schist collected by Resident Geologist staff returned nil Au, nil Ag, 530 ppm Cu and 58.39 ppm Zn (Resident Geologist's files, Resident Geologist's office, Schreiber-Hemlo District, Thunder Bay).

Anomalous amounts of copper also occur in till samples collected from the vicinity of the occurrence (Kettles 1993).

RECOMMENDATIONS FOR EXPLORATION

Gold

Schreiber Area

The vast majority of gold occurrences in the Schreiber area are hosted by discrete structures, usually composite quartz ± carbonate veins. Vein orientations are generally subparallel to fault and joint sets in host rocks; en echelon and conjugate arrays are common. Auriferous structures are hosted by a variety of rock types including supracrustal and felsic intrusive rocks. Veins are commonly localized along contacts and discontinuities. Host rocks show little evidence of ductile deformation although some primary features may be somewhat flattened.

There is a strong spatial association between gold occurrences and felsic intrusive rocks (quartz- and quartz-feldspar-porphyries, syenite and trondhjemite) as well as lamprophyre dikes. Locally auriferous, sericite-chlorite-quartz-pyrite ± carbonate alteration is commonly developed around veins, but is usually of limited lateral extent.

The vein-hosted nature of the mineralization suggests it was emplaced in a brittle shear setting. Dilatancy in such an environment may have resulted chiefly from bulk, inhomogeneous flattening, perhaps related to compressive stress imparted by the enclosing Terrace Bay and Whitesand batholiths. Zones of competency contrast and pre-existing weakness (e.g. contacts, interflow sedimentary units, etc.) were important in the localization of shears. The close spatial association between felsic intrusive rocks, gold occurrences and hydrothermal alteration may reflect the fact that these rocks are loci for fracturing; it also suggests that the hydrothermal activity which accompanied gold deposition may be related in part to late-stage events within these intrusions.

Most exploration in the past has focused on tracing and sampling narrow, but high-grade veins. It is possible that veins may occur in parallel or conjugate arrays or as brecciated, stockwork zones with abundant microfracturing. Such vein arrays and the intervening altered rocks may represent larger-tonnage, lower-grade targets.

Characterizing how gold occurs in a particular area may help in locating additional mineralized zones or in target area selection. Felsic intrusive rocks with which gold is spatially associated can be characterized on the basis of their mineralogy, texture and geochemistry. The alteration assemblages with which gold is associated may be unique and can be used to help sort out barren from gold-bearing systems. Detailed study of newly discovered veins on the North Shores property, for example, has shown that chloritization and silicification is well developed adjacent to gold-bearing veins, but is poorly developed or absent around barren veins. Moreover, auriferous veins appear to have similar or "preferred" orientations as opposed to more randomly oriented, barren veins (R. Felix, Noranda Exploration Company Limited, personal communication, 1993).

As summarized by Schnieders et al. (1993), certain exploration criteria can be utilized and/or modified for a variety of precious and base metal deposits in which hydrothermal processes have been important. The 2 most important criteria are: (1) evidence of hydrothermal fracturing and alteration and (2) rocks that are attributable to felsic magmatism, the late stages of which may often lead to the formation of hydrothermal ore deposits (Burnham and Ohmoto 1980). Adoption of these criteria has led to success at Hemlo, both in understanding local mineralization and in finding additional mineralized zones.

Additional recommendations for gold can be found in Schnieders et al. (1993), Schnieders and Smyk (1993) and in earlier Reports of Activities.

Base Metals

Prairie River Area

The Prairie River area comprises a number of base metal occurrences that occur within an east-trending package of metavolcanic and metasedimentary rocks over a distance of approximately 10 km from east of Santoy Lake to near McKellar Lake (Figure 3). Numerous occurrences, including the Marlhill, Prairie West, Bozena Lake, Goldbar Lake, MacKellar Bay and Alvey, have been the focus of exploration as recently as 1990, and reconnaissance-scale activity is ongoing in the surrounding area.

This portion of the Schreiber-Hemlo greenstone belt, mapped by Walker (1967), consists predominantly of amphibolite-facies, intermediate to felsic metavolcanic rocks, mainly andesite, rhyolite and associated pyroclastic rocks. In the vicinity of many of the base metal occurrences, the host rocks have been altered and deformed to produce distinctive sericite- and chlorite- and garnet-bearing schists. Mafic metavolcanic and clastic metasedimentary rocks and iron formation are intercalated with the aforementioned rocks. A large, east-closing fold, inferred by Walker (1967) may account for observed reversals in younging directions.

The Marlhill occurrence comprises 2 separate, subparallel copper- and zinc-rich zones, respectively, within an area approximately 90 m wide and 600 m long (assessment files, Resident Geologist's office, Schreiber-Hemlo District, Thunder Bay). Mineralization consists mainly of disseminated to stringer pyrite, chalcopyrite and sphalerite in quartz-sericite schist with quartz stringers. Similarly mineralized rocks occur at the Prairie West occurrence. At Goldbar Lake, the host rocks are sericite-chlorite-biotite ± carbonate ± garnet schists.

The MacKellar Bay and Bozena Lake occurrences are somewhat different from the showings described above in that they appear for the most part to be associated with fracture zones within felsic metavolcanic and metasedimentary rocks. The main Bozena Lake (North) occurrence, drilled by Gulf Minerals in 1981, consists of a conjugate fracture set infilled by quartz and/or calcite with sphalerite, pyrite and chalcopyrite (assessment files, Resident Geologist's office, Schreiber-Hemlo District, Thunder Bay). At the MacKellar Bay showing, quartz-carbonate veins contain pyrite, sphalerite and galena. Significant silver assays have been returned from this occurrence; freibergite [$Cu_6(Ag,Fe)_6Sb_4S_{13}$], identified by Kissin and McQuaig (1988) at the nearby Dead Horse Creek veins, is the probable silver carrier.

Significant assay results from these occurrences are listed in Table 4. It is important to note that some remarkable intersections were encountered outside of the main mineralized zones and between individual occurrences.

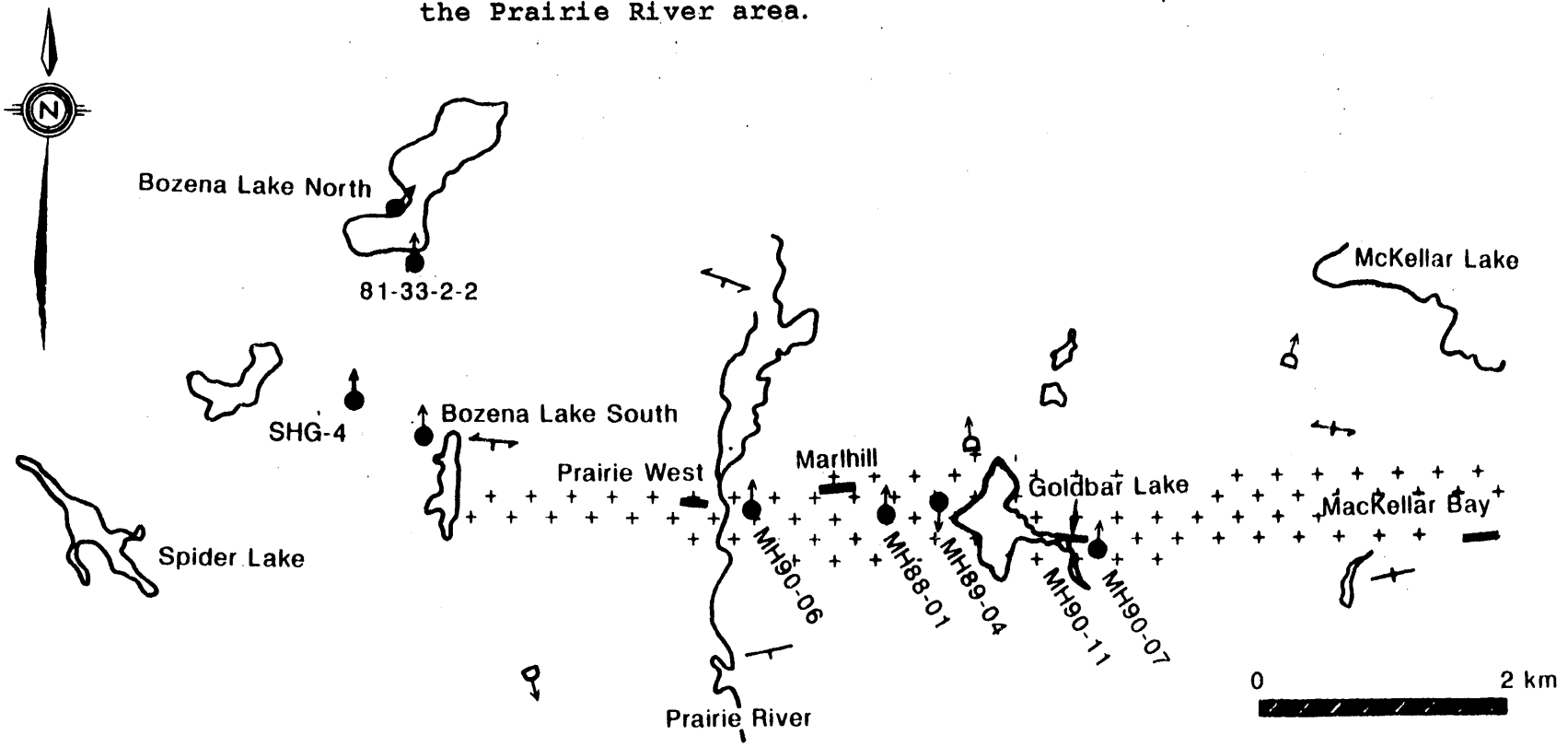
A broad, east-trending zone of sodium depletion ($Na_2O<2\%$) (Figure 3), gleaned from a whole-rock lithogeochemistry survey conducted by Noranda Exploration Company Limited in 1988 and 1989, envelopes the Prairie West, Marlhill, Goldbar Lake and MacKellar Bay occurrences (assessment files, Resident Geologist's office, Schreiber-Hemlo District, Thunder Bay). Hydrothermally altered rocks, ranging in composition from basalt to rhyolite show depletion in total Na, as well as in the relative amount of Na to K, displayed as a marked increase in their Alkali Indices (Figure 4). Representative, sodium-depleted samples from the Prairie River area mimic altered samples from the Winston Lake Mine suggesting that they too may represent part of an alteration zone related to volcanogenic massive sulphide deposition.

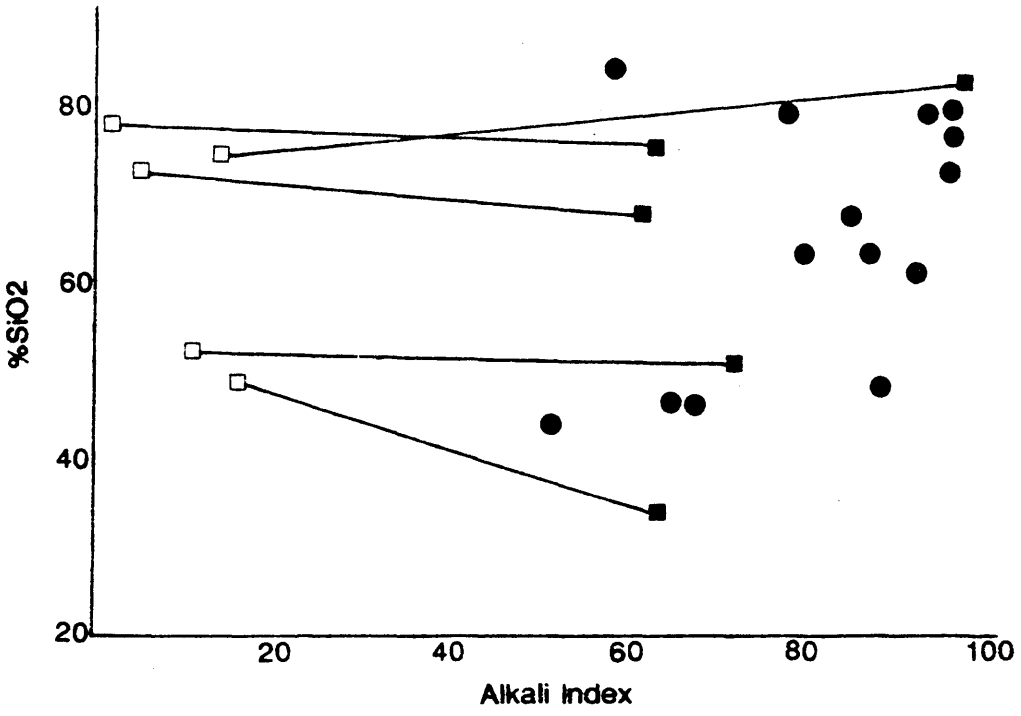
The distinctive geochemical signature of altered, mineralized rocks together with the style of mineralization and the nature of the host rocks suggest a volcanogenic massive sulphide model for base metal mineralization in the Prairie River area. The application of such a genetic model, however, is complicated by alteration and deformation which have obscured original lithologic features and stratigraphic relationships. While much exploration and drilling have taken place in the immediate vicinity of the Marlhill occurrence, favourable rocks

Table 4. Selected assays from the Prairie River area.

Occurrence/ Zone	Selected Assays/ Intersection Length				Host Rocks
	Zn (%)	Cu (%)	Ag (g/t)	Au (g/t)	
Marlhill	1.5	0.07	----	0.18	andesite tuff
		3.05 m			
	----	1.35	----	----	andesite tuff
		3.22 m			
MH 88-01	1.04	0.04	2.8	----	mafic to felsic volcanics
		11.0 m			
	0.52	----	----	----	" "
		42.5 m			
MH 89-04	0.22	----	----	----	chlorite-sericite schist
		20.7 m			
Prairie West	3.15	1.12	38.0	0.27	inter. to mafic tuff
		1.0 m			
Bozena Lake North	3.36	----	----	----	quartz-carbonate vein(s)
		17.04 m			
		including			
	13.24	0.11	----	----	
		3.35 m			
Bozena Lake South	0.98	0.53	----	----	andesite tuff
		2.11 m			
SHG-4	0.14	0.10	----	----	silicate BIF
		6.8 m			
Goldbar Lake	0.98	4.73	80.1	0.76	chlorite-sericite schist
		1.1 m			
	0.12	----	----	----	chlorite-biotite schist
		27.0 m			
MacKellar Bay	13.0	----	824.0	7.14% Pb	fractured felsic volcanics
		1.37 m			

Figure 3. Base metal occurrences and significant intersections in the Prairie River area.





Plot of wt.% SiO_2 vs. Alkali Index ($K_2O/(K_2O + Na_2O)$) x 100

□ Winston Lake volcanics (unaltered)

■ Winston Lake volcanics (altered equivalents)

● Prairie River volcanics (altered; Na_2O <1 wt.%)

Figure 4. Lithogeochemical data for Winston Lake and Prairie River volcanic rocks.

and other interesting base metal showings have been recognized. Garnetiferous pyroclastic breccias were noted in the Spider Lake area by Schnieders in Patterson et al. (1985). Schnieders et al. (1993) reported that prospectors J. Courtney and G. Daniels collected soil samples on their Fire Mountain property, just north of Highway 17, that returned assay values of up to 2623 ppm Zn.

Additional recommendations regarding exploration for volcanogenic massive sulphide deposits, as well as other base metal deposits, are presented in Schnieders et al. (1993), Schnieders and Smyk (1993) and in earlier Reports of Activities.

Industrial Minerals

Bodies of massive granodiorite to granite and diorite-monzonite-granodiorite, numbered 14 and 15, respectively on the Geology of Ontario maps (Ontario Geological Survey 1991a,b) should be prospected for dimension stone. The Killala Lake and Coldwell alkalic complexes should be investigated for their stone and ornamental feldspar potential. Flake graphite occurrences, such as those located north of Manitouwadge (Hinz and Lucas 1993), are worth investigation because of expected growth in graphite markets. High-purity quartz veins, like those south of Dickison Lake (Hinz and Lucas 1993), are in high demand especially if located near an existing road.

GEOLOGICAL SURVEY OF CANADA ACTIVITIES

E. Zaleski and V. Peterson of the Continental Geoscience Division continued a bedrock geologic study of the Manitouwadge greenstone belt that was initiated in 1991. Detailed mapping and lithogeochemistry has led to the publication of a 1:25 000 scale map of the belt (Zaleski and Peterson 1993).

I. Kettles of the Terrain Sciences Division completed follow-up geochemical sampling of drift and surficial sediments in the Manitouwadge area. Results from earlier work in 1991 have been published (Kettles 1993) and results from work completed in 1992 and 1993 are currently in press.

NSERC STRATEGIC GRANT PROJECT

The lead-isotopic compositions of 55 of the samples collected from the Manitouwadge area in 1992 have been determined. The <2 micron and -250 mesh fractions yielded 110 analyses. Five sulphide ore samples from the Geco Mine and 8 rock samples from E. Zaleski (GSC, see above) were also analyzed.

Preliminary findings appear to be similar to those from the volcanogenic massive sulphide deposits of the Chisel Lake area, Manitoba (Bell and Franklin 1993).

These include:

(i) ore samples represent the least radiogenic material analyzed;
(ii) till samples proximal to, and down-ice from, the Geco and Willroy deposits yield low (ore-like) Pb-isotopic compositions, suggesting geochemical dispersal by Quaternary processes; and
(iii) all data, taken together, form a linear array on a plot of $^{207}Pb/^{204}Pb$ vs. $^{206}Pb/^{204}Pb$ (J. Card, Carleton University, personal communication, 1994).

Splits of some of the samples collected for the isotopic study were incorporated into a joint regional geochemistry study, focused in the Manitouwadge greenstone belt, in collaboration with the Geological Survey of Canada (Kettles and Murton, in press).

The Manitouwadge work is part of a three-year university Strategic Grant project funded by the Natural Sciences and Engineering Research Council of Canada (NSERC). The principal investigator is K. Bell (Carleton University); J. Franklin, D. Sangster and W. Shilts (Geological Survey of Canada) are co-investigators. J. Card (Carleton University) is the project co-ordinator.

RESEARCH BY OTHER AGENCIES

R. Purdon (MSc candidate, Lakehead University, Thunder Bay) and P. Fralick (Professor, Lakehead University, Thunder Bay) are investigating sedimentary rocks in the Schreiber-Hemlo greenstone belt.

D. Wyman (Research Associate, University of Saskatchewan, Saskatoon) and R. Kerrich (Professor, University of Saskatchewan, Saskatoon) are conducting research on the use of trace elements to identify known deposit-bearing sequences in disrupted greenstone belts such as at Manitouwadge and Hemlo.

SELECTED PUBLICATIONS RECEIVED

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---- 1993. Shaded relief aeromagnetic map of the Manitouwadge greenstone belt; Geological Survey of Canada, Open File Map 2755, scale 1:25 000.

Good, D.J. 1992. Genesis of copper-precious metal sulfide deposits in the Port Coldwell alkalic complex, Ontario; unpublished Ph.D. thesis, McMaster University, Hamilton, 203p.

---- 1993. Genesis of copper-precious metal sulfide deposits of the Port Coldwell alkalic complex; Ontario Geological Survey, Open File Report 5839, 231p.

Kettles, I.M. 1993. Reconnaissance geochemical data for till samples from the Manitouwadge area, Ontario; Geological Survey of Canada, Open File 2616, 197p.

Muir, T.L. 1993. Geology of the Hemlo gold deposit area; Ontario Geological Survey, Open File Report 5877, 264p.

---- 1993. Lithology, Hemlo gold deposit area, western part; Ontario Geological Survey, Preliminary Map P.3237, scale 1:5000.

---- 1993. Lithology, Hemlo gold deposit area, north-central part; Ontario Geological Survey, Preliminary Map P.3238, scale 1:5000.

---- 1993. Lithology, Hemlo gold deposit area, south-central part; Ontario Geological Survey, Preliminary Map P.3239, scale 1:5000.

---- 1993. Lithology, Hemlo gold deposit area, eastern part; Ontario Geological Survey, Preliminary Map P.3240, scale 1:5000.

---- 1993. Structural geology, Hemlo gold deposit area, western part; Ontario Geological Survey, Preliminary Map P.3241, scale 1:5000.

---- 1993. Structural geology, Hemlo gold deposit area, north-central part; Ontario Geological Survey, Preliminary Map P.3242, scale 1:5000.

---- 1993. Structural geology, Hemlo gold deposit area, south-central part; Ontario Geological Survey, Preliminary Map P.3243, scale 1:5000.

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Sioux Lookout Resident Geologist's District - 1993

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INTRODUCTION

The volume of exploration undertaken in the Sioux Lookout District in 1993 declined slightly from the levels experienced during 1992. Prospectors and mineral exploration companies conducted 24 exploration programs in the district during the year. Exploration within the district was split evenly between gold and base metal programs. Programs in the Sioux Lookout portion of the Wabigoon greenstone belt accounted for 79 percent of the work done in the district. Figures 1a and 1b show the site locations for the programs carried out in 1993. Table 1, which is keyed to figures 1a and 1b, provides more detailed information on the exploration programs.

There was one advanced exploration program active in the area during 1993. A three year advanced exploration and development program started on the Musselwhite gold properties of Placer Dome Canada Ltd. located at Opapimiskan Lake in the North Caribou Lake belt. A positive feasibility study in 1996 would result in the development and production of the deposits.

Locke Rich Minerals Ltd. of Houston, Texas are negotiating with a mining company who wish to acquire the Goldlund Mine, located 38 km south of Sioux Lookout. It is reported that a due diligence agreement has been signed by the two companies.

MINING ACTIVITY

Two gold mines were in production within the Sioux Lookout Resident Geologist's district during 1993. Figures 2a and 2b give the location of the active mines in the district.

The Golden Patricia Mine (Lac Minerals Ltd.) is located approximately 70 km west-southwest of Pickle Lake. The mine recovers gold from a long quartz vein system. At present, the mine is accessed by two declines approximately 1 km apart. During 1992, a one-compartment shaft with manway to 330 m was commissioned and has been used throughout 1993. Access to the mine site is by air to a private strip on site. During the winter, a seasonal road is constructed which follows an existing powerline to the town of Pickle Lake. The mine employed 167 workers at the end of 1993.

The mine uses conventional grinding, gravity separation and cyanidation followed by zinc precipitation to recover gold. During 1993, the mill operated at approximately 375 tonnes per day with an average head grade of 17.6 g/t Au. During the year, 136 714 tonnes were milled to produce 74 712 troy ounces of gold (J. Brisco, Lac Minerals Ltd., written communication, 1994).

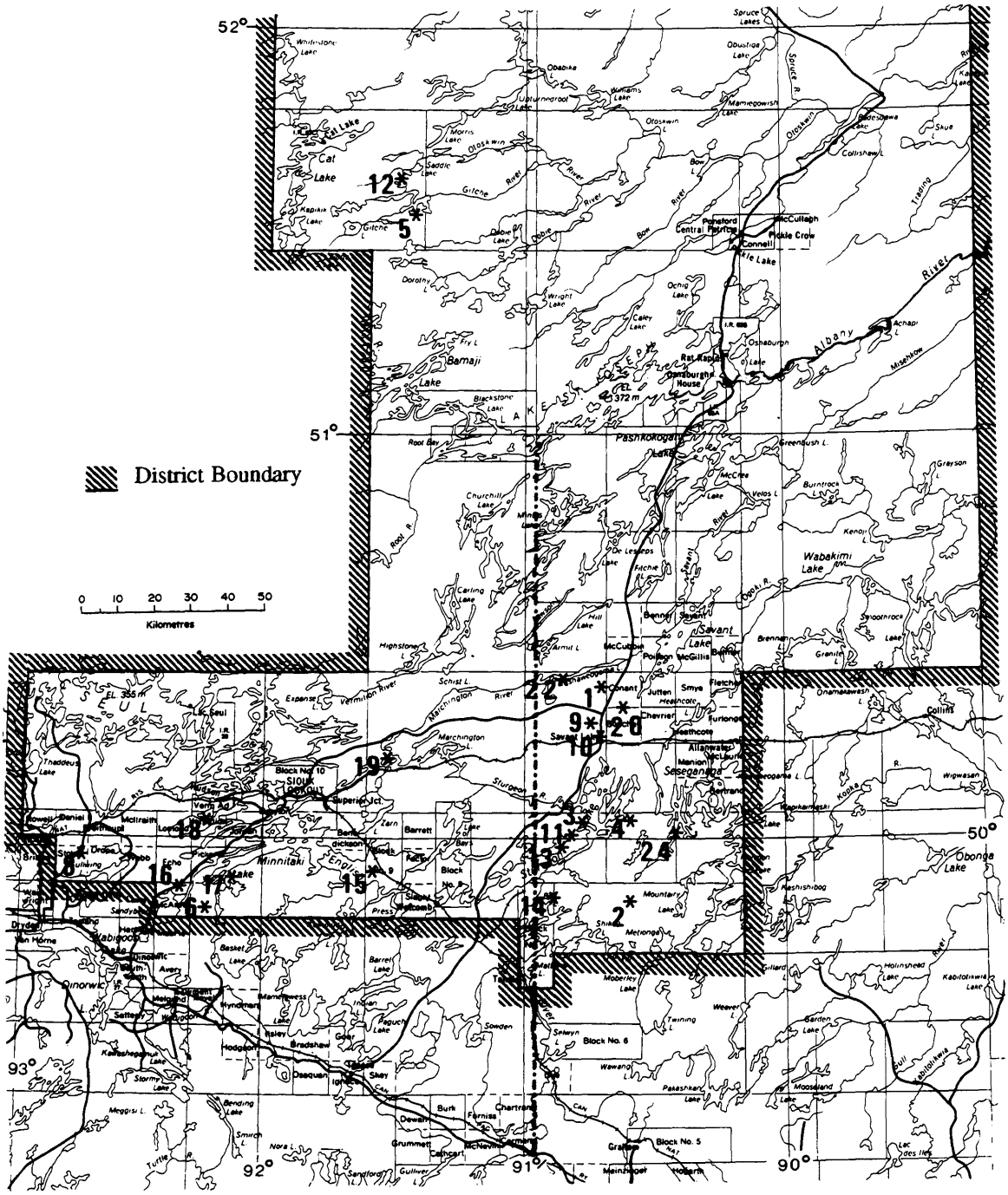


Figure 1a. Sioux Lookout Resident Geologist's District, exploration activity, 1993.

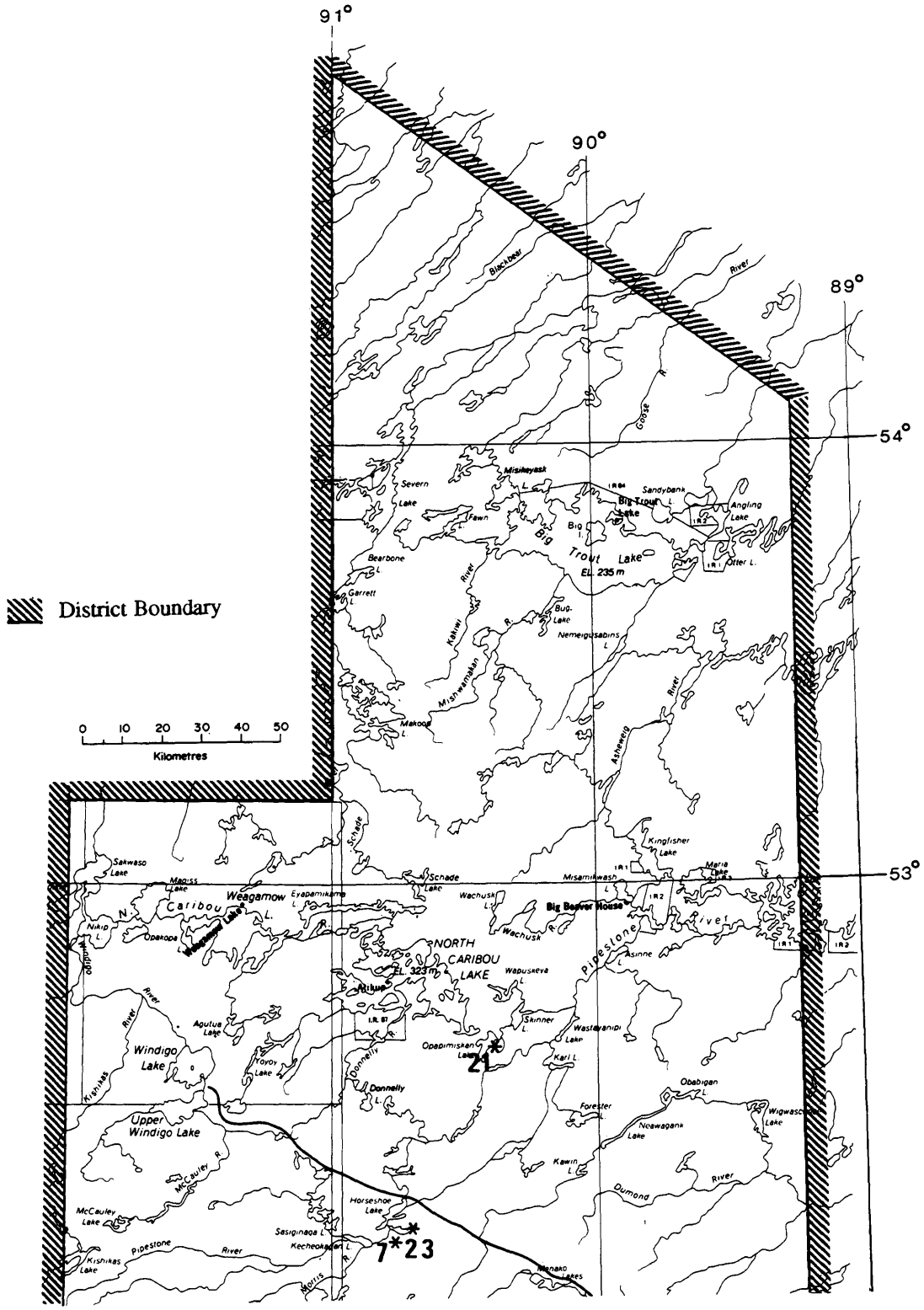


Figure 1b. Sioux Lookout Resident Geologist's District, exploration activity, 1993.

The Dona Lake Mine, (Dona Lake Gold Mine Ltd.) is located 12 km. southeast of the town of Pickle Lake. Dona Lake Gold Mine Ltd. is controlled by Ross Finley Ltd. The mine recovers gold from a highly deformed pyrrhotite-replaced iron formation. As of January 1 of 1994, reserves stood at approximately 148 000 tonnes at a grade of 7.78 g/t Au. Production during 1993 totalled 146 389 tonnes at a grade of 7.46 g/t Au . This includes 93 941 tonnes at 7.94 g/t Au mined by Placer Dome Inc. and 52 448 tonnes at 6.60 g/t Au mined by Ross Finley Ltd. Societe Miniere Ecudor Inc. recently acquired a 15 per cent interest in the mine. (D. Cullen, Dona Lake Gold Mine Ltd., written communication, 1994)

In 1994, a ramp will be driven from the 445 m level to the 505 m level to access the Main Zone between these levels. A drilling program is planned to test for down dip extensions of the Main Zone below the 505 level. Development and production will continue in the B Zone between the 220 and 352 levels. The crown pillar ore should be fully mined by spring and will be stockpiled on surface until required. Underground mining is expected to end by the summer of 1994. (D. Cullen, Dona Lake Gold Mine Ltd., written communication, 1994).

MINE REHABILITATION PROJECTS

Mattabi Mine/Lyon Lake Mine/F-Group Pit

A proposed closure plan, as required by Part VII of the Mining Act, was submitted to the Director of Mine Rehabilitation by Mattabi Mines Limited, on October 1, 1993.

This proposed Plan has been circulated to the Ministries of the Environment and Energy, Natural Resources and Labour for review and comment.

Mattabi Mines Limited has proposed a perpetual care closure strategy to collect and treat acid mine drainage originating from the F-Group Pit and Mattabi Mine/mill and tailings areas. Closure of the three mined areas includes grading, revegetation, removal of infrastructure., and long-term monitoring. Most of this work will be completed by 1997.

Metall Sturgeon Lake Mine

The closure plan for this property was approved by the Director of Mine Rehabilitation on November 3, 1993.

Metall Mining Corporation is committed to constructing a saturated alkaline cover over reactive sulphide tailings. This approach is designed to suppress the production of acid mine drainage; but will not eliminate it. Remediation work began in 1989 and is scheduled to be completed by 1996. The company will also monitor the property for at least 20 years to determine the success of the closure.

ADVANCED EXPLORATION PROGRAMS

The Musselwhite Project at Opapimiskan Lake was the only advanced exploration program in the Sioux Lookout District in 1993. The project is a joint venture between Placer Dome Canada Ltd. (68%) and TVX Gold Inc. (32%). Placer Dome Canada Ltd. is the project operator. During 1993, Placer Dome conducted a nearly continuous program of diamond drilling to further delineate zones of gold mineralization. A barge/platform on Opapimiskan Lake was used to complete part of the drilling. Placer Dome also conducted programs of line cutting and geophysical surveys. The current indicated gold resource for the project is 1.3 million ounces or 4 245 000 tonnes grading 9.52 g/t Au. A partial estimate of the inferred resource for the project is an additional 700 000 ounces of gold (George Cross News Letter, Dec. 10, 1993). In the winter of 1993/94, Placer Dome plans to continue delineation diamond drilling on the mineralized zones. In the spring, Placer Dome hopes to start construction on a single-lane, all-weather road

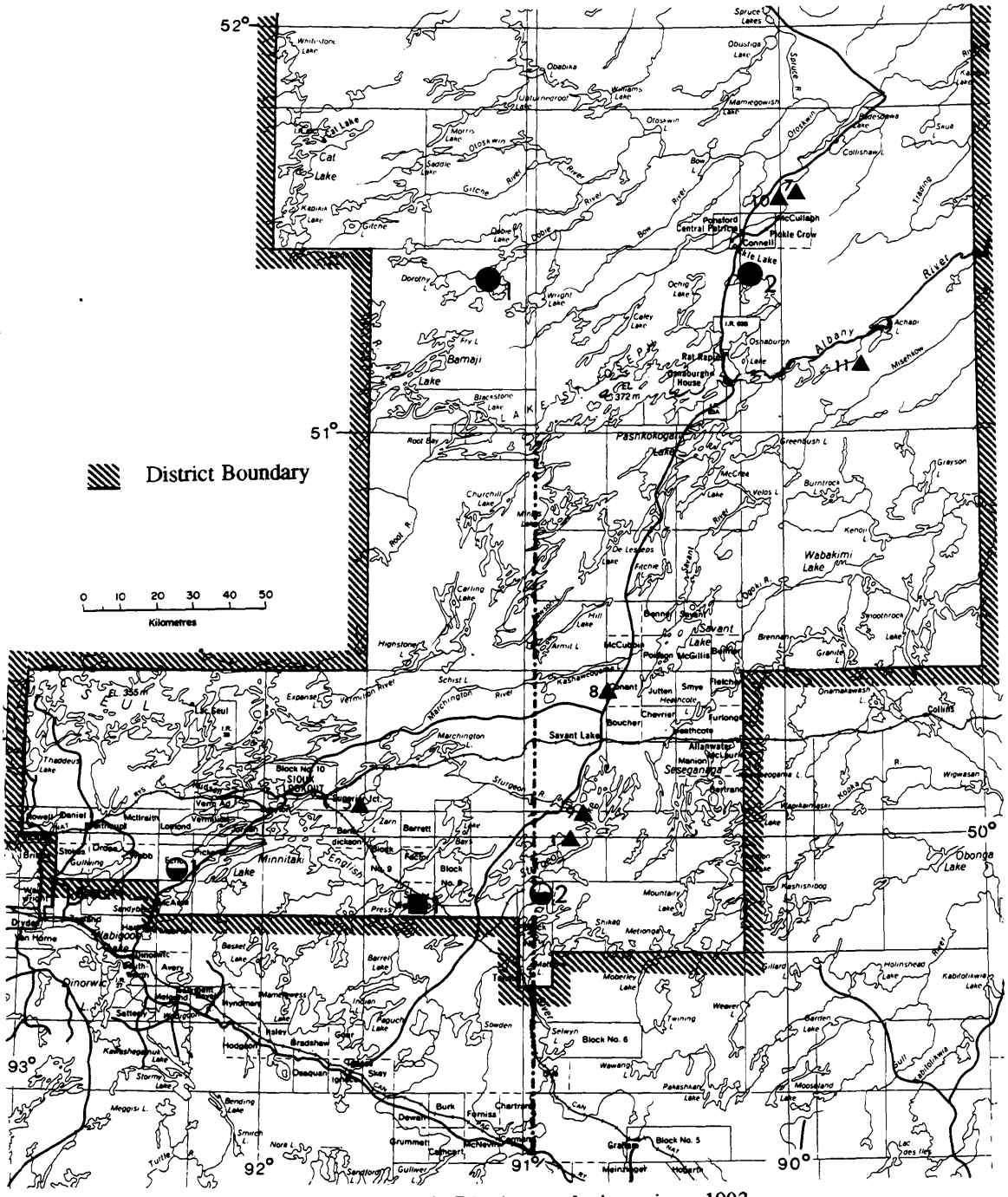


Figure 2a. Sioux Lookout Resident Geologist's District, producing mines, 1993.

EXPLANATION

- ● **Producing Mines, 1993**
  1. Lac Minerals Ltd., Golden Patricia Mine.....Au, Ag
  2. Dona Lake Gold Mine Ltd., Dona Lake Mine.....Au, Ag
- ○ **Advanced Exploration Projects**
  1. Placer Dome Canada Ltd./TVX Gold Inc., Musselwhite Project
- ◒ **Mills**
  1. Locke Rich Minerals Ltd.
  2. Mattabi Mines Ltd.
- ■ **Producing Quarries**
  1. C.N.R. Watcomb Quarry
- ▲ **Diamond Drill Core Collection Sites (keyed to Text)**

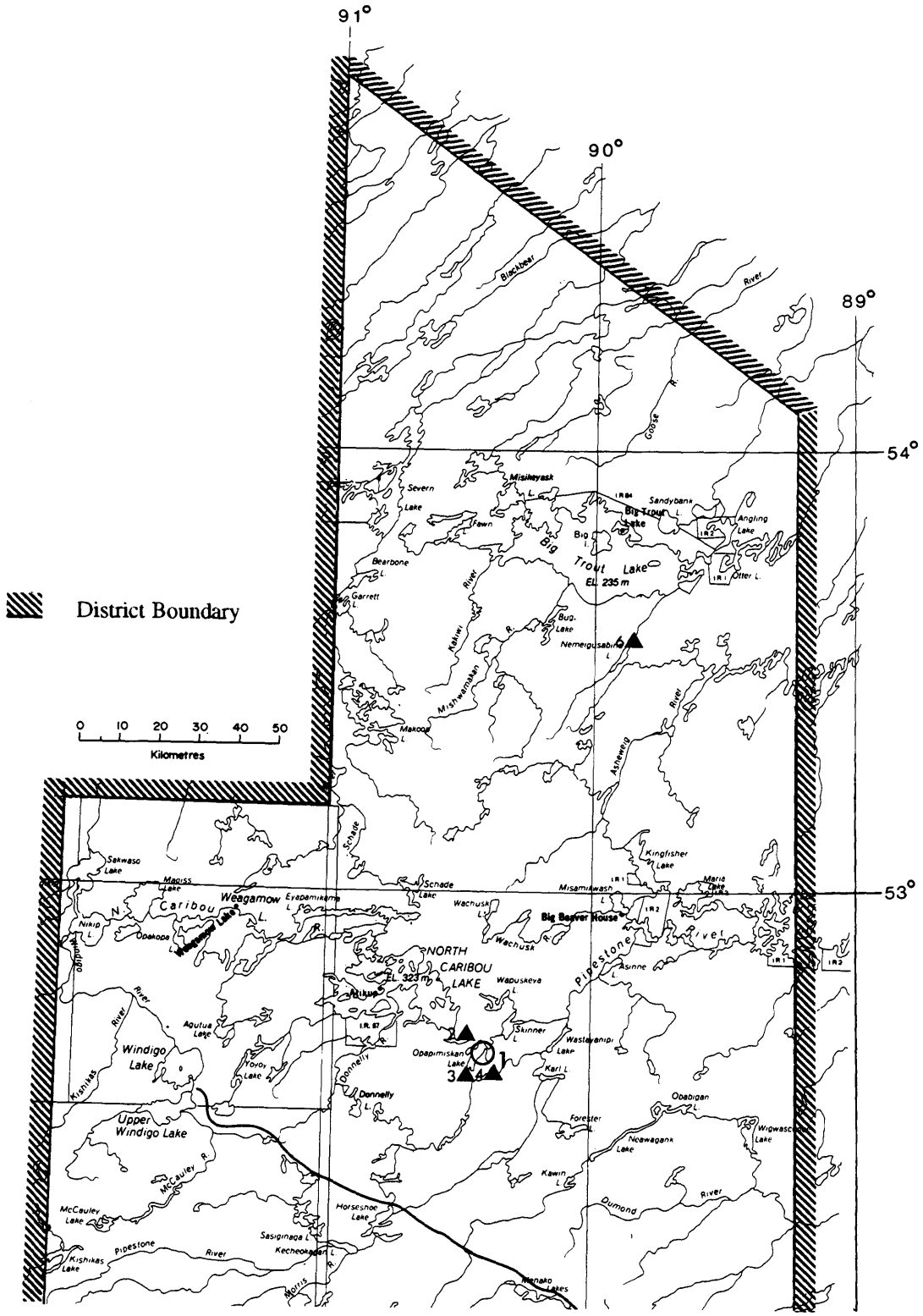


Figure 2b. Sioux Lookout Resident Geologist's District, producing mines, 1993.

to the property and initiate an underground exploration program. This will lead to a feasibility study in 1995 and, hopefully, a production decision in 1996. (E. Kimura, Placer Dome Canada Ltd., verbal communication, 1993)

EXPLORATION ACTIVITY

The level of exploration activity in 1993 in the Sioux Lookout Resident Geologists district was slightly less that it was in 1992. Records show a total of 24 exploration and prospecting programs took place in the district during the year. In addition to these programs of record, several major exploration companies did reconnaissance work and acquired claims as a result.

The focus of the exploration work was split between gold and base metals by both the mineral exploration companies and the prospectors. The southern part of the district still received more work than the north in terms of the number of programs. Table 1 is a summary of the 24 documented exploration programs. Table 2 is a summary of claims recorded and assessment work credit for the year.

Highlights of the year in exploration activity are as follows:

At McVicar Lake, BHP Minerals Canada Ltd. made the discovery of a narrow (2 - 50 cm) smoky-grey quartz vein with a strike length of at least 200 m. A series of 34 channel samples of the vein over a length of 125 m averaged 28.8 g/t Au. The vein was tested with 5 diamond drill holes and was encountered to a vertical depth of 135 m. Assays of the vein in drill core did not return significant values. (C. Waldie, BHP Minerals Canada Ltd., written communication, 1993)

Champion Bear Resources Ltd. conducted a 52 hole, 5348.2 m diamond drilling program on their Swimit Lake gold project (S. Sears, consultant, Sears, Barry and Associates, written communication, 1993). Early results from the drilling indicated mineralization in 6 holes averaging 0.23 ounce Au per ton over 1.55 m with the best intersection averaging 0.536 ounce Au per ton over 1.86 m. (Canada Stockwatch, January 14, 1993)

Dryden prospectors Alex Glatz and Alex Kozowy, discovered a series of low grade copper and zinc showings south of Anaway Lake in Stokes Tp. and in Drope Tp. The mineralization occurs in a unit mapped as a succession of metasediments. Assays over 0.5% Zn and 1.00% Cu have been obtained from sulphides (py, cp, sp) occurring in what the prospectors describe as mafic volcanics. (A. Glatz, Prospector, written communication, 1993)

DISTRICT STAFF ACTIVITIES

Classified staff in the Resident Geologist's office during 1993 included D. A. Janes, Resident Geologist, G. W. Seim, Staff Geologist and M. O. Roy, Administrative Assistant. During the spring of 1993, A. MacTavish was on contract to produce digital maps of a number of critical areas within the district. During the summer field season, J. Brinkman was employed as a field assistant. Both D. A. Janes and G. W. Seim continued evaluation of mineral occurrences and properties with potential for development in the Wabigoon Sub-province. G. W. Seim conducted field trips and limited examinations of selected portions of the Central Uchi belt.

Of great interest to the local staff was the move to a new office building close to the old office in Sioux Lookout. The Resident Geologist and Mining Recorder offices moved to this location in September 1993. This new building is designed for the purpose of serving the exploration and mining industry and contains a fully integrated data network, a sample preparation room and adequate file and storage space.

During the spring of 1993, the office staff carried out two demonstrations and training sessions for the Beep Mat

Table 1. Exploration activity during 1993

No. on Figs. 1a and 1b	Company or Individual	Activity
1	Asarco Expl. Co. of Canada Ltd.	3 ddh--444.2 m in the Evans Lake Area
2	A. Benderite	Stripping and trenching in the Dunne Lake area
3	A. Best	Diamond drilling in the Four Bay Lake area
4	A. Best	Line cutting, magnetometer survey and diamond drilling in the Squaw Lake area
5	BHP Minerals Canada Ltd.	12 ddh--1517 m, magnetometer, VLF-Em, HLEM, I.P. and humus surveys, and geological mapping, stripping and channel sampling in the McVicar Lake area
6	Champion Bear Resources Ltd.	52 ddh--5348.2 m in the Keikewabik Lake area
7	J. Dignard	Prospecting in the Kecheokagan Lake Area
8	A. Glatz and A. Kozowy	Prospecting, stripping and trenching in Drope and Stokes Tps.
9	Granges Inc.	Line cutting and a surface pulse Em survey in the Evans Lake area
10	W.L. Hollingsworth	Diamond drilling in the Evans Lake Area
11	C. Kuryliw	6 ddh in the Fourbay Lake area
12	Noranda Expl. Company Ltd.	2 ddh--248 m in the Saddle Lake area
13	Noranda Expl. Company Ltd.	IP, lithogeochemical and geological surveys in the Six Mile Lake area
14	Noranda Expl. Company Ltd.	4 ddh--2973 m (Mattabi), 2 ddh--1118 m (Sturgeon Lake), IP, geological and lithogeochemical surveys (Claw Lake) in the Bell Lake area
15	Noranda Expl. Company Ltd.	Geological, HLEM and lithogeochemical surveys in the Smock Lake area
16	Noranda Expl. Company Ltd.	Prospecting and reconnaissance HLEM survey in Echo and McAree Tps.
17	Noranda Expl. Company Ltd.	Prospecting and reconnaissance HLEM survey in the Kabik Lake area and Pickerel Tp.
18	Noranda Expl. Company Ltd.	Prospecting and reconnaissance HLEM survey in Vermilion Tp
19	Noranda Expl. Company Ltd.	Prospecting in the Sharon Lake area
20	Noranda Expl. Company Ltd.	Reconnaissance geology and lithogeochemical sampling in Boucher and Conant Tps.
21	Placer Dome Canada Ltd. (TVX Gold Inc.)	84 ddh--15944.95 m, line cutting and magnetometer survey in the Zeemel Lake and Skinner Lake area
22	R. Ramsay	Stripping and trenching in the Armit Lake area and McCubbin Tp.

23	A.M. Sanderson	Prospecting and till sampling in the Wapimisk Creek area
24	T. Twomey	Trenching in the Seseganaga Lake area

program in Savant Lake and Sioux Lookout. The Staff Geologist completed and published a study of mineral occurrences in the Central Uchi greenstone belt. The staff cooperated with contractors working on the Abandoned Mines Inventory System (AMIS). Several days were spent on liaison with contractors who constructed the site and transported drill core to the Sioux Lookout Remote Core Storage site.

The Resident Geologist's office staff conducted 20 property visits. One field trip was given by the Staff Geologist in the Central Uchi area. The staff of the Resident Geologist's office compiled an edition of the "Properties Available for Option, Joint Venture or Sale" and presented technical poster displays at the Mines and Minerals Symposium in Toronto and the Northwestern Mines and Minerals Symposium in Thunder Bay.

Table 2 Summary of claims recorded and assessment-work credit

Year	Claim Units Recorded	Claim Units Cancelled	Claim Units Active	Physical Work* $	Geotechnical Surveys $	Total $
1991**	1967	3842	11502	306896	60129	449360
1992	1655	1417	11743	1557864	355342	1963404
1993	1779	2379	11143	977384	410666	1124070

* includes diamond drilling
** Revised totals from June 1, 1991 to year end 1991.

PROPERTY EXAMINATIONS

Base Metal Re-evaluation -- Minnitaki Lake-Flying Loon Lake Area

The Minnitaki Lake-Flying Loon Lake Area experienced a first pass phase of base metal exploration in the 1970's. The discovery of the economic deposits at Sturgeon Lake to the east prompted this exploration work. Starting in 1990, the area received renewed interest in the form of claim staking of untested geophysical anomalies. Many of the claims lapsed over the past year. Only 2 of the many untested geophysical anomalies have been drilled since 1990. Noranda Exploration Company Ltd. restaked some of the untested geophysical anomalies in 1993.

The Sioux Lookout Resident Geologist's Office initiated a project to re-evaluate the base metal potential of the Minnitaki Lake-Flying Loon Lake area in the spring of the 1993. The re-evaluation started with an examination of the assessment files and historical data, and a reassessment of the 1982, Ontario sponsored Sioux Lookout (AERODAT) airborne electromagnetic and magnetometer survey. This was followed by geological reconnaissance and field investigation of a few of the untested airborne anomalies.

EXPLORATION HISTORY

Prior to the 1970's, parts of the Flying Loon Lake area were subject to periods of gold and iron exploration. In 1970, Noranda Exploration Company Ltd. and several junior companies started looking for base metal deposits in the area. This exploration work consisted of airborne geophysical surveys and the staking of the best anomalies. The companies then conducted ground geophysical and some geological mapping over the anomalies. This was followed

by diamond drill testing of many anomalies. The main pulse of exploration was completed by 1973.

In the mid- to late-1970's, Mattagami Lake Mines Ltd., Geophysical Engineering Limited and others made another pass at the Flying Loon Lake area. The companies conducted programs consisting of geological reconnaissance surveys, airborne geophysical surveys, ground follow-up and diamond drilling.

In 1981, St. Joseph Explorations Ltd. staked 3 claim blocks and conducted geophysical surveys and geological mapping in the Twin Bay area of Minnitaki Lake. The claims were allowed to lapse.

In 1984, BHP-Utah Mines Ltd. drill tested three more anomalies between Minnitaki Lake and Webfoot Lake.

In 1986, Noranda Exploration Company Ltd. staked a group of claims around Smock Lake and completed geophysical surveys. The claims were allowed to lapse.

In 1990, Rio Algom Ltd. staked several claim blocks between Minnitaki Lake and Yonde Lake. No work was reported on these claims before they lapsed in 1992.

Also in 1990, Breakwater Resources Ltd. restaked 2 of the 3 claim blocks staked by St. Joseph Explorations Ltd. in 1981 and drill tested 2 anomalies with 5 diamond drill holes.

GENERAL GEOLOGY

In 1977 and 1978, the Ontario Geological Survey undertook the first detailed mapping of the whole Flying Loon Lake area (Trowell et al., 1983) as part of a regional study on the Savant Lake-Crow Lake area. Previous workers mapped parts of the area at reconnaissance scales. Trowell et al., (1983) found outcrop in the Flying Loon Lake area to be very limited with large areas having continuous drift cover. The mapping found most of the area to be underlain by mafic metavolcanics. The only felsic metavolcanics noted in outcrop were in the Southeast Bay of Minnitaki Lake. The map produced by Trowell et al.(1983) shows the locations of diamond drill holes completed in the drift covered areas to the time of the mapping. The map indicates that the drilling intersected several intervals of intermediate to felsic pyroclastics, but does not show the pyroclastics as distinct lithologic units on the map.

FIELD WORK

The field work conducted on this project in 1993 consisted of the investigation of 4 untested airborne electromagnetic (AEM) anomalies and the examination of drill core from 3 of Breakwater Resources Ltd.'s 5 diamond drill holes around Twin Bay. (*see* Figures 3a and 3b for locations). The AEM anomalies were selected to represent a range of anomaly strengths. Two anomalies (Figure 3 a, location A and Figure 3b, location D) were investigated using a Geonics EM-16 to locate and trace the anomaly axis. This was followed by prospecting/geological reconnaissance of the immediate area. The other two anomalies (Figure 3a, locations B and C) were investigated by prospecting/geological reconnaissance in the area based on topographic location. This was done because there was no VLF signal available on that day. Not one of the anomalies were explained by sulphides or other conductive material. Outcrops identified by the Staff Geologist as felsic metavolcanics are located near anomalies locations B and C. Samples of the felsic metavolcanics were submitted to the Ontario Geoscience Laboratory for geochemical analysis. The analytical results are awaited.

The Staff Geologist examined drill core from 3 of Breakwater Resources Ltd.'s 5 diamond drill holes in the Twin Bay area of Minnitaki Lake. The 3 holes are located to the northeast of Twin Bay. All 3 holes tested a geophysical anomaly at the contact between the mafic metavolcanics on the north and metasediments, including iron formation, to the south. The drill logs indicate conductive sulphides in a thin felsic metavolcanic horizon at the contact between the mafic metavolcanics and the metasediments. The Staff Geologist found the drill core (which is stored at the drill sites) to be as described in the logs. Unfortunately, the core boxes containing the sulphides and the felsic metavolcanics had been removed by Breakwater.

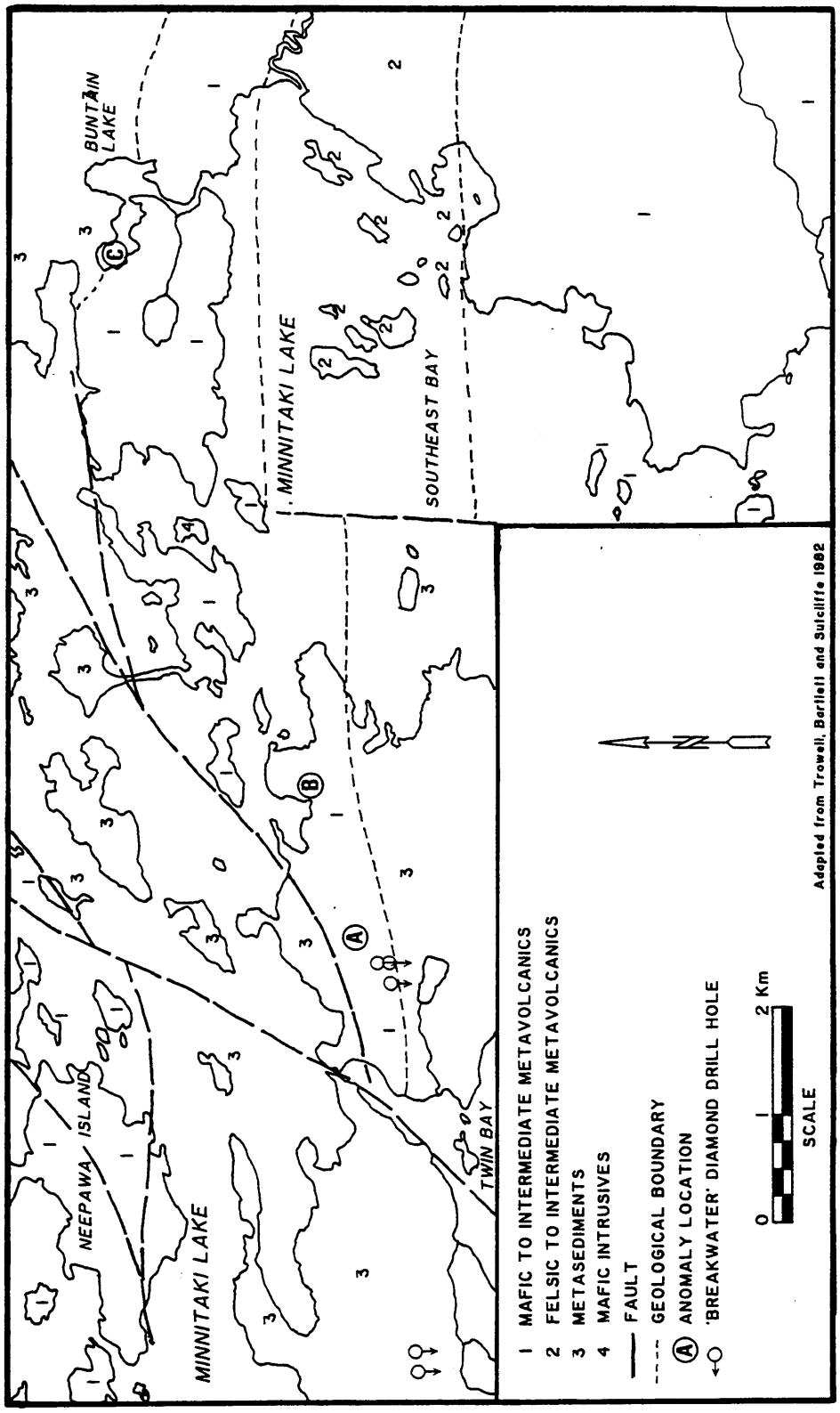


Figure 3a. Location map for the investigated geophysical anomalies in the Minnitaki Lake-Flying Loon Lake re-evaluation

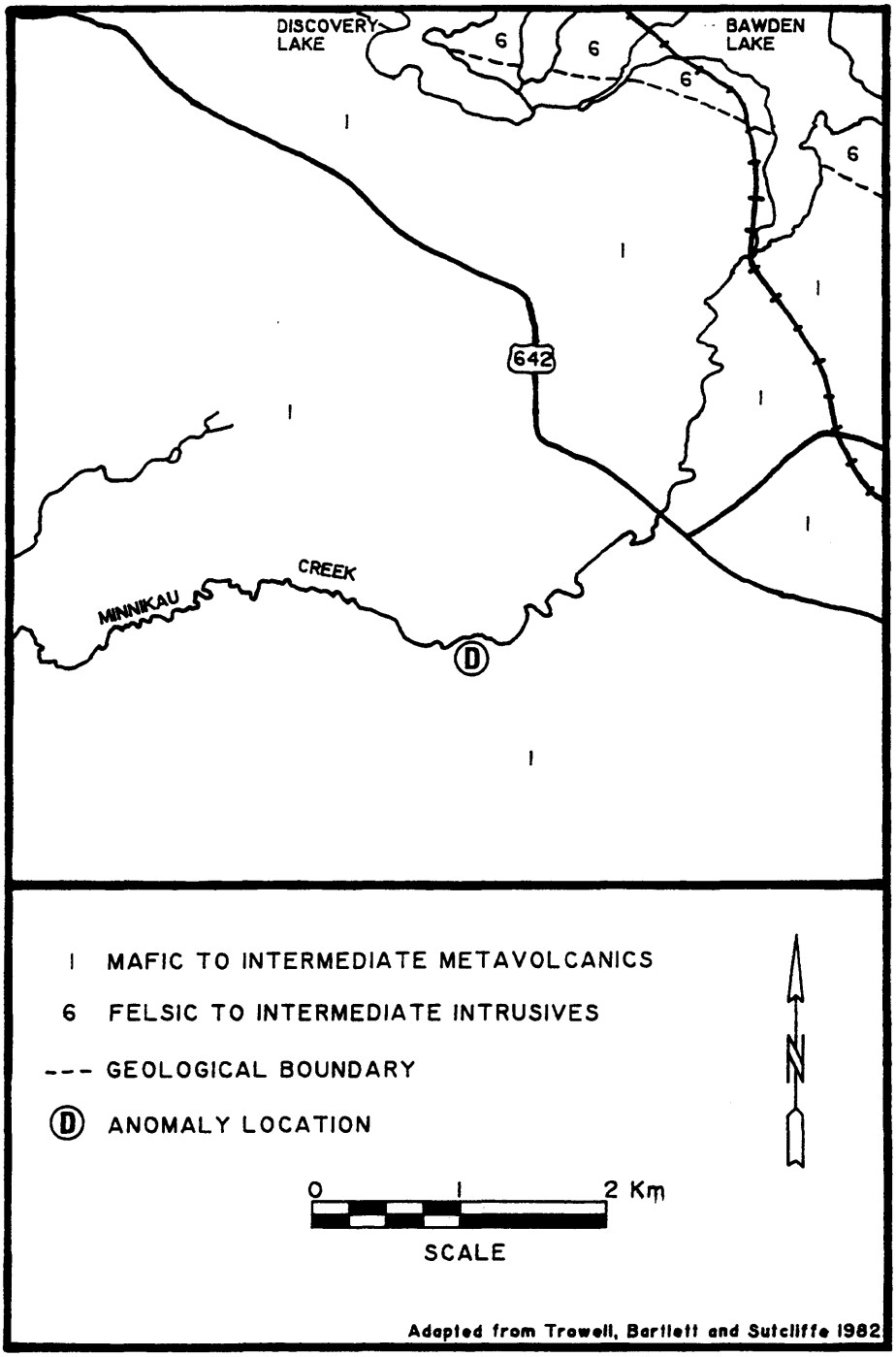


Figure 3b. Location map for the investigated geophysical anomalies in the Minnitaki Lake-Flying Loon Lake re-evaluation

RECOMMENDATIONS

The Flying Loon Lake area received a first pass exploration effort between 1970 and 1989. While there is presently some re-evaluation of the area, many anomalies of various strengths remain to be tested. Work on this project to date suggests that it is possible to investigate the un-tested AEM anomalies on the ground and uncover new information about the anomaly areas. Further prospecting and exploration of the Flying Loon Lake area is warranted.

The Salkeld Property, Belmore Bay of Sturgeon Lake.

The Salkeld gold property is located on claims Pa 816312 to 816314 inclusive, (*see* Figure 4) which coincide with old patents HW 712 and HW 713. (HW 713 was labelled as HW 718 on several older maps.) These claims are presently held by Falconbridge Limited. The earliest reported exploration work conducted on the property was carried out by Coniagas Mines Limited in January of 1936. Earlier work must have been done on the property, but has not been reported.

LOCATION AND ACCESS

The examined portion of the property is 800 m due east of the north end of Belmore (Mud) Lake on claim Pa 816312 at the south end of Northeast Bay of Sturgeon Lake. Light aircraft can land on Belmore Bay in the summer. Access to the south end of Belmore Bay is possible by boat in the summer and snowmobile in the winter. Some of the area is cut-over and other parts have large areas of blow down and may be difficult to cross. Where logging trails have been cut access is good. It is advisable to consult recent air photographs if overland travel is planned in this area.

EXPLORATION HISTORY

The earliest reported work on the property was performed by Coniagas Mines Limited in 1936. They drilled 3 x-ray diamond drill holes in January, 1936. The report of work is confusing and incomplete. A section of the No. 3 drill hole was reported to run $500 (gold at $35 per ounce) in gold over 7 or 14 feet. A test pit approximately 3 m deep was excavated near the drill hole but no results were given. (assessment file 52J/02SE-0054-D1, Resident Geologist's Office, Sioux Lookout)

In the spring of 1937, 3 additional holes were drilled by a Mr. Anderson. Hole #1 was reported to assay 0.54 ounce Au per ton over 5.2 feet. Hole #2 is reported to contain 2.0 ounces Au per ton over 3 feet. Hole #3 assayed 2.4 ounces Au per ton over 4.1 feet. The exact location of these holes is unknown. (assessment file 52J/02SE-0054-D1, Resident Geologist's Office, Sioux Lookout)

An additional 10 EX holes were reported to have been drilled by Mr. Anderson in 1955. Quartz veins from 1 to 1.5 m wide were reported in the core, but no assays were given. Visible gold was reported in the drill core. (assessment file 52J/02SE-0010-A1, Resident Geologist's Office, Sioux Lookout)

Falconbridge Limited acquired the claims from prospector A. Best in 1986. The old pits were cleaned out and mapped. Additional pits were excavated and examined. A sampling program for gold gave assays typically less than 2 g/t Au. Three samples returned 28.5, 46.0 and 366 g/t Au gold in veins containing milky white quartz and minor sulphide content (assessment file 52J/02SE-0077, Resident Geologist's Office, Sioux Lookout).

GEOLOGY AND MINERALIZATION

Trenching and drilling programs over a 50 year period have concentrated on mining claim HW 712 which was re-staked as mining claim TB 61879 and is now roughly equivalent to mining claim Pa 816312 (*see* Figure 4).

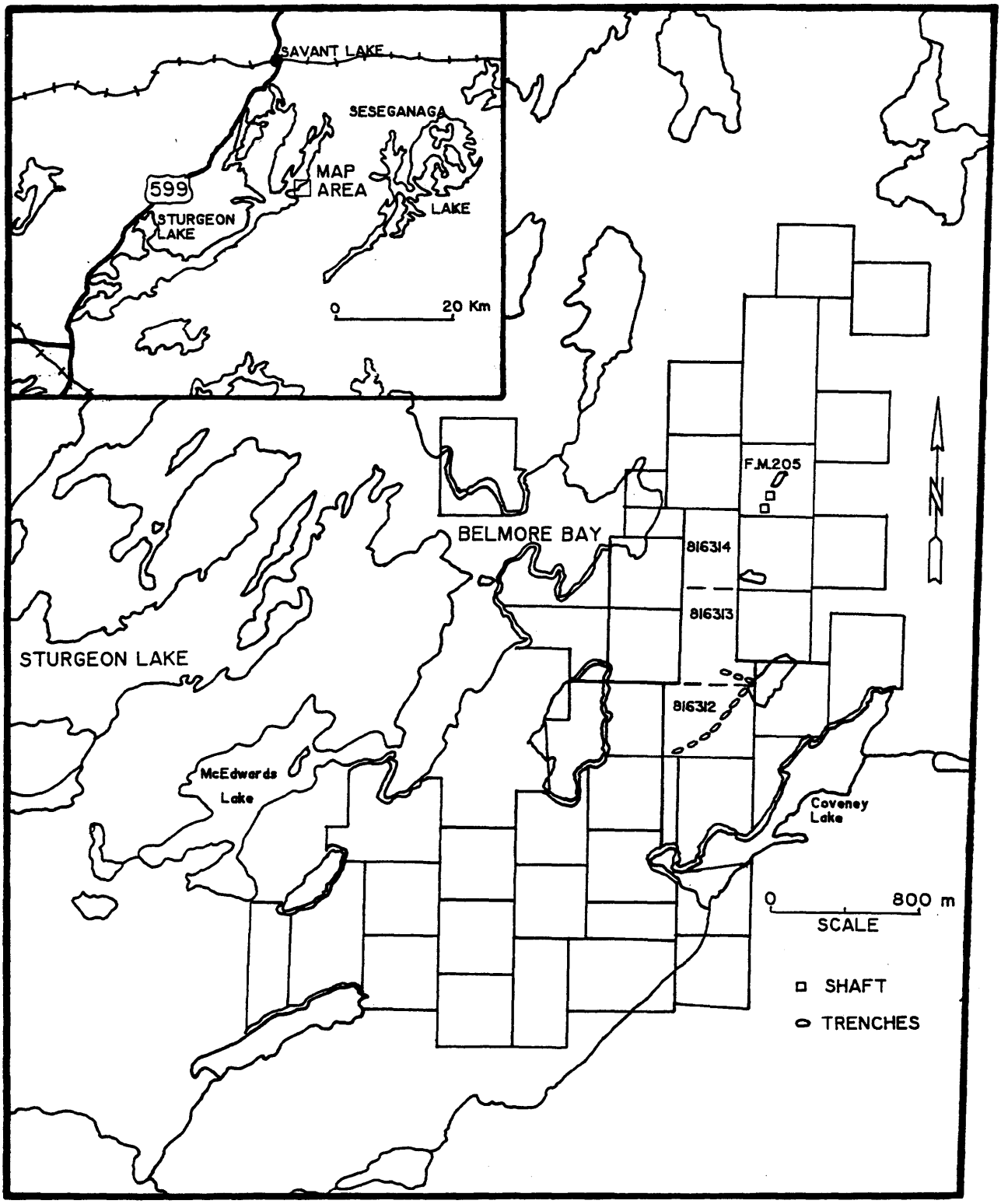


Figure 4. Location map for the Salkeld property, Belmore Bay of Sturgeon Lake.

The property geology consists of fine-grained to slightly porphyritic diorite intrusions flanked by massive metabasalt flows and intruded by quartz-feldspar dikes. The area has undergone several deformational events which produced multiphase folding. The earliest event produced a regional foliation which trends 030° to 060° and typically dips 60° to the southeast.

The second generation of folds have sub-vertical fold axes and have developed along and across the primary foliation (Trowell, 1977). The third generation of folds are minor kink bands. The second and third fold styles are rare in the deposit area. A few minor faults are present and produce shear zones trending 150° with a dip of 80° to the northeast.

All the gold mineralization found to date occurs in narrow quartz veins containing minor amounts of pyrite. These veins intrude the diorite. The diorite contacts with the veins carry minor pyrite with ankerite and calcite.

A field trip in August of 1993 examined most of the trenches on the property. The southern most trench was sampled as was a quartz vein blowout, locally called a quartz dome, near where the vein disappears under overburden. Quartz from a small pit closest to the quartz dome gave an assay of 0.375 ounce Au per ton (DAJ93-17). Four other selected grab samples from four trenches gave assays ranging between trace to 0.1 ounce Au per ton (Resident Geologist's files, Sioux Lookout).

RECOMMENDATIONS

It appears that the quartz veins which occur within the diorite intrusives are narrow and contain minor amounts of gold. The rare high assay is probably related to visible gold in minor amounts. The significance of the Salkeld occurrences are that they continue the gold occurrence trend for an additional 1 km south of the F.M. 205 gold occurrences, as shown in Figure 4. EM or magnetic surveys might identify shear zones with mineralization potential under overburden.

The Rainbow Quarry

Several requests for information on the Rainbow quarry led to visits to the site during the fall of 1993. Samples taken from this small quarry had led to this interest.

LOCATION

The deposit is located 8 km west of the village of Hudson which can be reached by Hwy. 664 which joins Hwy. 72 8 km south of Sioux Lookout. A forestry road west of Hudson passes by an abandoned loop in the road at 8 km west of the village (Figure 5). The abandoned road segment runs northwest for 0.8 km where a north trending trail crosses the largely overgrown road. The quarry site is approximately 0.8 km north on this trail. At the time this report was written, the site was covered by claims Pa 1145319 and Pa 1145320.

EXPLORATION HISTORY

The first report of the Rainbow Quarry is a property visit by H.L. King on Oct. 1, 1972 which is on file at the Sioux Lookout Resident Geologist's office. Mr. King was the Resident Geologist for the Kenora District at the time and was accompanied on the visit by Mr. S. Smith and Mr. Edstrom who where associated with Rainbow Quarries Ltd. Mr. King wrote a short description of the site and described the site as being underlain by interlayered mafic flows and metasediments. The rock to be quarried was termed as a quartzite containing green mica identified as mariposite or fuchsite.

The only other report on file was written in July 1974 by P.A. Palonon, at that time the newly appointed Resident Geologist for the new Sioux Lookout District.

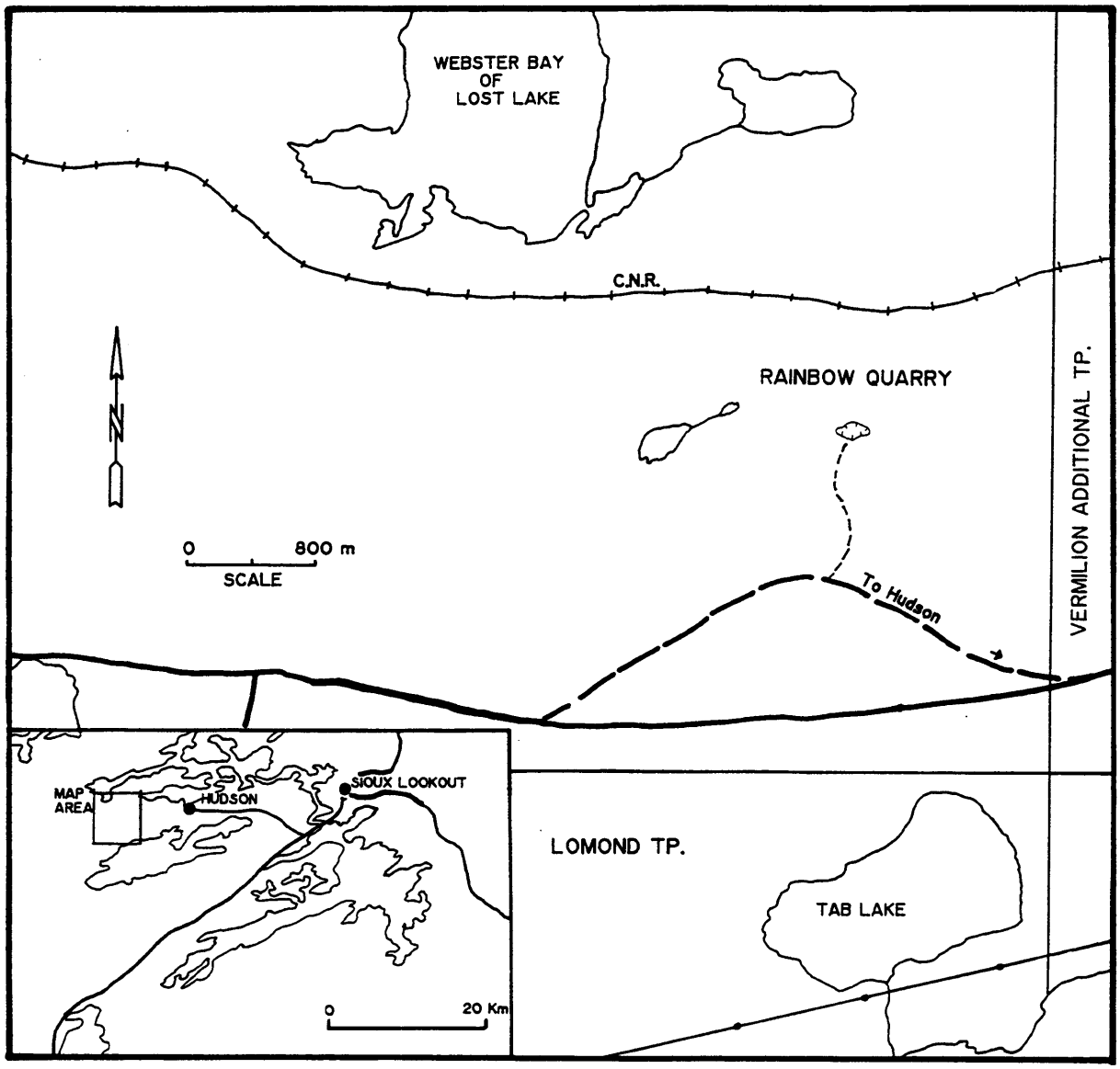


Figure 5. Location map for the Rainbow Quarry.

Dr. Palonen examined the property and wrote a detailed description of the local geology and mineralization. He described a section from north to south striking east which contained a black metavolcanic unit with stretched pillow selvedges. Units of green chromium mica in quartzite 11 feet in width are separated by a narrow band of gabbro. A 20 foot wide unit of chloritic greywacke, highly contorted with drag folds, capped the section. (Resident Geologist's files, Sioux Lookout)

A limited amount of development and sampling was done on the property after Dr. Palonen's visit. The author revisited the site in the fall of 1993. The location was determined by a Magellan GPS system to be at 50°04'53"N. 92°17'38" W. The area was mapped by J.F. Johnston (1972) as underlain by a mafic metavolcanic unit intruded by hybrid granite and granite gneiss. The area where the quarry is located was mapped by Johnston as overburden covered.

GEOLOGY AND MINERALIZATION

The most recent visit to the site confirmed most of the previous conclusions. A mafic bed to the north of the exposure is intruded by 30 cm to 1 m wide dikes of what appears to be sheared to fractured quartz. These were termed quartzite in earlier reports. The bedding and veins trend 070° and dip from 70° to 80° to the south. The quartz dikes or sills are complex and have an internal foliation parallel to strike, often marked by thin fuchsite layers. To the south of the quartz dikes there are irregular bands of a sheared, white mica rich felsic rock with a pearlescent appearance on the sheared face. Some bands appear to have a significant iron carbonate content and have rusty pits on weathered surfaces. The foliation appears to be swinging to the south as the beds trend eastward. The southern-most exposed unit is a mafic fine-grained bed of uncertain origin, highly contorted with drag or "z" folds. To the east end of the exposed area several quartz dikes are variably coloured by fuchsite and are more vein-like in appearance. The exposure disappears under overburden at this point. If the apparent southward swing of bedding is real, the z-folds would suggest a fold axis may be present to the south.

RECOMMENDATIONS

A number of areas near the described occurrence have thin quartz veins with fuchsite partings. If the apparent folding along an east-trending axis is correct, prospecting and stripping to find if a fold exists may reveal areas in the fold nose with potential for wider bands of sericite or fuchsite in quartz. These bands would have some potential for sawn or cleaved tiles and other decorative stone products.

Stokes and Drope Townships Sulphide Occurrences

INTRODUCTION

During the summer of 1993, Mr. A. Glatz and Mr. A. Kozowy prospected Drope and Stokes Townships to the north of the town of Dryden. They discovered several new sulphide (py, cp, sp) occurrences containing low tenors of zinc and copper.

This area was mapped by W. D. Harding at 1:63 360 scale between 1947 to 1948 as the Gullwing Lake - Sunstrum area (Harding 1950). F.J. Pettijohn had previously examined conglomerates east of the Gullwing Lake-Sunstrum area and had traced them to the west into Lomond Township (Pettijohn 1934).

Page and Christie (1980) mapped at 1:15 840 scale most of the area mapped by Harding. A large area between Bluett and Gullwing Lakes had been mapped by Harding as greywacke. Page and Christie, working at a more detailed scale, recognized an intermediate metavolcanic member with associated felsic pyroclastic rocks.

LOCATION

Three grids were cut by Mr. Glatz and Nr. Kozowy as part of their field examination of sulphide occurrences in Drope and Stokes townships (Figure 6). The area can be reached from Hwy. 17 in Dryden by taking the western access to Hwy. 601 north past Broadtail Lake to the southwest corner of Stokes Township. The road then trends northeasterly toward Anaway Lake. A number of timber harvesting secondary roads cross the area and give access to Loveland and Coates lakes which are located in the north central portion of Drope Tp.

Grid 1 is located on claims Pa 1150036 and 1150037 on the Stokes Tp. claim map. Grid 2 is located on claim Pa 1133717 and grid 3 is located on claim Pa 1133718, both of which are on the Drope Tp. map.

GEOLOGY AND MINERALIZATION

The 2 townships straddle the contact between metabasalts, metasediments and intermediate to felsic pyroclastics of the Wabigoon Subprovince and granitoids and granitic gneiss of the Winnipeg River Sub-province. Approximately half of Drope Tp. is underlain rocks of the Wabigoon Subprovince while approximately 10 per cent of Stokes Tp. is underlain by Wabigoon Subprovince rocks.

There are no records of previous base metal exploration in the Sioux Lookout Resident Geologist's assessment files for Drope and Stokes townships. The only recorded exploration in the study area was carried out between 1960 and 1980 when uranium hosted in granite and pegmatites was the target.

The outcrop sampled in Stokes Tp. (Figure 7a) is part of a narrow band of metasediment or pyroclastic tuff in contact to the north with dark mafic metavolcanic rocks. The area covered by grid no. 1 is poorly exposed, but a band of approximately 1 m in width containing 10 or more percent sulphides was sampled. Pyrite and sphalerite were present in hand specimens with traces of chalcopyrite. Sample DAJ93-22 was assayed to contain 0.54 % Zn zinc and 0.18 % Cu with minor amounts of nickel and cobalt in 0.02 % range (Table 3). (Resident Geologist's files, Sioux Lookout)

The other examined sites were located in Drope Tp. (Figure 7b) in the vicinity of Coates and Loveland lakes. Grid no. 2 is oriented east-west to follow the trend of geophysical conductors. Grid no. 3 was oriented along a 146° trend to follow another magnetic and geophysical trend to the east of Coates and Loveland lakes. The most recent mapping shows the area to be underlain by intermediate to felsic tuff intruded by minor granitic to pegmatitic dikes, sills and plugs (Page and Christie 1980).

Sample DAJ93-21 on Grid no. 2 contains up to 20 per cent pyrite with minor levels of copper and zinc. Samples DAJ93-19 and DAJ93-20 were collected from two sites on Grid no. 3. They were taken from sites near the contact with mafic metavolcanics and felsic pyroclastics. Both samples had 10 to 15 % pyrite and slightly anomalous contents of lead, zinc and copper (see table 3). (Resident Geologist's file, Sioux Lookout)

Table 3 Sampling in Drope and Stoke Townships

Sample #	Location	Zn	Cu	ppm Pb	Ni	Co	Township
DAJ93-19	Grid 3, L 24+00 S 2+00 E	135	13	<10	30	6	Drope
DAJ93-20	Grid 3, L 33+00 S 0+60 E	32	48	25	48	16	Drope
DAJ93-21	Grid 2, L 18+00 E 6+00 N	35	146	<10	120	41	Drope
DAJ93-22	Grid 1, L 33+00 E 5+00 S	5400	1750	<10	172	174	Stokes

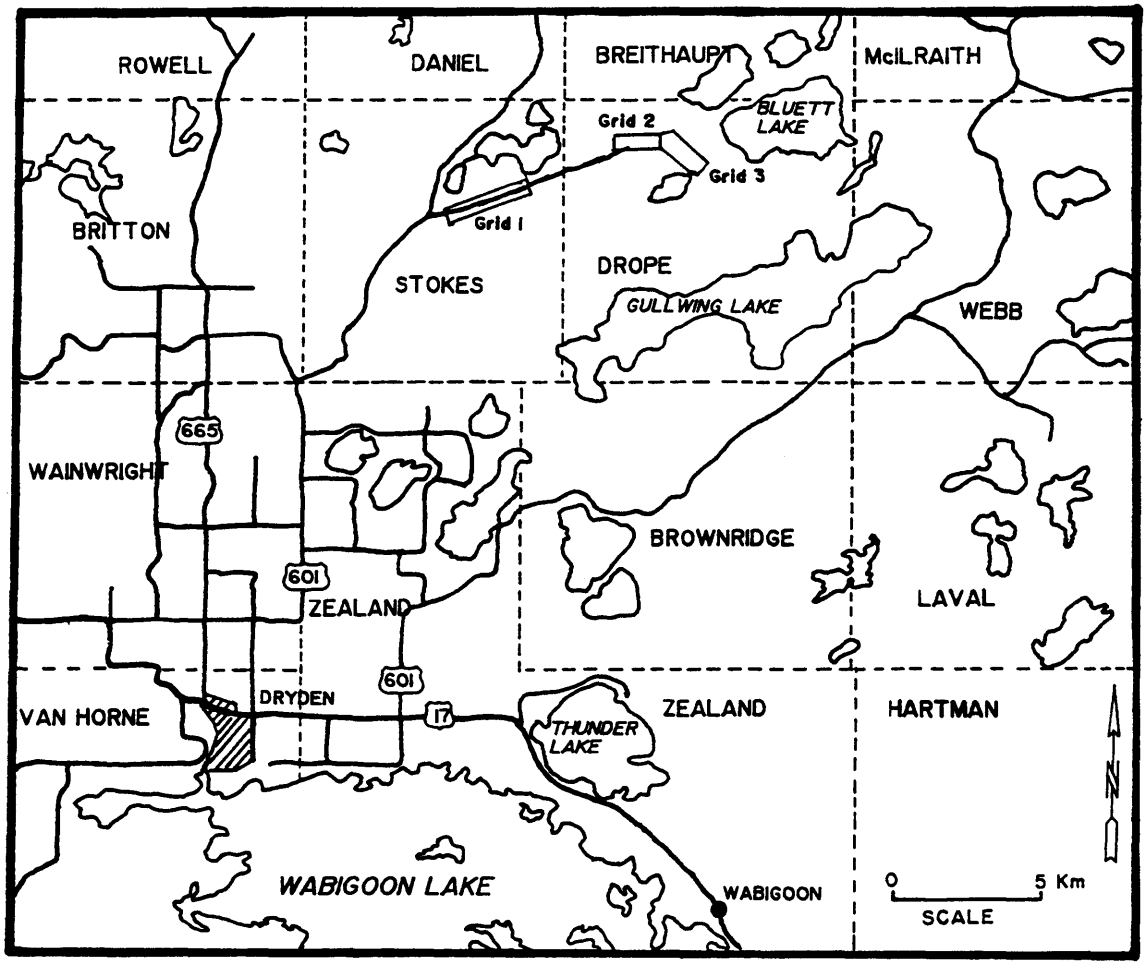


Figure 6. Location map for the Stokes and Drope Townships sulphide occurrences.

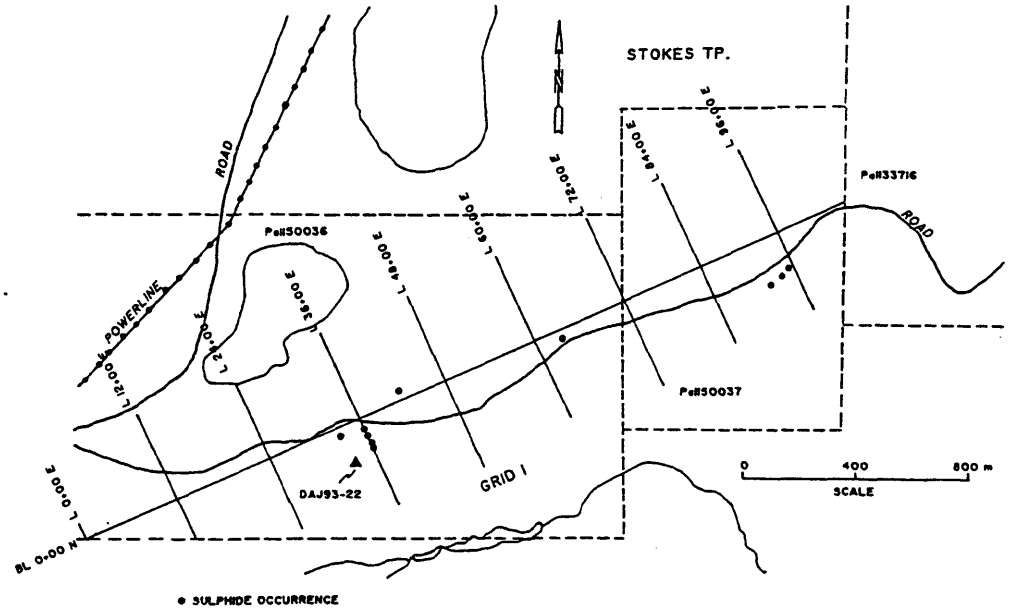
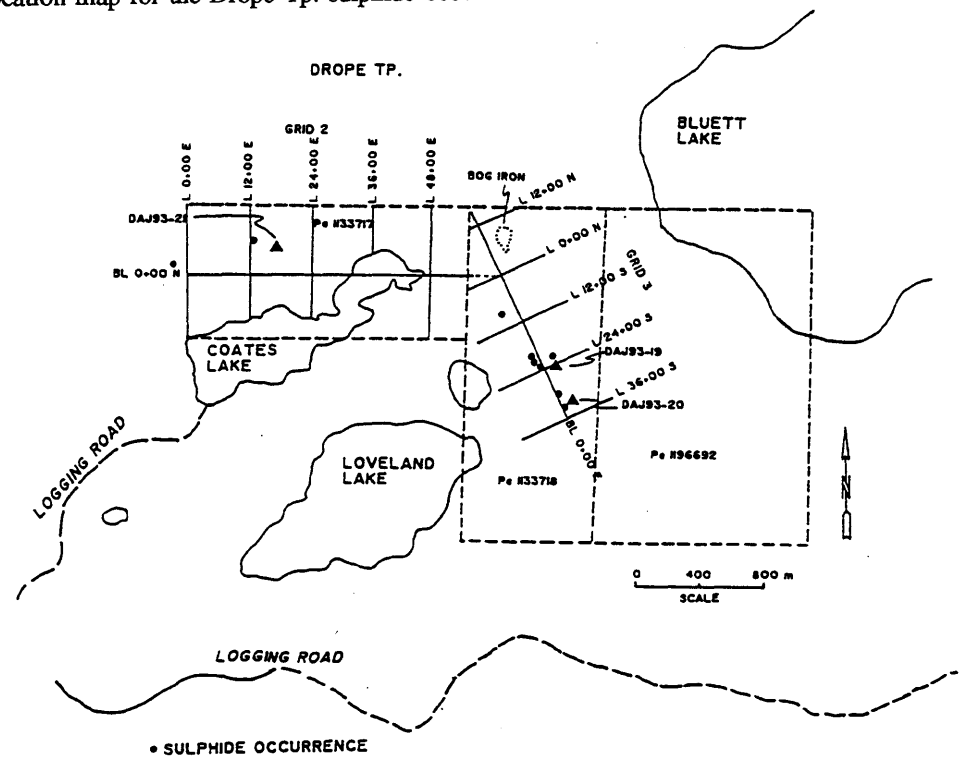


Figure 7a. Sample location map for the Stokes Tp. sulphide occurrences.

Figure 7b. Sample location map for the Drope Tp. sulphide occurrences.



DISCUSSION

Only 1 of the 3 grids sampled contained anomalous base metal values. This was a preliminary examination of the area and a much wider sampling would be required to draw statistically valid conclusions. The fact that 1 sample had anomalous base metal values in a distal VMS environment is encouraging. Prospecting to the northeast where coarse pyroclastics have been reported is recommended.

DRILL CORE STORAGE SITE

Fiscal restraint and re-organization of the Ministry resulted in major changes to the operation of the Drill Core Library. Core will only be accepted if the individual or company donating it delivers it to the off-site storage facility or other site as arranged with the Resident Geologist. There are three off-site storage facilities in the Northwest, located at Kenora, Red Lake and Sioux Lookout; each supervised by the Resident Geologist. From January 1, 1993 until April 23, the core library was operated the same way as in previous years. After April 23 operations were progressively transferred to the Resident Geologist and Staff Geologist and activities of the core library staff were directed elsewhere.

During 1993, a total of 1 629.1 m of core was collected from various locations in the Sioux Lookout District by MNDM personnel. There is a total of 70 127.8 m of core stored in the Kenora Core Library building (Kenora 40 438.0 m Red Lake 14 592.9 m, Sioux Lookout 15 096.9 m) and a further 123 532.9 m in outdoor storage (Kenora 40 593.0 m, Red Lake 61 351.6 m, Sioux Lookout 21 588.3 m). During the late summer and fall of 1993, core was retrieved from several locations in the Kenora, Red Lake and Sioux Lookout Districts and moved to the off-site storage yards by a contractor. This work was funded by the Jobs Ontario Capital Fund (JOCF).

The JOCF core recovery project recovered core from a total of 10 industry storage sites, (more than one company stored core at the same site). There were 12 028.1 m of core recovered from five sites near Savant Lake and Pickle Lake in the Sioux Lookout District plus an additional 9 5690.2 m were moved from temporary storage to the permanent site (includes core stored in Sioux Lookout and Kenora off-site storage sites). The contractor also recovered an undetermined amount of core from the companies listed below that did not have adequate documentation in the assessment files and is not included in the total length recorded for each company. These holes have been assigned MNDM hole numbers and the missing information will be entered into the database as it is obtained.

CORE RECOVERIES IN SIOUX LOOKOUT DISTRICT BY MNDM PERSONNEL

Kuryliw, Chester (Six Mile Lake road property)[1]	185.9 m
Moss-Power Resources Inc. (Opapimiskan Lake property)[2]	1 030.3 m
Moss-Power Resources Inc. (Libert Lake property)[3]	91.4 m
Santa Maria Resources Ltd. (Zeemel Lake property)[4]	115.8 m
Valerie Gold Resources Ltd. (Split Lake-Alcona property)[5]	205.7 m

CORE RECOVERIES IN SIOUX LOOKOUT DISTRICT BY JOCF CONTRACTOR

International Platinum Corporation Ltd. (Big Trout Lake property)[6]	964.9 m
Minnova Inc. (Pickle Lake area, includes core drilled by Kerr Addison Mines Ltd.)[7]	6604.2 m

Asarco Exploration Co. of Canada Ltd. (Conant Tp.)[8]	1183.3 m
Falconbridge Limited. (King Bay of Sturgeon Lake)[9]	557.5 m
Homestake Canada Inc. (Pickle Lake)[10]	1134.7 m
Pure Gold Resources Inc. (Webb Lake)[11]	1583.5 m

RECOMMENDATIONS FOR EXPLORATION

Stone and Industrial Minerals

Forecasts indicate continued growth for the Canadian dimension stone industry (Vagt, 1992). Colours which have experienced increased demand include green, yellow, blue and variegated granite. The colours which have maintained a steady market demand include pink, grey, white, red and black. (Hinz and Lucas, 1993)

With the release of the Bedrock Geology of Ontario map series in 1991, prospecting for granite deposits has become easier. Unit 14(massive granodiorite to granite) and Unit 15, (diorite-monzonite-granodiorite), have been recognized as having the potential to host quarriable granites. Prospectors should examine the maps and target these units for examination. (Hinz and Lucas, 1993)

Within the Sioux Lookout Resident Geologist's district over 40 of such bodies of granite are known to exist. Only a small fraction of these have been examined for their dimension stone potential. Another rock unit which merits examination is Unit 10, (mafic and ultramafic rocks). This unit may host quarriable black "granite".

Markets for flake, (crystalline) graphite are expected to see continued growth (Boucher 1992). The recent discovery of a flake graphite occurrence within the Sioux Lookout district, and a known occurrence at Treelined Lake to the west, has kindled interest in this commodity. Potential exists for deposits of flake graphite within the high-temperature (granulite facies) metamorphic terrane present in the English River Subprovince located north of Sioux Lookout. Ductile shear zones should be investigated for the development of flake graphite. Prospecting and outcrop examination are most effective for finding and evaluating graphite occurrences.

Another industrial mineral worth prospecting for is high-purity quartz (silica). Large, (greater than 30 m wide), bull-white quartz veins are a prime target. The vein material should be free of contaminants such as lime (CaO), iron as oxide (Fe_2O_3), alumina (Al_2O_3) and titanium dioxide (TiO_2).

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THUNDER BAY RESIDENT GEOLOGIST'S DISTRICT--1993

M.J. Lavigne[1] and J.F. Scott[2]

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INTRODUCTION

Lac des Iles Mines Ltd. began producing palladium bearing concentrate in December 1993. Mineral exploration activity was approximately the same as it was in 1992 and showed some signs of strengthening. Over 80% of the properties are being explored by prospectors.

MINING ACTIVITY

Shebandowan Mine

The Shebandowan Mine, owned by INCO Limited, is closed and is being maintained on a standby basis.

Lac des Iles Mine

Lac des Iles Mines Ltd. made the first commercial shipment of concentrate from its platinum-group metals mine to Falconbridge Ltd. in Sudbury on December 15. This action, which represents the official opening of the mine, expects to produce 20 000 to 30 000 tons of concentrate per year from 1 000 000 tons of ore. This translates to 3.7 million grams of palladium, 187 000 grams of platinum, 373 000 grams of gold, 680 000 kilograms of copper and 454 000 kilograms of nickel annually. The ore contains 0.18 ounce P.G.M./ton, 0.01 ounce Au/ton, 0.1% Cu and 0.1% Ni. Production from the open pit at the Roby Zone is expected to last 7 years to a depth of 150 m. The employment level at the site is 60 to 65 in addition to the trucking contractor.

Amethyst

Amethyst was mined from 12 sites. Five of these sites (Amethyst Mine Panorama, Blue Point Amethyst Mine, Ontario Gem Company Ltd., Pearl Lake Amethyst Mine and Noyes Diamond Willow Mine) are tourist-oriented pick your own sites along Highway 11-17 in Amethyst country (MacTavish Township), east of the City of Thunder Bay (Fig. 1). The other seven mines operate in MacTavish Township, MacGregor Township and the area just north of MacGregor Township: David Bak Quarry; Blue Star Resources Ltd.; Breezy Mountain Amethyst Mine; Crystal Creek Amethyst Mines; Gem Mountain Amethyst Mine; Gordon McLeod Quarry; and Purple Haze Mine. The Amethyst Miners Association of Ontario was formed in 1993 with the intent of developing product standards and a marketing strategy.

ONTARIO PROSPECTORS ASSISTANCE PROGRAM

Seventeen prospectors received Ontario Prospectors Assistance Program (OPAP) grants for a total planned expenditure of $170 000. In addition, 4 winter OPAP grants were awarded. The commodities sought covered a wide range, including base metals, gold, amethyst and building stone.

EXPLORATION ACTIVITY

The rapid decline in mineral exploration activity that began in 1989 levelled off in 1993. The balance of several types of semi-quantatative measures of activity indicates a slight decline in 1993 in comparison to 1992 in the Thunder Bay Resident Geologist's District. The number of properties being explored has gone up from 51 to 63, but the number of properties being diamond drilled has gone down from 15 to 6 (Table 1). Most of these drilling programs were small. Central Crude's Moss Lake project, the only advanced exploration project in the district in 1992, was inactive in 1993. A significant indicator that mineral exploration activity is beginning to improve is by the number of properties optioned: there were none in 1992 and 6 in 1993.

Four properties were being explored by major mining companies (8 in 1992, 11 in 1991, 31 in 1990, 21 in 1989), 7 by junior mining companies (6 in 1992, 7 in 1991, 17 in 1990, 30 in 1989, 57 in 1988) and 51 by prospectors. The primary target on 22 of these properties is gold, 22 properties were explored for base metals, 13 for amethyst, 2 for Ag-F-Ba, 1 for PGM and 2 for building stone. In the Thunder Bay Mining Division, which includes the Schreiber-Hemlo and Beardmore-Geraldton Resident Geologists' districts, the number of active claim units has decreased from 30 964 to 30 788 and the amount of assessment work received by the Mining Recorder's office has decreased from $4 027 098 to $3 807 610.

RESIDENT GEOLOGIST'S STAFF ACTIVITIES

The office of the Resident Geologist was staffed by M.J. Lavigne Jr., Resident Geologist; John Scott, Geologist; Cyndee Komar, Secretary; Susan Warren, Assessment File Clerk; and Nancy Baker, Acting Assessment File Clerk. The positions of Core Library Geologist and Assistant Core Library Geologist were eliminated during the course of a government of Ontario-wide expenditure control plan. The employees holding those position, Perry Sarvas and Peter Hinz, were declared surplus. Staff from the Thunder Bay, Schreiber-Hemlo and Beardmore-Geraldton Resident Geologists' offices were trained to carry out the functions of the Core Library Geologist. This office handled 1173 inquiries, conducted 20 property visits and 6 field trips. Four mineral occurrences were mapped and more work was done on an ongoing study of the North Coldstream Mine.

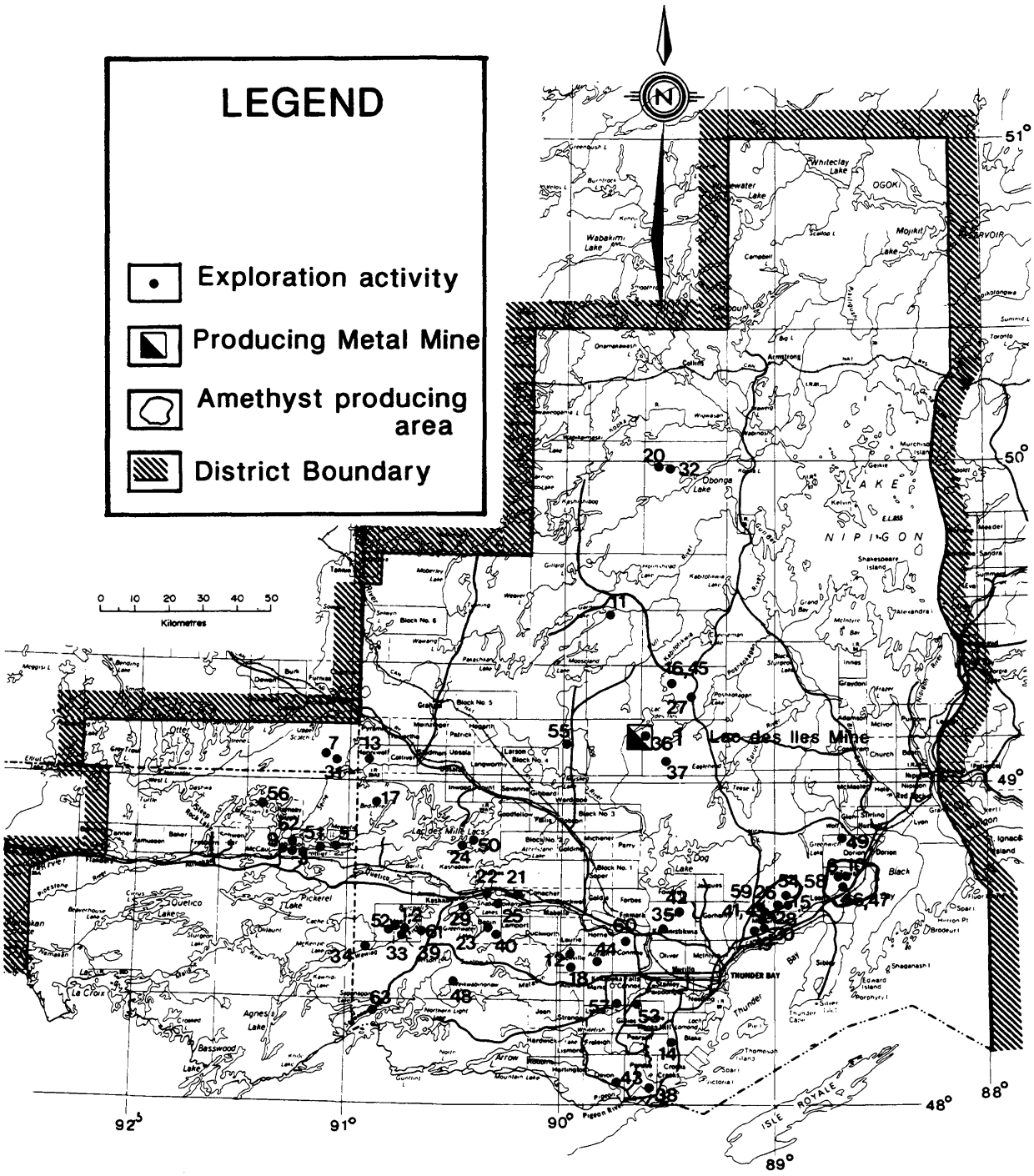

FIGURE 1: THUNDER BAY RESIDENT GEOLOGIST'S DISTRICT

TABLE 1. EXPLORATION PROGRAMS IN THE THUNDER BAY DISTRICT 1993 (corresponding to Fig. 1)

ABBREVIATIONS

AEM.....Airborne Electromagnetic Survey	HLEM.....Horizontal Loop Electromagnetic Survey
AM.....Airborne Magnetic Survey	IP.....Induced Polarization Survey
ARA.....Airborne Radiometric Survey	RES.....Resistivity Survey
DDH.....Diamond Drill Hole(s)	SP.....Self Potential Survey
GEM.....Ground Electromagnetic Survey	Str.....Stripping
GC.....Geochemical Survey	Tr.....Trenching
GL.....Geological Survey	UG.....Underground Development
GM.....Ground Magnetic Survey	VLEM.....Vertical Loop Electromagnetic Survey
GRA.....Ground Radiometric Survey	VLF-EM....Very Low Frequency Electromagnetic Survey

Company/Individual (Property Name)	Township/Area (Claim Map No./Commodity)	Exploration Activity
1. Aho, Ted and Fogen, M. (Moss Mine)	Moss Township G-676 (Au)	Prospecting, Str
2. Akiko Gold Resources Ltd. (Fisher Lake)	Burchell Lake G-706 (Au)	DDH (5-701 m), IP
3. Allegheny Mines Corporation (Sapawe Mine)	Hutchinson Township G-554 (Au)	GL
4. Anderson, Charles (Walkinshaw Creek)	Onion Lake G-747 (amy)	Str
5. Andrews, M. & Hicks, C.	Crooked Pine Lake G-519 (Au)	Tr, Str
6. Bak, Dave	McTavish Township G-675 (amy)	Str, Tr
7. Bernatchez, Ray	Lumby Lake G-545 (Stone, Au, BM, PGM)	GL, Str
8. BHP Minerals Canada Ltd.	Nipigon Plate (Cu)	Recon
9. Bjorkman, K. (Atikokan Iron Mine)	Hutchinson Township G-554 (BM, Au)	Prospecting, Str
10. Breezy Mountain Amethyst Mine	McTavish Township G-675 (amy)	Str
11. Bumbu, Costy (Bluff Claim occurrence)	Garden Lake G-721 (BM, Au)	Tr, sampling
12. Calvert, Dan	Sackville Township G-685	Prospecting
13. Chapman, Lawrence	Hanniwell Township G-550 (Au)	Prospecting
14. Chaschuk, Metro	Blake Township G-645 (BM)	DDH (1-244 m)
15. Christianson, Dave (Beck property)	Tartan Lake G-2706 (BM, amy)	Prospecting
16. Cumberland Resources Ltd. (Whistle Lake)	Wabikon Lake G-773 (BM, Stone)	Str, Tr
17. Dobranski, Don	Bedivere Lake G-524 (Au)	Prospecting
18. Douglas, Art	Sackville Township G-685 (BM Au)	Prospecting
19. Dumas , Lawrence	MacGregor Township G-672 (amy)	Str
20. Fowler, Brian	Puddy Lake G-118 (BM)	Prospecting
21. Gertzbein, D'Silva & Parker (JF West occ.)	Hagey Township G-713 (Au, BM)	Str, Tr
22. Green Ice Resources (Shebandowan Narrows)	Haines Township G-661 (Au)	GL, prospecting
23. Hackl, Joe (Horseshoe Lake)	Begin Township G-643 (Au)	Prospecting
24. Hackl, Joe (Bolton Bay)	Lac des Mille Lacs G-730 (BM, Au)	Prospecting
25. Hackl, Joe (Milkie occurrence)	Haines Township G-661 (Au)	Prospecting
26. Harty, Richard	Onion Lake G-747 (amy)	Str
27. Hayne, Bill (Nault Lake)	Wabikon Lake G-773 (BM, Au)	DDH (2-239 m), prospecting
28. Hietapakka, Ray	Tartan Lake G-2706 (amy)	Prospecting, Str, recon
29. Inco Exploration and Technical Services Inc.	Nipigon Plate, Shebandowan (BM)	GL, GC, compilation
30. Jones, Harry & Jones, Darren	MacGregor Township G-672 (amy)	Prospecting
31. Komarechka, Robert	van Nostrand Lake G-553 (Stone)	Prospecting
32. Kuhner, Knut	Puddy Lake G-118 (BM)	DDH
33. Kukkee, Ken	Moss Township G-676 (Au)	Tr, prospecting
34. Kwiatkowski, R. & Kukkee, E. (Elephant Lake)	Tilly Lake G-562 (BM, Au)	Prospecting
35. Labreque, Frank	Ware Township G-698 (Au)	Tr, prospecting
36. Lac des Iles Mines Ltd.	Lac des Iles G-739 (Pt, BM)	GL, GM, GEM

37. Lundmark, Harry (Block Creek)	Whitefin Lake G-778 (Au, BM)	GL
38. Luski, M.	Pardee Township G-681 (BM, PGM)	Prospecting
39. Martin, James	Moss Township G-676 (BM, Au)	Tr, prospecting
40. McKellar, Bob	Begin Township G-643 (Au)	Prospecting, sampling
41. Miron, Bill	MacGregor Township G-672 (amy)	Tr
42. Niemi, Alf	Ware Township G-698 (Au)	Prospecting
43. Nisbet, James	Devon Township G-650 (BM)	Str
44. Noranda Exploration Company Limited	Adrian Township G-640 (BM)	Recon, HLEM
45. Noranda Exploration Company Limited (Whistle Lake)	Wabikon Lake G-773 (BM)	Geophysics
46. Noyes, Clark (Detroit-Algoma Mine)	McTavish Township G-675 (amy)	Str
47. Noyes, Doug	McTavish Township G-675 (amy)	Str
48. Parker, Bob	Titmarsh Lake G-771	Prospecting
49. Petrunka, Dave (Dorion Lead-Zinc Mine)	Dorion/Glen townships G-651 (BM)	Str, Tr, GL
50. Phelps Dodge Corp. of Canada Ltd.	Lac des Mille Lacs G-2709 (Au, BM)	GL, geophysics
51. Pitkanen, Reino	Crooked Pine Lake G-519 (Au)	Prospecting
52. Ranta, Eino (Moss Mine area)	Moss Township G-676 (Au)	Tr, Str, sampling
53. Redden, Jim W. (Porcupine Mine area)	O'Connor/Gilles townships G-678 (Ag)	Power stripping
54. Richardson, W.G.	Tartan Lake G-2706 (amy)	Stripping, prospecting
55. Richmond, Bill	Buck Lake G-2660 (BM)	Str, sampling
56. Sande, D. & Stewart, E. (Lynxhead Bay)	Sawbill Bay G-558 (Au)	Str, sampling, GC
57. SEG Exploration Inc. (Pitch Creek)	O'Connor Township G-678 (bah)	DDH
58. Siltamaki, Aki	N. of MacGregor Township G-672 (amy)	Str, Tr
59. Smith, Basil (Walkinshaw Creek)	Onion Lake G-747 (amy)	Str
60. Stewart, Mel (Conmee fire tower)	Conmee/Adrian townships G-647 (Au, BM)	Prospecting, sampling
61. Ternowesky, John (Burchell Lake property)	Burchell Lake G-706 (BM, Au)	Prospecting
62. Wicheruk, Mitch (Jackfish Lake Mine)	Hutchinson Township G-554 (Au)	Prospecting
63. Wye Resources Inc. (Powell occurrence area)	Saganaga Lake G-555 (Au)	DDH

A prospecting course was conducted in Thunder Bay over 6 evenings with a one-day field trip. Forty students were accepted on a first-come basis from a list of 100 interested individuals. Two Beep Mat training sessions were conducted for prospectors. The Beep Mat was lent out to prospectors every week from the beginning of June to the beginning of November. On 11 occasions, this office lectured grade 2 and grade 5 students on mineral identification and their uses. Many other students and the general public were affected by public education efforts, especially the joint efforts with Lac des Iles Mines Ltd., the Thunder Bay Lapidary Society, Science North and numerous individuals during mining week, and also the Chamber of Commerce provincial meeting held in Thunder Bay in 1993.

PROPERTY VISITS

Chilian Occurrence

This gold occurrence is one of the many historical occurrences in the Shebandowan volcanic belt that has been reassessed in recent times. This occurrence is situated in the northwest corner of

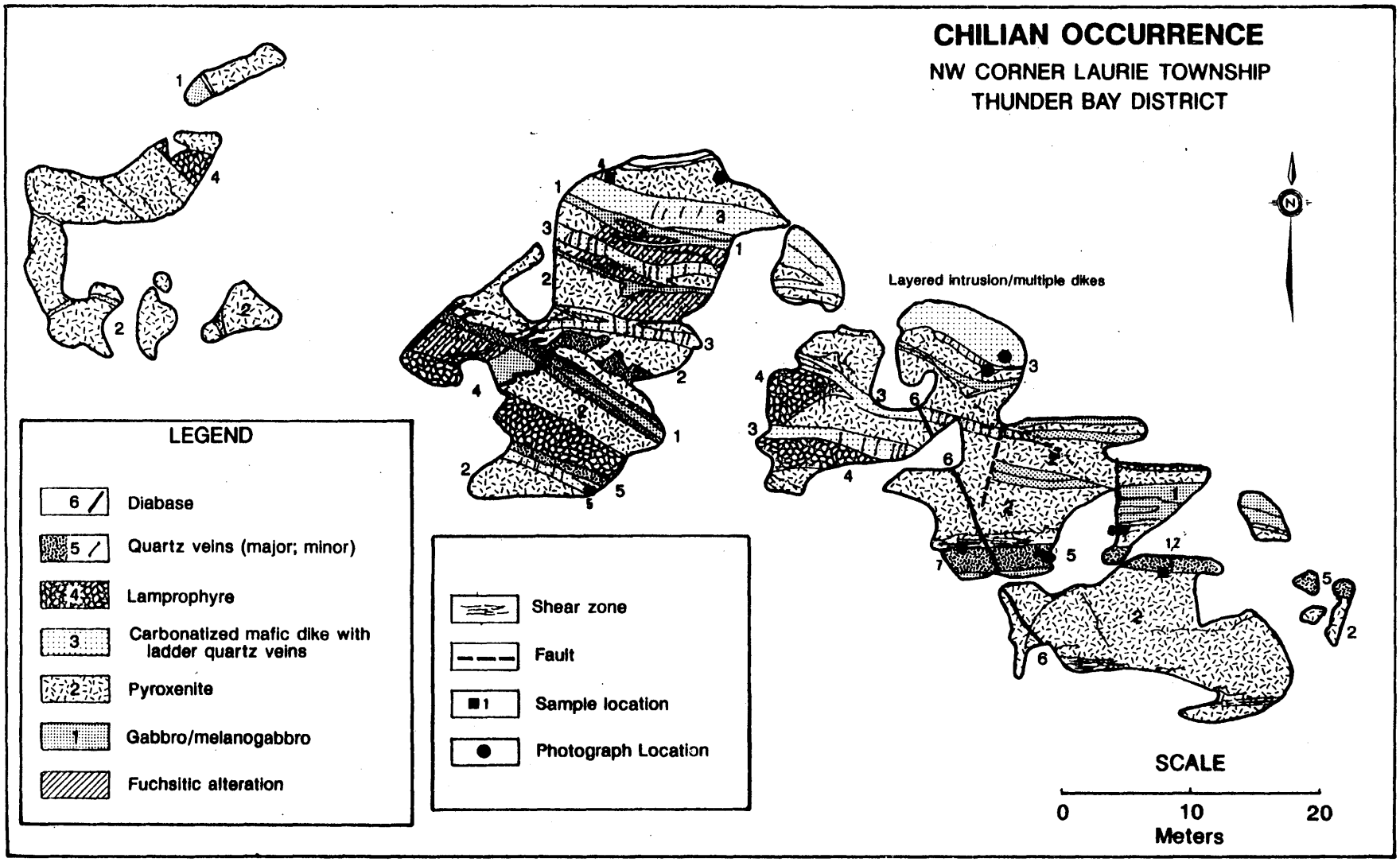

FIGURE 2 : GEOLOGY OF THE CHILEAN OCCURRENCE LAURI TOWNSHIP

Laurie Township and lies between the southern two lakes of an unnamed three-lake cluster. The approximate latitude and longitude are 48° 34.380' N and 90° 01.038' W (#22 on Fig. 5). Access to the property is by logging roads that branch south from the INCO Shebandowan Mine road, at Green Bay, for 3 km south, then 4 km east.

The earliest work on file with the Thunder Bay Resident Geologist's office is work conducted by George Chilian in 1958 when 10 short diamond drill holes were drilled for a total of 564 feet (172 m) and 4 small trenches were put down to expose the occurrence. The following rock types were intersected in the 1958 drilling: andesite; carbonatized andesite; quartz-feldspar porphyry; quartz porphyry; feldspar porphyry; lamprophyre; peridotite and an acid dike. Mineralization encountered in the drilling consisted of traces of chalcopyrite, galena and pyrite. Alteration consisted of fuchsite/mariposite, ankerite and silicification. The best assay reported by Chilian in 1958 was $321 ounce Au per ton and $12 ounce Ag per ton.

The property remained dormant until the late 1980s when Inco Gold Company stripped, trenched, sampled and drilled the occurrence. Work conducted by Inco Gold Company confirmed the presence of gold mineralization, but the grades reported were substantially less than those reported by Chilian in 1958. Inco Gold Company's best reported assay was 6.43 ppm Au. Inco Gold Company drilled 3 diamond drill holes for a total of 164 m. Rock types intersected in these holes were gabbro, mafic to intermediate sheeted dike complex, peridotite, and quartz veins. Alteration recognized included silicification and carbonatization. Fuchsite and leucoxene were also noted. Minor chalcopyrite and galena as well as pyrite were noted in the drill core.

In the spring and summer of 1993, Thunder Bay Resident Geologist staff spent 2 days mapping the geology of the gold occurrence exposed by the stripping carried out by Inco Gold Company.

The host rock is a mafic dyke swarm. Based on intrusive relationships, the oldest rock is a massive gabbroic to pyroxenitic rock (intrusive/extrusive?) that has undergone the strongest carbonate alteration and has subsequently been injected by a sequence of dikes, ultramafic to mafic in compositon (Fig. 2). Most dikes are less than 35 cm in width. Lamprophyric dikes, some with nebulous contact relations with their hosts, can be up to 4 m wide, although typically are only 1 m or less in width. The biotite content and its grain size is highly variable within the lamprophyres. It is possible that many of the other mafic dikes are also lamprophyric, especially those that seem to have gradational contacts to areas rich in biotite. Those dykes which are mapped as lamprophyre have at least 10% fine disseminated biotite, which in one location grades into an area with 50% coarse biotite.

Textures exhibited by the dikes include well developed chill margins, breccias with chloritic alteration around the fragments, and at least one dike exhibits an ocellar type texture in which the ocelli are arranged in layers or zones. This particular dike is about 16 cm wide.

An important feature of some of the dikes is that they contain "ladder quartz veins". Significant gold values are found in quartz veins of this type in gold occurrences to the southwest of the Chilian occurrence in the Gold Creek area.

Carbonatization is prevalent throughout the exposure; intense fuchsitic alteration is evident in the large trench that cuts across the middle rock exposure in the stripped off area. Generally, the green fuchsitic alteration is restricted to the most altered mafic to ultramafic intrusives.

The major quartz veins are in the order of 1 to 2.25 m wide and exhibit "crack-seal" textures. The immediate wallrock on the main vein at the eastern end of the stripped area is sheared, however, the majority of the outcrop is unfoliated. Samples of the quartz vein itself did not return any gold assays; a grab sample from the shear zone on the edge of the quartz vein (sample 6) returned the highest assay result of 0.04 ounce Au per ton. The quartz veins are pure white with some xenoliths. Numerous smaller quartz veins crosscut the dike complex, some of which have subhorizontal attitudes. These minor veins are narrow and for the most part are in the order of 1 cm wide. In most cases the smaller veins strike subparallel to the main veins.

As exposed in the stripped area, the dike assemblage plus the major quartz veins strike between 100 to 120° with a steep southerly to near vertical dip. The reason for the angular discordance between the attitude of the quartz vein in the eastern exposed section and the middle exposed section was not resolved. It may be due to either faulting or folding or it may represent 2 separate veins.

The youngest rock in the exposed area is a small, black, aphanitic Keweenawan diabase dike that contains 2 cm plagioclase crystals in its core area. This dike crosscuts all rock types and strikes 340° with a vertical dip.

It is reasonable to propose that the host gabbros and peridotites are Keewatin in age and that lamprophyric dike assemblage and the superimposed alteration, quartz veins, and gold mineralization are Timiskaming in age. This scenario is consistent with the regional association in which gold mineralization has a close spatial and temporal association with "Temiskaming" type assemblages (see Recommendations for Exploration). The dike swarm supports the contention that this assemblage was formed in a post Keewatin rift tectonic environment.

E. Ranta Occurrence

The E. Ranta gold occurrence is situated in Moss Township approximately 700 m southeast of the past producing Moss Mine. The showing is located in the vicinity of UTM co-ordinates 665058E 5378193N and can be accessed most easily through the Moss Mine property.

E. Ranta used power equipment to strip the overburden from along the edge of a small knoll defining the south edge of a shallow ravine to expose bedrock. The stripped area is approximately 250 m long and trends about 070°.

The showing is a previously undiscovered gold occurrence that was found by E. Ranta in the fall of 1992. A brief description of the occurrence was given by Lavigne et al. (1993). The occurrence was mapped in the summer of 1993 by Thunder Bay Resident Geologist's office staff.

Several mafic flow units have been exposed in the stripped area. These flows have been intruded by diorite and a syenite dike. The principal quartz vein is situated at the contact between the diorite intrusion and a mafic volcanic flow (Fig. 3).

The flow units are dark to medium green in colour and are feldspar porphyritic, with feldspar phenocrysts making up approximately 20% of the rock. The flows are vesicular, brecciated and have poorly developed pillows. The foliation in the flow units near the eastern end of the exposure strikes 072° with a dip of 50° to the north. Where the flows are vesicular, the predominant vesicle-filling mineral is chlorite with carbonate subordinate. The foliation near the western end of the mapped exposure is 100° with a presumed vertical dip. The western end of the stripped area is underlain by diorite containing xenoliths of vesicular volcanics.

The diorite intrusion is massive, unfoliated and is moderately fractured. It is light green in colour and exhibits fine to medium grain size. The diorite is feldspar porphyritic and weakly magnetic. Small grains (<0.5 mm) of magnetite make up to 3% of the rock in places. There is a trace of pyrite in the rock. The matrix is chloritic with some biotite present. Small wispy quartz veins are present within the diorite. The largest of these is located near the western end of the area mapped and ranges in thickness from 1 to 14 cm. The vein strikes 250° and is vertical. The quartz is white and black in colour and contains a trace of pyrite.

The syenite dike which intrudes the mafic flow (Fig. 3) is 60 cm wide, medium to fine grained and brick red in colour. No economic mineralization is associated with this dike.

The principal quartz vein that constitutes the gold occurrence is situated approximately 80 m from the west end of

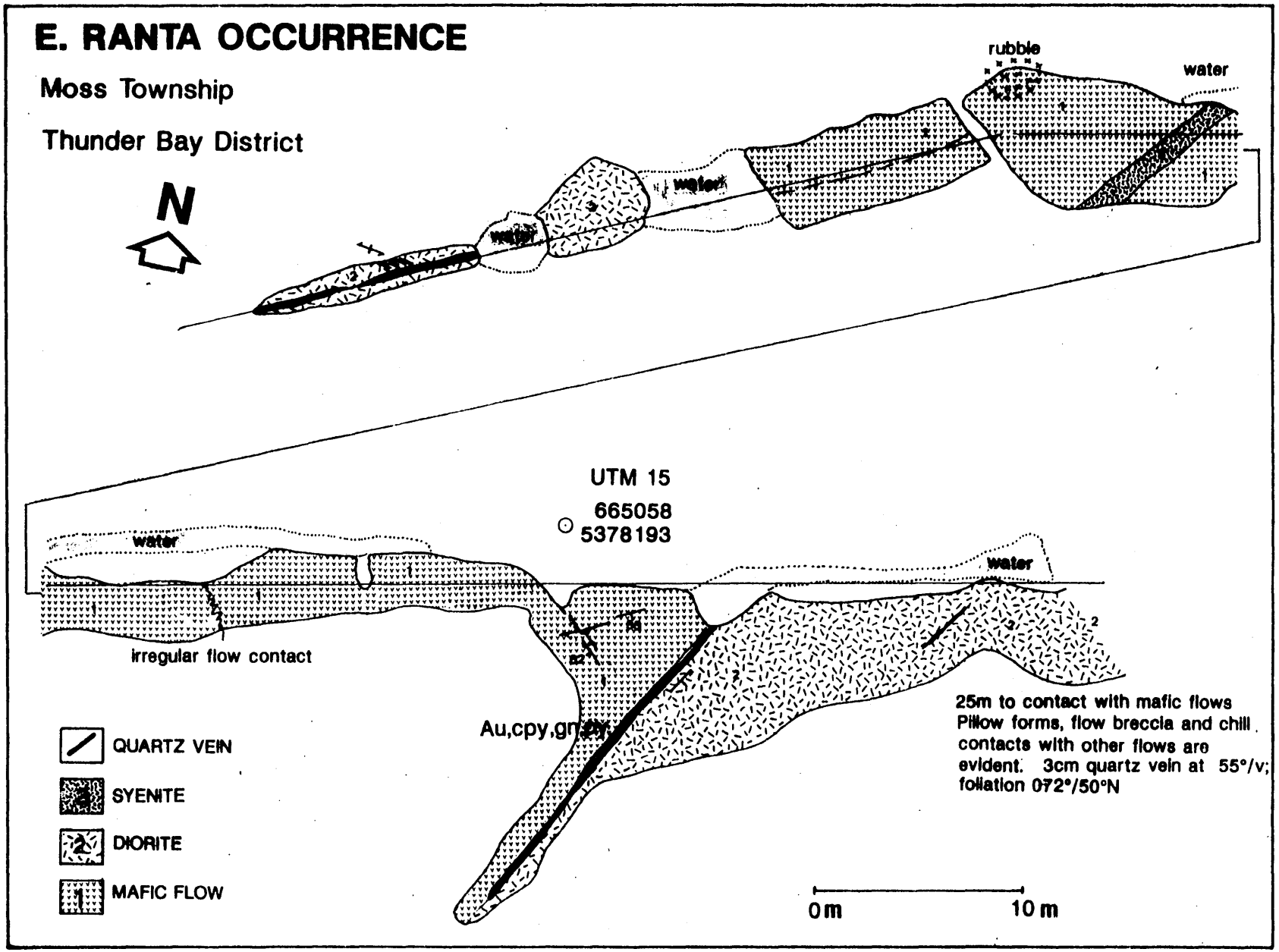

FIGURE 3 : GEOLOGY OF THE E. RANTA OCCURRENCE MOSS TOWNSHIP

the area mapped. The vein is about 30 cm wide, strikes 040° and has a 75° dip to the south. There is a silicified zone around the vein that permeates into the wall rock. Galena, sphalerite and chalcopyrite are present in the quartz vein. Assays of up to 3.0 ounces Au per ton have been recorded from grab samples from this vein (E. Ranta, personal communication, 1993).

RECOMMENDATIONS FOR EXPLORATION

Matawin Gold Belt

Introduction

The discovery of more than 40 gold occurrences over the last 10 years has led to the realization of a new gold belt. This belt, 75 km long and 6 km wide, traverses the eastern portion of the Shebandowan Greenstone Belt (Fig. 4). Of particular significance is the close spatial association between the gold mineralization and a younger "Timiskaming" type assemblage which uncomformably overlies and intrudes Keewatin greenstone. The "Timiskaming" type assemblage contains igneous rock with alkalic chemistry.

This gold belt begins in Lamport Township (just south of Lower Shebandowan Lake) and tracks eastward through Duckworth, Laurie, Horne, Conmee, Ware, Gorham and MacGregor townships (just north of the city of Thunder Bay) (Fig. 4). The realization of this gold belt is the culmination of the combined efforts of the mineral exploration community and geological surveys over the last 100 years.

History

In 1894 and 1895, Dr. Coleman of the Ontario Bureau of Mines visited mineral exploration and mining sites west of Lake Superior (Coleman 1896). Coleman reports that along Gold Creek in Duckworth and Laurie townships much stripping and trenching had taken place and is referred to as the Quartzite Mine (#16 on Fig. 5). The mineralization, which was previously reported to carry gold, is described as disseminated sulphides in felsic schist.

The Shebandowan Lake area was mapped by T.L. Tanton in 1928, 1929 and 1931 for the Canada Department of Mines and Resources (Tanton 1938). Tanton not only found visible gold in the Gold Creek area, but also delineated a belt of "Windigokan" volcanic and sedimentary rock which were recognized as uncomformably overlying the "Keewatin" volcanic rocks. Three gold occurrences plotted on his map are the Page, Scali and Hackl occurrences (#21, 32 and 53 on Fig. 5)

At the eastern end of this gold belt, in Gorham Township, immediately north of the city of Thunder Bay, several developed gold prospects are aligned along an east-west trend. Gold was first discovered here in 1935. The area was mapped by Ontario

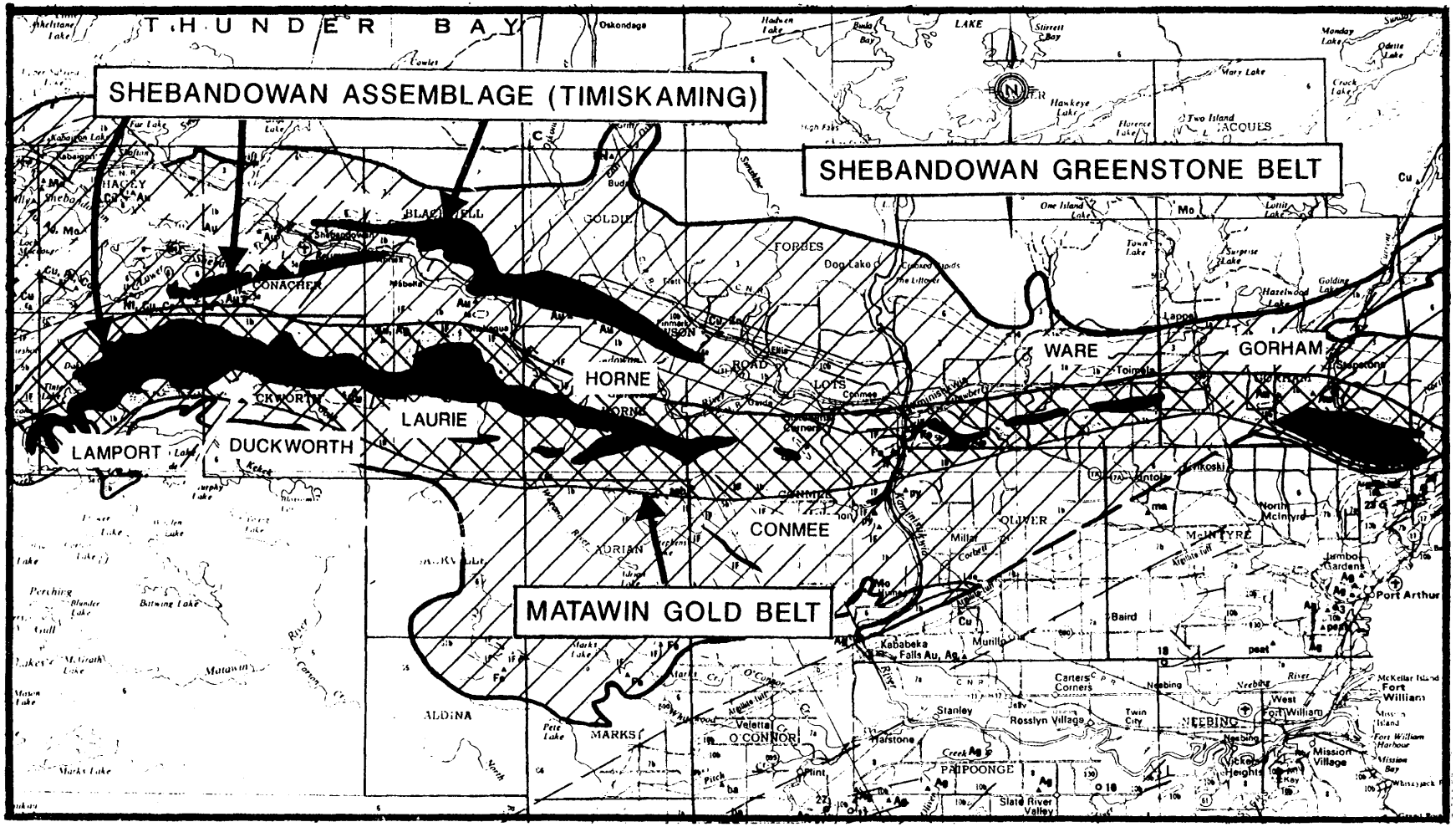

FIGURE 4 : LOCATION OF THE MATAWIN GOLD BELT WITHIN THE SHEBANDOWAN GREENSTONE BELT

Department of Mines geologist R.D. MacDonald in 1938. In addition to a "Keewatin" volcanic sequence, a younger volcanic-sedimentary sequence was also recognized (MacDonald 1939).

No mapping was carried out in the eastern part of the Shebandowan Greenstone Belt from 1938 until 1972 when Lamport and Duckworth townships were mapped (Srivastava and Fenwick 1973). In 1984, Maurice Carter of the Ontario Geological Survey (O.G.S.) initiated a three-year mapping project that covered Horne, Laurie and Conmee townships (as well as Blackwell, Forbes and Laurie townships) (Carter 1990a,b,c). In 1983 to 1984, John Scott mapped MacGregor Township (Scott 1990). In 1993, the remaining townships, which are transected by the gold belt, were mapped by the O.G.S. Ike Osmani mapped Lamport Township (as well as Begin Township and parts of Hagey and Haines townships); Murray Rogers mapped Duckworth Township (as well as Sackville and Aldina townships); Heather Brown mapped Ware Township. The existence of a post-Keewatin sequence was confirmed by this most recent mapping. Shegelski (1980) and Borradaile and Brown (1987) studied aspects of the "Timiskaming" in this area.

Prior to 1983, only 10 gold occurrences were known within this gold belt. Most of the exploration activity took place at the west end in Duckworth and Laurie townships; the commodity sought was iron. This area was known as the Matawin Iron Range (and thus the Matawin Gold Belt) and Monpre Iron Mines delineated 120 Mt at 30% Fe. At the east end, in Gorham Twp., 4 properties were extensively explored. At the west end, 6 gold occurrences were known, including the one reported by Coleman (Quartzite Mine), and 3 by Tanton (1938) (Hackl, Scali and Page occurrences). In 1943 to 1944, Gunflint Iron Mines Ltd. reported values as high as 30 g/t Au from chip samples of altered porphyry cut by quartz stringers (#31 on Fig. 5). In 1958, George Chilian reported a grab sample that assayed 314 g/t Au (#22 on Fig. 5). One of the gold occurrences reported by Tanton was worked on in 1972 by D. Scali and V. Borschneck (#32 on Fig. 5) (Resident Geologist's files, Resident Geologist's office, Thunder Bay District, Thunder Bay).

In 1983, the level of mineral exploration activity in the Shebandowan Greenstone Belt began to increase directly as a result of prospecting. Prospectors John Ternowesky, Bill Hayne and Dave Walsten carried out reconnaissance prospecting in Duckworth and Laurie townships. Literature and assessment file search led them to Dr. Coleman's account of the Quartzite Mine. Although 1 claim had already been recorded by prospector Jurate Lukosius-Sanders covering the Quartzite Mine, the remainder of the area was subsequently staked. Later that year, this property was optioned to Jalna Resources, who in turn carried out a two-year exploration program. In 1985, the property was optioned to Anaconda Canada Exploration. Inco Gold Company

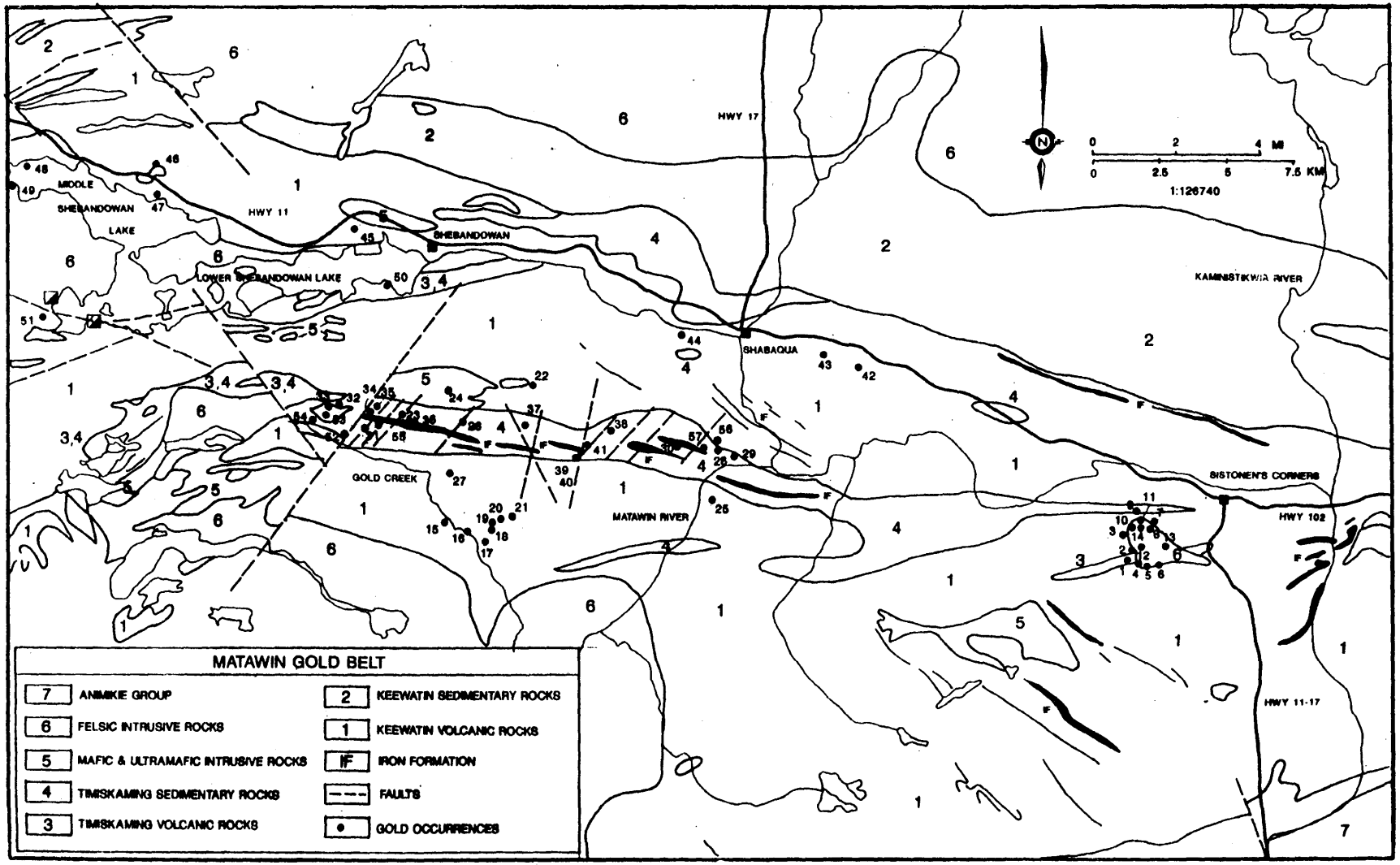

FIGURE 5: GOLD OCCURRENCES IN THE WEST HALF OF THE MATAWIN GOLD BELT

TABLE 2: LIST OF GOLD OCCURRENCES (CORRESPONDING TO FIG. 5)
CONMEE TOWNSHIP: FIRE TOWER STOCK (Stewart Option)

MAP NO.	REF. (TH.BAY ASSESS. FILES)	MAP NO.	REF. (TH.BAY ASSESS. FILES)
1	A ZONE	8	H ZONE
2	B and Q ZONE	9	I ZONE
3	K ZONE	10	J ZONE
4	C ZONE	11	L AND M ZONE
5	E ZONE	12	R AND S ZONE
6	F ZONE	13	P ZONE
7	G ZONE	14	N ZONE

MAP NO.	REF. (TH.BAY ASSESSMENT FILES)	HISTORICAL NAME
GOLD CREEK AREA		
15	A ZONE	
16	B ZONE	Quartzite Mine
17	C ZONE	Ternowesky Occurrence
18	D ZONE	
19	E ZONE	
20	F ZONE	
21	G ZONE	Page Occurrence
22	H ZONE	Chilian Occurrence
23	I ZONE	
24	J ZONE	
25	K ZONE	
26	L ZONE	
27	M ZONE	
28	N ZONE	
29	O ZONE	
30	Q ZONE	
31	R ZONE	Gunflint Occurrence
32	S ZONE	Scali Occurrence
33	T ZONE	
34	V ZONE	
35	W ZONE	
36	X ZONE	
37	Y ZONE	
38	Z ZONE	
39	Aa ZONE	
40	Ab ZONE	
41	Ac ZONE	
52	Ad ZONE	
53	U ZONE	Hackl Occurrence
54	Af and Ah ZONE	
55	P ZONE	
56	Ag ZONE	
57	Ai ZONE	
OTHER GOLD OCCURRENCES		
42		Dawson Road Lots-East trenches
43		Dawson Road Lots-West trenches
44		Kasper Occurrence
45		Bandore
46		J.F. West Occurrence
47		Calchrist Occurrence
48		Middle Gap Island Occurrence
49		Andowan Mines occurrence
50		Green Bay occurrence
51		Au near Inco #1 Shaft (Osmani 1994)

optioned the property in 1986 as well as several adjoining properties and explored them until 1990. These exploration programs resulted in the discovery of 27 new gold occurrences in the Quartzite Mine area and the Matawin Iron Range area which are described below.

In 1984, prospector Mel Stewart discovered sulphide rich float in Conmee Township and brought the property to Noranda Exploration Company Limited's attention. Samples collected by Noranda Exploration Company Limited during a property visit were anomalous in gold. An option agreement was signed between Noranda Exploration Company Limited and Mel Stewart and a three-year exploration program was undertaken. Inco Gold Company subsequently optioned the property in 1988 and also carried out 3 years of exploration. Noranda Exploration Company Limited optioned the property once again in 1990. These exploration programs resulted in the discovery of 14 new gold occurrences which are described below (#1 to 14 on Fig. 5).

In 1986, Inco Gold Company optioned the Lakehead Gold Mines property in Gorham Township. It was subsequently optioned to Esso Minerals Canada Ltd. in 1990 and Noranda Exploration Company Limited in 1992. Although this work confirmed and extended previously known mineralization, significant new discoveries were not made.

Regional Geology

The regional geology of the Shebandowan Greenstone Belt, as described by Williams et al. (1991) (Geology of Ontario), consists of 2 opposite-facing, volcanic assemblages (Greenwater and Burchell assemblages) and a third, younger, uncomformably overlying "Timiskaming" assemblage (Shebandowan Assemblage). The older suites contain several mafic to felsic volcanic cycles that consist of tholeiitic to calc-alkalic rocks and some komatiitic units. In contrast, the younger suites consist of sedimentary and volcanic rocks including units of alkalic affinity.

The younger Shebandowan Assemblage occurs as 2 distinct horizons in the central part of the Shebandowan Greenstone Belt (Fig. 4). The northern horizon straddles the southern shore of Lower Shebandowan Lake and along the northern boundary of the Shebandowan Greenstone Belt. The southern horizon is coincident with the Matawin Gold Belt seen on Fig. 4. The 2 horizons have some significant differences. The northern horizon has a volcanic component which is not well represented in the southern belt. The southern belt has abundant iron formation which is virtually absent in the northern belt.

In decreasing order of abundance, the lithologic makeup of the southern belt of the Shebandowan assemblage is: clastic sediments (argillite, greywacke, arkose, conglomerate); ironstone; felsic tuff; alkalic intrusives; and lamprophyre dikes.

Gold occurrences within the Matawin Gold Belt are predominantly within the Shebandowan Assemblage, however, many occurrences exist in the neighbouring "Keewatin" rocks of the Greenwater Assemblage (e.g. Chilian, #22 on Fig. 5). As can be seen on Fig. 5, there is 3 geographically and geologically distinct groupings of gold mineralization in the western half of the Matawin Gold Belt: 1) the Stewart property in Conmee Township is hosted by the Tower Syenite Stock (#1 to 14); 2) the Quartzite Mine area on the Duckworth-Laurie township boundary is hosted by felsic volcanics (#15 to 21); 3) the Matawin Iron Range gold mineralization is hosted by granodiorite to quartz syenite dykes and stocks (#3 to 41 and #52 to 57).

Stewart Property - Tower Syenite Stock

Gold mineralization on the Stewart property is hosted by the Tower Syenite Stock and highly altered volcanic and sedimentary rock at the western contact with the syenite. The Tower Syenite (1.5 x 3 km) is a composite stock consisting of an outer rim of quartz monzonite and a core ranging in composition from monzodiorite-diorite-gabbro including some lamprophyre. The margins of the stock have hematitic alteration.

The most significant mineralization occurs within the contact breccia. The breccia consists of angular to subrounded fragment of the intrusive and country rock set in a fine grain matrix of finely comminuted rock fragments, up to 40% black tourmaline and with 10 to 20% fine grain pyrite in both the matrix and the clast. The zone of mineralization is up to 300 m wide along the 2 km length of the western margin of the intrusive. Gold values typically range from 100 to 800 ppb, with values locally up to 27.4 ppm. The hydrothermal alteration assemblage includes: quartz (fissure filling and replacement); iron carbonate; tourmaline; hematite; chlorite; epidote; and sericite. The most significant zone of mineralization, termed the "A Zone" (#1 on Fig 5), was drilled by Noranda Exploration Company Limited in 1986 to 1987 and estimated to contains 60 000 t at 3 g/t Au (Resident Geologist's files, Resident Geologist's office, Thunder Bay District, Thunder Bay).

To date most of the mineralization discovered is at the western margin of the stock, however, Inco Gold Company did discover one zone in the centre of the stock (#13 on Fig. 5) and more recently, Maurice Carter of the O.G.S., while carrying out a detailed study of the stock, produced significant gold assays from unmineralized samples collected for the purpose of lithogeochemistry (Ontario Geological Survey, press release, December 14, 1993).

Quartzite Mine Area

Seven gold occurrences (#15 to 21 on Fig. 5) exist in the area where Coleman (1896) located a number of trenches along Gold Creek. In 1983, Jalna Resources rediscovered these workings as

well as 4 new zones of mineralization. Jalna optioned the property to Anaconda Canada Exploration Ltd. in 1984 and 1985. Subsequent exploration by Inco Gold Company resulted in the discovery of 2 more gold-bearing mineralized zones. The mineralization is hosted by a sequence of felsic fragmental rocks, from tuffs to breccias, with both lithic and crystal fragments. The mineralization is located in proximity to the sub-vertical hinge of a broad antiform where the rock is highly strained. The dominant style of mineralization is 2 to 7% finely disseminated to streaky pyrite in sericitic and siliceous zones that are 25 to 150 m wide and several hundred metres long. Surface sampling by Jalna on 1 zone outlined 55 m by 2.4 m averaging 3.0 g/t Au. Higher grades were found in quartz veins. For example, the 1 m wide quartz vein in the Ternowesky zone produced assays of 1.04 and 8.6 ounces Au per ton from grab samples (Resident Geologist's files, Resident Geologist's office, Thunder Bay District, Thunder Bay).

Matawin Iron Range Area

Until 1986, when Inco Gold Company optioned property from prospectors John Ternowesky and Dave Walsten, the area underlain by the Matawin Iron Range had seen very little exploration for gold. Over the next 4 years, Inco Gold Company increased the number of gold occurrences from 4 to 26. The dominant style of mineralization consists of quartz veins in granodiorite dikes. The dikes range in width from 5 to 120 m and have been traced for up to 2 km. The quartz veins range in width from 1 to 150 cm and are arranged as simple ladder veins to more complex arrangements and breccias. The quartz veins contain 1 to 15% pyrite, up to 3% galena, occasionally chalcopyrite, and commonly visible gold. The wallrock has been altered to iron carbonate, locally silicified and contains up to 10% pyrite. Other alteration minerals present are hematite, chlorite and sericite. Several zones are either hosted by lamprophyre dikes or have a spatial association with these dikes. The country rock, host to the dykes, is iron formation, felsic tuff and fine grain sedimentary rock.

In summary, recent focused exploration on short segments of the Matawin Gold Belt has produced more than 40 new gold occurrences. Long segments remain virtually unexplored and the potential for discovery is high.

CURRENT RESEARCH

Precambrian Section, Ontario Geological Survey

The Precambrian Section continued geological mapping of the Shebandowan Greenstone Belt west of the city of Thunder Bay. I. Osmani and J. Payne (1993) mapped Begin and Lamport townships and the southern parts of Haines and Hagey townships. This area hosts the Shebandowan Mine. M. Rogers (1993) mapped Sackville, Aldina and Duckworth townships. H. Brown and R.I. Fogal (1993)

mapped Ware Township. K. Farrow (1993) is carrying out a study of base metal mineralization in the Shebandowan Greenstone Belt.

Lakehead University

M. Sc. theses underway at Lakehead University include:

J. Selway: Platinum Group Mineralization in the Kawene Intrusion.

T. Werner: Paleomagnetism, Structure and Magnetic Fabric in a Traverse of the Quetico Subprovince Between Atikokan and Kashabowie, Northwestern Ontario.

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KIRKLAND LAKE RESIDENT GEOLOGIST'S DISTRICT - 1993

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INTRODUCTION

During 1993 there were nine active mineral or stone extraction operations in the Kirkland Lake Resident Geologist District: five underground gold mines, one tailings reclamation operation, one underground barite mine, one open pit hedmanite mine and one green carbonate decorative stone quarry. Other highlights include the completion by Hemlo Gold Mines Inc. of an underground exploration program in preparation of a final feasibility study of the Lightning zone; American Barrick Resources Corp. outlined the likely down-plunge extension of the Mattawasaga zone and are deepening the shaft at their Holt-McDermott gold mine; and Lac Minerals Ltd.'s Macassa gold mine experienced a set back caused by three rock bursts that buried two miners. Underground operations at Macassa are currently temporarily suspended.

Overall gold production for 1993 throughout the Kirkland Lake Resident Geologist District was 171 802 ounces, an increase of 1319 ounces compared to 1992 overall production figures.

Several exploration projects conducted within the district during 1993 were remarkably successful. Cyprus Canada Inc.'s further exploration of a previously discovered gold-bearing zone south of Kirkland Lake outlined possible reserves of one million tons at 0.2 ounces Au per ton. Sudbury Contact Mines Ltd. discovered a new gold-bearing zone in Gauthier Township, thereby upgrading the gold potential of nearby alteration zones.

G.E. Parsons conducted an OPAP-funded diamond-drill program that resulted in the intersection of a narrow, high-grade gold mineralized zone in Carr Township. This discovery may lead to further exploration in an underexplored area that now appears to have high gold potential.

Thirty-two Ontario Prospectors Assistance Program (OPAP) projects received funding within the Kirkland Lake Resident Gelogist District, for a total of $307 593. Four projects received Ontario Mineral Assistance Program (OMIP) grants totalling $370 167.

An airborne geophysical survey of the Blake River Syncline was flown with funding provided through the Northern Ontario Development Agreement (NODA). This survey was released on March 17, 1993. The first phase of a NODA-funded roto-sonic overburden-drill project that focuses on the study of kimberlites and diamond indicator minerals was completed in February. Thirty-one overburden holes, some testing known kimberlite pipes and their down-ice dispersion, were drilled.

Elimination of two Drill Core Library positions impacted on the service previously offered at the facility. The outside drill core storage site has been improved and the core stored at this site is now more accessible.

Active claim units for the Larder Lake Mining Division at the end of 1993 totalled 26 979. This figure is up by 5.7% over last year's total. Exploration expenditures filed for assessment work in the Larder Lake Mining Division in 1993 totalled $5 236 181. This figure is down by 9.8% compared to 1992 (see Table 1).

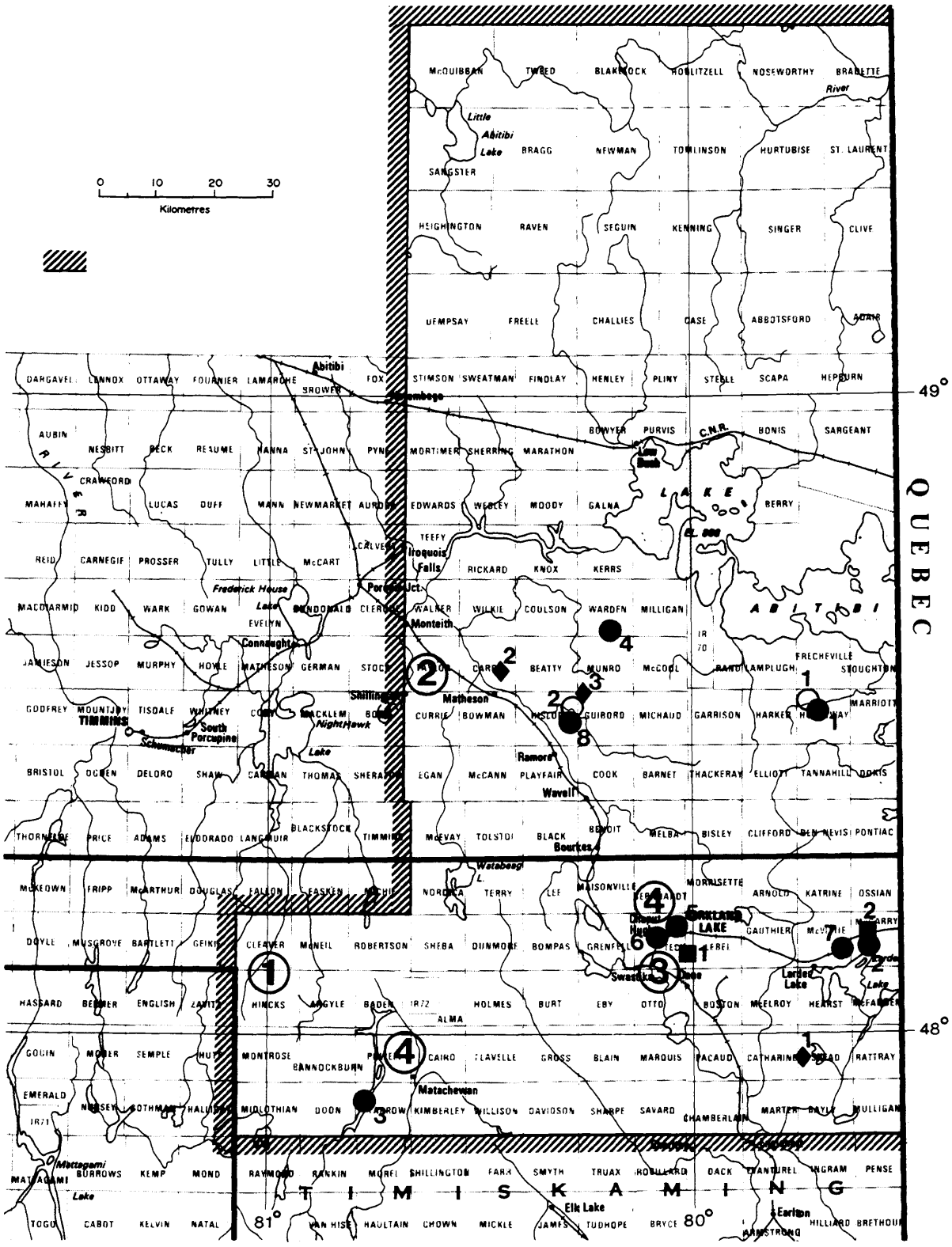

Figure 13.1. Kirkland Lake Resident Geologist's District

EXPLANATION

●Producing Mines, 1992

1. American Barrick Resources Corp.
   Holt-McDermott Mine . . . . . .Au, Ag
2. Deak Resources Corporation-GSR Mining Corp.
   Kerr Mine . . . . . .Au, Ag
3. Extender Minerals of Canada
   Yarrow Township Mine . . . . . barite
4. Hedman Resources Ltd.
   Hedman Mine . . . . . hedmanite (serpentine filler)
5. Lac Minerals Ltd.
   Lake Shore Tailings Project . . . . . .Au, Ag
6. Lac Minerals Ltd.
   Macassa Mine . . . . . Au,Ag
7. Northfield Minerals Inc.
   Cheminis Mine . . . . . .Au
8. St Andrew Goldfields Ltd.
   Hislop Mine . . . . . .Au

○Advanced Exploration Projects

1. Hemlo Gold Mines Inc.-Freewest Resources Inc.-Teddy Bear Valley Mines Ltd.
   Lightning Zone . . . . . .Au
2. Royal Oak Mines Inc.
   Matachewan Consolidated Property (Hislop Township) . . . . .Au

■Producing Quarries

1. Tundra Granite and Marble
   Teck Township Project . . . . . marble ("green-carbonate")
2. Tundra Granite and Marble
   Kerr Option . . . . . marble ("green-carbonate")

◆Property Visits

1. Benson Creek Fault Property
2. Carr Township Con. II, Lot 4 - G.E. Parsons
3. Gold Coin Property

(1)Location of OGS Field Party

1. Geology of Cleaver and Hincks townships (L.S. Jensen)
2. Study of gold mineralization and setting, Taylor Township (G.M. Siragusa)
3. Study of kimberlite occurrences (R.P. Sage)
4. Multi-media geochemical study of tailings dispersion (R.G. Jackson)

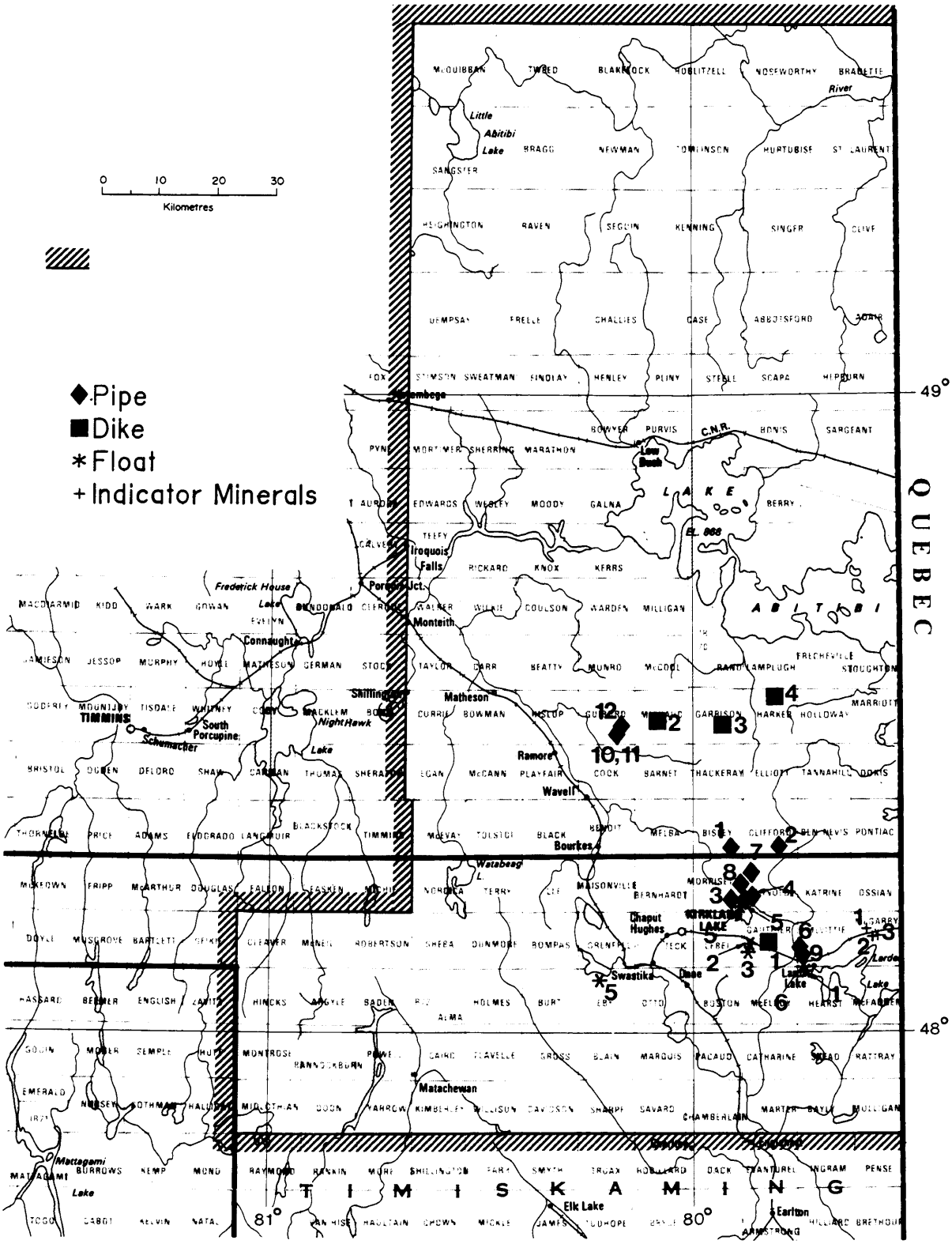

Figure 13.2. Kimberlite occurrences in the Kirkland Lake Resident Geologist's District

Table 1: Summary of Claims recorded and assessment work credit.

Year	Claim Units Recorded	Claim Units Cancel	Active Claim Units	Diamond Drilling ($)	Physical Surveys ($)	Geotech Surveys ($)	Total Filed ($)
1993	6077	4626	26979	2291228	844515	1988618	5236181
1992	6194	776	25528	included	3896493	1761393	5805779
1991 (June-Dec)	3130	1799	20168	in phys. surveys	1155649	993444	2443697

Year	Claims Recorded	Claims Cancel	Active Claims	Diamond Drilling (man days)	Geophysical Surveys (man days)	Geologic Surveys (man days)	Total Filed (man days)
1991 (Jan-May)	1659	2463	18948	40750	89987	16935	167964
1990	4170	6838	19821	100787	132394	24048	302037
1989	3511	5239	22642	154099	88288	34941	319325
1988	3885	4814	26240	209276	333274	34998	654132
1987	6742	3854	27146	197727	319836	17872	600241
1986	6973	6787	24160	107108	399511	48263	631038
1985	7558	5011	23974	95076	276646	19517	460183
1984	7943	4492	21397	93946	245542	44113	473820
1983	8354	3866	17946	121213	98366	15233	304770
1982	3253	5218	13458	99526	133511	17926	313690
1981	5498	2697	15423	69906	125459	19536	247087
1980	6299	1834	12622	64454	115031	10981	209357
1979	4261	1452	8157	29714	25352	4990	68763
1978	1710	2065	5248	32602	38100	8887	87144
1977	1826	2334	5703	37101	45436	1820	98992
1976	2350	2979	6712	47724	42338	6220	102936
1975	2916	5010	7341	45880	38047	6738	98624
1974	4757	2296	9435	40678	55716	4441	110165

MINING

At year end, gold was being extracted from five underground gold operations and one tailings recovery operation. In addition, barite and hedmanite were being extracted from two other operations.

Gold production for 1992 and 1993 is summarized in Table 2. Table 3 lists gold reserves in tons, grade and total contained ounces for all properties with known reserves within the district. Total production to date for all producing and past producing mines is tabulated in Table 4.

American Barrick Resources Corp.

American Barrick Resources began deepening the Holt-McDermott Mine shaft by 300 m to 920m. By year end, the shaft has been depeened to 747m. Thus far, a new ore zone containing 750 000 tons of 0.20 oz. Au per ton has been outlined south of and below the present mine workings. The work, including the establishment and lateral development of 2 or 3 levels, ore and

Table 2: Gold Production in the Kirkland Lake Resident Geologist's District - 1993-1994

Mine Owner	Township	Tons Milled		Production (oz Au)		Recovered Grade (oz Au/t)	
		1992	1993	1992	1993	1992	1993
Cheminis Northfield Resources Inc.	McVittie	40115	26126	4054	2382	0.101	0.099
Hislop East St Andrew Goldfields Ltd.	Hislop	0	20708	0	1634		0.079
Holt-McDermott American Barrick Resources Corp.	Holloway	453348	427700	46325	64219	0.102	0.150
Kerr Deak resources Corp. GSR Mining Ltd.	McGarry	292000	291520	28000	15350	0.096	0.053
Lake Shore Lac Minerals Ltd.	Teck	279130	334148	14846	17017	0.053	0.472
Macassa Lac Minerals Ltd	Teck	146839	150697	77258	71200	0.526	0.051
Total Including Tailings		1211432	1250899	170483	171802	0.141	0.137
Total Excluding Tailings		932302	916751	155637	154785	0.167	0.169

waste passes, loading pockets, crusher stations, etc., will cost an estimated $8.7 million. The newly discovered ore zone, below and south ofthe present mine workings, has a strike length of 260 m and is located between the -650 and -800 m levels. Production from this zone is expected to begin in 1995, and is expected to extend the mine life by two to three years (Northern Daily News, June 7, 1993, p.1, The Northern Miner, June 21, 1993, p.1, 2).

Both ore grade and production are up substantially at the mine. A total of 64 219 ounces of gold were produced from 427 700 tons of rock for an average recovered grade of 0.150 ounces Au per ton. The grade is up from 0.102 ounces Au per ton in 1992, (R.J. Haflidson, American Barrick Resources Corp., written communications, 1994).

Deak Resources Corporation - GSR Mining Corp.

Deak Resources Corportation's financial difficulties resulted in the shutdown of mining operations from February until August. Custom milling of ore continued. In April, Gwen Resources Ltd. became the major shareholder of Deak Resources and Alex Perron, Gwen Resources President, became the Chief Executive Office and President of Deak Resources Corporation (Northern Daily News, April, 1993). Bill Glover became the new mine manager at the Kerr Mine. Through an option deal with Cyprus Canada Inc., Cyprus is exploring two zones, the Mill and the G-Zone, south of the present Kerr mine workings between the 2500- and 3850-foot levels. In an ammended agreement, Cyprus must spend $4-million on exploration by March 1,

Table 3: Gold Reserves in the Kirkland Lake Resident Geologist's District to 1992

	Mine/Property	Reserves	Grade	Ounces
Producing Mines (1992)				
18.	Cheminis	256661	0.156	40166
33.	Holt-McDermott	2502000	0.17	429510
36.	Kerr	2175000	0.125	271875
31.	Hislop East	835544	0.17	142042
43.	Macassa	1363000	0.537	731320
44.	Macassa (tailings)	2389000	0.07	167230
Other Properties				
3.	Anoki	650000	0.136	88400
4.	Argyll (Maude Lake)	130000	0.158	20540
5.	Armistice	242224	0.175	42389
8.	Barber Larder	60000	0.16	9600
11.	Blue Quartz	109000	0.484	52756
13.	Buffonta	400000	0.180	72000
20.	Creek Zone	1118000	0.184	205712
22.	Cyrus Zone (1993)	1000000	0.2	200000
23.	Eastmaque	6800000	0.033	224400
24.	Garrcon	350900	0.19	66671
26.	Glimmer	1310000	0.303	396930
27.	Golden Harker	500000	0.16	80000
32.	Hislop West	19230	0.59	11346
35.	Iris	769756	0.07	53883
41.	Lightning	5500000	0.27	1485000
42.	Ludgate	650000	0.17	110500
45.	Matachewan Consolidated	93000	0.11	10230
52.	Newfield	513000	0.28	143640
53.	Omega	280000	0.16	44800
54.	Porphyry	316823	0.08	25346
56.	Ross	1055000	0.125	131875
58.	Shoot Zone	2100000	0.11	231000
61.	Teck Hughes	400000	0.25	100000
63	Upper Beaver	200000	0.23	46000
64.	Upper Canada	1297278	0.259	336180
67.	Young Davidson	5420000	0.119	645000
	Total includ. tailings	**40711416**	**0.161**	**6570281**
	Total exclud. tailings	**31522416**	**0.196**	**6178651**

Table 4: Gold Production in the Kirkland Lake Resident Geologist's District to 1993.

	Mine	Township	Tons Milled	Prod. (oz. Au)	Grade (oz.Au/T)	Years of Production
1	Aljo	Beatty	2 333	42	0.018	1940
2	American Eagle	Munro	60	40	0.667	1911
4	Argyll	Beatty	25	30	1.200	1918
6	Ashley	Bannockburn	157 076	50 123	0.32	1932-36
8	Barber Larder	McGarry	30 118	3 072	0.1	1988
9	Barry Hollinger	Pacaud	267 741	77 000	0.26	1918,25-36,44-46
10	Bidgood	Lebel	586 367	160 184	0.27	1934-51
11	Blue Quartz	Beatty	500	81	0.162	1923,26,28,34
12	Bourkes	Benoit	1 298	277	0.21	1918,36-38
13	Buffonta	Garrison	117 013	12 139	0.103	1981,91-92
14	Canadian Arrow	Hislop	279 593	17 045	0.06	1980-83
15	Canamax (Matheson Project)	Holloway	38 675	5 391	0.14	1988
16	Cathroy Larder (Mirado)	McElroy	89 719	10 231	0.11	1941-44,47,57,87
17	Centre Hill**	Munro	327 007	422	0.001	1967-70
18	Cheminis*	McVittie	75 191	7 636	0.102	1991
19	Chesterville	McGarry	3 260 439	358 880	0.11	1930-52
21	Croesus	Munro	5 333	14 859	2.79	1915-18,23,31-36
23	Eastmaque (tailings)	Teck	1 051 744	28 740	0.027	1988-91
25	Gateford (Swastika)	Teck	103 684	30 068	0.29	1910-47***
28	Golden Summit	Maisonville	737	57	0.077	1936-37,45
29	Gold Hill	Catharine	4 616	660	0.143	1927-28
30	Gold Pyramid	Guibord	175	36	0.206	1911
31	Hislop East*	Hislop	82 990	13 869	0.167	1990-91,993-
33	Holt-McDermott*	Holloway	2 851 208	317 638	0.111	1988-
34	Hudson-Rand	Teck	6 496	483	0.074	1922
36	Kerr*	Mcgarry	39 616 311	10 401 349	0.263	1911,38-
37	Kirkland Lake	Teck	3 140 283	1 172 955	0.37	1916-60
38	Kirkland Townsite	Teck	4 230	1 921	0.45	1958-59
39	Laguerre	McVittie	40 514	7 568	0.19	1937-39
40	Lake Shore	Teck	17 117 923	8 573 246	0.5	1918-65,82-87
43	Macassa*	Teck	7 292 894	3 260 042	0.447	1933-
44	Macassa (tailings)*	Teck	1 301 148	72 145	0.055	1987-
46	Matachewan Consolidated	Powell	3 525 200	378 101	0.11	1934-54
47	McBean	Gauthier	557 621	45 900	0.08	1984-86
48	Miller Independence	Pacaud	31	59	1.903	1918
49	Moffat-Hall	Lebel	16 388	4 780	0.29	1934-35
50	Morris Kirkland	Lebel	127 253	16 999	0.13	1936-38,40-42
51	New Telluride	Skead	104	62	0.596	1931-32
53	Omega	McVittie	1 615 081	214 098	0.13	1913,26-28,36-47
55	Queenston	Gauthier	1 054	177	0.168	1941
56	Ross	Hislop	6 714 482	995 832	0.15	1936-89
57	Ryan Lake**	Powell	188 790	1 352	0.01	1948-57,62-64
59	Stairs	Midlothian	15 835	3 573	0.23	1965-66
60	Sylvanite	Teck	5 049 536	1 674 808	0.33	1927-61
61	Teck Hughes	Teck	9 565 302	3 709 007	0.38	1917-68
62	Toburn	Teck	1 186 316	570 659	0.48	1912-53***
63	Upper Beaver	Gauthier	580 562	140 709	0.24	1913-72***
64	Upper Canada	Gauthier	4 648 984	1 398 291	0.3	1938-71
65	White-Guyatt	Munro	50	10	0.2	1911
66	Wright Hargreaves	Teck	9 934 327	4 821 296	0.49	1921-65
67	Young Davidson	Powell	6 213 272	585 690	0.1	1934-57
	Total		**127 793 629**	**39 159 632**	**0.306**	

* Producer in 1993
** Base Metal Mine
*** Intermittent Production

1997 in order to obtain a 65% interest in the Mill and G zone areas, and a 50% interest in the South zone area (Kirkland Lake Gazette, November 26, 1993, p.11).

Gold production was down from 1992 due to the shutdown of operations for approximately half of the year, with 15 350 ounces of gold having been produced from 291 520 tons of ore

at an average recovery grade of 0.053 ounces Au per ton, (W. Glover, Deak Resources Corporation, written communications, 1994).

Extender Minerals of Canada Ltd.

Extender Mines of Canada Ltd. continued to produce barite from their Yarrow Township Mine in Yarrow Township (R.Hill, Extender Minerals of Canada Ltd., written communications, 1994).

Hedman Resources Ltd.

The Hedman Mine in Warden Township, operated by Hedman Resources Ltd., continued to produce hedmanite, a mineral filler, during 1993 (R.F. Bertrand, Hedman Resources Ltd., written communications, 1994).

Lac Minerals Ltd. - Macassa Mine

Mining at Lac Mineral Ltd. Macassa Mine was suspended on November 26, 1993 after three large rock bursts on the 6450-foot and 6600-foot levels dislodged more than 23 000 tonnes of rock. Two miners were trapped, resulting in the suspension of mining operations until their bodies are recovered and an investigation into the rock bursts is completed.

Gold production at the mine was down slightly due to the suspension of underground operations beginning in late November. The mine produced a total of 71 200 ounces of gold from 150 697 tons of rock for an average grade of 0.472 ounces Au per ton, (R. Rucker, Lac Minerals Ltd., written communications, 1994).

Lac Minerals Ltd. - Lake Shore Tailings Project

Tailings continued to be processed despite the disruption to mining at the Macassa mine due to the November rock burst. Production from the operation stood at 17 017 ounces from 334 148 tons of tailings processed at an average recovered grade of 0.0509 Au gold per ton, (R. Rucker, Lac Minerals Ltd., written communications, 1994).

Northfield Minerals Inc.

With the shutdown of mining at the Kerr Mine in January, mining operations at the Cheminis Mine were also suspended. Mining was resumed in July at a production rate of 200 tons per day. The ore was custom milled at the Kerr Mine and the Holt-McDermott Mine. The company also began a rehabilitation program on the shaft from the 700-foot to the 1075-foot level. 1993 production amounted to 2382 ounces of gold from 26 126 tons of ore, (V. Popov, Northfield Minerals Inc., written communications, 1994).

St Andrew Goldfields Ltd.

After a public meeting in Holtyre announcing the re-opening of the Hislop Mine and the purchase of the property from Goldpost Resources Inc., St Andrew Goldfields re-opened the mine, and by year end, produced 1634 ounces of gold from 20 708 tons of ore at an average recovered grade of 0.079 ounces Au per ton (P. Blakey, St Andrew Goldfields Ltd., written communications, 1994).

ADVANCED EXPLORATION

Hemlo Gold Mines Inc.-Freewest Resources Inc.-Teddy Bear Valley Mines Ltd.

A $12 million underground exploration program of the Lightning gold zone was completed by the Holloway Joint Venture partners Hemlo Gold Mines Inc.-Freewest Resources Inc.-Teddy Bear Valley Mines Ltd. Work included the sinking of a 441.4-m shaft, 11 000 m of drifting, 25 000 m of underground diamond drilling and the collection of an 8000 tonne bulk sample from the upper portion of the ore zone. The partners are optimistic that the results will justify the development and production of the ore zone at a rate of 1500 tonnes per day. It is estimated that the ore zone, as delineated to date, contains reserves of 5.5 million tons grading 0.28 ounce Au per tonne (The Northern Miner, April 12, 1993, p.2, The Northern Miner, September 6, 1993, p.1, Canadian Mines Handbook 1993-94, p.179).

Royal Oak Mines Inc.

Royal Oak Mines Inc. began extracting a 25 000-ton bulk sample from the Matachewan Consolidated property in Hislop Township in December, 1993, (M.K. Witte, Mines & Minerals Symposium, Toronto, 1993).

EXPLORATION HIGHLIGHTS

Cyprus Canada Ltd. optioned Queenston Mining Inc.'s Amalgamated Kirkland Lake property, Teck Township. In August they began an eight-hole, 10 000 foot diamond drill program (The Northern Miner, May 24, 1993, p.3, The Northern Miner, August 23, 1993, p.11). Cyprus Canada Inc. has extended a previously discovered gold mineralized zone on the Amalgamated Kirkland property located approximately one kilometre south - southwest of the town of Kirkland Lake. This zone, now known as the "Cyprus zone", was the focus of a 9-hole, 4700m (15 275 feet) diamond drill program. The zone has a general east strike, steep dip, and was tested to a depth of 1800 feet. The mineralized zone measures approximately 1640 by 410 by 19.7 feet and is open both in the up- and down-plunge directions. Some of the significant assay results returned to date include 0.59 ounces Au per ton over 15.74 feet, 0.532 ounces Au per ton over 9.84 feet, 0.31 ounces over 41.66 feet, 0.254 ounces over 30.34 feet and 0.162 ounces over 57.34 feet. The outlined zone equates to just over 1-million tons of material grading 0.2 ounces Au per ton. According to Charles Page, Queenston's executive vice-president, the Cyprus structure is hosted in a breccia zone accompanied by silicification, quartz veining and minor pyrite. The host rock is essentially a tuffaceous volcanic rock and, to a lesser degree, sedimentary rocks. Cyprus can earn a 70% interest in the Amalgamated Kirkland property by spending a minimum of $500 000 per year and provide Queenston with a positive feasibility report within 10 years. Cyprus must also pay Queenston $900 000 in cash. Cyprus is planning a 10 000-foot diamond drill program in January, 1994, to test the mineralized zone between surface and 5000 feet, (Canada Stockwatch, November 18, 1993 and Northern Daily News, Nov. 19 and 20, 1993, The Northern Miner November 29, 1993, p.1 and 2 and Kirkland Lake Gazette, November 26, 1993).

A reverse-circulation drill program by Subdury Contact Mines Limited discovered a new gold zone in Gauthier Township. Follow-up diamond drilling to the reverese-circulation drill program and an IP survey returned a gold value of 0.13 ounce Au per ton over 9.8 feet in the discovery hole. A second diamond drill hole collared 1300 feet to the west returned 0.04 ounce Au per ton over 26 feet and a hole mid-way between the two interesected 0.17 oz/ton over 46 feet. Further IP work and diamond drilling will take place starting in January, 1994, (The Northern Miner, December 13, 1993, p.1,10, Sudbury Contact Mines Limited press release, December 8, 1993, Northern Daily News, December 10, 1993, p.1).

Much of the exploration in the area during 1993 focused on the search for kimberlite pipes and diamonds. Areas of search have expanded both north and south of the known pipes. A summary of the significant results is as follows (see Table 5 and Figure 2):

- KWG Resources Inc. and Regal Goldfields Ltd. extracted a 123-tonne bulk sample from the C-14 in pipe Clifford Township and recovered 7 macrodiamonds. They have agreed to extract another bulk sample at an estimated cost of $500 000 (The Northern Miner, January 25, 1993, p.2, Northern Daily News, March 19, 1993, p.6A, Northern Daily News, June 15, 1993, p.1, The Northern Miner, June 21, 1993, p.6).
- Goldhunter Explorations Inc. and Regal Goldfields Ltd. collected a 47-tonne bulk sample on the A-4 pipe in Arnold Township. Four macrodiamonds, two of which were "gem quality" weighing 0.135 and 0.074 karats, were recovered (P4, UTM Zone-17 E-583100 N-5341250) (Northern Daily News, January 22, 1993, p.1, The Northern Miner, May, 10, 1993, p.3).
- Sudbury Contact Mines Limited completed a 73-hole reverse-circulation (RC) overburden drill program on about 30 targets to the south-east of their 2 pipes (P6) in Gauthier, McVittie, Hearst, Rattray, Mulligan and McElroy townships. An additonal 20 reverse- circulation drill hole follow-up program was completed (Northern Daily

Table 5: Summary of documented kimberlite occurrences in the Kirkland Lake Resident Geologist's District.

No.	Township	Name	UTM Zone	Easting	Northing	MDI No.	Diamonds Found?	Remarks
Pipes								
P1	Bisley	Nickila Lake (B-30)(MA6)	17	580400	5348350	C 2299	Yes	Assessment files: KL-0818,KL-1514, KL-1912, MNDM drill hole KL1183
P2	Clifford	C-14	17	589200	5347800	C 2300	Yes	Assessment files: KL-1518
P3	Morrisette	Morrisette Creek (MA20)	17	580900	5340000	T 1144	No	Assessment file: KL-1911
P4	Arnold	Alfie Creek 1 (A4)(MA13-1)	17	583100	5341250	T 1146	Yes	Assessment files: KL-1911, KL-1496
P5	Arnold	Alfie Creek 2 (MA 13-2)	17	582650	5340950	T 1145	No	Assessment file: KL-1911
P6	McVittie	Diamond Lake Pipe	17	592400	5330200	T 1283	Yes	Assessment file: KL-2528
P7	Arnold	Arnold 1 (A1)	17	583220	5345050	T 1281	No	Assessment file: KL-1495
P8	Arnold	AM-47 (MA-14)	17	582800	5342700	T 1282	No	
P9	McVittie	Diamond Lake Pipe No.2	17	592600	5329850	T 1283		
P10	Guibord	Tandem Resources	17	559550	5367950		Yes	Possibly 2 pipes and 1 dike. Exact location unknown.
P11							No	
P12	Guibord	Falconbridge Gold	17	560400	5370200		No	
Dikes								
01	Gauthier	Upper Canada	17	587300	533250	T 0701	No	NMI 32D/04SW Au14,GSC Paper 68-7
D2	Michaud	Ludgate	17	567300	5370400	C 0377	No	
D3	Garrison	Buffonta	17	577450	5369650	C 2441	No	
D4	Harker	Lightval Mines	17	577450	5369650	C 2393	No	Exact location unknown.
Float								
F1	Hearst		17	594000	5327750		No	
F2	Gauthier		17	584250	5332050		No	
F3	Gauthier		17	583900	5331600		No	
F4	Arnold		17	584500	5337950		No	
F5	Eby		17	558600	5325500		No	Originally reported as the discovery of a lamproite boulder now being questioned.
F6	McVittie		17	5938005	5328300		No	
Indicator Minerals								
I1	McGarry	McGarry Gold	17	602750	5335100		Yes	Assessment file: KL-1812
I2	McGarry	McGarry Gold	17	604150	5334000		Yes	Assessment file: KL-1812
I3	McGarry	McGarry Gold	17	604750	5334150		Yes	Assessment file: KL-1812

News, February 5, 1993, p.1, Northern Daily News, March 19, 1993, p.17A, Northern Daily News, June 7, 1993, p.6).

Analyses of drill core from G.E. Parsons' diamond drill hole DDH 93-1 recorded an intersection assaying 4.6 ounce Au per ton over two feet in Carr Township (see below for further information).

A summary of other exploration activity is listed in Table 6.

Table 6: Exploration activity in the Kirkland Lake Resident Geologist's District.

AEM	Airborne Electromagnetic Survey	IP	Induced Polarization Survey
AM	Airborne Magnetic Survey	M	Magnetic Survey
CD	Core Donation	MS	Metallurgical Study
DD	Diamond Drilling	Pr	Prospecting
EM	Electromagnetic Survey	RS	Remote Sensing
EXP	Exploration Program	rTr	Trenching
Gc	Geochemical Survey	SA	Assays
GL	Geological Survey	sTr	Stripping
Gv	Gravity Survey	UG	Underground Geology

Township(s)	Company(Property Name)	Exploration Activity	File Number
Abbotsford	Seal River Explaration Ltd.	SA, DD(3)(306.9m)	KL-2466,KL-3182(OPAP)
Abbotsford,Adair	BPH Minerals Canada Ltd.	GL,Gc,EM,M,DD(15)(2069m),SA	KL-3027
Abbotsford,Scapa	Noranda Exploration Co. Ltd.(Scapa 1-89 Property)	DD(1)(180.0 m)	KL-3166
Adair	Noranda Exploration Co. Ltd.(Adair 1-89 Grp.)	DD(8)(1088.1m)	KL-3186
Alma,Cairo	Inco Exploration & Tech. Services Inc.	M.IP,R,DD(2)(335.0m),SA, rTr	KL-3214,KL-3176
Arnold,Morrisette	Findore Minerals Inc.-Goldhunter Explorations Inc.(AM-47)	DD	NM(07/26/93)
Arnold	Regal Goldfields Ltd.(A-4)	bulk sample	NM(05/10/93)
Arnold,Lebel,Morrisette	Mullan, G.(Victoria Lake Property)	GL,EM,M	KL-3200
Arnold,Lebel,Morrisette	Pamorex Minerals Inc.(Murdock Creek Property)	GL,SA,sTr	KL-3126(OMIP)
Arnold,Morrisette	Kinbauri Gold Corp.(Alfie Creek Property)	DD(2)(275')	KL-1420
Baden	Strike Minerals Ltd.	GL	KL-2565(OMIP)
Bannockburn,Powell	Leahy, M.(102 Group)	Pr,sTr,SA	KL-3177
Beatty	Parsons, G.E.(Beatty Tp. Project)	DD(1)(267')	KL-3193(OPAP)
Beatty,Hislop	Noranda Exploration Co. Ltd.(Hemlo-Glimmer Project)	DD(10)(2098m), DD(2)(3433m),DD(31)	KL-3142(OMIP),KL-3180, NM(12/13/93),NM (12/20/93)
Ben Nevis	Kiazyk, B.	DD(3)(328')	KL-3189
Ben Nevis	Metal Mining Corp.(Mountain Lake Resource Inc.)	DD	NM(11/22/93)
Ben Nevis	Minnova Inc.	GL,SA	KL-3138
Ben Nevis	West Bank Resources Inc.(Canagau Property)	GL,IP,M,SA,Gc	KL-3133(Don.)
Ben Nevis, Pontiac	Joutel Res. Ltd.	EM,GL,SA,sTr, DD(6)(4,839')	KL-2969(OMIP)
Ben Nevis,Katrine	Kiazyk, B.	DD(3)(406'),SA	KL-1396(OPAP)
Benoit	Skjonsby, K.	M,EM,DD(6)(240.9m),SA	KL-2530
Benoit,Black	Joutel Resources Ltd.(Group B & Group C)	EM,DD(1)(379')	KL-2940(OMIP)
Bernhardt	Boone, P.	rTr	KL-3109

Township(s)	Company(Property Name)	Exploration Activity	File Number
Bernhardt	Merrick, A.	M,EM	KL-1845
Bernhardt	Mullan, G.(Amikougami Prospect)	GL	KL-3198
Bisley	Davies, A.W.	Gc,GL,SA	KL-3151(OPAP)
Black	Bochawna Copper Mines Ltd.	GL	KL-2968(OPAP)
Black	Joutel Resources Limited, Canuc Joint Venture(Butler Lake Group)	DD(1)(903'),SA	KL-3165
Black	Regal Goldfields Ltd.	GL,SA,DD(2)(700')	KL-3141(OMIP)
Black	Trinity Explorations Ltd.(Guinness Project)	GL	KL-3202
Boston	Langdon, D.A.	M,EM,GL,SA	KL-3104(OPAP), KL-3216(OPAP)
Bradette,Noesworthy	Newmont Exploration of Canada Ltd. (Noranda Option)	IP, GL	KL-3103(OMIP)
Bradette,Noseworthy	Newmont Exploration of Canada Ltd.	SA,,DD(8)(2326.3m)	KL-1988
Bradette,Noseworthy	Noranda Explorations Co. Ltd(Bradette 1-82)	DD(5)(4,174')	KL-2032
Cairo	Inco Ltd.	DD(2)(335m),SA	KL-3025
Cairo,Flavelle	Biralger Resources Ltd.	GL,M,EM	KL-0226(OMIP)
Carr	Falconbridge Gold Corporation(Carr 52 Property)	GL	KL-3018
Carr	Falconbridge Ltd.(McChristine Option)	M,EM	KL-3139
Carr	Falconbridge Ltd.(Carr 53 Property)	DD(1)(206.04 m),SA	KL-3179
Carr	Ginn, P.	GL,SA	KL-3221(OPAP)
Carr	Parsons, G.E.	DD(8)(4794'),SA	KL-3157,KL-3163,KL-3185, KL-3194(OPAP)
Catharine	Atapa Minerals Ltd.	DD(15)(2.285'),SA	KL-3209
Catharine	Hill R.	GL	KL-1137(OPAP)
Catharine	Kosy, R.(Claim L1185692)	M,EM	KL-3105
Catharine	Kosy, R.: Salo, A.	M,EM	KL-3219
Catharine	Kosy, R.: Leahy, M.,: Salo, A.	Pr	KL-2938
Catharine	Perron, A.H.(Benson Lake Grid)	M,EM	KL-3168
Catharine	Teck Exploration Ltd.(Block Five)	IP,sTr	KL-2636(OMIP)
Catharine	Wigglesworth, F.	rTr,SA,DD(1)(490')	KL-3184,KL-3188,KL-2939
Catharine,Pacaud	Atapa Minerals Ltd.	DD(6)(2150'),SA	KL-3210
Catharine,Pacaud	Teck Exploration Ltd.(Block 1 & 1A)	IP,sTr,SA	KL-2633(OMIP)
Cleaver	Flinsky, W.	sTr,rTr.Pr	KL-3132
Clifford	KWG Resources Inc./Regal Goldfields Ltd.(C-14)	bulk sample	NDN(02/09/93), NDN (06/15/93),NM(06/21/93)
Cook	Marshall, C.	sTr	KL-3183
Currie	Salo, L.J.	rTr	KL-3019(OPAP)

Township(s)	Company(Property Name)	Exploration Activity	File Number
Eby	Black, A.	sTr,DD(2)(500')	KL-3068
Flavelle	Queenston Mining Inc.	GL	KL-2961(OMIP)
Garrison	Greer, M.(M.G. Three Claims)	sTr,SA	KL-3005(OPAP)
Garrison	Jonpol Explorations Ltd.(Garrison Property)	MS,SA,DD(4)(6348')	KL-1324(OMIP)
Garrison,Harker,Elliott, Thackeray	Perrex Resources Inc.(Ghost River Property)	IP	KL-2211
Garrison,Thackeray	Perrex Resources Inc.(The New Bufforta)	DD(4)(138'),SA	KL-3211
Gauthier	Casan Mining Ltd.	RS	KL-0469(OMIP)
Gauthier	Pamorex Minerals Inc.(Beaverhouse Lake J.V. Project)	EM,DD(3)(6174')	KL-3061(OMIP)
Gauthier	Panthco Resources Inc.	DD(1)(151.2m)	KL-2182
Gauthier	Queenston Mining Inc.(Jascan & Duffet Properties)	SA,sTr	KL-2928(OMIP)
Gauthier	Queenston Mining Inc.(Property B & L Zones)	DD(7)(3476'),SA	KL-3128(OMIP)
Gauthier,McElroy	Hill, R.(Moose Crossing Property)	GL,sTr	KL-1138(OPAP)
Gauthier,McVittie	Pamorex Minerals Inc.	sTr,SA,GL,DD(3)(2536')	KL-2957(OMIP), KL-2929(OMIP)
Gauthier,McVittie	Pamorex Minerals Inc.	DD(1)(800'),sTr,SA,GL	KL-2929(OMIP)
Gauthier,McVittie	Sudbury Contact Mines Ltd.(Diamond Lake Grid)	M,EM	KL-3136(OMIP)
Grenfell	Leahy, M.(Hotchkin Lake Daimond Porperty)	M,GL	KL-3150
Grenfell	Vallier, B.W.(Kapakita Creek Property)	DD(2)(1449'),SA,M,EM	KL-3162,KL-2918
Grenfell	Vallier, B.W.(Kapakita Creek Property)	M,EM,SA	KL-2918
Grenfell,Maisonville	849261 Ont. Ltd.(Wewegimok Project)	M,EM	KL-3201
Harker	Falconbridge Gold Corp.	EM,M	KL-3137
Harker,Elliott,Thackeray	The Alberta Gold Exploration Corporation(Iris Joint Venture Project)	DD(8)(5110'),SA,GL,M,EM	KL-3170,KL-0012
Harker,Garrison	Noranda Exploration Co. Ltd.	DD(6)(1867.0 m)	KL-3174
Harker,Holloway	Freewest Resources Inc.(Noranda Option)	DDH(29)(55,494'),SA	KL-0893(OMIP)
Harker,Holloway,Frecheville, Stoughton	Noranda Exploration Co. Ltd.(Golden Highway)	DD(11)(5163.0m)	KL-3207
Hearst	Knutson Mining Corp. Ltd.	rTr	KL-1449(Don.)
Hearst	Skead Holdings Ltd.	SA,DD(1)(996')	KL-2930(OMIP)
Hearst, McVittie	Sudbury Contact Mines Ltd.	SA	KL-2570
Hearst,McVittie	MacGregor, R.A.(Larder Townsite Property)	DD(1)(437.7m)	KL-1683
Hearst,Skead,McElroy, McVittie,Rattray	Skead Holdings Ltd.	SA	KL-3204
Hepburn	Chouinard, C.	GL,SA,HS	KL-3167(OPAP)

Township(s)	Company(Property Name)	Exploration Activity	File Number
Hepburn	Seal River Exploration Ltd.	M,SA,GL,Gc,DD(2) (322.5m)	KL-2466
Hincks	Inco Exploration Services Inc.(Hutt Project)	GL,SA	KL-3217
Hincks	Premier Exploration Inc.	Pr,EM,M	KL-3129
Hislop	Chevron Minerals Inc.	M,IP,sTr,DD(89) (26187.2m)	KL-3031
Hislop	Hemlo Gold Inc.-Glimmer Resources Inc.	DD	NM((11/29/93)
Hislop	Stroud Resources Ltd.(Creek Zone)	DD	(NM(06/07/93)
Hoblitzell	Cogema Canada Ltd.	DD(3)(796m),SA,IP	KL-3077
Holloway,Tannahill	Bastarache, G.: Castonguay, C.(Bastarache/Castonguay Property)	M,EM	KL-3220
Holmes	Pamorex Minerals Inc.(Macham North Property)	GL,SA,sTr	KL-3124(OMIP)
Holmes	Pamorex Minerals Inc.(Middleton Creek Property)	GL	KL-3123(OMIP)
Holmes	Pamorex Minerals Inc.(Abel Lake Property)	GL,SA,sTr	KL-3122(OMIP)
Holmes	Sutton, M.: Hanson, T.(Holmes Property)	IP	KL-3154
Lamplugh	Seal River Explorations Ltd.(Lightning River Property)	IP	KL-3152
Lebel	Leahy, M.: Black A.(crystal Lake Project)	SA,sTr	KL-1598(OPAP)
Lebel,Gauthier,Arnold	Pamorex Minerals Inc.(Consolidated Thompson-Lundmark West)	Pr,GL,EM,M,DD(3) (10000'),SA,sTr	KL-3127(OMIP)
Maisonville	Dyment, L.M.: Kidston , J.A.	GL,EM,M,Pr,Gc,SA,sTr	KL-3064
Maisonville	Dyment, L.M.: Kidston, J.A.(Pipeline North Property)	GL,SA	KL-3172
Maisonville	Premier Exploration Inc.	DD(7)(700')	KL-2967(OPAP)
Marriott	Neal, H.E.(Marriott South Property)	IP,GL	KL-3156
Marriott	West Viking Exploration Ltd.	EM,M	KL-3106
Marter	Mitchell, T.	DD(3)(693'),SA	KL-3169
Marter	Zabudsky, D.	DD(2)(200')	KL-3116(OPAP)
McCool	Granges Inc.(Project SE1 Block)	M,EM	KL-3173
McCool	VonCardinal, T.	M,EM	KL-3131
McElroy	MacGregor, R.A.(Moly Hill Property)	SA	KL-1688
McElroy	MacGregor, R.A.(South East Grid)	GL,SA	KL-1690
McElroy	Skead Holdings Ltd.(Spring Lake)	DD(1)(130.4m)	KL-3191
McElroy	Yost, C.A.: Yost, R.	DD(2)(711'),SA	KL-2874(OPAP)
McElroy,Hearst,Skead, Catharine	Skead Holdings Ltd.(Diamond Lake Property)	DD(1)(186.35 m)	KL-3159
McFadden	Wright, B.	Pr	KL-3107(OPAP)
McGarry	Cyprus Canada Inc.(Kerr Mine)	DD	KLG(11/26/93)

Township(s)	Company(Property Name)	Exploration Activity	File Number
McGarry	Mullan, G.(Recession Larder Gold Property)	GL,M,EM	KL-3153
McGarry	Surf Inlet Mines Ltd.	GL,SA,DD(3)(4050')	KL-3125(OMIP)
McGarry,McFadden,Rattray, Skead	Sudbury Contact Mines Ltd.	AEM,AM RC drilling 90 holes	KL-3049(OMIP) NDN(02/05/93), NM(06/07/93)
McGarry,McVittie	Northfield Minerals Inc.(Cheminis Project)	GL,SA,UG	KL-3134(OMIP)
McGarry,McVittie, Gauthier	Rockford Minerals Inc.	GL	KL-3120(Don.)
McNeil	Argyle Ventures Inc.(McNeil Property)	DD(6)(2000'),EM	KL-0136(OMIP),KL-3190
McVittie	Hemlo Gold Mines Inc.	DD(8)	NDN(09/03/93)
McVittie	MacGregor, R.A.	SA	KL-1682
McVittie	Skead Holdings Ltd.(Fork Lake Property)	DD(2)(314.0m)	KL-2528(OMIP)
Melba	Gleeson, C.E.	Pr, SA	KL-3175
Milligan	Hedman Resources Ltd.(McCool-Milligan)	DD(2)(307m)	KL-3155
Montrose	Hall, B.V.	EM	KL-3010
Montrose	Inco Limited(Montrose Project)	GL,SA	KL-3158
Montrose	Montrose Gold Resources Inc.	SA,Gc,IP,M,DD(3)(1485')	KL-2988(OMIP)
Montrose	Trinity Explorations Ltd.	GL,SA,Pr,M,EM	KL-3017
Moody	Glen Auden Resources Ltd.	DD(4)(2442'),SA	KL-0952
Morrisette	Glencairn Explorations Ltd	DD(8)(4596')	KL-0964(OMIP)
Morrisette	Mathias, A.: O'Connor, F.T.: Morritt, I.D.	CD	KL-1771
Morrisette	Medici Resources Ltd.	Gc,SA	KL-3195
Morrisette	Wheaton River Minerals Ltd.	DD	NM(02/08/93)
Mortimer	St. Denis, R.	rTr,SA	KL-3178
Mulligan	Marshall, F.	DD(2)(446'),SA	KL-3215
Mulligan	Marshall, F., Marshall, J.	sTr,SA,DD(3)(774')	KL-1746(OPAP)
Mulligan,Rattray	Sudbury Contact Mines Ltd.	GL,Gc,SA,DD(2)(538.6m)	KL-3004(OMIP)
Munro	Ferderber, R.(Munro Project)	GL, EM	KL-3206(OPAP)
Munro	Granges Inc.(Munro Lake Property)	EM,M	KL-3161
Munro	Inco Ltd.	GL,SA	KL-3021(OMIP)
Munro,Warden	Granges Inc.(Headman Option - Project 541)	M,EM	KL-3192
Ossian	Beland, D.	GL	KL-3164(OPAP)
Ossian	Labbe, P.	GL	KL-3119(OPAP)
Ossian,Pontiac	Culhane, K.	Pr,SA	KL-3117(OPAP)
Otto	Birnie, W.K.	GL,sTr	KL-0235(OPAP),KL-3187
Otto	Birnie, W.K.	sTr	KL-3187

Township(s)	Company(Property Name)	Exploration Activity	File Number
Otto	Jomi Minerals & Expediting Ltd.(Dyment-Kidston Group C)	GL,SA,sTr,Gc	KL-1319(OPAP)
Otto	Rivard, F.(Otto Property)	EM,M,GL,SA	KL-2393
Otto	Rivard, F.	DD(4) (365.5m),SA	KL-3212
Otto	Weller, W.A.	sTr,rTr	KL-3097
Pacaud	Harrington, P.(Harrington Pacaud)	DD(1)(358'),SA	KL-3218
Playfair	Cunningham, L.J.	DD(3)(591'),SA	KL-0627
Pontiac	Griesbach, G.: Chouinard, C.: Chouinard, M.(Clarice Lake Property)	Pr, rTr	KL-3197
Pontiac	Orofino Resources Ltd.(Project 9211)	GL,Gc,A	KL-3171
Pontiac	Silvermaque Mining Ltd.	EM	KL-3203
Rattray,Skead	Noranda Exploration Co. Ltd.(MacGregor Option)	SA	KL-2056
Rickard	Greater Lenora Resources Corp.	EM,M	KL-3140
Robertson	Falconbridge Ltd.	DD(4)(3606m)	KL-3181
Robertson	Queenston Mining Inc.	EM,DD(29)(55493.7m)	KL-2949(OMIP)
Skead	Lacasse, L.	M,EM,Pr,SA	KL-3222(OPAP)
Skead	MacGregor, R.A.(Group F1)	SA	KL-1705
Skead	MacGregor, R.A.(Lincon Nipissing Project)	M,EM,SA,Pr	KL-1708
Stimson	Noranda Exploration Co. Ltd.(Patton River Property)	DD(1)(273.1m)	KL-3160
Tannahill	Gagne,Y.: St. Amand, A.	DD(2)(391')	KL-0897
Teck	Battle Mountain (Canada) Inc.(Amalgamated Kirkland Project)	M,GL,SA,sTr,IP,DD(10) (3714.4m)	KL-2923(OMIP)
Teck	Cyprus Canada Inc.(Amalgamated Kirkland)	DD(8)(10000')	NM(08/23/93)
Teck	Freewest Gold Recovery Inc.	GL	KL-0892(Don.)
Teck	Morgan, J.	sTr	KL-3118(OPAP)
Teck	Mullan, G.(Shamrock Prospect)	Pr	KL-3196
Teck	Pamorex Minerals Inc.	EM,DD(3)(1847')	KL-3121(OMIP)
Teck	Perron, A.H.(Perron-North, Perron-One & Perron-Two)	M,EM	KL-3205
Teck	Queenston Mining Inc.(Upper Kirkland Property)	GL	KL-2332(Don.)
Walker	Cosby, M.S.	EM	KL-0594
Warden,Milligan	INCO Ltd.(Medd-Cooperation)	DD(3)(3575')	KL-2985(OMIP)
Wilkie	Fournier, E.	SA,Str,DD(1)(411')	KL-0886(OPAP)
Wilkie	Glen Auden Resources Ltd.	DD(1)(263.9m),SA	KL-3199

Sources: NM (The Northern Miner), NDN (Northern Daily News), KLG (Kirkland Lake Gazette)

RESIDENT GEOLOGIST'S STAFF ACTIVITIES

Permanent staff of the Kirkland Lake Resident Geologist's office at year end include: G. Meyer, Resident Geologist: D. Guindon, Staff Geologist and F.M. Boucher, Administrative Assistant.

1993 marked a major change to the Provincial Drill Core Library staffing levels. In April, Zoran Madon, Drill Core Library Geologist and Marc Gaudreau, Drill Core Library Assistant, were issued surplus notices. Consequently, reduced staffing levels and increased work-loads have resulted in many procedural changes to the Resident's office and to the Swastika Drill Core Facility. An information brochure outlining these changes is now available from the Kirkland Lake office. Please refer to the summary on Drill Core Library operations later in this report for further information.

D. Guindon was seconded to the Mines and Minerals Client Services Section until March 31, 1993, to work on the Mineral Deposits Index (MDI) data base, and T. Beckett provided back-fill for the duration of the Staff Geologist's secondment.

D. Robinson, contract employee, assigned a keyword function to approximately 5000 technical articles in the library electronic data base.

M. Hamilton, Geological Assistant and S. Dell, Mining Clerk, worked on the Summer Experience '93 program.

Futures work placements under the co-ordination of F.M. Boucher included S. Smith, S. Dell and L. Lavric.

The Kirkland Lake Resident Geologist's office continues to display a high level of activity, (see Table 7, Summary of Staff Activities).

PROPERTY VISITS

Benson Creek Fault Property

The Benson Creek Fault property is located just south of Benson Lake in Skead Township at UTM Zone 17, 593850E 5313100N.

In the spring of 1993, prospectors Gary Kosy and Dave Zabudsky discovered high-grade gold mineralization associated with several narrow, parallel and sub-parallel, semi-massive pyrite veins, up to 10 cm wide, that are locally chalcopyrite rich. This sulphide vein mineralization is hosted in mafic volcanic rocks that contain up to 10% disseminated pyrite and occurs near the contact between proclastic mafic volcanic rock and a massive mafic flow unit. The pyrite veins occupy fractures that are parallel to sub-parallel to the stratigraphic contact. Their dip is near vertical and their strike is 040°. The regional strike of the rock units is more or less perpendicular to the observed contact, thus local folding is considered responsible for the observed strike direction of the contact between the pyroclastic and massive flow units.

The property was optioned by Cane Corporation and four exploration holes were drilled. The holes were orientated perpendicular to the strike of the auriferous pyrite veins. Despite substantial encouragement from surface grab samples only one drill core sample returned an assay of more than 0.3 ounces Au per ton. Two outcrops have been extensively stripped in the showing area. These outcrops are separated by low ground and an attempt to expose bedrock within the intervening area with a backhoe was unsuccessful. Immediately west of the low Table ground, the mafic volcanic rocks are strongly carbonatized. Such alteration, commonly associated with gold mineralization, has not been observed to be associated with the auriferous pyrite veins. The low ground separating the two outcrop areas is possibly a splay off the Benson Creek Fault. The trend of this possible "fault" could not be determined in the field, however, a north trend for the Benson Creek Fault is shown just south of Benson Lake on the Timmins-Kirkland Lake Geological Compilation Series,

Table 7. Summary of staff activities - 1993.

Event	Number
Office visits	2071
Office visits - Drill Core Library	479
Telephone inquiries	1842
Telephone inquiries - Drill Core Library	634
Property visits	15
Field trips attended	4
Prospectors courses presented	1
Number of prospector course students	18
Poster sessions	2
Talks given	2
Other public education events	5
Assessment files & donations processed	157
OPAP/OMIP reports processed	89
Titles added to library database	80

Map 2205. If this interpretation is correct, then the carbonate alteration adjoining the "fault" suggests that this section of the "fault" was a conduit for hydrothermal fluids.

The Benson Creek Fault Zone is auriferous in other areas suggesting that it formed conduits along which gold-bearing hydrothermal solutions ascended at several locations. In the showing area there is a close relationship between pyrite and gold mineralization. It is therefore suggested that IP surveys conducted perpendicular to the pyrite veins would delineate zones with elevated sulphide content. Such sulphide zones, where in contact with the "fault" zone, would perhaps have the highest gold potential. Any further drilling should intersect such sites perpendicular to the "fault" zone rather than perpendicular to the local stratigraphy.

CARR TWP - CON 2 LOT 4 - G.E. PARSONS

In July, G. Meyer and D. Guindon were invited to view drill core from a diamond-drill hole that had penetrated partially through the Destor-Porcupine Fault Zone (DPFZ) in Carr Township (UTM Zone 17, 539300E 5378350N). The diamond drilling was conducted as part of an OPAP-supported drill program by prospector G.E. Parsons.

Carr Township was mapped in 1945 by Prest (1951). Mafic volcanic rocks and ultramafic rocks south of the Destor-Porcupine Fault Zone form part of the Bowman tectonic assemblage (Jackson and Fyon 1991). Rocks north of the fault, consisting of wackes and argillites, are considered to be part of the Hoyle assemblage (Jackson and Fyon 1991). The area is heavily drift covered with no bedrock exposure.

Over the years, several mining and exploration companies and individuals have diamond drilled into and along the fault zone in search of gold mineralization. Until recently, exploratory drilling has resulted in intersecting only encouraging alteration with associated low gold values in the hanging wall volcanic rocks above and in the fault zone.

The core examined during the property visit is from diamond drill hole 92-1 collared 1000 feet east and 400 feet south of the northwest corner of the south half of Lot 4, Concession 2. The hole was drilled at -70° on a due north azimuth. Based on the intersection of a second hole to the north, the DPFZ has an apparent dip of 47° to the south in this area.

The geology of the hole, as logged by Parsons and observed by the authors, (272 feet to the end of the hole) is as follows: above the fault zone, the core is composed of either fine grain andesite

(possibly magnesium-rich, tholeiitic basalt) or diorite porphyry composed of small white feldspar phenocrysts and greenish black hornblende phenocrysts in a fine green-grey matrix. The fault zone begins abruptly with the development of shearing, a strong foliation and quartz-healed brecciation. The fault zone comprises brecciated, purplish siliceous zones containing up to 2% fine grain subhedral disseminated pyrite and Kerr-type "green-carbonate" rock, alternately banded with chloritic bands or a quartz-healed breccia. The bottom of the hole, still within the fault zone, consists of talc-chlorite schist cut by a foliated dark red-brown syenite dike.

The core was unsplit but sludge samples were collected and analysed on 10 foot intervals. Results were low with the best analysis of 0.01 ounce Au per ton in the siliceous zone being recorded.

Subsequent to viewing of this core, G.E. Parsons brought to our attention a drill core log for DDH 93-1. This hole, located 450 feet west and 200 feet north of DDH 92-1, was drilled due north at -70°. The bottom of the hole penetrated 30 feet beyond the DPFZ and intersected ultramafic talc-chlorite-serpentine schist. A two-foot section from this zone, containing a narrow interval with visible gold within fractures adjoining a narrow quartz vein, returned an assay of 4.6 ounces Au per ton (G.E. Parsons, personal communications, 1993).

A preliminary review of some geological data for this area suggests an alignment of high gold values in Asarco's reverse-circulation holes CR-9 and CR-10 in Carr Township (Assessment File K.L. 0154) with OGS rotosonic drill holes 84-24 and 84-28 in Currie Township (Baker et al. 1984). The reverse-circulation holes returned up to 6640 ppb and >15 000 ppb gold, respectively, in -10 mesh heavy mineral concentrates, and the roto-sonic core samples recorded high gold grain counts in the basal tills. These holes align with G.E. Parsons DDH 93-1 in a down-ice direction along an azimuth of approximately 240°. This is the same azimuth as has been determined for the older regional ice flow direction by Baker et al. (1984). The overburden drill holes are scattered along a total distance of 16 km. As Parsons' diamond drill hole is in an up-ice direction from these holes, the high gold values recorded in the overburden drill holes may be part of a "glacial dispersion fan", hence the general source area of the gold in the overburden may have been discovered.

However, as a word of caution, the high gold tenure in the overburden drill hole samples may very well be from other, more local sources, given the large transport distances involved (i.e. up to 16 km).

Gold Coin Property

On August 9, 1993 G. Meyer visited Garry Windsor's Claim 9257 in Guibord Township located in the northwestern quarter, north half, Lot 10, Concession VI, or UTM Zone 17, 355340E 5375975N, (MDI# C 2604). This claim was the southern-most claim of a group of five claims previously held by the White Guyatt Mining Company. These claims were extensively explored by that company in 1936 and 1946 and in the early forties by Wright-Hargreaves Mines Limited. Quartz veins were discovered in all five of the claims, and veins #4 and #5 on the Windsor claim were the focus of the property visit.

The claim is underlain by overturned, well-banded turbiditic metasedimentary rocks which strike 110° to 125° and dip steeply south. The veins cross-cut stratigraphy striking at 045° - 080° and dipping to the northwest.

Vein #4, 140 m south-southeast of of the No. 4 claimpost, is a quartz vein up to 50 cm wide with semi-massive pyrite bands paralleling the host rock contact. Pyrite in the interior of the pyrite bands is very fine grained and commonly rimmed by slightly coarser grained pyrite. Stingers of disseminated pyrite are coarser grained than the semi-massive pyrite and contain galena, sphalerite and chalcopyrite. Three grab samples taken by Garry Windsor returned assays of 0.358, 0.194 and 0.06 ounces Au per ton. Drill hole S-17, drilled by White Guyatt in 1946,

failed to intersect comparable vein material where anticipated. A high grade drill intersection grading 2.92 ounces Au per ton from 435.1 to 438.3 feet, if part of the same vein system, would suggest a dip of the vein at 65° to the north-northwest. A similar dip of the vein is indicated in diamond drill hole S-48 which tests the #4 vein near surface.

Vein #5, 80 m south-southeast of the vein #4, is 50 cm wide and has been exposed for a length of 40 m. This vein consists of extensive sericite, carbonate and possibly albite alteration. Fine grained pyrite, which makes up about 5% of the alteration zone, is closely associated with minute quartz veinlets. Considerable visible gold was reported in previous work and some was observed during the property visit. Two drill holes were designed to test the down-dip extension. Diamond drill hole S-16 failed to intersect the zone, but diamomd drill hole S-27 intersected it from 176.7 to 178.6 feet, suggesting a dip of 78° to the north-northwest. The grade for this 1.9 foot intercept was 0.01 ounces Au per ton.

Reconnaissance Geochemical Study of Sericite-Carbonate Alteration Associated with the Lightning Gold Zone

Gold camps in Archean rocks commonly have many, well developed sericite-carbonate hydrothermal alteration zones. This type of alteration is generally associated with all epigenetic gold deposits. Auriferous quartz veins appear to have small alteration halos associated with them when compared with replacement type gold deposits. It appears that most sericite-carbonate alteration zones do not have gold deposits associated with them. This raises the question that if there are "productive" and "unproductive" sericite-carbonate alteration zones, what factors control and influence their genesis and distribution of gold deposits? Since the alteration is a result of hydrothermal activity, it follows that gold deposits only form if there was sufficient gold in solution. Upon cooling, at an appropriate temperature-pressure range, quartz would precipitate simultaneously with gold, provided that both have reached saturation. The challenge is to determine chemical and mineralogical characteristics of rocks within the sericite-carbonate alteration zones that are diagnostic of proximity to gold mineralization. If this is achieved, then areas of high gold potential in sericite-carbonate alteration zones could possibly be determined by analyses of a few specific elements. This approach would be particularly useful to explore for "blind" gold deposits.

The sericite-carbonate alteration zone associated with the Lightning gold zone is ideal for such a study. A previously thought "unproductive" alteration zone was transformed into a "productive" alteration zone with the discovery of the Lightning gold zone. The alteration zone is many magnitudes larger than the gold deposit and occurs as a planar body adjacent to the gold zone, which tops at 250 m below surface. The alteration zone continues to surface and extends on strike both east and west for a considerable distance. Gold mineralization and the sericite-carbonate alteration zone both occur in mafic flows. This is one of the few alteration zones where chemical and mineralogical variations can be studied adjacent to and laterally away from the associated gold deposit.

With the assistance of Hemlo Gold Mines Inc., Freewest Resources Inc. and Teddy Bear Valley Mines Ltd., the most appropriate drill holes were selected for sampling the alteration zone. As an initial orientation survey, twenty-five samples of homogeneous material, devoid of quartz veins and fractures were analyzed by Activation Laboratories Limited for 49 elements. The analytical methods were ICAP and INAA at the research grade. Fifteen were strongly sericitized-carbonatized mafic volcanic rocks, eight were unaltered or slightly altered-equivalent rocks, and one sample was ultramafic in composition. Results of the ultramafic sample are excluded from the present chemical comparisons. The silica content of unaltered and altered volcanic rocks range from 44% to 60% and from 39% to 60%, respectively. The average silica content for the unaltered and altered volcanic rocks is similar and presumably the

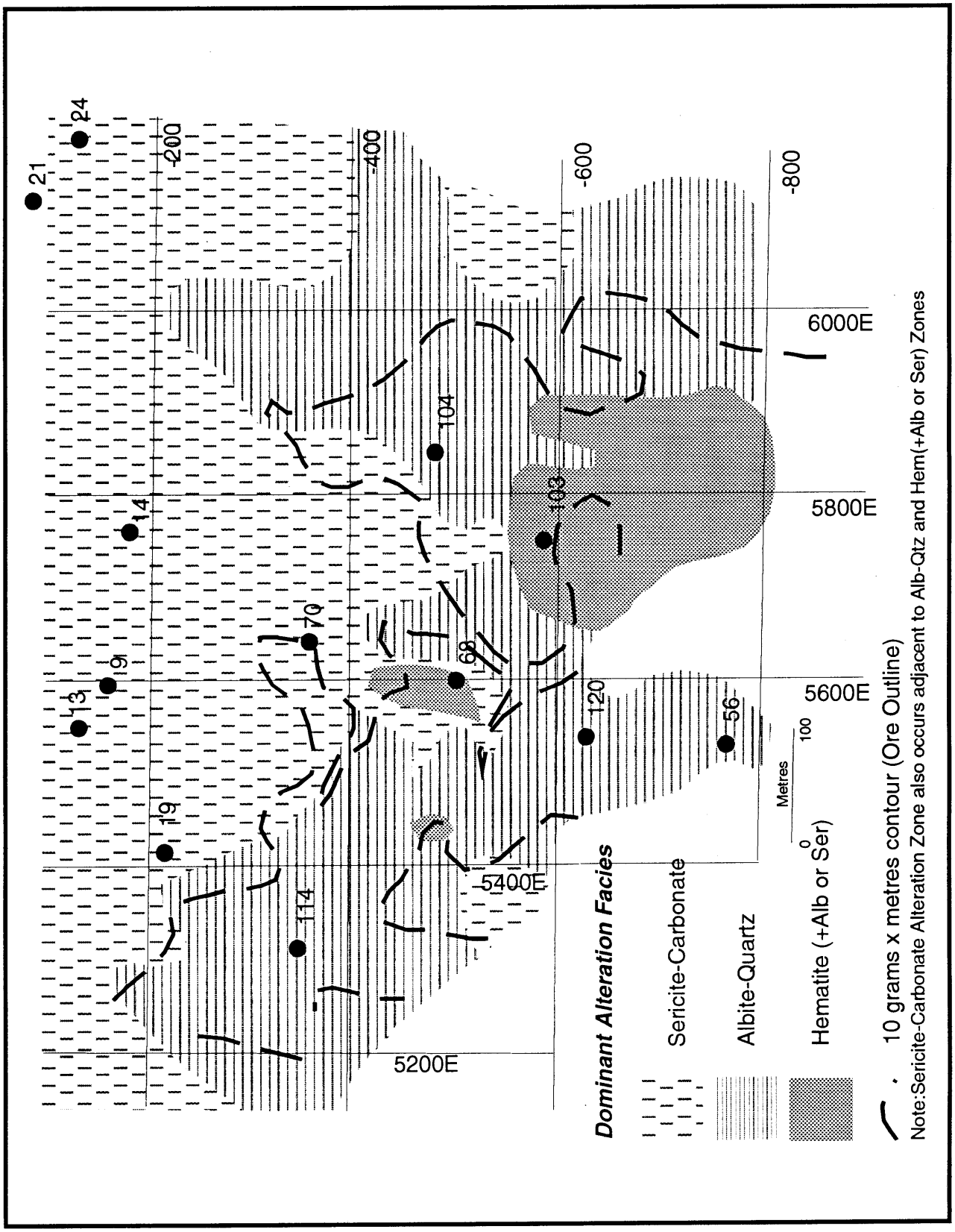

Figure 3. Drill hole location and alteration distribution - Lightning Zone - Vertical Longitudinal Projection - courtesy of Hemlo Gold Mines Inc. and joint venture partners Freewest Resources Inc. and Teddy Bear Valley Mines Ltd.

Table 8: Lithogeochemistry of diamond drill core samples, Lightning Zone, Holloway Township.

Sample	Hole #	Depth	Altered?	SiO_2 %	TiO_2 %	Al_2O_3 %	Fe_2O_3 %	MnO %	MgO %	CaO %	Na_2O %	K_2O %	P_2O_5 %	Ba ppm	Sr ppm	Zr ppm	Y ppm	LOI %	Total %	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Cd ppm	Bi ppm	V ppm	Be ppm
K.L 92-0102	114	343.0	Y	48.09	1.35	11.09	14.55	0.2	2.9	5.1	2.38	1.48	0.46	197	126	199	66	12.63	100.24	6	5	110	-0.4	11	-1	-5	23	-2
K.L 92-0106	120	576.5	N	46.15	1.14	13.23	9.32	0.15	5.75	8.95	3.38	0.02	0.12	86	464	32	32	9.39	97.61	25	7	74	0.6	100	-1	-5	194	-2
K.L 92-0109	104	476.2	Y	47.34	1.31	10.49	15.03	0.19	1.41	5.04	5.1	0.64	0.58	192	194	157	62	10.47	97.6	28	-5	147	-0.4	9	-1	-5	9	-2
K.L 92-0110	103	501.6	Y	41.59	1.36	10.91	16.07	0.34	1.62	7	2.85	2.02	0.66	266	195	187	82	13.42	97.83	23	9	191	-0.4	8	-1	-5	7	-2
K.L 92-0111	70	264.2	Y	50.86	1.42	12.64	7.66	0.23	1.46	7.42	4.43	1.28	0.5	150	133	207	74	9.62	97.53	21	6	51	-0.4	9	-1	-5	22	-2
K.L 92-0112	70	251.9	N	53.95	1.36	11.44	12.11	0.16	1.62	5.09	4.28	0.02	0.52	33	91	208	64	7.04	97.58	15	6	173	-0.4	9	-1	-5	23	-2
K.L 92-0113	68	267.9	Y	50.46	1.37	10.15	8.43	0.26	1.85	8.95	0.6	2.44	0.38	349	118	177	72	12.95	97.84	3	13	77	-0.4	10	-1	-5	44	-2
K.L 92-0114	68	459.2	N	47.23	1.54	12.45	9.94	0.37	1.39	8.68	4.14	1.64	0.56	222	138	270	84	10.57	98.51	24	-5	63	-0.4	9	-1	-5	25	-2
K.L 92-0115	68	498	Y	45.54	1.33	10.58	13.67	0.36	1.35	7.28	4.29	0.88	0.66	200	195	190	76	12	97.93	23	5	100	-0.4	7	-1	-5	6	-2
K.L 92-0116	56	777.4	Y	46.92	1.29	10.93	13.63	0.17	1.98	5.42	3.65	0.92	0.48	119	125	170	78	12.32	97.7	18	-5	89	-0.4	11	-1	-5	19	-2
K.L 92-0118*	56	752.2	N	30.55	0.64	7.94	10.46	0.18	13.41	13.5	1.73	0.22	0.22	54	315	62	8	22.02	100.86	2	-5	139	-0.4	337	-1	-5	79	-2
K.L 92-0121	24	124.0	N	45.32	1.22	14.16	9.93	0.2	5.33	7.22	3	1.1	0.12	213	96	65	34	10.49	98.07	153	-5	93	0.7	81	-1	-5	317	-2
K.L 92-0122	24	140.0	Y	46.26	1.24	13.67	7.45	0.2	4.84	5.3	4.28	1.84	0.1	458	180	63	24	12.47	97.64	122	-5	74	0.9	80	-1	-5	312	-2
K.L 92-0123	19	112.7	Y	58.39	0.5	14.3	4.97	0.07	2.29	3.62	3.33	2.32	0.12	422	184	132	20	7.79	97.68	32	8	39	-0.4	65	-1	-5	71	-2
K.L 92-0124	21	63.3	N	44.87	1.19	13.87	13.32	0.13	6.05	5.15	3.1	0.4	0.08	101	119	56	38	10.23	98.36	10	6	91	0.6	56	-1	-5	249	-2
K.L 92-0125	21	41.8	Y	40.56	1.09	10.91	8.86	0.19	3.52	11.56	2.03	1.8	0.12	231	182	78	34	16.92	97.58	126	-5	54	0.6	49	1	-5	215	-2
K.L 92-0126	21	93.8	Y	38.96	1.02	11	10.28	0.2	3.73	11.41	0.36	3.04	0.12	171	174	73	38	17.65	97.77	104	7	85	0.8	55	-1	-5	247	-2
K.L 92-0127	19	140.1	N	59.65	0.53	15.44	5.42	0.06	3.4	2.7	4.03	1.44	0.2	426	258	129	30	5.09	97.96	36	12	68	-0.4	70	-1	-5	71	-2
K.L 92-0130	13	95.5	Y	55.3	0.58	15.27	7.79	0.08	3.72	0.51	2.56	2.88	0.14	438	110	122	22	8.85	97.69	23	5	68	-0.4	74	-1	-5	93	-2
K.L 92-0131	13	167.8	N	44.93	1.13	13.73	13.01	0.16	6.33	4.76	5.02	0.16	0.12	72	169	79	14	8.38	97.71	124	9	88	0.8	86	-1	-5	232	-2
K.L 92-0133	14	97.8	Y	58.57	0.57	14.36	5.56	0.1	2.87	2.18	5.19	1.96	0.24	554	380	325	14	6.72	98.31	28	9	56	-0.4	67	-1	-5	75	-2
K.L 92-0134	9	225.7	Y	55.27	0.57	17	5.92	0.08	2.81	1.58	5.42	2.74	0.22	987	101	136	12	5.92	97.53	66	6	58	0.5	77	-1	-5	88	-2
K.L 92-0135	9	64.2	Y	59.54	0.5	14.48	5.23	0.07	2.54	2.16	4.22	2.1	0.16	362	219	159	18	6.84	97.85	38	11	36	-0.4	68	-1	-5	72	-2
K.L 92-0136	9	141.3	N	44.39	1.13	13.44	13.68	0.13	6.41	5.23	3.26	0.24	0.06	112	161	113	20	9.97	97.92	44	-5	65	0.6	70	-1	-5	236	-2
Average (15)			Y	49.58	1.03	12.52	9.67	0.18	2.59	5.64	3.38	1.89	0.33	340	174	158	46	11.10		44.1	6.9	82.3		40			86.9	
Average (8)			N	48.31	1.16	13.47	10.84	0.17	4.54	5.97	3.78	0.63	0.22	158	187	119	40	8.90		53.9	6.9	89.4		60			168.4	
Unalt ered to Alt .	% change			2.6	-11.2	-7.1	-10.8	5.9	-43	-5.6	-10.6	200	50	115	-7	32.8	15	24.7		-18.2		-7.9		-33			-48.4	

Sample #	Hole #	Depth	Altered Y/N?	Au ppb	As ppm	Br ppm	Co ppm	Cr ppm	Cs ppm	Hf ppm	Hg ppm	Ir ppb	Mo ppm	Rb ppm	Sb ppm	Sc ppm	Se ppm	Ta ppm	Th ppm	U ppm	W ppm	La ppm	Ce ppm	Nd ppm	Sm ppm	Eu ppm	Tb ppm	Yb ppm	Lu ppm	Mass g
K.L 92-0102	114	343	Y	-2	7	-1	19	33	-0.2	4.4	-1	-1	-2	45	10	26	-1	0	1.0	0	-1.0	9.3	29	20	7.4	2.8	1.8	7	1	2.1
K.L 92-0106	120	576.5	N	-2	7	-1	43	110	-0.2	1.1	-1	-1	-2	-10	4	38	-1	0	0.0	0	1.0	1.6	5	4	1.5	0.6	0.4	2	0	1.9
K.L 92-0109	104	476.2	Y	18	20	-1	20	12	-0.2	3.4	-1	-1	-2	27	4	26	-1	0	1.0	0	5.0	7.8	23	16	5.8	1.8	1.4	6	1	1.9
K.L 92-0110	103	501.6	Y	2	23	-1	19	8.3	1.4	4.2	-1	-1	-2	54	8	27	-1	0	1.0	0	11.0	9.8	29	21	7.2	2.6	1.7	7	1	2
K.L 92-0111	70	264.2	Y	4	14	-1	11	27	0.9	4.7	-1	-1	-2	40	2	25	-1	1	1.0	0	3.0	9.9	30	23	7.2	2.2	1.8	6	1	1.9
K.L 92-0112	70	251.9	N	-2	15	-1	16	26	-0.2	4.6	-1	-1	-2	-10	2	26	-1	0	1.0	0	3.0	9.8	29	20	6.6	2.1	1.7	6	1	2
K.L 92-0113	68	267.9	Y	-2	7	-1	16	6.4	1.8	3.4	-1	-1	-2	65	8	30	-1	0	1.0	0	3.0	6.9	23	16	5.5	1.7	1.4	5	1	1.9
K.L 92-0114	68	459.2	N	8	6	-1	23	37	1.5	5.1	-1	-1	-2	51	6	32	-1	1	1.0	0	-1.0	10.9	34	28	8.1	2.6	2	8	1	1.9
K.L 92-0115	68	498	Y	-2	11	-1	14	4.5	1.5	3.7	-1	-1	-2	-10	7	26	-1	1	1.0	0	7.0	9.8	29	23	7.2	2.4	2	7	1	1.9
K.L 92-0116	56	777.4	Y	12	16	-1	20	27	1.9	4.3	-1	-1	-2	26	6	25	-1	1	1.0	0	3.0	9.4	30	23	7.4	2.3	1.8	7	1	2.2
K.L 92-0118*	56	752.2	N	3	3	-1	52	340	-0.2	-0.2	-1	-1	-2	-10	26	17	-1	0	2.0	0	3.0	26.3	57	27	5.5	1.4	0.5	1	0	1.8
K.L 92-0121	24	124	N	-2	4	-1	41	75	1.1	1.5	-1	-1	-2	33	8	49	-1	0	0.0	0	-1.0	2.2	7	5	1.6	0.5	0.4	2	0	2.1
K.L 92-0122	24	140	Y	-2	70	-1	45	80	2	1.5	-1	-1	-2	16	16	46	-1	0	0.0	0	3.0	2.6	8	6	2.1	0.8	0.5	3	0	1.9
K.L 92-0123	19	112.7	Y	2	6	-1	14	110	1.6	2.3	-1	-1	-2	52	2	11	-1	0	4.0	1	-1.0	20.1	39	16	2.9	0.8	0.3	1	0	1.6
K.L 92-0124	21	63.3	N	2	7	-1	44	100	1.1	1.3	-1	-1	-2	14	7	44	-1	0	0.0	0	-1.0	2.2	7	5	1.5	0.6	0.4	2	0	2
K.L 92-0125	21	41.8	Y	4	56	-1	44	25	1.5	1.6	-1	-1	-2	37	7	44	-1	0	0.0	0	7.0	2.8	7	5	1.8	0.7	0.4	2	0	2
K.L 92-0126	21	93.8	Y	8	61	-1	47	40	1.6	1.4	-1	-1	-2	65	9	36	-1	0	0.0	0	8.0	3.5	10	7	2.2	0.8	0.6	3	0	1.8
K.L 92-0127	19	140.1	N	-2	20	-1	18	130	1.3	2.7	-1	-1	-2	47	1	12	-1	0	4.0	1	-1.0	26.4	53	24	4.2	1.1	0.5	1	0	2
K.L 92-0130	13	95.5	Y	4	2	-1	20	130	2.4	2.6	-1	-1	-2	80	3	17	-1	0	4.0	1	-1.0	23.6	47	21	3.6	0.7	0.4	1	0	1.7
K.L 92-0131	13	167.8	N	-2	11	-1	45	92	-0.2	1.5	-1	-1	-2	-10	5	43	-1	0	0.0	0	-1.0	2.2	6	5	1.5	0.6	0.4	2	0	1.8
K.L 92-0133	14	97.8	Y	6	3	-1	20	180	1.6	3.3	-1	-1	-2	50	6	12	-1	0	4.0	2	2.0	26.6	55	25	4.6	1.3	0.5	1	0	1.6
K.L 92-0134	9	225.7	Y	272	93	-1	23	160	1.4	3	-1	-1	4	55	4	14	-1	0	5.0	2	9.0	29.2	54	24	4.2	1	0.5	1	0	1.7
K.L 92-0135	9	64.2	Y	8	77	-1	20	160	1.8	2.8	-1	-1	-2	50	21	11	-1	0	4.0	1	2.0	26.9	48	20	3.8	1	0.4	1	0	1.8
K.L 92-0136	9	141	N	-2	4	-1	48	95	-0.2	1.3	-1	-1	-2	14	5	41	-1	0	0.0	0	-1.0	2.7	8	6	1.9	0.7	0.5	2	0	1.9
Average (15)			Y	23.2	31.1		23	67	1.45	3.1				44.8	7.5	25.1			1.8		4.4	13.2	30.7	17.7	4.9	1.52	0.91	3.86	0.55	
Average (8)			N	3	9		35	75	0.73	2.4				23.6	4.8	35.6			0.8		1.3	7.3	18.6	12.1	3.4	1.11	0.79	2.99	0.44	
Unaltered to Altered	% change			736	236		-34	-11	99	29				90	56	-29			120.0		252.0	81	65	46	44	37	15	29	25	

* Ultramafic rock

sericite-carbonate alteration zone is not silicified. Variations in silica content are thus considered inherent inhomogeneity of the rocks sampled. Concentrations for several elements are below detection limits. These may become of interest if increased sensitivity of detection in the laboratory equipment could be achieved.

Average concentrations for the unaltered and altered mafic volcanic rocks were calculated (Table 8). Using these averages, the percentage enrichment or depletion of altered volcanic rocks was determined (Table 8). Those elements which underwent substantial enrichment or depletion were then plotted on longitudinal sections (not included with this report). It should be noted that the intersections of the drill holes on the longitudinal section (Figure 3) are lower compared to the actual depth at which the samples were taken. An interpretation of the average values for unaltered and altered volcanic rocks and the plots on the longitudinal section is as follows:

K_2O - moderate enrichment adjacent to the ore zone; and moderate to strong enrichment in the up-dip direction and laterally

MgO - strong depletion adjacent to the ore zone; and possible weak depletion in up-dip direction

Au - weak to moderate enrichment (few ppb) adjacent and up-dip from ore zone; and lateral extension is limited with one anomalous sample (272 ppb) recorded

As - weak to moderate enrichment adjacent to ore zone; moderate to strong enrichment in up-dip direction, especially to the east; and possible weak enrichment laterally to the west

W - moderate to strong enrichment adjacent to ore zone and in up-dip direction; and lateral extension possibly limited to within eastern- and western- most sample sites

V - strong depletion next to ore zone; and possible weak depletion in up-dip direction

Ni - strong depletion next to ore zone only

Th - not anomalous next to ore zone; and moderate to strong enrichment in up-dip direction, (two eastern-most samples not enriched in thorium)

Ba - not anomalous next to ore zone; and possible enrichment in up-dip direction

From an exploration point of view, only the distribution of the anomalous elements in the sericite-carbonate alteration, in the up-dip direction from the ore zone, is of interest. This preliminary study suggests that searching for "blind" gold deposits in sericite-carbonate alteration zones should include analyses for the following: %SiO2, %K2O, %MgO, Au ppb, As ppm, Ba ppm, Th ppm and W ppm.

It is stressed that this investigation a preliminary orientation survey. Sample density is inadequate and does not extend sufficiently far laterally, thus, the results may be considered tentative. Despite these limitations, certain elements appear to have well developed anomalous trends. A comprehensive study, involving several hundred samples should delineate well defined anomalous patterns and serve as a valuable exploration tool in the search for "blind" gold deposits.

RECOMMENDATIONS FOR EXPLORATION

Matheson Area

From Stock to Guibord townships, the Destor-Porcupine Fault Zone (DPFZ) is up to several hundred metres wide, consisting of sheared and altered mafic and ultramafic rocks. From Carr Township westwards, the fault zone is in contact with greywackes and argillites of the Hoyle assemblage. East of, and partly including Carr Township, a wedge of mafic and ultramafic volcanic rocks separates these sediments from the

DPFZ. The extreme western extension of this wedge was tested by G.E. Parsons in OPAP-funded DDH 93-1 and a high grade, narrow gold mineralized zone was intersected. There are no known local outcrops and the diamond-drill hole was designed to test essentially an unexplored section along and adjacent to the DPFZ. The preliminary results of this drilling suggest that another significant gold mineralized zone may have been discovered proximal to the DPFZ. Some significant gold deposits and drill holes with encouraging results, spatially related to within the DPFZ and the mafic-ultramafic wedge, from west to east are as follows: St Andrews Gold Mine, Stock Twp.; Shoot and Porphyry Zones, Taylor Twp.; Asarco's reverse circulation holes # CR-9 and CR-10, Carr Twp.; G.E. Parsons DDH 93-1, Carr Twp. and the Hemlo Gold Mines Inc. - Glimmer Resources Inc. gold deposit at the Hislop and Beatty townships boundary. The zone, with apparent high gold potential, has a strike length of at least 40 km and has only been subjected to extensive exploration in limited areas.

If anomalous gold values in sonic and reverse circulation drill holes are part of a 16 km long "glacial gold-bearing dispersion fan", then the magnitude of this fan may indicate significant sub-cropping gold mineralization in the up-ice direction. It should be noted however that such a long dispersion fan is highly speculative. The Parsons' DDH 93-1, with a narrow high grade-gold intersection, is located in the up-ice direction from these overburden drill holes, and for this reason as well as its proximity to the DPFZ, makes it an attractive target for further follow-up diamond drilling.

Extensive clay cover and widespread patented land holdings inhibit exploration somewhat along the DPFZ in the Matheson area. However, the sonic drill tests conducted 1984 to 1987 as part of the Black River Matheson (BRIM) project record interesting gold grain counts in several locations. The highest gold grain counts are in the basal till and a linear anomalous correlation of the three aforementioned holes is suggested at an azimuth of 240°. The BRIM roto-sonic holes are widely spaced; however, additional fill-in roto-sonic holes should be considered close to and south of the DPFZ.

Gauthier Volcanic Rocks

The Gauthier volcanic rocks occur in the northern section of Gauthier Township and continue both east and west in adjoining townships. Characteristics of these volcanic rocks, including some intensely hydrothermally altered zones, were reported in last year's Report of Activities (Meyer et. 1992). Alteration zones are characterised by complete sericization and carbonitization and spatially related silicification and carbonitization. This close spatial relationship of the alteration zones suggests a likely common hydrothermal origin.

Sericite, carbonate and silica hydrothermal alteration zones have wide-spread distribution in gold camps. Some are directly associated with gold mineralization while others do not appear to have this relationship. Sudbury Contact's recent discovery of an auriferous zone in the northwestern section of Gauthier Township gives credence to the possible association of these alteration zones with gold mineralization in the general vicinity.

Near the northeastern corner of the Kidston property, at UTM Zone 17, 586950E 5335875N, rhyolite was previously mapped in this area by Norart Uranium & Gold Mines. Some "rhyolite" is silica- and carbonate-rich, and it is uncertain how much of this is due to hydrothermal alteration. The carbonate, possibly ankerite, oxidizes at the surface and gives the rock a rusty appearance. Alteration and schistosity trend in an east west direction.

In summer of 1993, Mike Dyment and Tom Obradovich stripped outcrop approximately one km southeast of the Kidston property. The stripping, funded by an OPAP grant, is located at UTM Zone 17, 588200E 5335030N. A sericite-carbonate alteration zone with an associated silicified-carbonatized zone was exposed. The strike of the contact between these two rock types is west to northwest. Judging by the

limited bedrock exposure, the alteration zones at the Kidston and Dyment-Obradovich properties do not align with each other and do not appear to be the same alteration zone unless they have been offset by faulting. Sudbury Contact's auriferous zone apparently is not on stike with the alteration zones described above. Therefore, it appears that there may be a minimum of three sub-parallel zones with high gold potential. The hydrothermal alteration zone near the Kidston property is large and intensive. If these criteria are significant, then there may be potential for associated gold deposits on strike or at depth in this area.

These exposed sericite-carbonate alteration zones can be further explored by sampling and analyzing them for specific elements (see section on Lightning zone). Sericite-carbonate alteration zones generally have low resistivity signatures and may thus be delineated by different types of geophysical surveys. I.P. surveys to detect dissemminated sulphides would also be an appropriate survey to conduct in this area.

DRILL CORE LIBRARY SYSTEM

In April 1993, staff at the Drill Core Libraries were notified that they were placed on the surplus list. By the end of July, both Zoran Madon, the Core Library Geologist, and Marc Gaudreau, the Core Library Assistant, had been assigned new positions within the Ministry in Sudbury. Budget and staffing constraints required the following to occur: the photocopier was removed from the core library, drill logs and location maps were transferred to the Resident Geologist office; client access to the core library was established on an appointment only basis.

A jobsOntario Capital Fund project transferred drill core from wooden pallets onto steel pallets in a new compound at the off-site core storage area at the Swastika tree nursery, approximately 30 km west of Kirkland Lake. Approximately 75% of the drill core was transferred and rotten core boxes were replaced during the exercise. The drill core data base was updated to reflect these changes. Users will be able to use the facility from May until November (snow free period) by signing out a key from the Resident Geologist office.

Those wishing to view drill core should contact the Resident Geologist office at least a one week prior to a planned visit.

ONTARIO GEOLOGICAL SURVEY ACTIVITIES

L.S. Jensen mapped the bedrock in Cleaver and Hinks townships as part of a multi-year study of the Abibiti Greenstone Belt. Argyle and Baden were mapped by D. Kresz in 1991 and McNeil and Robertson townships by Jensen in 1992.

G.M. Siragusa completed a study on gold mineralization within the Porcupine Camp. Part of the 1993 field season concentrated on the Shoot Zone in Taylor Township.

R.P. Sage began a multiyear project on the study of kimberite occurrences in Ontario.

R.G. Jackson began a multi-media geochemical study of tailings dispersion from several abandoned tailings sites in northeastern Ontario, including Kirkland Lake and Matachewan.

For further information on any of these projects, please refer to Summary of Field Work and Other Activities, Ontario Geological Survey, Miscellaneous Paper 162.

GOVERNMENT FUNDED RESEARCH

Thirty-one roto-sonic overburden drill holes were completed as part of the first phase of a NODA funded project to apply drift prospecting techniques to kimberlite exploration. The project was managed by M.B. McClenaghan and R.N.W. DiLabio of the Geological Survey of Canada.

J. Veillette of the Geological Survey of Canada conducted a program of shallow lake bottom sampling on Lake Abitibi as follow-up to his surficial mapping and Quaternary geology work in northwestern Quebec.

RESEARCH BY OTHER AGENCIES

Queens University

R.M. Harrap and H. Helmstaedt continued a study of the structure and emplacement mechanisms of the Round Lake Batholith, south of Kirkland Lake.

University of Toronto

D.J. Schultze continued a study of the petrographic and chemical variations of mantle xenoliths from kimberlite pipes in the Kirkland Lake area.

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SUMMARY OF ACTIVITIES 1993

TIMMINS RESIDENT GEOLOGIST'S OFFICE

L.E. Luhta[1]
P.J. Sangster[2]
D.M. Draper[3]

1. Resident Geologist, Timmins
2. Staff Geologist, Timmins
3. Data Geologist, Timmins

INTRODUCTION

In 1993, the level of mining activity in the Timmins Resident Geologist's District held steady with 6 gold mines, 1 base metal mine and 1 industrial mineral producer.

Placer Dome Inc. focused its attention on exploring for additional gold ore at the Detour Lake Mine and at the Dome Mine. The company reported record production levels at the Dome Mine and announced intentions to proceed with the proposed superpit on the Dome Mine property. Surface drilling east of the Dome Number 8 shaft continued in 1993. A surface diamond drill program is planned for late 1993 on the Paymaster Property adjacent to the Dome Mine and plans to return the property to production status by late 1994 have been announced.

Surface diamond drilling at the Detour Lake Mine has extended the ore westward at depth. A small surface diamond drill program was also completed at McAlpine Lake west of the Detour Lake Mine (Placer Dome Inc., personal communication, 1993).

Falconbridge continued gold mining operations at the Hoyle Pond and Bell Creek mines.

The St. Andrew Goldfields Ltd. Stock Township mine completed its fourth year of production.

The Timmins Operations of Royal Oak Mines Inc. included the Pamour No.1 Mine and adjacent open pits. The acquisition of separately worked former producers adjacent to the Pamour No. 1 Mine will allow the company to proceed with plans to mine the underground boundary pillars of the Hallnor and Bonetal deposits.

Falconbridge Ltd. announced significant additions to the ore reserves of the Kidd Creek Number 3 Mine. The increased reserves will result in another 2 to 4 years of mine operation. The north ore body has now been defined to a depth of 7000 feet below surface.

The Penhorwood talc mine, owned by Luzenac Incorporated, remained the sole industrial mineral producer in the district. Great White Minerals Limited continued the evaluation of a silica deposit in Fripp Township.

Prospectors and exploration companies working in the area continued to use funding provided by the Ontario Prospector's Assistance Program (OPAP) and the Ontario Mineral Incentives Program (OMIP)(Table 1).

CLAIM STAKING ACTIVITY

A total of 7,852 16-hectare claim units were recorded from January 1993 to December 31, 1993. As of January 1, 1994, there were 34,779 active 16-hectare units in the Porcupine Mining Division. This figure represents an all time high in the number of active claims in the Division. Although it does indicate a high level of mining exploration activity, it may also reflect a reaction to recent changes to staking regulations.

For distribution of claims please refer to Figures 1a. to 1e. inclusive. For a summary of claim staking activity in the Timmins Resident Geologist's District, please refer to Table 2.

MINING ACTIVITY

For summaries of production figures for the Timmins Resident Geologist's District, please refer to Tables 3, 4, and 5.

Base Metal Mines

Falconbridge Limited,
Kidd Creek Mine

In 1993, approximately 65% of production came from the No. 1 Mine, the bottom level of which is 2500 feet below surface. The No. 2 Mine produced 26% with its bottom level at 4600 feet below surface, and the new No. 3 Mine area below 4600 feet produced the remaining 9% of the ore. At the end of 1993, the bottom stoping area was at 5100 feet below surface. Stopes are being developed 6000 feet below surface for mining in 1994.

Underground development in 1993 was restricted to stope development in the No. 1 and 2 Mines. mining development and exploratory development was done in the No. 3 Mine.

In late 1993, Falconbridge Ltd. confirmed that significant extensions to the Kidd Creek orebody to at least a depth of 7400 feet below surface have been discovered. An additional 10 million tonnes of potential ore grade mineralization below the 5600-foot level has been reported (Falconbridge Ltd., News Release, October 26, 1993). However, no reserve figures have been published.

In a continued effort to explore the "North Rhyolite", 43,755 feet of surface diamond drilling, was done to the north-west of the mine workings. In the last few years, suitable stratigraphy, alteration and base metal values have been intersected but no deposits of economic significance have been discovered. (Falconbridge Ltd., personal communications, 1993)

PRECIOUS METALS

Falconbridge Gold Corporation,
Hoyle Pond Mine and Bell Creek Mine

In July, 1993, Kinross Gold Corporation announced an agreement with Falconbridge Ltd. to acquire the latter company's 56.4% interest in Falconbridge Gold Corp. for $22 million. The deal was finalised in October, 1993. (The Northern Miner, July 26 and December 27, 1993)

From February to the end of May 1993, the Bell Creek mill was put on a care and maintenance basis. Limited production was resumed at the end of May. Ore from mining operations at the Hoyle Pond Mine was stockpiled from February to the end of May.

In late 1993, Kinross initiated a large exploration program designed to extend the known ore zones both laterally and vertically at both mines. The program includes both surface and underground diamond drilling.

Kinross Gold Corporation is proposing to construct a road to directly link the Hoyle Pond Mine with the Bell Creek mill. The distance between the two sites is 4.5 km; 2.2 km of new road will have to be built. This will substantially reduce the length of the present route which is approximately 30 km. The proposed road will have to cross the Porcupine River. Kinross Gold Corporation has met with representatives of the Ministry of Natural Resources, the Ministry of Northern Development and Mines, the Ministry of the Environment and the Mattagami Region Conservation Authority. The company will commission an engineering firm to prepare preliminary designs and cost estimates. (Kinross Gold Corporation, personal communication, 1993)

Placer Dome Incorporated,
Detour Lake Mine

As a follow-up to the surface diamond-drill program which traced the main ore horizon westward, the exploration drift on the 560 m level which began in November, 1992, was completed with the face located 2 km west of the shaft. A 17,000 m underground diamond-drill program at 40 m centres is currently being done from the drift with the completion date set for mid-1994. Another exploration drift extending the 330 m level westward began in late 1993. Exploratory underground diamond drilling thus far has identified significant possible new ore zones in the hangingwall mafic volcanic rocks to the north of the main zone as well as defining mineralization in the main zone. (Placer Dome Incorporated, personal communications, 1993).

On a visit, September 22nd, to the Detour Lake Mine, the writer took samples from the pebble dike on the 525 m level which was previously thought to be a possible kimberlite intrusion (L.E. Luhta et al 1992). Upon closer examination of the samples, the matrix material was found to have a tectonic fabric which would give the dike an age equivalent at least to the last tectonic event which occurred in the mine area. The composition seems more mafic rather than ultramafic with a fair amount of plagioclase intergrown with biotite and amphibole.

Placer Dome Incorporated,
Dome Mine

In 1991, the potential for a large expansion of the pit was recognized. A reserve amenable for open pit mining of 24.8 million tons at a grade of 0.068 ounce gold per ton was outlined to a depth of 930 feet below surface. The total waste rock which would have to be removed is 172 million tons in order to mine that reserve. The feasibility study in developing this "super" pit has been completed, and a production decision was made at the end of January, 1994. Capital costs are estimated at $150 million and this includes expanding the milling rate to 9100 tons per day. The present mine office building as well as the warehouse, shops and the No.3 headframe will have to be torn down to accommodate the new pit. These

structures except for the headframe will be relocated. Construction and development is to start April, 1994, with production scheduled to begin a year later with a rate of 315,000 ounces gold per year.

The focus underground was on defining areas which could be mined by longhole bulk mining methods. Next year the mine staff hopes to obtain 40% of the underground ore by this method. Thirty percent of underground diamond drilling, out of a total of 81,688 feet, was done on exploration at the bottom levels at the mine. The deepest level is at 4500 feet below surface. The balance of the drilling was done exploring for and defining reserves in all other areas of the mine.

Placer Dome Inc. recently signed an agreement with Falconbridge Ltd. to purchase ore, totalling 1 million tons, from the "Temiskaming Claims" to the northeast of the Dome Mine property. Placer Dome has been mining there under a royalty agreement with Falconbridge who acquired them through that company's association with McIntyre Porcupine Mines Ltd. However, due to the low grade nature of the gold mineralization, the previous royalty agreement was too high to make mining these claims economical. (Placer Dome Inc., personal communications, 1993 and 1994)

Royal Oak Mines Incorporated

Production was divided evenly between the underground operations and the open pit operations. At the Pamour No. 1 Mine, one large longhole stope on the 1400-foot level provided ore from the conglomerate horizon and 14 different narrow vein stopes provided ore from the volcanic rocks to the north. These narrow vein stopes provided Royal Oak with 5% of the total ore tonnage, but 20% of the number of ounces. Two longhole stopes were mined in conglomerate ore in the adjacent Hoyle underground mine to the east of Pamour. It is being mined under a royalty agreement with Kinross Gold Corporation (formerly Falconbridge Gold Corporation). The bottom mining level at the Hoyle Mine is at 1600 feet below surface. The ore is conveyed from the Hoyle Mine to Pamour #1 on the 1400-foot level where it is hoisted to surface.

Ore from greywacke was mined in the No. 3 and No. 2 pits between Pamour No. 1 and the Hoyle Mine. A possibility exists for expanding the No. 3 Pit westward. Some gold production was obtained from the No. 5 Pit which began as a surface pillar recovery program near the Broulan property to the west.

A surface diamond-drill program took place just west of the production shaft (#3 Shaft) at Pamour No. 1 to evaluate an area for possible open pit mining. Results were being evaluated in early 1994 and, if positive, a second phase of diamond drilling will be done. (Royal Oak Mines Inc., personal communications, 1993 and 1994)

St. Andrew Goldfields Ltd., Stock Mine

Production at the Stock Mine decreased from 15,000 tons per month to 3000 tons per month in the fall of 1993. At the end of the year, only one stope was in production in the west zone and remnant pillars in other

areas were being mined out. The short fall in production was taken up by the mining of ore from the Goldpost Resources Ltd. Hislop East property in Hislop Township. This property ,plus others, were purchased from Goldpost Resources Ltd. by St. Andrew Goldfields early in 1993. The bulk of the ore came from the N-2 Zone and the West Zone at the Stock Mine. Presently, an exploration and development program is being conducted at the mine to find additional reserves down dip of the N-2 area, as well as to search for possible en echelon lenses in that area. Also, exploration for the possible extensions of ore in the West Zone is being done.

INDUSTRIAL MINERALS

Luzenac Incorporated

In 1993, Luzenac Incorporated produced 28,155 tons of talc from approximately 45,000 tons of ore mined and milled. The open pit mine and concentrator are located in Penhorwood Township and the talc micronization facility is in Timmins. Most of the talc is sold to the paint and plastics industry, the pulp and paper industry. A small amount is sold to the cosmetic and rubber industries.

In 1993, 50 people were employed by Luzenac Incorporated. (Luzenac Incorporated, personal communications, 1993)

EXPLORATION ACTIVITY

Asarco Exploration of Canada Ltd.

The company drilled 19 surface diamond-drill holes in two programs in 1993 near their Aquarius gold deposit in Macklem Township to explore for extensions of the gold-bearing horizon; the carbonate-altered, ultramafic zone.

Four surface diamond-drill holes were completed on the company's Delnor property in the north part of Deloro Township and just to the south of the Destor-Porcupine fault. The drill targets were based on a structural interpretation of geophysical data. Mafic volcanic rocks, which have been intensely carbonatized and containing abundant disseminated pyrite, occur on the property along with a sericite schist and iron formation to the south west. No gold values were intersected.

In early 1993, Asarco completed three surface diamond-drill holes on an iron formation in Garnet Township. Initially, a base metal program was planned on the structure; however, minor gold values in the iron formation were obtained in 1992 during a surface sampling program and the focus was changed to gold.

Asarco completed one surface diamond-drill hole in Nova Township to test an airborne conductor for base metals. Graphitic argillite containing anomalous base metal values was intersected.
(Asarco Exploration Canada Ltd., personal communications, 1993)

BHP Minerals Canada Limited
BHP Minerals Canada Limited completed one diamond-drill hole on their claims in the northern part and along the eastern boundary of Carscallen Township in 1993 during an exploration program for base metals. No mineralization was intersected; however, altered rhyolitic rocks were obtained in the core. (BHP Minerals Canada Limited, personal communications, 1993)

Bonhomme, Lionel and Associates
In 1993, the Mountjoy Jessop et al Syndicate completed three surface diamond-drill holes, totalling 2550 feet, in a base metal exploration program on their four corner property at the intersection of Mountjoy, Godfrey, Jamieson and Jessop townships. As well, a borehole geophysical survey was done. Whole rock geochemistry was done on 150 samples from this drilling and previous drilling. As well, the samples were analysed for rare earth elements.

The Reid Syndicate was set up to explore in the northeast corner of Reid Township. Forty-one claim units were staked. Whole rock analyses was done on 50 core samples from the Timmins Resident Geologist's Drill Core Library. The results were compiled with other results obtained by previous workers on the claims. Geophysical and geological compilations were also done. (Lionel Bonhomme, personal communications, 1993)

Cameco Corporation
Cameco Corporation optioned a gold property in Huffman Township from E. Kirkwood and W. Brereton. The property, located along strike from the past producing Jerome Mine, was subsequently enlarged by Cameco. In the last few years, work done by the vendors has defined the geology of the property and obtained significant soil geochemical anomalies. (W. Brereton, personal communication, 1993)

Cameco continued soil sampling and bedrock sampling for geochemical analysis. A surface diamond-drill program is scheduled for early 1994.

On another gold exploration program, Cameco completed geophysical surveys, soil and bedrock sampling on their own staked claims north of Ridout Lake in Greenlaw Township. Surface diamond drilling is scheduled to start the last week of January, 1994. (Cameco Corporation, personal communications, 1993)

Cross Lake Minerals Ltd.
Cross Lake Minerals acquired claims in Timmins, Bond and Sheraton townships over a series of felsic rocks with a number of airborne electromagnetic anomalies. It was reported that the claim group also covers a drill intersection in which 42 feet of 3% zinc was previously intersected in a diamond-drill hole near the Bond-Sheraton Township boundary. Geophysical surveys outlined three possible massive sulphide targets. Cross Lake Minerals drilled four surface diamond-drill holes in Sheraton Township. Massive sulphides and graphitic argillites were intersected with nothing of economic significance reported.
(Cross Lake Minerals Ltd., News Release, October 18, 1993; The Northern Miner, August 30 and November 20, 1993; Robert Middleton, personal communication, 1993)

Falconbridge Limited
Falconbridge Exploration concentrated all of its efforts in the exploration for base metals in the Timmins area in 1993.

In the Kamiskotia area, the company completed 13,000 m of surface diamond drilling in 28 holes on six properties. Included in the above, Falconbridge drilled 16 holes, totalling 6000 m, on their Exploratory Licence of Occupation
on the former Kam-Kotia Mine property. All of the holes were drilled to test electromagnetic conductors. In January, 1994, three diamond drills were operating on the property. Two were testing EM conductors in the north part of the property and the third was drilling a deep hole beneath the workings of the Kam-Kotia Mine.

In the Kidd area, within 4 km of the Kidd Creek Mine, Falconbridge drilled eight surface diamond-drill holes, totalling 5600 m. Included in this was drilling on the Whitestar Copper Mines Ltd. property adjacent to and on the western boundary of the Kidd Creek Mine property. Nothing of significance was intersected on this property and the option was dropped.

East of the Falconbridge Metallurgical site and along the Kidd Creek felsic horizon, Falconbridge completed 11 surface diamond-drill holes on EM conductors. Some of this drilling was done in the Kirkland Lake Resident Geologist's area. (Falconbridge Ltd., personal communications, 1993 and 1994)

Kennecott Canada Incorporated
As a follow-up to the exploration program done in Tooms township in 1992, Kennecott Canada Incorporated completed 1564 m of surface diamond drilling in eight holes. The exploration target was high grade kambalda-type komatiite-hosted nickel sulphide deposits. Targets were based on geological and geophysical targets obtained in the 1992 program (L.E. Luhta et al, 1992). The best intersection was a 1.6 m core length averaging 1.6% nickel. The option on the property was dropped and the property was returned to E. Kirkwood. (MPH Consulting Ltd., personal communication, 1993)

Moneta Porcupine Mines Ltd.
Moneta Porcupine Mines Ltd. completed a 600-foot surface diamond-drill hole in the extreme northwest corner of Deloro Township. Graphitic argillites were intersected in one part of the hole, and in another part, nine feet of 50% pyrite mineralization was obtained. Sampling and assaying selected parts of the hole returned values up to 30 ppb gold.

Moneta Porcupine Mines Ltd. completed a 236 m surface diamond-drill hole in the central part of Jamieson Township at the end of February. An electromagnetic conductor was the target, but nothing was intersected that would explain the conductor. Tholeiitic basalts were intersected as well as a 15 m sericite-carbonate alteration zone with narrow quartz carbonate veinlets. This zone contained between 3 and 20 ppb gold.

Moneta Porcupine Mines Ltd. intersected 3 m of 10% zinc at a vertical depth of 107 m in Godfrey Township. The hole was a follow-up to a gold

intersection of 82.2 g/t Au over 1.5 m (2.5 ounces Au per ton over 5 feet) obtained by Falconbridge Ltd. in 1991 at a vertical depth of 130 m along the same section. Falconbridge also intersected zinc mineralization (0.32% Zn over 1.3 m) at a vertical depth of 140 m in the same hole. The mineralization was within a mafic breccia at the contact between mafic volcanic rocks and a rhyolite. Up the hole (east) from the mineralization is a conductive graphitic argillite. The rhyolite, which has been traced by geophysical surveys and diamond drilling, is 1.5 km long by 300 m wide. The rhyolite observed in the Moneta core was sericitized and contained some fine chloritic stringers - alteration often related to VMS deposits.

An additional 7 surface diamond-drill holes were drilled in the area to follow-up on the zinc intersection; however, no significant mineralization was obtained. Down the hole electromagnetic surveys were completed on some of the drill holes and two anomalies were obtained. These were interpreted to be within the rhyolitic package and not associated with the graphitic argillite horizon. Follow-up drilling has yet to be done on these surveys. (Moneta Porcupine Mines Ltd., personal communication, 1992; The Northern Miner, April 12 and 19, 1993; The Timmins Times, July 25, 1993)

Noranda Exploration Company Limited
Following preliminary base metal exploration work, Noranda Exploration drilled 6 surface diamond-drill holes, totalling 1825 m, in Foleyet Township in 1993. Surface diamond drilling continued in January, 1994.

In Fox (Porcupine Mining Division) and Stimson (Larder Lake Mining Division) townships, Noranda Exploration conducted a base metal exploration program. Two surface diamond-drill programs were completed in 1993, with a total of 10 holes (2420 m), all being drilled in Stimson Township. During the initial program three holes were drilled to test EM anomalies. One of the holes intersected fine, disseminated sphalerite within felsic rocks adjacent to a graphitic argillite giving an assay of 0.31% zinc over 67 m. The other holes intersected anomalous zinc values as well. In the area of drilling, sedimentary and volcanic rocks are enveloped by felsic intrusive rocks and have undergone contact metamorphism. The rhyolite is porphyritic and contains fine, disseminated sphalerite. The graphitic argillite contains up to 5% pyrite with minor sphalerite (personal observations of drill core, 1993). Following this drill program, Noranda Exploration staked a large number of claims covering EM anomalies along a magnetic/non-magnetic interface. The original 23 claims were optioned from Cross Lake Minerals Ltd. In late 1993, Noranda completed a second surface diamond-drill program. No results are yet available.

Noranda Exploration Company Ltd. acted as agent for the gold exploration programs of Hemlo Gold Mines Inc. in the Timmins area. On the "West Porcupine" gold exploration project in Penhorwood, Kenogaming and Sewell townships, Noranda Exploration drilled 5 surface diamond-drill holes, totalling 1422 m, on claims optioned from Glen Auden Resources. Three holes, totalling 670 m, were completed in the Sylvanite Lake area in Denyes Township on claims optioned from J. Patrie. One hole intersected an extensive carbonate/sericite alteration with some quartz-tourmaline

veining adjacent to an altered (talc/carbonate), ultramafic rock. A gold intersection of 3.4 g/t Au over 1.3 m was obtained (personal observations of drill core, 1993).

In a surface diamond-drill program in Denton Township on the Cripple Creek property optioned from GoWest Amalgamated Resources, Noranda completed 4 holes, totalling 1490 m.

This drilling intersected gold values in an unexplored area. Values of 1.07 g/t Au over 5 m, 5.77 g/t Au over 2.8 m and 3.77 g/t Au over 1.0 m were reported. (Noranda Exploration Company Limited, personal communication, 1993; The Northern Miner, May 24 and August 30, 1993)

Phelps Dodge Corporation
Phelps Dodge Corp. of Canada completed 1300 m of surface diamond drilling in early 1993 on the Shunsby base metal property in Cunningham Township. The property was optioned from Kirkton Resources Corporation who in turn had an agreement with MW Resources Ltd. and Chelsea Resources. Phelps Dodge Corp. subsequently dropped the option and Kirkton Resources ceased their commitments to their agreement as well. Since 1989, approximately $1 million was spent on the property by Kirkton Resources and Phelps Dodge Corporation. By having the work completed, Kirkton Resources Corporation has retained a 35% interest in the property. (Phelps Dodge Corporation of Canada, personal communication, 1992 MPH Consulting Ltd., personal communications, 1993)

Placer Dome Incorporated
Most of the 1993 exploration efforts of Placer Dome Incorporated were in an attempt to find ore at their two producing mines in the area. The company completed five surface diamond-drill holes, totalling 3450 m, to continuing a program to explore for the western extension of the main ore zone at the Detour Lake Mine. The drilling was done for a targeted depth of 750 m below surface. The drilling was also done to test for gold mineralization in the hangingwall basalts. In the final hole of the program, which was 2.5 km from the shaft and over 500 m from the face of the exploration drift on the 560 m level, the main ore structure was intersected.

Four surface diamond-drill holes, totalling 846 m, were completed in the vicinity of McAlpine Lake 4 to 5 km northwest of the Detour Lake Mine on two properties optioned from Gowest Amalgamated Resources Ltd. and Pelangio-Larder Mines Ltd. respectively.

Placer Dome completed 28 surface diamond-drill holes, totalling 2878 m, to evaluate the open pit potential to the northeast of the No. 8 shaft at the Dome Mine in Tisdale Township. A few low grade zones at the Blueberry Hill pit adjacent to the No. 8 shaft were intersected; however, nothing of economic significance was obtained further to the east.

To the west of the Dome Mine on the Paymaster property, nine short surface diamond-drill holes were completed to test near surface targets. (Placer Dome Incorporated, personal communications, 1993)

Royal Oak Mines Incorporated
Ninety percent of the exploration expenditures of Royal Oak Mines Inc. occurred at the Hallnor Mine property. Surface diamond drilling was done and a dewatering program of the old mine workings continues. Since May, 1990, $1.4 million has been spent at this site. In 1993, a total of 16,306 feet of surface diamond drilling in 37 holes has been completed at the Hallnor site. This resulted in the discovery of three parallel veins located to the south of the #1 discovery vein which was previously mined out. At the end of 1993, the underground workings at the Hallnor had been dewatered to 1400 feet below surface. The main exploration target is the extension of three veins systems to the west between 1400 feet and 4000 feet below surface on the Broulan property now owned by Royal Oak near the Hallnor/Broulan property. Another target occurs to the east on Pamour ground near the Hallnor/Pamour boundary across the Hallnor fault.

The exploration department also carried out a surface diamond drilling program east of the Pamour #1 shaft to explore for potential ore amenable to underground bulk mining methods. As well, 32 holes, totalling 5760 feet, of surface diamond drilling was done in late 1993 west of the Pamour #1 shaft exploring for open pitable ore.

In early 1993, the Royal Oak exploration department drilled 13 surface diamond-drill holes, totalling 2369 feet, at their Night Hawk Lake property in Cody Township. There are 4 known gold-bearing horizons, of which 2 have a calculated mineral inventory. The 1993 drilling focused on the Ramp Zone and holes were drilled at spacings of 100 feet over a total distance of 1100 feet. The best intersection obtained was 0.23 ounce Au per ton over 25.5 feet. (Royal Oak Mines, personal communications, 1993)

Timginn Syndicate
In 1993, the Timginn Syndicate was formed by a group of private investors headed by Robert M. Ginn. The syndicate acquired a total of 520 acres in several properties adjacent to the past-producing Hollinger and McIntyre gold mines in the heart of Timmins. In April, 4 surface diamond-drill holes, totalling 2630 m were completed in a gold exploration program. Prior to the drilling, a new geological interpretation for the properties had been made using Ministry of Northern Development and Mines aeromagnetic and electromagnetic survey data released in 1988.

A follow-up surface diamond-drill program began in late 1993 and is continuing into 1994. (Robert M. Ginn, personal communication, 1993)

Westminer Canada Limited
Westminer Canada Limited has been actively studying the western Abitibi Greenstone Belt for its exploration potential for volcanogenic massive sulphide deposits, komatiite-hosted nickel deposits and lode gold deposits. The company has acquired a land position in the Timmins area. One group of claims was optioned from Moneta Porcupine Mines Ltd. in Loveland and Macdiarmid townships. (Westminer Canada Ltd., personal communications, 1993)

Diamond Exploration Highlights
Re-evaluation of the results of the Monopros 1988/89 drill program prompted a joint venture between KWG Resources Ltd. and Blue Falcon Mines Ltd. to conduct a diamond exploration program in the Attawapiskat River area in mid-1992.

An excess of 150,000 acres covering 280 potential diamond drill targets was staked and airborne geophysical surveys completed by the end of the 1992. Called the Spider 1 Project, the exploration program is now 70% controlled by KWG Resources Ltd. and 30% by Spider Resources Inc.. A total of $7.4 million was raised by KWG Resources to work on the Spider 1 Project and the Spider 2 Project in the Kirkland Lake area. Twelve high priority diamond drill targets were identified in early 1993 and diamond drilling was started in late March to test these targets. In April, the company drilled 2 holes in the Attawapiskat area on property optioned from Continental Precious Metals Inc. Drilling intersected a sixty foot bed of gypsum but failed to penetrate the Paleozoic cover. Operations were postponed due to ground and weather conditions.
(Blue Falcon Mines, Spider Resources; personal communication, 1992/93, Northern Miner, Jan. 18, 1993)

In late 1992 and early 1993, Alcanex Ltd., a private Ontario company, staked 40,000 acres of land for its diamond potential in the Coral Rapids and Otter Rapids area along the Abitibi River in the James Bay Lowlands.

Ten companies have acquired properties from the ground staked by Alcanex including: Valerie Gold - 5800 acres in Valentine and Hobson Twps; Emperor Gold Corp. - 1600 acres in Heath Twp.; Sultan Minerals Inc. - 2200 acres in Ophir and Hobson Twps.; Wealth Resources Ltd.; Arbor Resources Inc.; Pacific Mariner Exploration Ltd. The companies have collectively completed an airborne survey covering all claims and have also conducted a soil sampling program for indicator minerals.
(Alcanex Ltd., personal communications, 1993, 1994)

In January, 1992, Noront Resources Ltd. acquired 126 claim units in Hobson and Hogg Townships 18 km north of Coral Rapids on the Abitibi River. The company has obtained a geological report on the property, known as the "Ranoke Diamond Property", which recommended the diamond drilling of 8 aeromagnetic features which may indicate kimberlite pipes. (Noront Resources Ltd., personal communications, 1993, Noront Resources Ltd., news releases, Jan. 28, 1993, Feb. 17, 1993)

In November, 1992, Southern Arizona Mining and Smelting Corp. announced it had signed an agreement with Blue Falcon Mines Ltd. to fund an exploration program designed to locate the source kimberlite of the "Jarvi diamond" found in 1971 in Sheraton Township. Re-interpretation and enhancement of the Ontario Geological Survey airborne geophysical data and the examination of geophysical data from assessment files was done for the area of the "Jarvi diamond" discovery. A linecutting program and a ground magnetometer survey were completed on the claims in Sheraton Township. Diamond drilling was done to test 3 targets during early 1993 . It was found that the anomalies were caused by magnetite bands within andesitic rocks. (Gordon Leliever, personal communications, 1993; Southern Arizona Mining and Smelting Corp. News Releases, Nov. 9, 1992 and Jan. 22, 1993)

East West Resources Corp. has reported it has claims covering 25 kimberlite targets on the Temiskaming Rift north of Kirkland Lake. On the west side, some of these properties are in Reaume, Duff and Dundonald townships . (East West Resources, personal communications, 1993; Northern Miner, Jan. 18, 1993)

In March, 1993, Inter-Rock Gold Inc. acquired 222 16- hectare units in the James Bay Lowlands to the south of the Albany River in the Jaab Lake area and areas to the south and east of Jaab Lake. Magnetic responses which could be kimberlites were targeted for the staking program. (Inter-Rock Gold Inc., personal communications, 1993)

Pure Gold Resources staked several block claims in the west of Burstall Township and South Ridge Lake areas in mid-February, 1993, as part of a diamond exploration program. In April, a program of overburden drilling was conducted to test several targets established using airborne magnetic survey data and an interpretation aerial photography was initiated. Overburden sample analyses are to be done at the laboratories of Ashton Mining. (I. Mason, Pure Gold Resources, personal communication, April, 1993)

In mid-April, Trade Winds Resources Ltd. began a reverse circulation drilling program over a "bulls-eye" airborne magnetic survey anomaly thought to indicate kimberlite in Tully Township. (Trade Winds Resources, personal communications, 1993)

William Kerr initiated an OPAP-funded prospecting program within the Kapuskasing Structure near Chapleau in 1991, approximately one year before the current diamond rush started. He has discovered a well-defined indicator mineral train and has staked eight claim groups on aeromagnetic anomalies. Microprobe work has confirmed the presence of both eclogitic (G-3 and G-5) and peridotitic (G-9) pyrope garnets, as well as abundant chrome diopside and ilmenite grains. One esker sample analysed in late 1992 returned 25 chrome diopsides and 26 pyrope garnets immediately down-ice from one of the staked claims. During 1993, Mr. Kerr continued work on his property, including diamond drilling and received support from an exploration company to further develop his diamond exploration theories. (William Kerr, personal communications, 1992/93)

PROPERTY EVALUATION AND DEVELOPMENT PROJECTS

Formosa Environmental Aggregates Ltd.
Formosa Environmental Aggregates Ltd. completed 10 surface diamond-drill holes in Canfield and Carroll townships with the assistance of an OMIP grant. These holes were drilled to evaluate a gypsum deposit located on their property. (Robin Coad, Project Supervisor, personal communication, 1993)

Great White Minerals Ltd.
Great White Minerals Ltd., with funding partially supplied by the Ontario Heritage Fund, continued the evaluation of a silica deposit in Fripp Township. A 1000 ton bulk sample was taken, crushed and tested to determine its suitability for various applications including both high

purity uses and as decorative stone. Experiments were done with several sorting and blending methods. Results of the completed market research studies are currently confidential. A "white pad" stockpile with irrigation was built immediately to the north of the deposit. Blasting of the hanging wall was done to open a new "North Face" in the quarry. The company also acquired additional adjacent claims as a base metal prospect and completed prospecting, sampling, stripping and trenching. Results from both projects have been positive and additional work is scheduled for 1994.
(D. Larche, President, Great White Minerals, January, 1994.)

Outokumpu Metals and Resources Canada
In 1993, Outokumpu Metals and Resources Canada, a subsidiary of Outokumpu Mines Ltd. of Finland, acquired an option on the Montcalm nickel deposit owned by a syndicate composed of Teck Corporation, Domik Exploration (a subsidiary of Dowa Mining Co. Ltd. of Japan) and Metall Mining Corporation. The deposit was discovered in September, 1976, when nickel/copper mineralization was intersected while diamond drilling an airborne electromagnetic anomaly. Published drill indicated reserves are 4.2 million tons at a grade of 1.4% nickel and 0.7% copper.

In the fall of 1993, a surface diamond-drill program was started by Outokumpu to fill in gaps from the previous drilling in order to improve the confidence of the previous ore reserve estimates. By the end of 1993, a total of 4000 m in 13 holes had been drilled. A second program of 10,000 m is scheduled to begin in January 1994 to fill in more gaps and to attempt to extend the deposit to 300 m below surface. Previous drilling delineated the deposit to between the 200 and 250 m elevation. (Outokumpu Metals and Resources Canada, personal communications, 1993)

Placer Dome Inc., Paymaster Project
Placer Dome Inc. plans to bring the former Paymaster Mine into production the first quarter of 1995 at 700 tons per mine day (i.e. 5 days per week). The mine will be operated as a satellite to the neighbouring Dome Mine. Most of the ore will be mined from 6025 feet to 6500 feet below surface. This ore was delineated by Placer Dome in 1991 when a program of underground development and diamond drilling was done. To access this ore, the No. 6 winze, which is between the 4075 level and the 6025 level, is presently being deepened to 6725 feet below surface. Access to the 4075 level from surface is by the No. 5 shaft. Construction of a headframe over this shaft was completed in 1989. Placer Dome Inc. now owns 100% of the Paymaster property after purchasing the 40% interest owned by American Reserve Mining Corp. in 1992. Placer Dome Inc. initially acquired a 60% interest from American Reserve in 1989. In 1993, a total of 2200 feet of underground development was done at the mine. This included 180 feet of shaft sinking. The remainder was lateral development and raising on three levels between the 4075 and 6025 levels for ventilation and escapeways. A total mineral resource of 917,941 tons at a grade of 0.295 ounce gold per ton has been calculated for the Paymaster Mine. Included in this is a reserve of 475,515 tons at a grade of 0.25 ounce gold per ton down to 6625 feet below surface. The deposit is still open down plunge. (Placer Dome Inc., personal communications, 1993)

Resident Geologist Staff Activities

The Timmins Resident Geologist Office is staffed by L.E. Luhta, Resident Geologist; P.J. Sangster, Staff Geologist; D.M. Draper, Data Geologist and D.C. Egerland, Secretary.
In May, 1993 the staff of the Timmins Drill Core Library, C.D.Hamblin, Drill Core Library Geologist and M.L. Leroux, Drill Core Library Geologist Assistant, were declared surplus and were subsequently transferred to other positions in August. Core library access is now provided by the Resident and Staff Geologist by appointment only. As usual, client service remained the number one priority. Over 2 500 client visits to the Resident's office were logged and some 4 300 telephone requests for information from external client groups were made.

The Resident's assessment file and technical library continued to expand with 114 assessment files and 12 OPAP/OMIP submissions being incorporated into the database. Additional information from Rio Algom and Homestake not previously submitted for assessment which was donated when these companies closed their Timmins offices in 1992 has been integrated into the Resident Geologist's assessment file library. Two new Geological Data Inventory Folios, Reeves and Penhorwood township, have been compiled and an 1993 updated edition of the Keith Township GDIF has been completed. These GDIF's are unpublished and are available only from the Timmins Resident Geologist's Office.

December 10, 1993 marked the completion date of a special employment program which began in March 1993. Sponsored by the Timmins Economic Development Corporation and funded by Canada Manpower, the program enabled the Timmins Resident Geologist's office to three projects which could otherwise not have been done.

Program design, management and supervision were provided by Pam Sangster, Staff Geologist, Timmins. Diane Draper, Data Geologist provided leadership and technical support for parts 2 and 3 of the program. Diane Egerland, Secretary provided purchasing/budget control and xerox and computer training for the program.

All of the rock and mineral samples in the Timmins Resident Geologist's rock and mineral collection at the time the project was initiated have been, labelled, computer indexed and have been plotted onto 1:20,000 mylar base maps on file at the Timmins drill core library. An updated hardcopy index, "Rock and Mineral Specimen Catalogue" has been completed.

A multiple volume set of open file format reports referencing early mining/exploration activity in the Timmins Resident Geologist's District has been completed for all producing mines in the district. The compilations include not only Northern Miner clippings but also references to all published information for each mine. To compliment this data the Resident's aerial photography library which includes a large percentage of historical photos has also been upgraded and computer indexed.

All fragile and damaged vintage maps have been repaired where possible and re-copied when necessary. Due to the extremely delicate state of many of

the maps it was often necessary to resort to engineering scale xeroxing. All of the books in the Resident Geologist's technical library (some 2200 volumes) have been carded where necessary and indexed according to case and shelf location. All of the maps in the Resident's library (some 4000) dating from the 1900's to the present have been checked for proper indexing and filing.

In conjunction with the Porcupine Prospectors and Developers Association, using rocks and minerals culled from the Resident Geologist's collection, 25 rock and mineral kits were assembled and distributed to all elementary schools in Timmins during the month of Oct./93. The kits were subsequently returned to the Resident and will be upgraded and loaned to elementary schools on demand.

A basic prospecting course was organized and offered through the Chapleau campus of Sault College. Unfortunately there was insufficient interest to present the course.

In celebration of the 50th anniversary of the Resident Geologist's Program a "Self Guided Tour of the Porcupine Camp" was produced in conjunction with the Communications Services Branch. The tour features mining and geological points of interest in the City of Timmins.

Lorne Luhta presented a slide show, on the history of diamond exploration at the Northeastern Ontario Mines and Minerals Symposium in April and a talk on the history of mining exploration and development in the camp was presented at the provincial Mines and Minerals Symposium in December.

Additional unpublished reports produced by the Resident Geologists Office in 1993 included:
Properties Available for Sale, Joint Venture or Option in the Timmins Resident Geologist's District
The History of Diamond Exploration in the Timmins Resident Geologist's District The Timmins Resident Geologist's District Advanced Exploration and Development Summary 1980 - 1993.
The Timmins Resident Geologist's District, Professional Directory 1993.

Staff of the Timmins Resident Geologist's Office spent considerable time in assisting local explorationists with OPAP/OMIP applications and submissions. Additional time was spent in follow-up field examinations of properties funded by these programs.

SWAYZE MINERAL PROSPECT STUDY

Using funding supplied under NODA, in a program initiated in 1991, Stewart Fumerton, contract Geologist, has documented a total of 223 mineral prospects in the northern and eastern parts of the Swayze greenstone belt.

A computer application has been developed in order to enter observations and comments into a digital data base. Interim results of this study have been published in two OFRs. OFR 5871 is a "Print Out" of all prospects that had been documented by August 1993. The companion report, OFR 5872, is the same data in a digital format together with a copy of the computer application. (S.Fumerton, personal communication, February, 1994)

PROPERTY EXAMINATIONS

Moneta Porcupine Mines Limited,
Jamieson Township

INTRODUCTION

On March 8, 1993, the writer examined the core of hole #93-1 obtained from a recently completed surface diamond-drill hole in the central part of Jamieson Township. The hole was drilled by Moneta Porcupine Mines Ltd.. An airborne electromagnetic conductor was the target.

LOCATION AND ACCESS

The surface diamond-drill hole was drilled in the central part of Jamieson Township just north and west of the junction of the Kamiscotia and Mattagami Rivers. The hole was drilled in the southeast corner of claim P.1182109, a block claim comprised of 16 16-hectare units. The NTS map sheet is 42A/NW, The latitude is 48°34′; The longitude 81°32′.

Access was by a winter trail off of Highway 567 located where the highway crosses the Godfrey-Jamieson township boundary. An ice bridge was made over the Kamiscotia River to access the drill set-up.

GENERAL GEOLOGY

Jamieson Township is underlain by metavolcanics, metasediments and mafic to felsic, intrusive rocks of Precambrian age and occurs on the western end of the Abitibi "greenstone" belt. Metamorphism has occurred under greenschist facies conditions. The claims occur at the east end of the Kamiscotia Assemblage (P.C. Thurston et al, 1991). This assemblage consists of the synvolcanic tholeiitic Kamiscotia Gabbroic Complex to the west, overlain by the Kamiscotia Volcanic Complex to the east. Principal rock types in the Kamiscotia Metavolcanic Complex include pillowed and fragmental (pillow breccia), mafic volcanic rocks; massive, flow-banded fragmental and tuffaceous, felsic metavolcanic rocks; massive mafic intrusions and felsic autobrecciated and flow-banded felsic intrusions. The Moneta claims occur in the northern part of the complex where mafic extrusive and intrusive rocks (sills) predominate.

The Kamiscotia Assemblage forms a broad monoclinal arc which faces east and northeast and all stratigraphic tops face that direction.

The drill hole location was between two north-trending faults just west and parallel to the Mattagami River Fault. The Mattagami River Fault separates the volcanic rocks of the Kamiscotia complex from the Kidd-Munro assemblage.

ECONOMIC GEOLOGY

Four volcanogenic copper-zinc (VMS) past producing mines and several other deposits occur within the Kamiscotia Volcanic Complex. The host rocks are predominantly mafic metavolcanic rocks with subordinate high-silica, rhyolite flows and tuffs. The sulphides (generally pyrite, pyrrhotite, chalcopyrite and sphalerite) at each mine occur as several smaller lenses or masses within a restricted stratigraphic interval. Chloritic and sericitic wall rock alteration is typical. The closest mine, the Jameland Mine, occurs 5 km east of the location of the drilling.

PREVIOUS WORK

The Jamieson Township area has been subject to extensive and continuous prospecting activity since 1928. Limited bedrock exposure has hampered mineral exploration with most of the geological maps being the result of interpretation of airborne and ground magnetic surveys.

Assessment files on record with the Timmins Resident Geologist's Office indicate that four companies have previously completed exploration programs on the property.

The Dominion Gulf Company began mapping in 1950 and by 1956 had covered the area south from the Kamkotia Mine to the Mattagami River and south from the Little Kamiskotia River to the southern boundary of Jamieson Township. Geophysical, geochemical, geological surveys and diamond drilling were done. Ultimately, the exploration outlined a 1400-foot long sulphide zone with reserves of 7 million tons of 25% pyrite, chalcopyrite and sphalerite in Conc. III, Lots 11 and 12, Jamieson Township.

A deposit in the vicinity of the massive sulphide lense was discovered by Jameland Mines Ltd. and was mined 1969 and 1972.

In 1965, the St. Lucie Exploration Co. Ltd. completed geophysical surveys and as follow up a series of five diamond-drill holes. The holes were drilled along an east-west line from the Mattagami to the Kamiskotia River. One hole drilled approximately 1/2 mile due south of the Moneta hole reportedly intersected 600 feet of anorthosite. Although no assay values were on file, up to 50% chalcopyrite and 70% pyrrhotite were reported in the drill log.

Ten years later, Cominco Ltd. explored the property as part of their Robison project. Overburden drilling and diamond drilling were completed in the area of the current Moneta drilling. No results of the diamond-drill program are on file.

Following the 1988 release of the Ontario Geological Survey Airborne Electromagnetic and Total Intensity Survey, Granges Exploration completed ground electromagnetic surveys. This survey located conductors east of the Mattagami River; however, no conductor was located at the site of the airborne conductor drilled by Moneta.

Moneta Porcupine Mines Ltd. completed a ground Max-Min electromagnetic survey over the location of the airborne conductor and obtained a weak electromagnetic anomaly.

INVESTIGATIONS

The hole was drilled S60°W at a dip of -45° to a depth of 236 m. The first 180 m of core is tholeiitic basalt grey-green to dark green in colour pillowed to massive, magnetic in places, locally carbonatized, and is weakly foliated at 50° to the core axis. Narrow irregular quartz and calcite stringers occur throughout. From 180 m to 195 m occurs a carbonate-sericite-siliceous alteration zone, lime green to yellow in colour with up to 3 to 5% disseminated pyrite and containing quartz carbonate stringers up to 20 cm in thickness. These stringers are parallel to a foliation of 50° to the core axis and contain a minor amount

of tourmaline. A broken up fault zone occurs between 181 and 182 m. From 195 m to the end of the hole, tholeiitic basalt was intersected similar to that intersected at the beginning of the hole.

CONCLUSIONS

The alteration zone between 180 and 195 m is very similar to the alteration in the M1 gold zone at the St. Andrew Goldfields Stock MIne (Luhta et al, 1992). Gold values of up to 20 parts per billion were obtained from samples of core from this section sent for assay. The weak conductor obtained by Moneta's ground survey could be explained by the fault zone at 181 m down the hole. However, Moneta personnel feel that the airborne conductor is located further north and further line cutting and geophysical surveys are planned.

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Middleton, R.S. 1973 Magnetic Survey of Robb and Jamieson Townships, District of Cochrane; Ontario Division of Mines, G.P.R. 1, 56p. Accompanied by Map 2255, scale 1 inch to 1/2 mile.

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Mel de Quadros Property,
Ivanhoe Township

INTRODUCTION

On January 11, 1994, the writer inspected diamond drill core drilled on a property in the north central part of Ivanhoe Township by Mel de Quadros, an OPAP grant recipient. The claims were optioned from W. Whymark and D. Hunter. The diamond drill hole was drilled in late November, early December, 1993, by Larry Salo, contractor, and brought to the M.N.D.M. Timmins Core Library for logging. The core was donated to the library. The purpose of the diamond drilling was to test an electromagnetic anomaly close to the contact between mafic volcanic rocks and a felsic intrusive body.

LOCATION AND ACCESS

The diamond drill hole was located at the western boundary in the northern part of claim 1193495 which consists of 12 units in the north-central part of Ivanhoe Township. This western boundary of the claims adjoins the

eastern boundary of Ivanhoe Provincial Park. The NTS map sheet is NTS 42B and the latitude and longitude are 48° 09′ N and 82° 30′ E respectively. Access is obtained by driving south along the Ivanhoe Lake Park road, south of Highway 101, and continuing south along the road 3 km past the bridge which crosses the Ivanhoe River. The diamond drill hole location is just off the west side of the road.

GENERAL GEOLOGY

The rocks of Ivanhoe Township are of Archean age with the oldest rocks being the highly metamorphosed rocks within the Kapuskasing structural zone located in the northwest corner of the township. The Ivanhoe Lake fault striking northwest and located in the northwest corner is considered to be the boundary between the Kapuskasing structural zone to the west and the younger rocks of the Swayze greenstone belt and associated intrusions to the east. These younger "Keewatin-type" supracrustal rocks are metamorphosed to greenschist and amphibolite facies and have been divided into two lithologic distinct assemblages, - the Muskego-Reeves assemblage (MRA) and the Horwood Lake assemblage (HLA). The Muskego River fault, a broad east-trending deformation zone comprising variable schistose and carbonatized rocks, defines the boundary between the MRA to the north and the HLA to the south. This fault also delineates an abrupt transition from greenschist facies rocks to the north into amphibolite facies rocks to the south.

John Ayer, 1991, described the MRA as follows:
"The MRA is a very diverse lithologic succession comprising both volcanic and sedimentary units. The units trend easterly and young to the south. Extrusive rocks are mainly mafic flows with subordinate units of ultramafic flows and felsic to intermediate flows and pyroclastic rocks. Mafic flows are pillowed to massive and locally amygdaloidal. Supercooling textures are common and include varioles and massive mafic flows with spinifex-like acicular mafic and plagioclase crystals in a fine-grained groundmass. Ultramafic flows are talcose and are typically polyhedral jointed to rarely spinifex-textured. Felsic volcanic rocks are feldspar and/or quartz-phyric. They occur as extensively brecciated flows and fragmental units which include both monolithic pyroclastic deposits and heterolithic debris flows. Sedimentary units comprise mainly thickly- to thinly-bedded wackes and feldspar-phyric tuffaceous wackes. Thickly-bedded conglomerates contain poorly-sorted, subangular, heterolithic volcanic and subvolcanic intrusive clasts."

The HLA is described by John Ayer as being comprised of "monotonous mafic volcanic flows which differ from those of the MRA principally in their lack of intercalations of ultramafic volcanic rocks, felsic volcanic rocks or sedimentary rocks. Mafic volcanic rocks of the HLA are amphibolitized and commonly garnetiferous. Pillow selvages, varioles and amygdules are locally evident. Where preserved, pillow tops indicate consistent facing to the southwest. Near the south-central margin of the map area, the garnetiferous, amphibolitized, mafic flows contain rounded epidote-rich pods averaging 10-20 cm, which can comprise up to 50% of the rock".

Synvolcanic sill intrusions of mainly gabbro with minor leucogabbro, metagabbro and pyroxenite occur within the MRA and HLA. Some of these may be in fact large massive flows. They are more extensive in the HLA.

The west part of Ivanhoe Township is underlain by gneissic, strongly-foliated, pretectonic, granitic intrusions. Post-tectonic granitic intrusions are located to the east of the Ivanhoe Lake fault. They are massive and unfoliated. The Ivanhoe Lake stock, located in the north-central part of Ivanhoe Township, is predominantly granodiorite in the west and quartz monzodiorite in the east.

PROPERTY GEOLOGY

There is no outcrop on the property. The collar of the drill hole is located just south of a wedge of sedimentary rocks containing wacke, mudstone and graphitic mudstone. (OGS Map P.3199) This wedge is between mafic flows to the south and the Ivanhoe Lake stock to the north. A zone of extensive silicification is shown to occur in mafic volcanic rocks 1.5 km to the east and adjacent to the southeast contact of the stock.

The target was the extreme east end of a airborne electromagnetic anomaly (OGS Map 81374) (The major part of this anomaly occurs with the provincial park.) The east end of the anomaly is located at the north side of a circular magnetic high.

PREVIOUS WORK

No work has been reported on the property (Timmins Resident Geologist's Assessment Files). Work has been recorded in the northeastern part of Ivanhoe Township where subeconomic massive to disseminated sulphides were intersected in diamond drilling. (J.A. Ayer, 1991)

A ground magnetometer and electromagnetometer survey was conducted on the property in 1993. A very strong conductor was confirmed at a depth of 48 m to 57 m with good conductivity of 38 MHOS on the 444 frequency. The ground magnetics show a strong, flanking magnetic anomaly of approximately 1200 to 1400 gammas (against a background of 600-700 gammas) to the south of the conductor. (De Quadros, Mel, 1991)

INVESTIGATIONS

The hole was drilled northwards at a dip of -50° to a total length 199.34 m. Bedrock was intersected at 66.7 m.

Initially, a black to dark grey, aphanitic, magnetic, mafic volcanic rock was intersected. This rock becomes gradually less magnetic, and the colour changes to a lighter green further down the hole towards the contact at 90 m. Next, 18 m of altered ultramafic rock was intersected. This rock varies from a dark grey-green, talc-chloritic rock to a lighter grey-green, talc-chlorite-carbonate rock with abundant scattered carbonate stringers.

A 1.4 m light grey, porphyry dike with abundant feldspar phenocrysts throughout the core occurs within the ultramafic. The upper (southern) contact of this dike is at an angle of 45° to the core axis, and the lower contact is sheared and at an angle of 10° to the core axis.

In contact with the ultramafic down the hole is 19.5 m of a dark grey to black, graphitic argillite. The contact between the two is sheared. The foliation (bedding?) is at 45° to the core axis. Pyrite blebs and bands

parallel to the foliation are quite common throughout this rock, as well as some minor cross- cutting pyritic stringers.

The next 8 m of core intersected a zone of silicification of the argillite which progressively intensified down-hole with the pyrite content decreasing gradually. This silicified argillite has a gradational contact with the unaltered graphitic argillite above. From 135.6 m to the end of the hole occurs a very light grey, mottled looking, aphanitic, silicified and feldspathized zone. In places, the rock resembles a quartz-rich rhyolite, however, there are sections throughout the core which contain abundant fine leucoxene grains, especially at the upper contact for about 15 m.

The writer interprets this altered zone to be a feldspathized and silicified mafic volcanic rock with the alteration resulting from the intrusion of the Ivanhoe Lake stock located just to the north. John Ayer, 1991, mapped a similar zone to to the east. A very minor amount of sulphide mineralization (mostly pyrite) occurs throughout this zone except for a section between 184.1 and 187.2 m down the hole, where, fine pyrite and pyrrhotite mineralization occurs in narrow stringers and disseminations within the rock; however, this mineralization does not exceed 1%.

CONCLUSIONS

The targeted electromagnetic anomaly was thought to be caused by a volcanogenic massive sulphide deposit. However, the diamond drilling proved that it was caused by a graphitic argillite. Sampling of some of the silicified and feldspathized mafic volcanic intersected further down the hole should be done and assayed for gold, especially in the mineralized area between 184.1 and 187.2 m.

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DENROSS GOLD OCCURRENCE,
HORWOOD TOWNSHIP

INTRODUCTION

On Oct.21, 1993 the writer and P.J. Sangster, Staff Geologist, visited the DenRoss Showing, a new gold occurrence, held by George Ross and Roger Denomme in Horwood Township. Douglas Panagapko of Cameco Corporation and George Ross were also in attendance.

LOCATION AND ACCESS
The occurrence is located in the northwest part of Horwood Twp. on Horwood Peninsula, Horwood Lake, 1 km southwest of Longfellow Lake (NTS 42B01W, Lat. 48° 02 01'N, Long. 82° 16 01'W). Access is by road, driving west from Timmins along Hwy 101 to the Kenogaming Logging Road, then south along this road to the Tionaga Siding on the CNR Main Rail Line. Immediately after crossing the tracks, a turn to the west is made onto a new secondary logging road towards the Horwood Peninsula. The occurrence is 15.7 km from the Tionaga Siding on the north side of the road. Another location, 12 km west of the siding on the south side of the road at a intersection of this road with a narrower road going south was also examined.

EXPLORATION HISTORY
George Ross and Roger Denomme found the occurrence in June, 1993 while prospecting along the newly constructed logging road. The partners staked 4 contiguous block claims totalling 30 units. Claim numbers are: 1177396, 1193573, 74 and 75. Representatives of a number of mining companies were brought in by the partners to view the occurrence.

GENERAL GEOLOGY
The occurrence lies within a narrowing of the Swayze Greenstone belt separating a large metavolcanic - metasedimentary area to the south from a smaller one to the north. Mafic metavolcanic rocks predominate, with a minor amount of felsic volcanic rocks. Mafic to ultramafic plutons of various sizes intrude the metavolcanic sequence. Both early and late felsic intrusive rocks occur in the area. Diabase dikes intrude all of the above mentioned lithologies.
All bedrock is of Early Precambrian (Archean) age. Regional metamorphism is of greenschist facies and locally becomes epidote-almandine amphibolite grade within contact metamorphic aureoles surrounding the granitic plutons.

The DenRoss occurrence is hosted in metavolcanic rocks just to the north of the Horwood Peninsula Pluton, an elongate leucrocratic granitic mass 5 km in length and about 800 m in width (Breaks, F.W., 1978). This small stock consists of fine to medium-grained, massive, equigranular, biotite-horneblende quartz diorite with lesser portions of biotite-horneblende granodiorite. To the west of the showing a metagabbro intrusive is shown to occur on the mapsheet(OGS Map 2329). The metagabbro is foliated to massive, generally medium grained, and dense dark green-black which contrasts with the fine-grained schistose to massive, generally medium grained, light grey green pillowed metavolcanic host rock.

INVESTIGATION
Very little bedrock was exposed at the first site visited; however, there was abundant fractured angular loose rubble which originated from either directly below or very close to the site. The bedrock exposed and the loose rock which covered the site predominately consisted of a dark grey to black, aphanitic, very hard, fractured rock. A few pieces of rock were magnetic, however most of the rock was non-magnetic. This rock contained approximately 1% disseminated pyrrhotite in places with a minor amount of chalcopyrite. A small exposed bedrock area of this rock contained pyrite

and pyrrhotite in narrow (2-3 mm) fractures. One small outcrop area contained a light grey porphyry dike containing feldspar phenocrysts.

Thin section examination by INCO Exploration and Technical Services Inc. of a piece of the black aphanitic rock determined that it was a highly metamorphosed mafic volcanic rock (John Perry, Personal communications).

The second site visited, was 3.7 km to the east of the above and along the south side of the logging road. A very small outcrop (1 m in diameter) was exposed. The rock was a quartz-sericite schist, light green in colour with quartz carbonate tourmaline stringers.

SAMPLING/ASSAYING

In September, 1993 representatives from Noranda Exploration Co. Ltd. sampled the occurrence and results obtained were up to 2g/t Au from chip samples, 11 g/t Au from grab samples and 41 g/t Au from a sample of float. Their best copper value obtained was 0.27%. D. Gamble working for Phelps Dodge Corporation of Canada Ltd. obtained assays of 0.9 g/t, 6.5g/t and 27.2 g/t Au from rusty samples containing pyrite, pyrrhotite and traces of chalcopyrite in fractures. Samples of mafic volcanic rock with disseminated pyrite and pyrrhotite returned assays of up to 0.6 g/t Au. Of the 6 samples taken by Stewart Fumerton in October, 1993, while working on a mineral deposits study in the Swayze area as part of the Federal/Provincial Northern Ontario Development Agreement (NODA), 2 samples with pyrite within fractures assayed 1.03 and 10.63 g/t Au. The 4 others containing minor disseminated pyrite and pyrrhotite returned trace gold values. The highest gold and copper assays obtained by Doug Panagapko of Cameco Corp. from 7 samples taken at the time of our visit were 0.71 g/t and 0.61% respectively from one of the samples.

Five samples were taken by the writer. A sample of bedrock with fine fractures filled with pyrite and pyrrhotite assayed 132 ppb gold. A bedrock sample with minor disseminated pyrrhotite assayed 98 ppb gold. A sample of float similar to the first sample assayed 254 ppb gold. A sample of porphyry dike assayed less than 3 ppb gold. A sample of float similar to the second sample assayed 102 ppb gold.
One sample taken from the second site visited assayed 95 ppb gold.

CONCLUSIONS

Although samples taken from the DenRoss occurrence by the writer did not give significant gold assays, encouraging results have been obtained by others. The metamorphism of the host rock, a mafic volcanic of amphibolite grade, was due to the proximity of the Horwood Peninsula Pluton. As well, this probably resulted in the gold-copper mineralization at the Denross occurrence. The contact aureole surrounding the Pluton would be a good target for locating additional mineralization. At the occurrence itself, an extensive stripping, mapping and sampling program is recommended.

REFERENCES

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BHP MINERALS CANADA LIMITED,
MCARTHUR TOWNSHIP

LOCATION AND ACCESS
The property consists of 108 unpatented claims in south central McArthur Township.
(NTS: 42A/3; LATITUDE: 48°15'; LONGITUDE: 81°16'30") and is accessed from Timmins via Pine Street South (the Papakomeka Road) to the Mountjoy River Road.

BHP Minerals, completed an exploration program for nickel and volcanogenic massive sulphide deposits on the claims from 1990-1992. Various portions of the property have been explored by 10 companies since the early 1970's for asbestos, gold and base metals (including Ni).

REGIONAL GEOLOGY
Map 2363, Geology of McArthur and Douglas Townships shows the area to be underlain by a series of northwest to north trending, steeply north and east dipping Archean ultramafic to felsic flows and tuffs, minor sediments and intercalated iron formation. According to Pyke (1978) the sequence in this area represents two cycles of volcanism with the boundary being the south contact of the ultramafic sequence. The first cycle of volcanism is evidenced by an ultramafic to felsic sequence exposed in the Peterlong Lake area. Typically, iron formation has been mapped at the top of this cycle. The second cycle of volcanism is marked by the ultramafic package in McArthur Township which is in turn succeeded by 3500m+ of pillowed mafic volcanics and which is in turn succeeded by 900m of intermediate to felsic volcanic rock.

The volcanic package is intruded by a series of gabbroic dykes and sills, thought to be of sub-volcanic origin. Felsic intrusions described as "epizonal trondjemites" are also thought to be subvolcanic. The property is bounded on the north and the east by the Adams and Geike plutons, respectively. These are described as "porphyritic granodiorite" Younger northeast trending diabase dykes are mapped throughout the entire area.

PROPERTY GEOLOGY
Work done by BHP indicates that the property is underlain by a series of felsic to mafic to intermediate flows and tuffs, mafic volcanics, chert and argillic sediments, ultramafic volcanics and oxide and sulphide iron formations.

The ultramafic complex consists of a series of flows exhibiting both cumulate and spinifex textures. No visible nickel suphides were reported. Whole rock analyses of the basal zone indicates a dunitic composition. Nickel values within the complex average 1150ppm Ni.

In April, 1992, 3 holes totalling 787m were diamond drilled to test for gold and base metal potential as a follow up to work done in 1991. The holes intersected a felsic volcanic package consisting of "fine grained tuff to coarse breccia" which hosts a oxide/sulphide facies iron formation. Anomalous values in zinc, gold and copper have been reported in the iron formation.

OBSERVATIONS

Staff of BHP Minerals had mentioned this site to the author as having several excellent exposures of spinifex. The on-site visit confirmed this. In some respects, (ie. access and spinifex "veins") this locality is superior to Pyke's Hill in Munro Township.

On Friday May 13, 1993 , the author was shown the location of spinifex sites on the BHP-Utah Minerals property in south central McArthur Township by S. Lomas, Geologist, BHP.

The tour was focused on several excellent exposures of spinifex mapped by BHP during a recent base metal exploration program. Although some spinfex had been mentioned in the area previously by Dale Pyke in GR 161, Geology of the Redstone River Area, no definite flows were recognized in McArthur Township. Results of subsequent studies by Pyke, Naldrett and Eckstrand in 1973 confirm that there is in fact a series of very well defined ultramafic flows. Chilled and fractured textures and spinifex texture are seen at the at the upper part of each flow unit while the lower part of the flow unit exhibits foliated skeletal olivine and medium to fine grained peridotite. There is a marked absence of the knobby peridotite zone as noted in lower flow unit of the Munro Township flows. Numerous spinifex "veins" whose genesis and significance have yet to be defined have also been mapped at the McArthur Township site.

REFERENCES

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Mineral Deposit Inventory Files - Search McArthur Township
Timmins Resident Geologist Assessment File T-3480,
BHP Minerals Canada Ltd., McArthur Property, 1991

RECOMMENDATIONS FOR EXPLORATION

Tisdale Township

In 1987 and 1988, Pamorex Minerals Inc. completed two deep surface diamond-drill holes in an area of intense surface alteration (ankerite - sericite - pyrite) of tholeiitic basalts. The holes were drilled approximately one kilometre to the northeast of the former Coniaurum Mine in the northern part of Lot 5, Concession III, Tisdale Township, and along strike from the Hollinger - McIntyre - Coniaurum gold complex; an area which has produced over 31 million ounces of gold from over 110 million tons of gold ore as well as 10 million tons of porphyry copper ore at a grade of 0.67% copper and 0.03 ounce gold per ton.

Research by Professor Robert Mason of Queen's University led him to believe that the alteration in this area could be due to a buried porphyry system. It was postulated that such a buried porphyry may be responsible for the alteration exposed on surface, as this alteration is very similar to that found surrounding the Hollinger - McIntyre - Coniaurum gold ore zones and associated porphyries. Hence, the rationale for drilling the holes was to intersect such a possible buried porphyry and associated gold-bearing quartz vein system.

The two diamond drill holes were started vertically, but deviated with depth towards the west. Both were drilled to a depth of just over 855 m (2,800 feet); however, the anticipated porphyry target was not intersected. The drilling intersected a succession of massive, pillowed and variolitic, mafic volcanic rocks. The intense alteration on surface was intersected several times in the holes. A few narrow drill intersections recorded anomalous gold values in both drill holes.

Following the completion of the second deep hole, four shorter holes totalling 1,038 m were drilled to investigate geochemical results obtained in the two deep holes and to follow-up on results of shallow diamond drilling done in the area by Coniaurum Mines Ltd. in 1936-1937. The earlier drilling by Coniaurum intersected minor gold mineralization within the alteration zone. One of Pamorex Minerals Inc.'s targets, the V9 interflow unit, was intersected and found to contain narrow mineralized quartz veins with erratic gold values ranging from nil to 20 g/t Au. While nothing of economic significance was found, it was concluded that Pamorex Minerals Inc.'s investigation did not eliminate the possibility of a buried porphyry being found at greater depths.

After reviewing the data, the author concluded that the two deep diamond drill holes may have been drilled either in the wrong place or at the wrong angle in order to intersect a buried porphyry with possible gold mineralization.

The mineralization and porphyries of the Hollinger - McIntyre - Coniaurum system strike north of east and plunge at -45° to the east, parallel to the large neighbouring Porcupine Syncline. Pamorex Minerals Inc.'s two deep vertical holes were collared in the alteration zone, but gradually deviated to the west. If the targeted alteration zone also has a -45° easterly plunge that corresponds to the regional plunge, then these two holes would have gradually deviated away from the alteration zone with depth. The author therefore suggests that Professor Mason's hypothesis has merit. However, in order to properly test this hypothesis, future diamond drilling should be directed either down-plunge, or if vertical drilling is preferred, then drill holes should be collared further to the east along strike so as to intersect a possible buried porphyry and associated gold mineralization at depth.

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TABLE 1 SUMMARY OF GOVERNMENT INCENTIVE PROGRAMS (OPAP / OMIP)
TIMMINS RESIDENT GEOLOGIST'S DISTRICT 1992 - 1993

YEAR	OPAP PROGRAMS	TOTAL AWARDED	OMIP PROGRAMS	TOTAL AWARDED
1993	32	$320 000	6	$ 309 000
1992	75	$706 000	20	$2 627 197
1991	57	$558 542	35	$2 484 604
1990	65	$622 909	14	$ 595 836

TABLE 2. Summary of claims recorded and assessment work credit to 1993, Timmins Resident Geologist's District

YEAR	CLAIM UNITS RECORDED	CLAIM UNITS CANCELLED	CLAIM UNITS ACTIVE	DIAMOND DRILLING	GEOTECHNICAL SURVEYS GEOPHYSICAL	GEOTECHNICAL SURVEYS GEOLOGICAL	TOTAL WORK VALUE
1993	7 852	3 191	34 779	$ 2 016 974	$ 1 439 217		$ 4 437 645
1992	10 474	2 248	28 987	$ 807 799	$ 756 454	$ 395 934	$ 2 323 218
1991*	4 682	4 367	19 879	62 409	199 836	8 140	279 806
				$ 624 764	$ 104 667	$ 76 540	$ 1 067 217
1990	4 864	10 431	19 472	130 847	112 881	20 638	313 085
1989	4 724	12 347	24 715	172 600	218 347	46 227	522 490
1988	5 867	6 117	34 553	119 758	325 685	17 260	532 820
1987	8 934	4 402	34 474	120 384	612 631	32 001	807 277
1986	17 889	8 689	33 181	129 932	481 547	26 266	717 522
1985	6 052	10 024	23 207	131 330	278 881	34 032	503 338
1984	7 633	11 040	27 179	140 864	495 323	51 723	738 038
1983	11 859	4 967	30 586	128 126	199 892	44 755	407 161
1982	5 420	6 457	23 694	91 203	359 970	36 178	596 097
1981	8 934	2 934	24 731	114 823	261 301	23 177	471 827
1980	10 742	1 778	18 753	59 993	212 208	5 246	296 852
1979	3 975	2 504	9 597	40 850	59 605	5 480	151 003
1978	3 623	4 429	8 126	38 056	47 333	1 880	94 045
1977	2 438	4 336	8 932	77 496	135 134	3 755	228 090
1976	5 837	3 621	10 830	25 819	43 920	2 140	97 258
1975	4 162	4 142	8 614	83 388	108 420	1 300	200 034
1970	3 903	3 916	(8 600)	96 946	59 013	5 560	167 465
1965	47 900	9 922	(19 000)	242 869	224 959	(6 500)	486 246
1960	1 321	2 296	(4 750)	(21 000)	(9 000)	(1 400)	(39 000)
1955	1 793	757	(5 250)	(4 000)	(3 000)	(1 500)	(10 000)

Unless indicated otherwise ($), the assessment work credit is given in "man days". Parentheses indicate approximate figures.

* Due to regulation changes implemented by the new Mining Act, as of June, 1991, total assessment work values shown in this table are reported in man days for January to June, 1991, and in dollar value of expenditures for July to December, 1991.

Table 3. Production statistics 1993 for active mining operations, Timmins Resident Geologist's District.

Abbreviations/Notations

[1]	Total proven and probable reserves	L	Lateral mine development
g/t	Grams per tonne	V	Vertical mine development
opT	Ounces per ton	R	Ramp development
T	Imperial ton	S	Surface diamond drilling
t	Metric tonne	U	Underground diamond drilling
N/A	Not Available		

Property (No. employed)	Production	Grade	Amount Milled	Recovery %	No. of Stopes	Mine Dev.	Drilling	Reserves
Falconbridge Limited								
—Kidd Creek Mine	3,466,806 t	3.77% Zn	3,474,553 t	76.3 Zn	55	5345m L	43,755′ S	N/A
—(1950)		3.28% Cu		95.7 Cu		3716m V	183,754′ U	
		49 g/t Ag		77.0 Ag				
		0.11% Pb						
—Figures are totals for #1,# 2,#3 mines.								
Falconbridge Gold Corp. (Au) (now Kinross Gold Corporation)								
—Bell Creek Mine	4,300 oz	8.85 g/t	15,305 t	97.85	4	N/A	N/A	30,000 t @ 9.2 g/t
—Hoyle Pond Mine	46,703 oz	19.2 g/t	77,368 t	97.85	11	N/A	N/A	259,490 t @ 15.1 g/t
—(86)								
Placer Dome Incorp. (Au)								
—Detour Lake Mine	141,840 oz	5.0 g/t	953,155 t	93.2	4	10,216m total	1,500m S 63,478m U	N/A
—(252)								
—Dome Mine	184,810 oz	0.119 opT	1,616,400 T	96.08	51	17,109′ L 1,683′ V	5200′ S 81,688′ U	25,000,000 T @ 0.068 opT (Open pit est.)
—Underground reserve figures unavailable at time of compilation.								
Royal Oak Mines Inc. (Au)								
Total Timmins Operations								
(313)	86,114 oz	0.072 opT	1,330,722 T	89.6				3,824,900 T @ 0.099 opT (Dec/92)
—Pamour #1 U/G		0.169 opT	134,351 T	—	15	9,469′ L 7,210′ V	10,069′ S 27,088′ U	
—Hoyle Mine U/G		0.071 opT	543,073 T	—	2	8,403′ L 349′ V 152′ R	626′ S 26,511′ U	
—Open Pits		0.052 opT	625,569 T					
St. Andrew Goldfields Limited (Au)								
—Stock Mine	23,788 oz	0.150 opT	166,652 T	94.97	9	3,653′ L 589′ V 1,674′ R	19,047′ U	88,000 T[1] @ 0.177 opT
—(90)								
Luzenac Incorporated (talc)								
—Penhorwood Mine	28,155 T	—	45,000 T	—	open pit	none	none	N/A
—(50)								

Table 4.

BASE METAL PRODUCTION, TIMMINS RESIDENT GEOLOGIST'S DISTRICT TO THE END OF 1993

MINE	TOWNSHIP	DATES	ORE MILLED	GRADES
Alexo	Dundonald	1912-19 1943-44	51 857 tons 4 923 tons	4.5% Ni, 0.5% Cu
Canadian Jamieson	Godfrey	1966-71	816 173 tons	2.44% Cu, 4.22% Zn
Jameland	Jamieson	1969-72	509 356 tons	0.99% Cu, 0.88% Zn
Kam Kotia	Robb	1943-44, 1961-72	6.6 Mtons	1.1% Cu, 1.17% Zn, 0.10 oz/T Ag
Kidd Creek	Kidd	1966-	100.8Mtonnes	2.34% Cu, 6.94% Zn, 0.28% Pb, 90.7g/t Ag
Langmuir #2	Langmuir	1972-78	1.1 Mtons	1.43% Ni
Langmuir #1	Langmuir	1990-91	111,502 tons	1.74% Ni
McIntyre	Tisdale	1963-82	10 Mtonnes	0.67% Cu
Redstone	Eldorado	1989-92	294,895 tons	2.4% Ni
United Obalski	Godfrey	1966	Produced 240 tons Cu concentrate	

Table 5.

GOLD PRODUCTION FROM THE TIMMINS RESIDENT GEOLOGIST DISTRICT (to the end of 1992)

MINE NAME	TOWNSHIP	YEARS OF PRODUCTION	TONS MILLED	OZ. PRODUCED	GRADE
Ankerite	Deloro	1926-53,-78	4,993,929	957,292	0.19
Ankerite/March	Deloro	1926-1935	317,769	61,039	0.19
Aquarius	Macklem	1984,1988-89	139,634	27,117	0.19
Aunor (Pamour No. 3)	Deloro	1940-1984	8,482,174	2,502,214	0.30
Banner	Whitney	1927-28,-33,-35	315	670	0.13
Bell Creek	Hoyle	1987-1991	622,227	111,988	0.18
		1992-	4,988	1,065	0.22
Bonetal	Whitney	1941-1951	352,254	51,510	0.15
Bonwhit	Whitney	1951-1954	200,555	67,940	0.34
Broulan	Whitney	1939-1953	1,146,059	243,757	0.21
Cincinnati	Deloro	1914,1922-1924	3,200	736	0.23
Concordia	Deloro	1935	230	16	0.07
Coniaurum/Carium	Tisdale	1913-1918	4,464,006	1,109,574	0.25
		1928-1961			
Crown	Tisdale	1913-1921	226,180	138,330	0.61
Davidson	Tisdale	1918-1920	9,371	2,438	0.26
		1988	43,850	7,301	
Delnite	Deloro	1937-1964	3,847,364	920,404	0.20
(open pit)	Deloro	1987-1988	59,067	3,602	0.77
DeSantis	Ogden	1933,39-42	196,928	35,842	0.18
		1961-1964			
DeSantis	Turnbull	1926		13	
Detour Lake Mine	Sunday Lake	1983-	8,390,300	938,597	0.11
Dome Mine	Tisdale	1910-	50,969,667	12,016,863	0.23
Faymar	Deloro	1940-1942	119,181	21,851	0.18
Fuller	Tisdale	1940-1944	44,028	6,566	0.15
Gillies Lake	Tisdale	1929-31,35-37	54,502	15,278	0.28
Goldhawk	Cody	1947	636	53	0.08
Goldhawk (open pit)	Cody	1980	40,000	3,967	0.10
Halcrow-Swayze	Halcrow	1935	211	40	0.19
Hallnor (Pamour No.2)	Whitney	1938-68,-81	4,226,419	1,645,892	0.39
Hollinger-Schumacher	Tisdale	1915-1918	112,124	27,182	0.24
Hollinger					
(Pamour Timmins Prop.)	Tisdale	1910-1968,	65,778,234	19,327,691	0.29
		1976-1988	2,615,866	182,058	0.07
Hoyle	Whitney	1941-44,46-49	725,494	71,843	0.10
Hoyle Pond	Hoyle	1985-	737,018	384,827	0.60
Hugh-Pam	Whitney	1926,48-65	636,751	119,604	0.19
Jerome	Osway	1941-43,56	335,060	56,893	0.17
Joburke	Keith	1973-75,79-81	440,117	43,571	0.10
Kingbridge/Gomak	Chester	1935-1936	1,387	98	0.07
McIntyre					
(Pamour Schumacher)	Tisdale	1912-1988	37,634,691	10,751,941	0.29
McLaren	Deloro	1933-1937	876	201	0.23
Moneta	Tisdale	1938-1943	314,829	149,250	0.47
Naybob	Ogden	1932-1964	304,100	50,731	0.17
Owl Creek	Hoyle	1981-1989	1,789,247	(head grade	0.14)
Pamour No. 1	Whitney	1936-	47,662,056	4,414,053	0.09
(incl. pits 3 & 4 & heap leach)					
Paymaster	Tisdale	1915-1966	5,607,402	1,192,206	0.21
Porcupine Lake/Hunter	Whitney	1937-40,44	10,821	1,369	0.13
Porcupine Peninsular	Cody	1924-27,-40,-47	99,688	27,354	0.27
Preston	Tisdale	1938-1968	6,284,405	1,539,355	0.24
Preston N Y	Tisdale	1933	2,800	153	0.05
Preston/Porcupine Pet	Deloro	1914-1915		314	
Preston/Porphyry Hill	Deloro	1913-1915	46	312	6.78
Reef Mine	Whitney	1915-1965	2,144,507	498,932	0.23
St. Andrew Goldfields	Stock	1989-	568,944	91,680	0.16
Tionaga/Smith-Thorne	Horwood	1938-1939	6,653	2,299	0.35
Tisdale Ankerite	Tisdale	1952	14,655	2,236	0.15
Tommy Burns/Arcadia	Shaw	1917	21	14	0.28
Vipond	Tisdale	1911-1941	1,565,218	414,367	0.26

N.B.
ERG Resources Inc. produced 18,260 oz. Au from treatment of 2,549,189 tons of tailings from March 1988 to June 1989.

TABLE 6. Exploration activity during 1993, Timmins Resident Geologist's District

Abbreviations

DD .....Diamond Drilling
Expl.Act. ....See "Exploration Activity", this chapter
GC .....Geochemical survey
Gl .....Geological survey
GP .....Geophysical surveys
GR .....Gravity survey
HLEM .....Horizontal loop electromagnetic survey
IP .....Induced polarization
lc .....linecutting
Mag .....Ground magnetic survey
PEM .....Pulse electromagnetic survey
Samp .....Sampling
Str .....Stripping
Tr .....Trenching
VLF .....Very low frequency electromagnetic survey

NO.	COMPANY/PROPERTY	TOWNSHIP	ACTIVITY	REMARKS
1	Alcanex Ltd.	Pitt Tp.	GC,Airborne GP	diamond exploration
2	Arsenault, J.P.	Slack Tp.	Rtr,Str	
3	Asarco Exploration	Macklem Tp.	DD-19	gold exploration on the Aquarius property
		Deloro Tp.	DD-4	gold explorarion; Delnor property
		Garnet Tp.	DD-3	gold exploration
		Nova Tp.	DD-1	base metal exploration
4	BHP Minerals	Carscallen Tp.	DDH-1,GC	base metal exploration
5	Bonhomme, L. & Associates	Mountjoy,Godfrey,Jameison & Jessop tps.	DD-3-2550',GP,GC	Four Corners Property; base metal exploration
		Reid Tp.	GC	whole rock analyses of core samples & compilation
6	Cameco Corporation	Huffman Tp.	GC	gold exploration
		Greenlaw Tp.	GP,GC	gold exploration
7	Caron, D.	Mountjoy Tp.	Mag,HLEM	
8	Comstate Resources	Mountjoy Tp.	Gl,Samp,GC	gold exploration
		Reid Tp.	Mag,HLEM,IP,PEM,GR	gold & base metal expln.
9	Cree Lake Resources	Raney Tp.	Gl,GC	
10	Cross Lake Minerals	Timmins,Bond,Sheraton tps.	Mag,DD-4	base metal exploration
11	Croxall, J.	Thorneloe Tp.	DD-1-155m	drilled to test IP anomaly
12	Denross Property	Horwood Tp.	Samp,Assays	see Property Visit section
13	de Quardros, M.	Ivanhoe Tp.	DD-1-199.3m	see Property Visit section
14	Falconbridge Ltd.	Genoa, Marion tps.	Mag,HLEM,VLF	3 anomalies located
		Hutt, Semple tps.	Mag,HLEM	
		Kidd Tp.	DD-8-5600m	base metal exploration
		Robb Tp.	DD-28-1300m	Kamiskotia Area; base metal exploration

TABLE 6 con't. Exploration activity during 1993, Timmins Resident Geologist's District

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16	Granges Exploration	Tooms Tp.	DD-2-276m	base metal exploration
17	Gauthier, Al	Hillary, Reeves tps.	Prospecting,Samp	
18	Grant, J & Collin, Y	Deloro Tp.	Str,Samp,Gl,GP	gold & nickel exploration
19	Inco Exploration	Hutt Tp. Agate Tp.	DD-2,lc,GP DD-7	No further work planned No further work planned
20	Kangas, M.	Price Tp.	DD-3-235.7m,Str	gold exploration
21	Kennecott Inc.	Tooms, Greenlaw tps.	DD-8-1564m	follow-up to 1992 nickel expln. program; best intersection 1.6m @ 1.6% Ni
22	KWG Resources	Area 531 841	DD-2-1214'	Expln.Act.
23	Lalonde, D.	Whitesides Tp.	DD-1-129.3m	
24	Lashex Ltd.	Zavitz Tp.	HLEM,Gl,Assays,GC, Mag,VLF	92 program; gold & base metal 93 follow-up program
25	McDonough, K. & B.	Greenlaw, Cunningham tps.	VLF	gold & base metal exploration
26	McKinnon Prospecting	Shuel Tp. to Limestone Rapids Area	approx. 8000' DD,GP	gold exploration; ground GP following-up previous airborne
27	Moneta Porcupine	Godfrey Tp. Jamieson Tp. Deloro Tp.	DD-3-918m,Mag,VLF DD-1-212.7m DD-600'	 base metals
28	Mortimer, F.R.	Swayze Tp.	lc,Mag,VLF, DD-1-402',Str	gold exploration
29	Noranda Exploration	Cunningham, Garnet, Blamey tps. Denton Tp. Denyes Tp. Foleyet Tp. Kenogaming, Sewell tps. Penhorwood Tp.	Mag,HLEM DD-4-1490m DD-3-670m DD-6-1825m DD-3-851.3m,Mag DD-2-570.6m,Mag	several major conductive zones outlined gold expln.; GoWest option gold expln.; Patrie option gold exploration gold expln.; Glen Auden option gold expln.; Glen Auden option
30	Norman, Ryburn	Reaume Tp.	Prospecting,Mag,VLF,IP	
31	Patrie Property	Denyes Tp. Halcrow Tp.	IP GC	

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NO.	COMPANY/PROPERTY	TOWNSHIP	ACTIVITY	REMARKS
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		Tisdale Tp.	DD-28-2878m	adjacent to Dome No.8 shaft (not plotted as expln.)
		Tisdale Tp.	DD-9	on Paymaster Property; (not plotted as expln.)
33	Pyke, D.R.	Tisdale, Mountjoy tps.	Mag,HLEM,VLF	work done late 1992
34	Rousseau, R.	Robb, Turnbull tps.	lc,Mag	gold & base metal expln.
35	Royal Oak Mines Inc.	Cody Tp.	DD-13-2369'	gold exploration
		Whitney Tp.	DD-37-16,306'	Hallnor Property
		Whitney Tp.	DD-32-5760'	west of Pamour #1 shaft
36	Salo, J.	Dundonald Tp.	DD-1-720'	gold & base metal expln.
37	Stewart-Mussely Property	Parnell Tp.	Tr	gold exploration
38	Timginn Syndicate	Tisdale Tp.	DD-4-2630m	Expln.Act.
39	Tri Origin Ltd.	English Tp.	Gl Compilation	field work planned for 1994
—	Westminer Canada Ltd.	Timmins Area	Land acquisition	gold & base metal exploration
40	Phelps Dodge Corporation of Canada	Cunningham Tp.	DD-1300m	base metal expln.; Shunsby property

TABLE 6. Exploration activity during 1993, Timmins Resident Geologist's District

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Table 7.

Ontario Geological Survey - Field Projects, 1993

A detailed description of work done by the Ontario Geological Survey in the Timmins Resident Geologist District is provided in Summary of Field Work and Other Activities 1993 (Ontario Geological Survey, Miscellaneous Paper 162)

1993 Ontario Geological Survey 1993 Field Projects, Timmins Resident Geologist District:
Geology of Dundonald and German Townships, T.L. Muir

Geology of Matheson and Evelyn Townships, B.R. Berger

Geology of the Northeastern Swayze Greenstone Belt, J.A. Ayer

Gold Mineralization in the Stock and Taylor Townships Area of the Abitibi Greenstone Belt, G.M. Siragusa

Sediment-Hosted Sulphide Mineralization in Metasedimentary Subprovinces, J.R. Parker

Kimberlites of Ontario, R.P. Sage

Geology of Nova and Strachan Townships, Southern Montcalm Greenstone Belt, A.D. MacTavish

Swayze Greenstone Belt, Mineral Deposit Study, S.L. Fumerton

Quaternary Mapping and Drift Sampling Program, Western Swayze Belt, M.A. Bernier

Evaluation of Aggregate Potential of Mine Development Rock in the Timmins Area, C.A. Kaszycki

Table 8.
Summary of programs funded through NODA during 1993 in the Timmins Resident Geologist's District.

MINING AND MINERALS TECHNOLOGY PROGRAM
Collection, Cataloguing and Analysis of Ontario Inactive Mine Data
Evaluation of Thickened Tailings Discharge Disposal System at Kidd Creek

GEOSCIENCE PROGRAM
Quaternary Evaluation of the Swayze Greenstone Belt
Mineral Deposits Study - Western Abitibi
Precambrian Mapping of the Northwest Timmins Area
Quaternary Data Compilation - Timmins
Mineral Deposits Study - Kidd Creek
Bedrock Geology, Western Abitibi Belt
Ore Deposit Signatures by Borehole Geophysics

INDUSTRIAL MINERALS & ECONOMIC DEVELOPMENT PROGRAM
Site Evaluation and Market Testing of Ontario Anorthosite Deposits

Table 9. Known Mineral Deposits Not Being Mined in the Timmins Resident Geologist District

NB: All of the deposits listed here were subject to development at some time during 1980-1991

Project/Property Name Location Company	Commodity	Reserves	Status/Notes
Aquarius Property Macklem Township Asarco	Au	1982- 280,000 T @ 0.22 oz/T 1983- mill installed 1984- test mined 32,000 T @ 0.225 oz/T 1988-89 production 1990- inferred reserves 18 Mtons @ 0.08 oz/T	Awaiting feasibility study Active 1981,-82,-83,-85,-87,-9(Production 1984,1988-89
Augdome Tisdale Township Augdome Corporation	Au	140,000 tons @ 0.10 oz/ton Au	Accessed from Dome Mine underground workings Inactive
Broulan Whitney Township Royal Oak Mines Ltd.	Au	336,000 tons @ 0.043 oz/ton	1988 UG development Inactive
Canadian Magnesite Deloro Township Magnesium Refractories	Magnesite	25,000 tons blasted, 1500 tons test milled	Inactive
Cargill Deposit Cargill Township Sherritt Gordon	Phosphate, Vermiculite	Approx 60 Mtons @ 20% P_2O_5: high grade zone 7 Mtons 32% P_2O_5	significant reserves of vermiculite Inactive
Carshaw Shaw Township Marshall Minerals	Au	1982- 167,000 @ 0.209 oz Au/ton 1984- 120,000 ton stockpile	1988 - underground development Inactive
Clavos Clergue Township Canada Tungsten	Au	1986- 470 000 tonnes @ 7.2 g/t Au 1987- 580,000 tonnes @ 7.6 g/t Au 1988- 650,000 tons @ .22 oz Au/ton or 1.16 Mtons @ 0.15 oz Au/ton	Inactive since end of 1987 1985 - new discovery made 305m west of Clavos Gold Zone Inactive
Consolidated Shunsby Cunningham Township MW Resources Ltd.	Base Metals	1990- Main Zone possible 681,000 tonnes, 0.27% Cu, 1.50% Zn North Zone unclassified 45,350 tonnes, 3.20% Cu, 3.10% Zn, 0.68g/t Au Lower Chert possible 464,460 tonnes, 1.14% Cu, 1.56% Zn Upper Chert possible 201,449 tonnes, 0.81% Cu, 1.94% Zn LCUC possible 447,526 tonnes 1.10% Cu, 1.49% Zn	Inactive
Davidson Tisdale Tisdale Township Davidson Tisdale Mines	Au	1987 - 53,000 tons @ 0.23 oz/ton Au	1987 44,000 tons custom milled Inactive
Desantis Mine Ogden Township L. Bonhomme	Au	Significant but unpublished	Limited previous production; 1980's- UG development Inactive
Extender Minerals Penhorwood Township Extender Minerals	Barite	1986 - 100,000 tons	Underground development & limited production Inactive

Table 9 con't. Known Mineral Deposits Not Being Mined in the Timmins Resident Geologist District

Project/Property Name Location Company	Commodity	Reserves	Status/Notes
Holmer Deposit Bristol Township Holmer Gold Mines	Au	720,000 tons @ 0.12 oz/ton Au	Inactive
Intex/ Frankfield Tully Township	Au	1980- 300,000 to 400,000 tons @ 0.24 oz/ton Au	Inactive
Jerome Mine Osway Township E.B. Eddy Forest Products Ltd.	Au	1987- 750,000 tons @ 0.19 oz/ton 1989- 524,000 tonnes @ 6.85 g/tonne above 244m level	Underground development Past producer Inactive
Kenilworth Deloro Township Victoria Porcupine Mines Ltd	Au	1962 - 1 Mt @ 0.129 oz Au/ton	Past producer Inactive
Kenty Swayze Township Emerald Isle Resources Ltd.	Au	1987 - 43,300 tonnes @ 4.70 g/t Au 1947 - 335,600 tonnes @ 1.30 g/t Au	Some production 1965 Inactive
Kidd # 3 Zone Chester Township Kidd Resources	Au	1987 - 450,000 tons 0.29 oz/ton Au	Inactive
Kipling Kipling Township Great Lakes Kaolin	Kaolin, silica sand, ball clay	Unpublished - defined by approx 9,000m drilling	Company owns test plant in Parry Sound; bulk sample in 1992
Lucas Abitibi Price Lucas Township Abitibi Price	Au	1982- 235,000 tons @ 0.10 oz Au/ton	Inactive
Martison Lake South of Ridge Lake Area Sherritt Gordon	Phosphate	140,000,000 tons @ 20% P_2O_5	Inactive
Murgold Chester Township The Van Diemens Company Ltd	Au	1989- 460,000 tonnes @ 8.1 g/tonne above 150 m	Underground development 1981, 1988- $4.2 million spent Inactive
Nickel Offsets Tully Township Canhorn Mining Ltd.	Au	1987 - 650,000 tons @ 0.23 oz/ton	Inactive
Onakawana Lignite Dyer Township Onakawana Development Ltd.	Lignite	Total proven reserves - 172 million tonnes	Inactive

Table 9 con't. Known Mineral Deposits Not Being Mined in the Timmins Resident Geologist District

Project/Property Name Location Company	Commodity	Reserves	Status/Notes
Orofino Mine Silk & Horwood Townships Claude Rundle Gold Mines	Au	1984- 1.6 Mtons @ 0.14 oz/ton 1987- 242,000 tons @ 0.24 oz/ton	Underground development Inactive
Porcupine Peninsular Macklem Township Royal Oak Mines Ltd.	Au	600,000 tons @ 0.17 oz Au / ton	Previous UG development Inactive
Roseval Silica Penhorwood Township Gaetan Lavallee	Silica	1990- 110,000 tonnes 98% Si (Roseval #1 Pit) 120,000 tonnes 98% Si (Roseval #2 Pit) 260,520 tonnes 98% Si (Roseval #3 Pit)	Past producer Si for silicon metal Inactive
Rundle Mine Newton Township Claude Rundle Gold Mines	Au	1986- 172,000 tons @ 0.258 oz Au/ton 1988- 266,410 tonnes @ 7.35 g/t above 195m; 268,419t @ 5.72 g/t below 195m 1990- 8 zones 624,850 tonnes @ 8.19 g/t Au	Previous UG development Inactive
Vedron Belmoral Tisdale Township Vedron Ltd.	Au	1 Mtons @ 0.258 oz Au/ton, 1988- 340,000 tons @ 0.164 oz Au/ton 1989- above 650 ft level 360,000 tons @ 0.17 oz Au/ton	Underground development Inactive

Table 10

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Quaternary Mapping and Drift Sampling Program, Western Swayze Belt, M.A. Bernier

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Figure 1a

TIMMINS RESIDENT GEOLOGIST'S DISTRICT
(northwest portion)

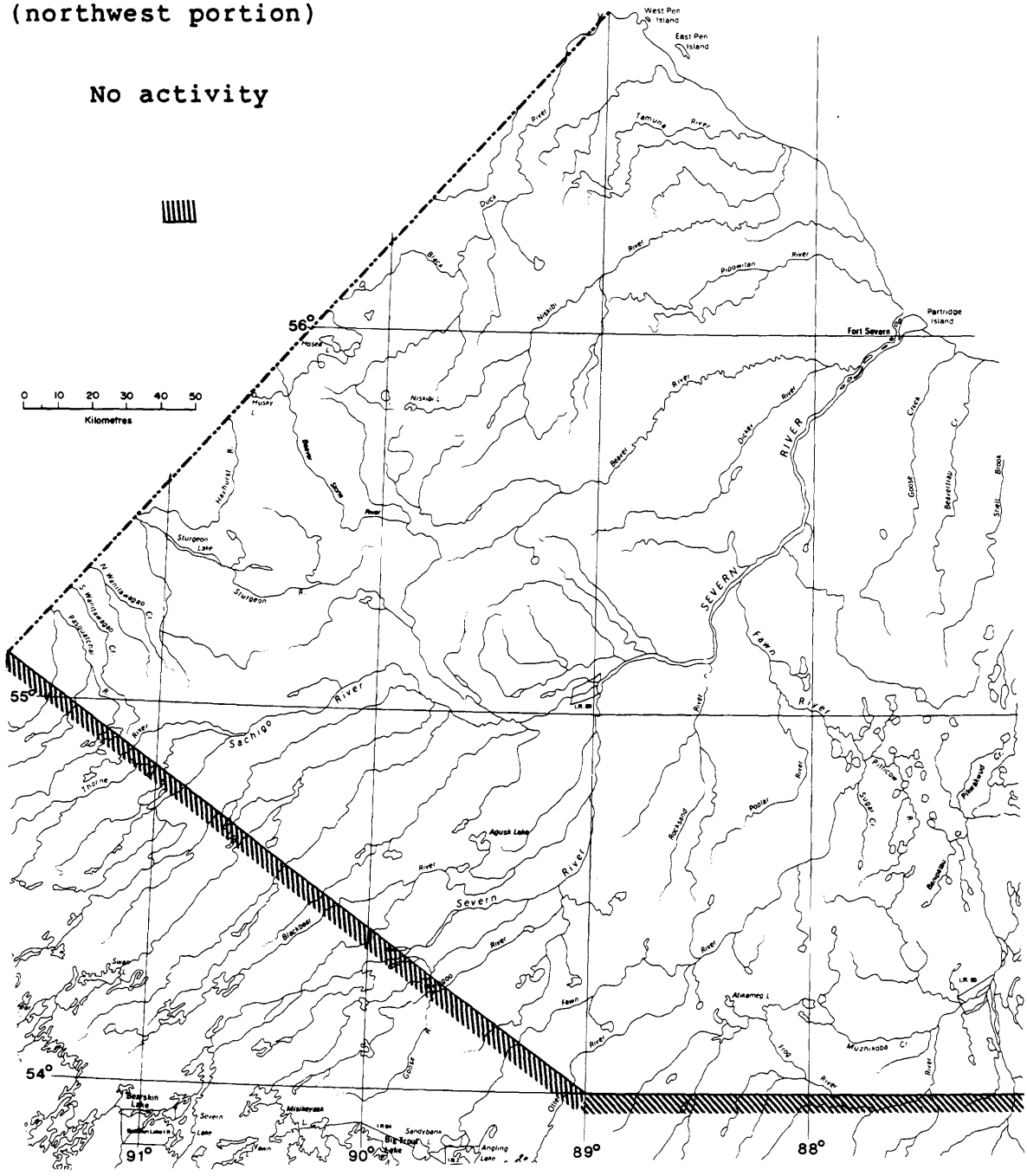
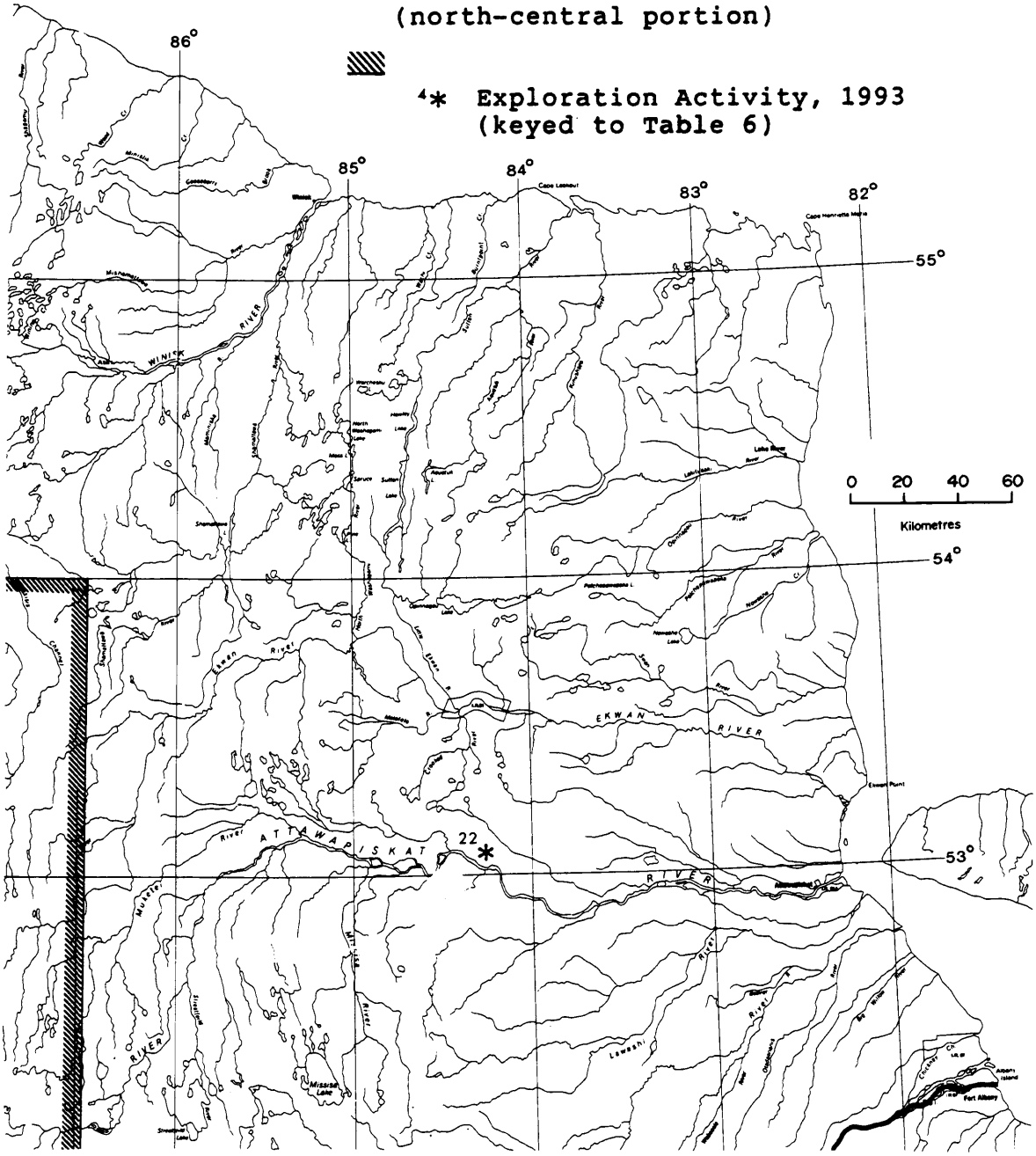


FIGURE 1b

TIMMINS RESIDENT GEOLOGIST'S DISTRICT
(north-central portion)



4* Exploration Activity, 1993
(keyed to Table 6)

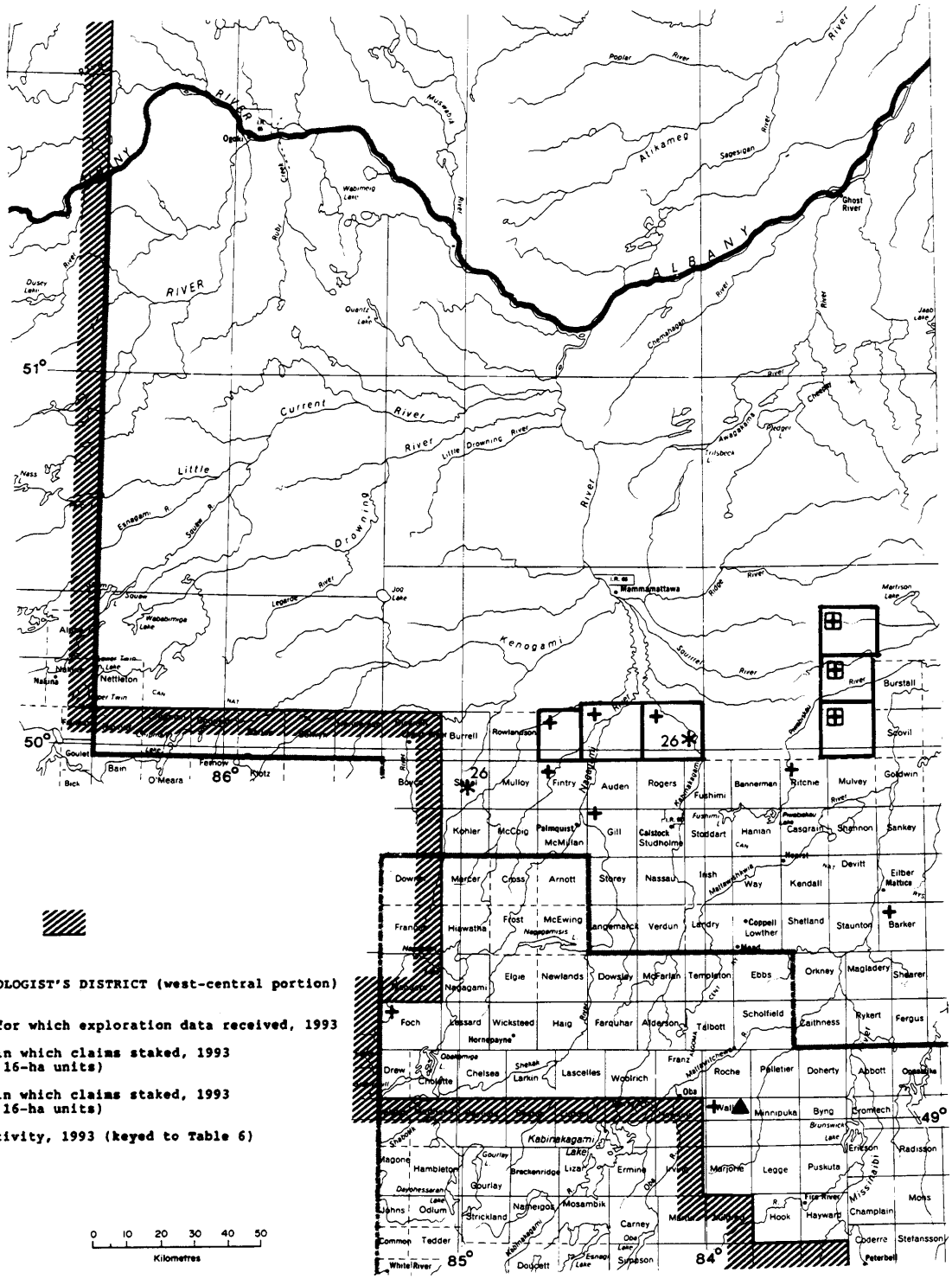


Figure 1c

TIMMINS RESIDENT GEOLOGIST'S DISTRICT (west-central portion)

- ▲ **Township/Area for which exploration data received, 1993**
- ✦ **Township/Area in which claims staked, 1993 (less than 100 16-ha units)**
- ▩ **Township/Area in which claims staked, 1993 (more than 100 16-ha units)**
- ✱ **Exploration Activity, 1993 (keyed to Table 6)**

Figure 1d

TIMMINS RESIDENT GEOLOGIST'S DISTRICT
(east-central portion)

▲ Township/Area for which exploration data received, 1993

\+ Township/Area in which claims staked, 1993 (less than 100 16-ha units)

⊞ Township/Area in which claims staked, 1993 (more than 100 16-ha units)

4* Exploration activity, 1993 (keyed to Table 6)

4● Producing Mine, 1993 (keyed to Legend for Figure 2)

⊛ Township where 1993 OPAP funded project in progress

⊕ Township where 1993 OMIP funded project in progress

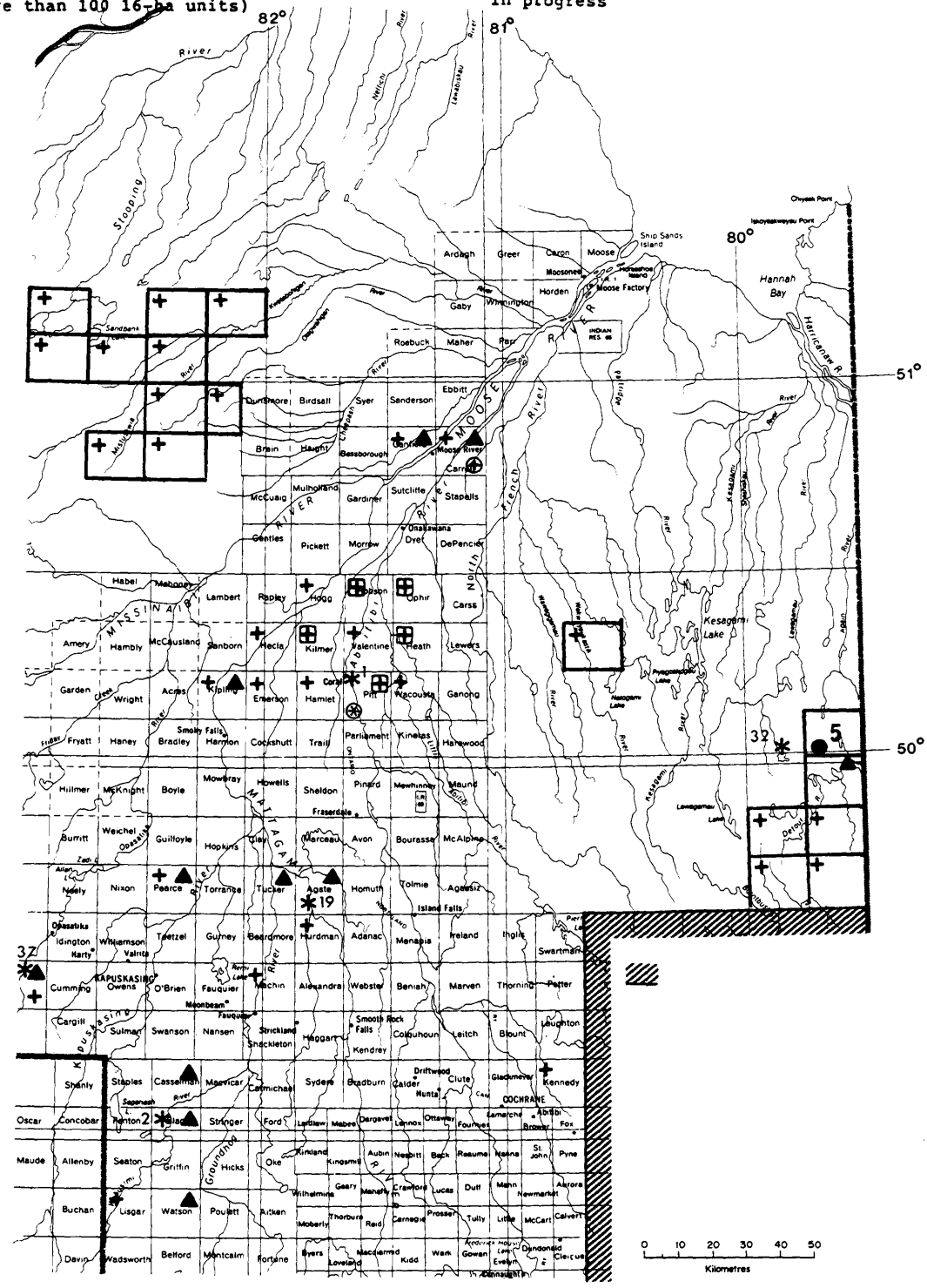


FIGURE 1e

TIMMINS RESIDENT GEOLOGIST'S DISTRICT
(south portion)

▲ Township/Area for which exploration data received, 1993

+ Township/Area in which claims staked, 1993
(less than 100 16-ha units)

⊞ Township/Area in which claims staked, 1993
(more than 100 16-ha units)

[4]* Exploration activity, 1993 (keyed to Table 6)

⊛ Township where 1993 OPAP funded project in progress

⊕ Township where 1993 OMIP funded project in progress

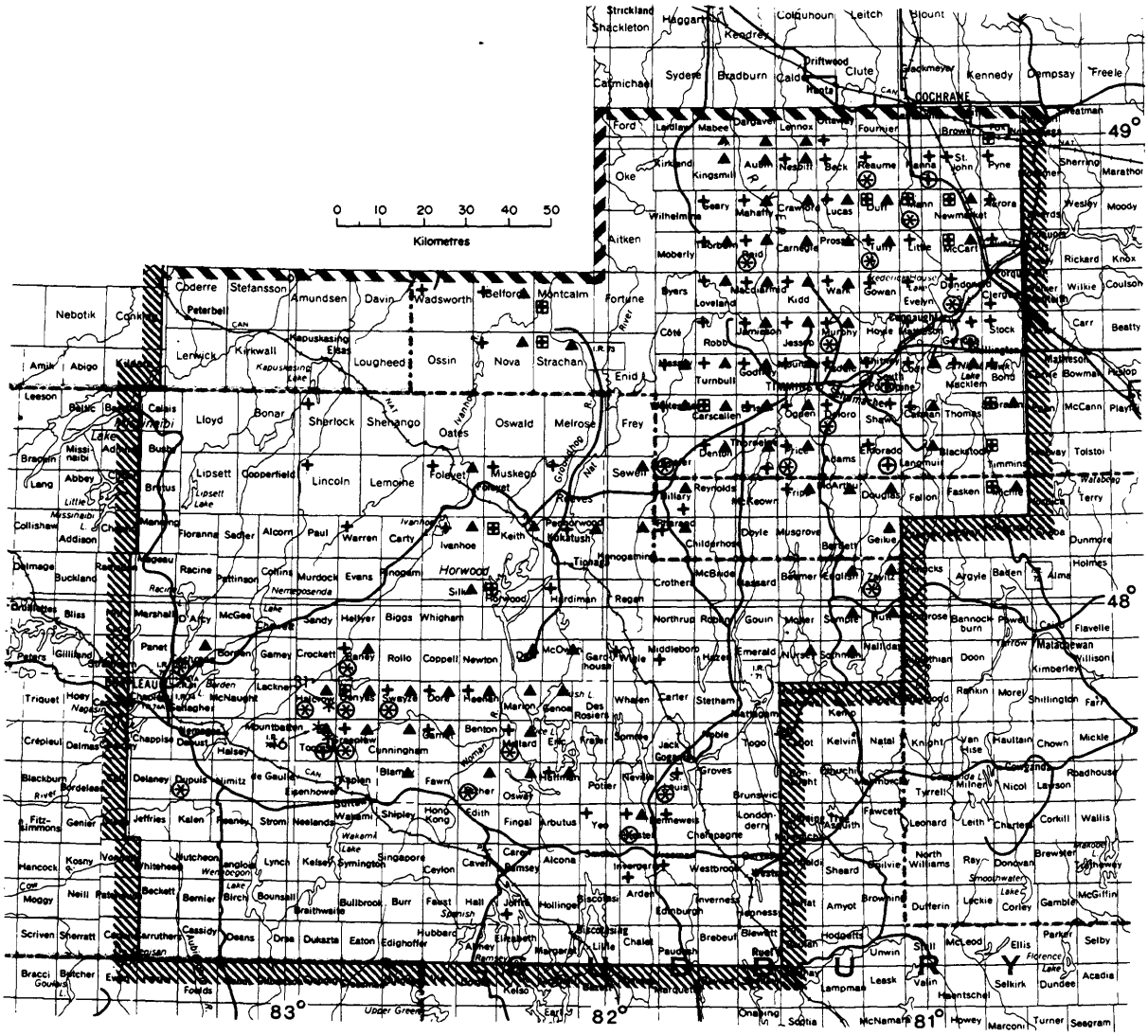


FIGURE 2: LEGEND

TIMMINS RESIDENT GEOLOGIST'S DISTRICT
Mining and Exploration Activity

4* Exploration activity, 1993 (keyed to Table 6)

4● Producing Mine, 1993
1. Falconbridge Gold Corp.*, Hoyle Pond Mine .....Au
2. Falconbridge Gold Corp.*, Bell Creek Mine .....Au
3. Falconbridge Limited,
Kidd Creek Mine .....Cu,Zn,Ag,Pb,Cd,Sn,In
4. Luzenac Incorporated, Penhorwood Mine .....talc
5. Placer Dome Inc., Detour Lake Mine .....Au
6. Placer Dome Inc., Dome Mine .....Au,Ag
7. Royal Oak Mines Inc., Timmins Operations .....Au
8. St. Andrew Goldfields Ltd. .....Au

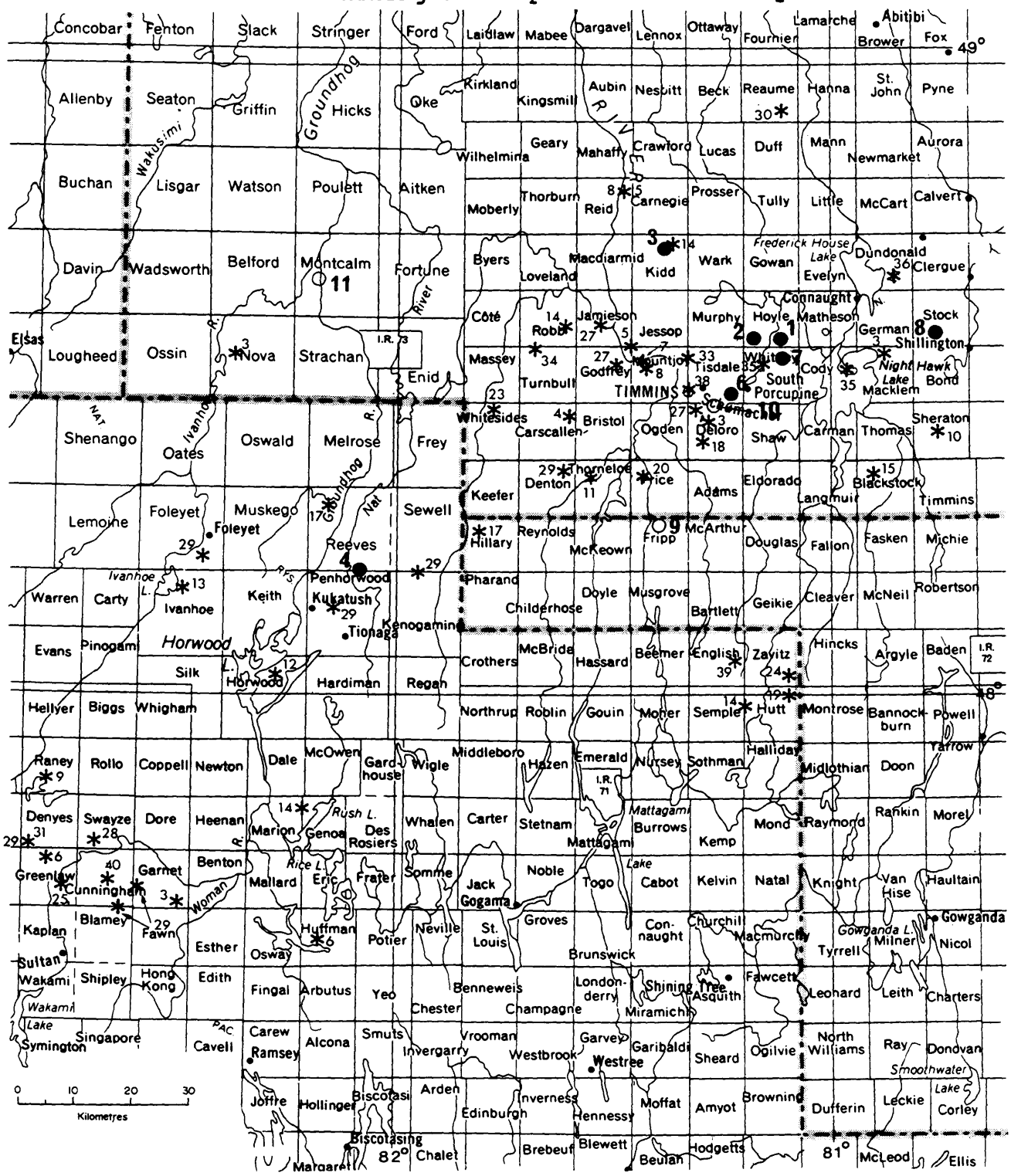
9○ Advanced Exploration and Development Project, 1993
9. Great White Minerals Limited .....Si
10. Placer Dome Inc., Paymaster Project .....Au
11. Outokumpu Mines Ltd., Montcalm Deposit .....Ni

* now Kinross Gold Corporation

FIGURE 2

TIMMINS RESIDENT GEOLOGIST'S DISTRICT

Mining and Exploration Activity



COBALT RESIDENT GEOLOGIST'S DISTRICT - 1993

J.C.IRELAND[1] and R.V.ZALNIERIUNAS[2]

[1] Resident Geologist, Cobalt, Precambrian Geoscience Section, Ontario Geological Survey

[2] Contract Geologist, Cobalt, Precambrian Geoscience Section, Ontario Geological Survey

INTRODUCTION

The Cobalt Resident Geologist District was extended southeast to Deep River, Ontario, as a result of the closing of the Dorset Resident Geologist office in September, 1993.

Negotiations between the Teme-Augama Anishnabai (TAA) and the Province of Ontario appeared to be heading for a successful conclusion, culminating in a ratification vote by the TAA on a framework agreement in November. Unfortunately, the Agreement in Principal was narrowly rejected by a majority of Status residents. The Province left the agreement on the table for the TAA to reconsider and moved to proceed with removal of the Land Caution through the courts.

Exploration activities continued to increase, focusing on gold, base metals, industrial minerals, building stone, diamonds and silver-cobalt. A record 67 companies and individuals worked on 81 projects in 1993. The Shining Tree area was the most active with 33 projects, followed by Cobalt with 18, Temagami with 13, the Engelhart area with 12 and the North Bay area with 5 projects. All of the reported projects were "Grass Roots" level investigations. There were 1131 claim units recorded and 748 claim units cancelled in 1993. Thirteen companies or individuals completed 50 diamond drill or reverse-circulation drill holes for a total of 13,104.2 metres.

Ontario Prospectors Assistance Program (OPAP) grants again contributed significantly to 1993 exploration activity levels. In the Cobalt Resident Geologist District, 25 successful applicants received grants valued at $242,996.

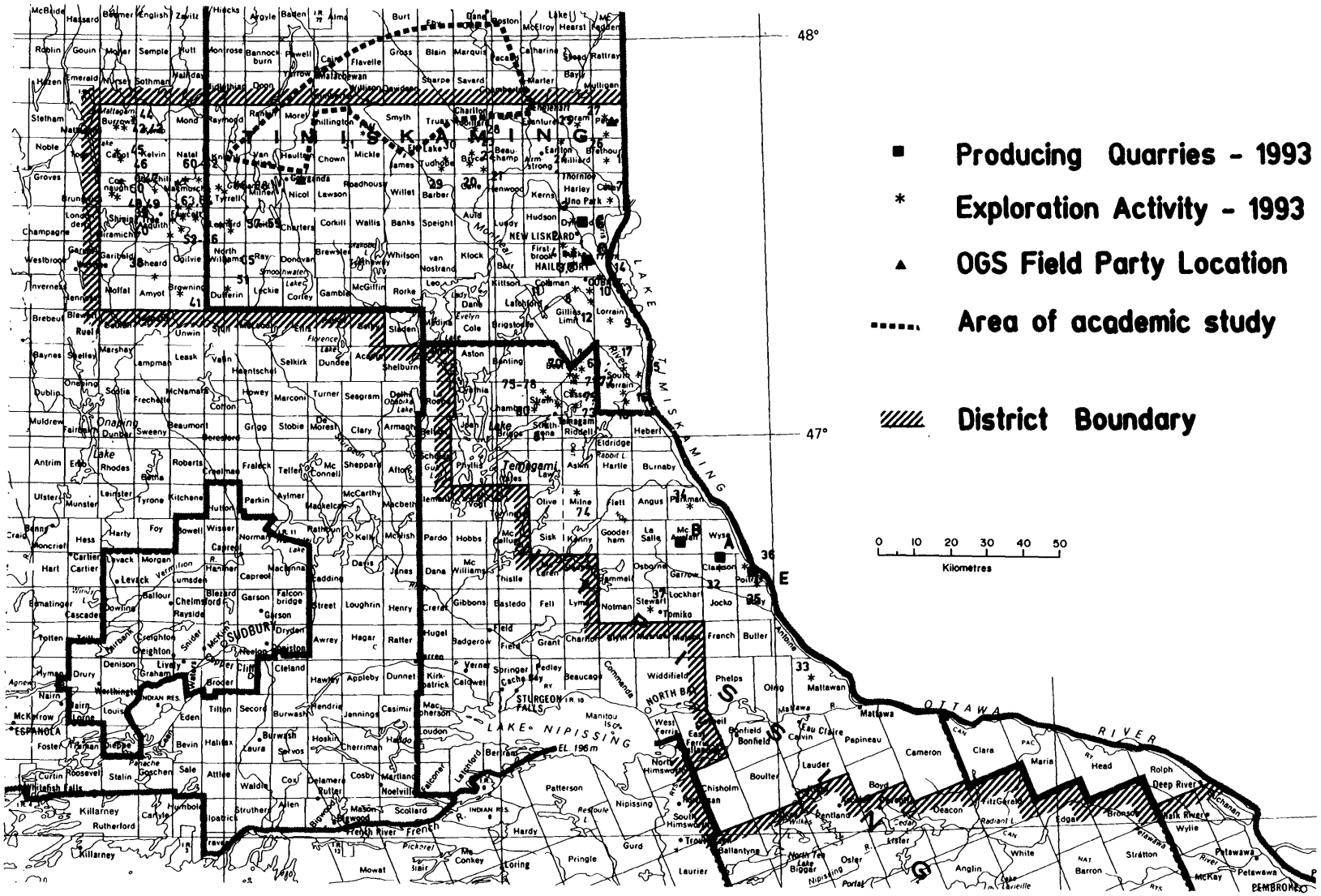


Figure CO-1 Cobalt Resident Geologist's District

TABLE CO-1 Claims Staked in the Cobalt Resident Geologist's District - 1993

DATE	CLAIMS STAKED	UNITS STAKED	TOWNSHIP 1	TOWNSHIP 2	CLAIM NUMBERS	CLAIM STAKER	TRANSFERRED TO
DEC/92	2	32	AMYOT		1176745-46	SALO, L.	STRIKE MINERALS
DEC/92	1	16	AMYOT	SHEARD	1176754	SALO, L.	
DEC/92	1	16	AMYOT		1176744	SALO, R.	STRIKE MINERALS
DEC/92	1	16	AMYOT		1176755	SALO, R.	
DEC/92	1	16	AMYOT		1182491	SALO, R.	STRIKE MINERALS
SEPT/93	1	1	ANTOINE		1197404	SMITH, G.	
OCT/93	5	5	ANTOINE		1197478 et al	SMITH, G.	
OCT/93	2	11	ASQUITH		1200713	HARKIN, G.	MULLAN & OBRADOVICH
OCT/93	1	1	ASQUITH		1186938	MCBRIDE, J.	
MAY/93	1	2	ASQUITH		1200317	ROBERGE, D.	PREMIER EXPLORATION
OCT/93	1	2	BEST		1165372	SAVILLE, T.	
AUG/93	2	2	BOULTER		1084606-07	PERRON, P.	
DEC/92	1	16	BROWNING		1176756	SALO, L.	
DEC/92	1	16	BROWNING		1176758	SALO, L.	
DEC/92	1	16	BROWNING		1176759	SALO, L.	
DEC/92	1	16	BROWNING	OGILVIE	1176761	SALO, L.	
DEC/92	1	16	BROWNING		1182490	SALO, L.	
JAN/93	1	16	BROWNING	UNWIN	1176752	SALO, R.	SALO, L.
JAN/93	1	15	BROWNING		1176765	SALO, R.	SALO, L.
SEPT/93	1	1	BRYCE		1118587	EWANCHUCK, J.	
SEPT/93	1	2	BRYCE		1118591	EWANCHUCK, J.	
APR/93	1	4	BRYCE		1179388	GEREGHTY, G.	
APR/93	2	6	BRYCE		1187236-37	HARKIN, G.	MORRIS, J.
MAR/93	2	20	BRYCE		1193408	KORBA, E.J.	DUNN, G.C.
JAN/93	4	12	BUCKE		1118549	EWANCHUCK, J.	BETHLEHAM RES./EWANC
JAN/93	1	2	BUCKE		1197203	EWANCHUCK, J.	BETHLEHAM RES./EWANC
DEC/92	1	4	BUCKE		1186964	ROBERGE, D.	MULLAN, G.
SEPT/93	1	1	BURROWS		1191189	BAIRD, D.	TITTLEY, H.Z.
NOV/93	6	19	BURROWS		1201288	LARCHE, D.	TITTLEY, H.Z.
NOV/93	1	2	BURROWS		1201294	LARCHE, D.	TITTLEY, H.Z.
JUL/93	1	3	BURROWS		1190127	LEGAULT, J.	TITTLEY, H.Z.
FEB/93	1	4	BURROWS		1193362	RENAUDAT, F.	FALCONBRIDGE LTD.
FEB/93	2	6	BURROWS		1193363-64	RENAUDAT, F.	FALCONBRIDGE LTD.
JUL/93	1	4	BURROWS		1193228	ROBERT, J.	TITTLEY, H.Z.
NOV/93	3	9	BURROWS	KEMP	1191098	SALO, L.	TITTLEY, H.Z.
NOV/93	1	2	BURROWS		1191195	SALO, L.	TITTLEY, H.Z.
SEPT/93	1	2	BURROWS		1191188	TITTLEY, H.Z.	
JUN/93	2	2	CASEY		118575-76	EWANCHUCK, J.	AGNICO EAGLE ML
MAY/93	6	15	CASEY		1200173	STEWART, B.	
APR/93	2	10	CASSELS		1165451-52	GORDON, D. & CLEMENT, J.	
JUL/93	2	2	CASSELS		1118463-64	LARONDE, D.D.	
OCT/93	1	2	CHURCHILL		1200685	FORBES, J.	
NOV/93	4	25	CHURCHILL	ASQUITH	1185355	HARINGTON, P.M.	OBRADOVICH, T.
DEC/92	1	6	CHURCHILL		1186962	HARINGTON, P.M.	PREMIER EXPLORATION
MAY/93	1	3	CHURCHILL		1200318	HARINGTON, P.M.	PREMIER EXPLORATION
AUG/93	1	1	CHURCHILL		1200452	HARINGTON, P.M.	PREMIER EXPLORATION
AUG/93	5	11	CHURCHILL		1200453-57	HARINGTON, P.M.	PREMIER EXPLORATION
OCT/93	1	1	CHURCHILL		1200742	HARKIN, G.	MULLAN, G.
NOV/93	1	4	CHURCHILL		1118306	MIRON, T.	
DEC/92	1	16	CHURCHILL		1186961	ROBERGE, D.	PREMIER EXPLORATION
MAY/93	1	3	CHURCHILL		1200316	ROBERGE, D.	PREMIER EXPLORATION
OCT/93	3	7	CHURCHILL		1191311	SALO, L.	PREMAC EXPLORATION
MAR/93	1	6	CLARKSON	POITRAS	1179202	PHARAND, C.L.	
MAR/93	1	1	COLEMAN		1118578	MCBRIDE, G.	FALCONBRIDGE LTD.
JUN/93	2	3	COLEMAN		1118614-15	MCBRIDE, G.	FALCONBRIDGE LTD.
FEB/93	2	2	COLEMAN		1187101-102	MCBRIDE, G.	FALCONBRIDGE LTD.
MAR/93	1	1	COLEMAN		1118577	MCBRIDE, L.	FALCONBRIDGE LTD.
MAR/93	1	1	COLEMAN		1118579	MCBRIDE, L.	FALCONBRIDGE LTD.

TABLE CO-1 (continued)

DATE	CLAIMS STAKED	UNITS STAKED	TOWNSHIP 1	TOWNSHIP 2	CLAIM NUMBERS	CLAIM STAKER	TRANSFERRED TO
MAR/93	1	1	COLEMAN		1118580	MCBRIDE, L.	FALCONBRIDGE LTD.
APR/93	1	2	CONNAUGHT		1193466	BRETON, C.	NORANDA EXPLORATION
NOV/93	1	6	CONNAUGHT		1200369	RENAUD, V.	MULLAN, G.
NOV/93	1	8	CONNAUGHT		1200371	RENAUD, V.	MULLAN, G.
NOV/93	1	4	DACK		1200731	O'HARA, S.	
APR/93	1	6	FARR		1186066	PINKERTON, G.	
MAR/93	1	4	FARR		1186067	PINKERTON, G.	
MAR/93	1	6	FARR		1186069	PINKERTON, G.	
APR/93	1	6	FARR		1186070	PINKERTON, G.	
JAN/93	1	1	FAWCETT		1180364	ANNETT, R.	
JAN/93	1	1	FAWCETT		1189832	JONES, D.V.	MULLAN, G.
NOV/93	3	9	FAWCETT		1200732	SALO, L.	PREMIER EXPLORATION
MAR/93	1	1	FIRSTBROOK		1118581	MCBRIDE, L.	FALCONBRIDGE LTD.
DEC/92	1	16	HARRIS		1186959	ROBERGE, D.	MULLAN, G.
APR/93	1	2	HILLIARD		1200172	KOSY, G.	
APR/93	1	1	INGRAM		1200170	KOSY, G.	
DEC/92	2	20	LEONARD		1187019-20	GRYBA, P.	PILGER, G.
JUN/93	2	2	LEONARD		1186432	LACARTE, A.	
JUL/93	1	1	LEONARD		1186434	LACARTE, A.	
JUN/93	2	4	LEONARD		1200208-209	MACCALLUM, R.	
MAY/93	1	15	LEONARD		1200296	RENAUDAT, F.	KNIES, E.
MAY/93	1	2	LEONARD		1200297	RENAUDAT, F.	LACARTE, A.
JUN/93	1	2	LORRAIN		1118628	BEECHAM, A.W.	683648 ONT. LTD.
APR/93	3	6	LORRAIN		1179632-34	GORE, J.A.	CHITARONI, G.
JUL/93	3	39	LORRAIN	S LORRAIN	1118652-54	HALLE, L.	MARIADASSOU, J.
JUL/93	3	33	LORRAIN		1118640-42	LASHBROOK, R.	MARIADASSOU, J.
JUL/93	3	34	LORRAIN		1118643-45	LASHBROOK, R.	MARIADASSOU, J.
JUL/93	3	28	LORRAIN		1118646-48	LASHBROOK, R.	MARIADASSOU, J.
JUL/93	3	33	LORRAIN		1118649-51	LASHBROOK, R.	MARIADASSOU, J.
MAR/93	2	2	LORRAIN		1118569	SMIRLE, R.G.	
APR/93	1	9	MACMURCHY		1156471	ATKINSON, F.	
MAR/93	1	4	MACMURCHY	FAWCETT & TYRRELL	1151268	DAVIS, C.	
APR/93	2	16	MACMURCHY		1151269-70	DAVIS, C.	
NOV/93	1	8	MACMURCHY		1200805	KOSY, G.	
NOV/93	1	6	MACMURCHY		1200861	KOSY, G.	
JUN/93	1	1	MACMURCHY		1182658	LONDRY, D.J.	
AUG/93	1	8	MACMURCHY		1193846	LONDRY, D.J.	CYPRUS CANADA
AUG/93	1	1	MACMURCHY		1186937	MCDIARMID, O.	
JUN/93	1	8	MACMURCHY		1190916	MULLEN, D.V.	
JUN/93	2	2	MACMURCHY		1193735-36	MULLEN, D.V.	
JUL/93	1	3	MACMURCHY		1200372	MUTTEN, D.	
JUN/93	3	10	MACMURCHY		1189500	ROBERT, J.	PREMIER EXPLORATION
NOV/93	1	15	MACMURCHY		1200819	SADOGUIS, G.	OBRADOVICH, T.
JUN/93	2	7	MACMURCHY		1200328	SALO, L.	PREMIER EXPLORATION
DEC/92	1	1	MACMURCHY		1194595	TOMAC, J.	
APR/93	1	4	MACMURCHY		1185794	WATTS, H.	
JUN/93	1	1	MACMURCHY		1200322	WHELAN, J.	
SEPT/93	1	2	MACMURCHY		1200323	WHELAN, J.	
SEPT/93	1	1	MATTAWAN		1165570	JEANVEAUX, J-M.	
NOV/93	1	6	MATTAWAN		1197395	KOMARECHKA, R.G.	
JUL/93	1	8	N WILLIAMS		1151758	TINDALE, J.L.	ASQUITH RESOURCES
JUL/93	1	2	N WILLIAMS		1191309	TINDALE, J.L.	
FEB/93	1	16	NOTMAN	LYMAN	1179439	WESTIN, B. & EWANCHUCK, J.	
DEC/92	1	16	OGILVIE	BROWNING	1182492	SALO, L.	STRIKE MINERALS
AUG/93	1	6	PARKMAN		1179525	KOMARECHKA, R.G.	
JUL/93	2	5	PENSE		1200003-4	GERVAIS, P.	SUDBURY CONTACT
FEB/93	2	6	PENSE		1187087	SALO, L.	TYRANEX GOLD MINES
JAN/93	1	2	PENSE		1187088	SALO, L.	TYRANEX GOLD MINES
JAN/93	1	4	PENSE		1187090	SALO, L.	TYRANEX GOLD MINES
MAR/93	2	12	PENSE		1190993-94	ST. LOUIS, H.	TYRANEX GOLD MINES
MAR/93	3	16	PENSE		1190996-98	ST. LOUIS, H.	TYRANEX GOLD MINES
SEPT/93	1	1	POITRAS		1179521	KOMARECHKA, R.G.	
JUL/93	2	6	POITRAS		1179522-23	KOMARECHKA, R.G.	
MAR/93	1	2	POITRAS		1179201	PHARAND, C.L.	

TABLE CO-1 (continued)

DATE	CLAIMS STAKED	UNITS STAKED	TOWNSHIP 1	TOWNSHIP 2	CLAIM NUMBERS	CLAIM STAKER	TRANSFERRED TO
SEPT/93	1	6	S LORRAIN		1118544	GORE, J.A.	
NOV/93	1	1	S LORRAIN		1118545	GORE, J.A.	
SEPT/93	1	2	S LORRAIN		1118620	GORE, J.A.	
DEC/92	2	5	S LORRAIN		1179630-31	GORE, J.A.	
NOV/93	2	4	S LORRAIN		1200714-15	GORE, J.A.	
AUG/93	1	2	S LORRAIN		1118657	HALLE, L.	MARIADASSOU, J.
JUL/93	2	23	S LORRAIN		118655	HALLE, L.	MARIADASSOU, J.
MAR/93	4	4	S LORRAIN		1118571	MOORE, H.A.	
DEC/92	1	16	SHEARD		1182483	SALO, L.	WENGER, E.
DEC/92	1	16	SHEARD		1182486	SALO, L.	WENGER, E.
DEC/92	2	32	SHEARD		1182484-85	SALO, R.	WENGER, E.
APR/93	1	6	SMYTH		1193421	KORBA, E.J.	DUNN, G.C.
JUN/93	2	2	STRATHY		1118439-40	BLAKE, F.	
JUN/93	2	2	STRATHY		1118474-75	BLAKE, F.	
JUN/93	1	16	STRATHY		1118616	FALCONBRIDGE LTD	
JAN/93	1	9	STRATHY		1189041	JONES, D.V.	
DEC/92	1	9	STRATHY		1189041	JONES, D.V.	
NOV/93	1	3	STRATHY		1191016	KING, D.F.	
NOV/93	2	2	STRATHY		1200808-9	KING, D.F.	
AUG/93	1	1	STRATHY		1187103	MCBRIDE, G.	
APR/93	1	1	TUDHOPE		1179097	MCBRIDE, G.	EWANCHUCK, J.
JUN/93	1	1	TYRRELL		1197367	BARRY, R.	
SEPT/93	1	2	TYRRELL		1200669	KOSY, G.	
Total =	223	1131		39			

TABLE CO-2 Claims Cancelled in the Cobalt Resident Geologist's District - 1993

DATE	CLAIMS CANC'D	UNITS CANC'D	TOWNSHIP 1	TOWNSHIP 2	CLAIM NUMBERS	CLAIM HOLDER
OCT/93	1	1	ASQUITH		873104	SULLIVAN, WM.
MAY/93	7	7	ASQUITH	CHURCHILL	1180424...	ONITAP/PREMIER
NOV/93	4	4	ASQUITH	CHURCHILL	1185352	POLLOCK, J.
OCT/93	7	7	ASQUITH	CHURCHILL	875015 et al	PREMAC EXPLORATION
MAY/93	226	226	ASQUITH	KERNS	1167807...	many
MAY/93	3	3	BURROWS		1156289-91	ASARCO EXPLORATION
OCT/93	1	2	CHURCHILL		1185586	FORBES, J.
NOV/93	1	1	CHURCHILL		1152718	MCBRIDE, G.
OCT/93	3	3	CHURCHILL		1151831	PREMAC EXPLORATION
SEPT/93	64	64	CHURCHILL	TEEFY	1048020 et al	many
NOV/93	37	37	FAWCETT		1092141 et al	O'DONNELL, J.
AUG/93	1	1	FIRSTBROOK		1179109	BENNER, R.
JUL/93	1	1	GILLIES LIMIT		1179076	FALCONBRIDGE LTD
MAY/93	2	2	LORRAIN		1179074-75	MILROY, J.A.
OCT/93	1	1	MACMURCHY		1132197	COSTA, F. & LABRE, M.
JUL/93	9	26	MACMURCHY		496691..	NEW SABINA RESOURCES
MAY/93	10	10	MACMURCHY		505127/496694	NEW SABINA RESOURCES
NOV/93	3	3	MARIA		608303-04-05	CONS. NORTH COAST INDS. LTD.
MAY/93	1	1	TYRRELL		496443	BARRY, A.
NOV/93	348	348	many		many	many
Total =	730	748	+10 townships			

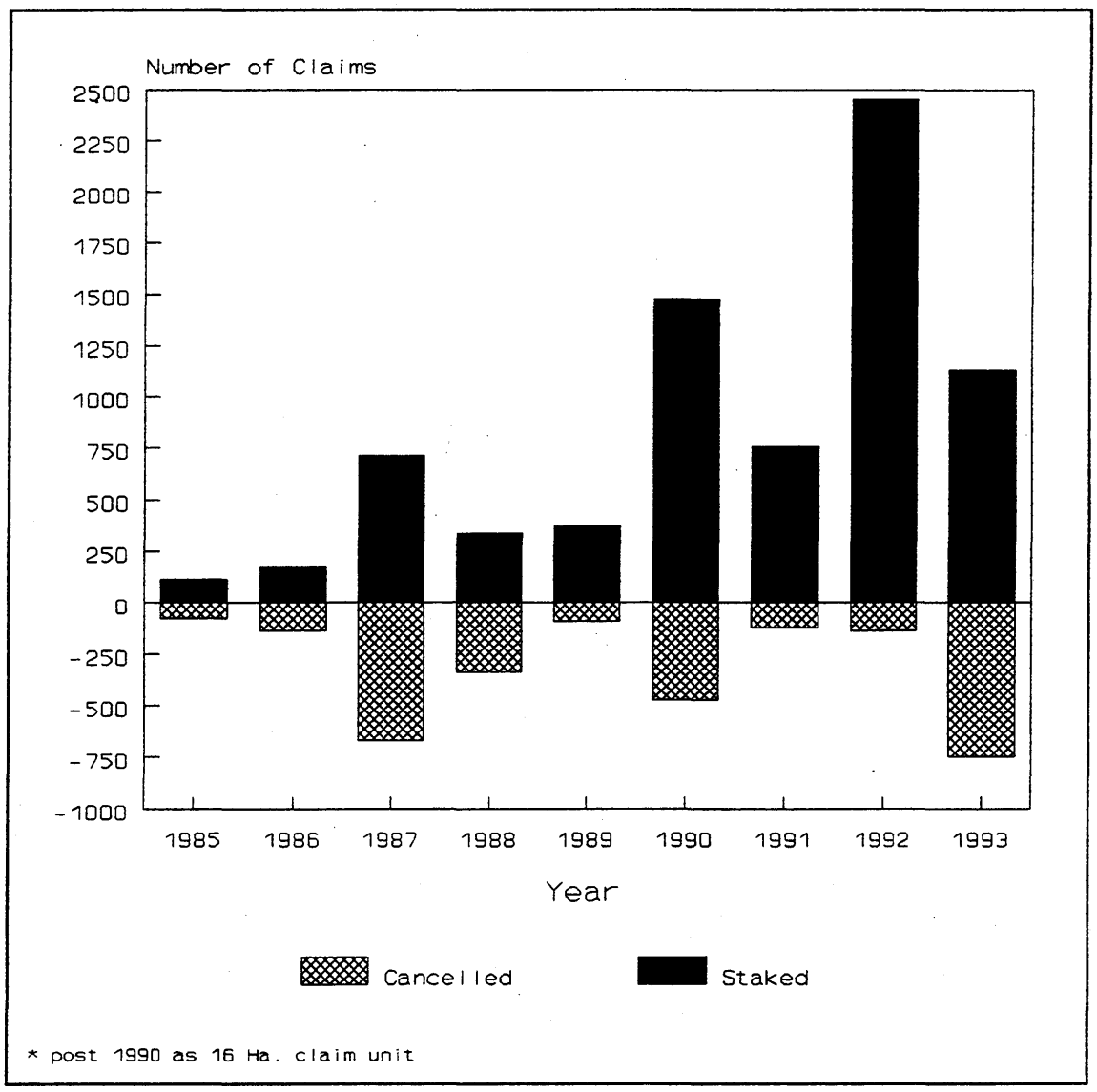


Figure CO-2 Claim-staking activity in the Cobalt Resident Geologist's District

MINING ACTIVITY

CENTRAL ONTARIO NATURAL STONE QUARRIES LIMITED, (J. Pilger) (A)

Clarkson Township
UTM: 5173840N, 639070E
NTS: 31L/11NE
MDI: none

Central Ontario Natural Stone Company Limited, received permit approval and initiated a new stone quarry in Clarkson Township during 1993. The quarry is located on a single claim, the centre of which is located 700 m south of the northern township boundary and 6 kilometres west-northwest of the village of Thorne. Development work consisted of building an access road, in part funded by a Northern Ontario Resource Transportation Committee (NORTC) grant, stripping and blasting. Only approximately 120 tonnes were taken from this site.

The extracted material is reported to be multi-coloured and will be used for building and landscaping stones. The predominate colour is green and the product is said to be similar in part to that of McLaren's Bay Mica Stone Quarries. The stone is relatively fissile along it's gneissosity planes, which allows it to be readily sculpted to variable thicknesses. It is envisioned that the stone will be primarily used as a masonry facing stone.

The company has applied for permits and plans to start two additional quarry operations in MacAuslan Township next year. (R. Lashbrook, Lashex and J. Pilger, Central Ontario Natural Stone Company Limited, personal communications.)

McLAREN'S BAY MICA STONE QUARRIES, (G. Boughner)(B)

McAuslan Township
UTM: 5175394N, 625393E
NTS: 31L/11NW
MDI N 0096

The McLaren's Bay Mica Stone quarries are located in central McAuslan

Township, just north of Reynold's Lake. The site is accessed via the McLaren Bay Road, north from Highway 63. The operation is seasonal and produces a white and green or red banded gneiss which is composed of white, high silica metaquartzite intercalated with either green or red coloured muscovite rich bands and variable pegmatite. Products are used as masonry and landscaping stones as well as a paint additive.

The year 1993 proved to be poor for business. It is estimated that possibly 400 tonnes of material were shipped. (G. Boughner, Mclaren's Bay Mica Stone, personal communications, 1994.)

MILLER MINERALS (A Division of Miller Paving Limited) (C)
(formerly Dymond Clay Products Limited)

(G. Bell & T.Overton)

During 1993, Miller Paving Limited purchased the Dymond Clay Products Limited's properties and operations in the New Liskeard area. Miller Minerals (A Division of Miller Paving Limited) was created to manage the two operating limestone quarries and the lime kiln. The company successfully continued an existing campaign to expand it's client base and signed two significant long term contracts. Their major client base is in the mining industry.

Sales of metallurgical flux stone, agricultural lime (limestone fines) and aggregate remained strong in 1993, with 25,500 tonnes produced from the Breault and Bucke quarries. The shaft lime kiln operation saw it's first full year of production in 1993, with 13,500 tonnes of quicklime produced.

Miller Minerals entered into an agreement with Tundra Granite & Marble Incorporated whereby the latter was allowed to extract and evaluate large-block limestone from the Breault quarry during 1993. Testing is scheduled to continue in 1994 (see 'Tundra Granite & Marble Incorporated' under "ADVANCED EXPLORATION AND DEVELOPMENT").

The company looks forward to increased volume in 1994 of both limestone aggregates and quicklime production, and has placed a strong emphasis on selective quarrying and quality control.

Breault Quarry,
Dymond Township
UTM: 5270299N, 601538E
NTS: 31M/12SE
MDI: T 1457

The Breault quarry is located in the northeast corner of Dymond Township, about 10 km north of New Liskeard. The quarry produces most of the high-calcium limestone feed for the shaft kiln quicklime operation. Feed is crushed to about 10 cm by 10 cm and trucked 25 km to the lime kiln, located at the Bucke quarry site near Haileybury, Ontario.

Bucke Quarry and Lime Kiln Operation,
Bucke Township
UTM: 5255508N, 601596E
NTS: 31M/5NE
MDI: T 0037

The Buck quarry produces a slightly lower-grade calcium limestone than the Breault quarry which is used primarily for agricultural lime (limestone fines), metallurgical flux stone and crushed aggregate. Some material is used for blending in the lime kiln.

THORNE BRILLIANT STONE QUARRY, (P. Pharand)(E)
Poitras Township
UTM: 5171789N, 645192E
NTS: 31L/11NE
MDI N 0166

The Thorne Brilliant Stone quarry is located in Poitras Township, at the top of the ski hill, 1 km south of Thorne, Ontario. The site produces, on a seasonal basis, a white and red flagstone and masonry stone from a fine- to medium-grained quartz-muscovite gneiss. Red coloration is due to hematite staining of the mica flakes.

Only minor quantities of material was sold in 1993 for rock gardens and patios, for an estimated total of approximately 100 tonnes. The owners built a road and completed some initial development work on a black, biotite gneiss located adjacent to the operating quarry. Extracted material from this new pit is being marketed as a "black granite". (P. Pharand, Thorne Brilliant Stone Quarry, personal communications, 1994.)

ADVANCED EXPLORATION AND DEVELOPMENT

TUNDRA GRANITE & MARBLE Incorporated
Breault Quarry,
Dymond Township
UTM: 5270299N, 601538E
NTS: 31M/12SE
MDI: T 1457

Tundra Granite and Marble Limited entered into an agreement in 1993 with Miller Minerals, a division of Miller Paving Limited, to cut test blocks of limestone from Miller Mineral's Breault quarry in Dymond Township. Tundra Granite and Marble Limited manufactures a variety of dimension stone products at it's facilities near Kirkland Lake.

The idle north face of the Breault quarry was squared off and a diamond wire saw was installed to cut the blocks. Several cuts were attempted to get past the extensive blast shattered zone created during earlier quarrying operations. After extending 65 feet into the quarry wall, micro-fractures were still being observed in the blocks.

Tundra Granite and Marble Limited are evaluating three types of limestone from the Breault quarry, a buff yellow shelly limestone, a grey-green brecciated stromatolitic limestone and a beige, fine-grained micritic limestone containing minor small shell fragments.

Several blocks of various sizes totalling approximately 20 tonnes were recovered and shipped to Kirkland Lake for cutting. Test results indicate the rocks adjacent

to the pit are too fractured to produce large slab dimension stone. Tundra Granite and Marble Limited plan to test a less disturbed section in 1994. (Tundra Granite and Marble Limited personal communications, 1993)

EXPLORATION ACTIVITIES

A summary of 1993 exploration activities in the Cobalt Resident Geologist District is available in Table CO.03.

RESIDENT GEOLOGIST'S STAFF ACTIVITIES

During 1993, the Cobalt Resident Geologist office was staffed by: J. Ireland, Resident Geologist and Acting Manager of Temiskaming Testing Laboratories (TTL); E. Baša, Staff Geologist; R.V. Zalnieriunas, Contract Staff Geologist; and G. Quevillon, who succeeded C. Pickard as Administrative Assistant. Steve Dalley and Greg Leblanc were our Experience '93 summer student assistants.

1993 was a year of change and transition for all staff at Cobalt.
J. Ireland continued to pull double duty as Resident Geologist and Acting Manager of Temiskaming Testing Laboratories (TTL). In February, the Ministry of Northern Development and Mines announced the closure of TTL effective September 1, 1993. As Acting Manager of TTL, J. Ireland had the responsibility of shutting down TTL and putting the facility on Care and Maintenance. He also assisted TTL staff in the re-deployment process.

In addition to her responsibilities as Staff Geologist, E. Baša gave a slide presentation entitled "Geological History of Cobalt" to a very receptive Sudbury Geological Discussion Group in May.
R. Zalnieriunas continued in the position of Assistant to the Manager, TTL/Resident Geologist and assumed the duties of Staff Geologist in October, when E. Baša began maternity leave. He provided client services support and assisted E. Baša and J. Ireland in the office and field.

Re-deployment brought G. Quevillon, a former Chemical Technician at TTL, over to the Resident Geologist office as Administrative Assistant, succeeding C. Pickard, who held the position under contract.

Staff Activities

Overall, office and staff activities in 1993 achieved the same levels as 1992, a record year for the Cobalt Resident Geologist office. Total office inquiries in 1993 were comparable to the record 1,268 visitors in 1992. (see TABLE **CO-5** below).

TABLE CO-5 Cobalt Resident Geologist Office Staff Primary Activities - 1993.

•	Office Inquiries	1252*
•	Phone Inquiries	990*
•	Property Visits	26
•	Hazards Inspections	8
•	Field Tours Given	12
•	Field Tours Attended	4
•	Internal Field Trips	3*

* Figures quoted in table **CO.05,** do not include the Abandoned Mines Inventory Site Investigation group (see below)

The number of visitors is indicative of continued interest in the diverse mineral potential of the area. An increase in the price of gold during the second half of 1993 resulted in a corresponding increase in gold exploration. The anticipated lifting of the Temagami Land Caution also brought people into the office for consultation and assessment searches. Diamond and base metal exploration activities in the Tri-Towns area remained significant in 1993.

During the period August - December, 1993, the Cobalt Resident Geologist office provided logistical and technical support to Pat Chance and Associates, a group of 6 consulting geologists and their assistants, contracted to work on the Cobalt

COBALT-1993

Abandoned Mines Inventory Site Investigations Program. This program covered those areas excluded from the 1992 program; Lake Temagami area, Earlton-Engelhart area, South Lorrain silver camp, Cobalt silver camp, Gowganda-Elk Lake silver camps and the Shining Tree area.

Based upon recently documented copper occurrences in a large area south of Shining Tree, staff visited several copper showings hosted in Huronian quartz arenite. The preliminary results of this investigation were presented as a poster display at the Mines and Minerals Division's Geoscience Symposium in December and are summarized in the "SPECIAL PROJECTS" section of this report.

Regular staff activities included:

- reviewing and commenting on land use issues (Timber Management plans, Temagami Comprehensive Planning Council, Wendaban Stewardship Authority plan proposals, Ministry of Natural Resources' Candidate Parks, ANSI's, Wetland Initiatives, Official Plan amendments, etc.)

- presentation of the Discover '93 Prospectors course over a 6 week period in April and May at the Haileybury School of Mines, Haileybury. Of the 21 registrants, 18 completed the course.

- staff participation in Mining Awareness Week activities by manning a poster display at the Temiskaming Mall, New Liskeard.

- staff participation in the Cobalt Miner's Festival (poster display and geology tours) in July.

- continued monitoring of selected crown pillars in the Cobalt area as part of the Crown Pillar Stability Pilot Project, initiated in 1992 by the Abandoned Mines Section of Mining Lands and Rehabilitation Division, MNDM.

- presentation by staff of mine hazards and explosives safety talks to 3 elementary schools in the Cobalt-Haileybury area.

- presentation of a poster display at the Mines and Minerals Division's symposium in Toronto in December and in Sudbury in April featuring a review and re-interpretation of whole rock data from the Cobalt Silver camp.

In addition, staff attended several professional seminars and training sessions during the year, including a Diamond Short Course offered following the Regional Symposium in Sudbury and the Geophysical Methods for Diamond Exploration workshop, held at the Haileybury School of Mines.

PROPERTY VISITS:

CHITARONI PROPERTY (OPAP)
Best Township
UTM: 595260E; 5224640N
NTS:31M/4
MDI:n/a

During 1993, Mr. A. Chitaroni completed initial evaluation of the geology hosting the south extension of the Northland Pyrite Mine in Best Township.

The Northland Pyrite Mine produced high-sulphur pyrite almost continuously from 1906 until 1911. Lenses of massive pyrite and pyrrhotite occur in a 45 m wide band of north-trending, steeply east-dipping, Archean felsic agglomerate and lapilli tuff, immediately east of a large granitic intrusive. The mineralized felsic fragmental unit is bounded to the east by a thick sequence of foliated and chloritized, pillowed mafic volcanic rocks.

Previous geophysical work and limited diamond drilling have defined the mineralized horizon 500 m north and south of the mine workings. Mr. Chitaroni recently established a grid on the property and has begun a ground magnetometer and V.L.F. electromagnetic survey. He hopes to extend the known mineralized zone further south and is also looking for parallel conductors under James lake and to the east, where chalcopyrite is documented in silicified and chloritized, mafic pillowed volcanic rocks.

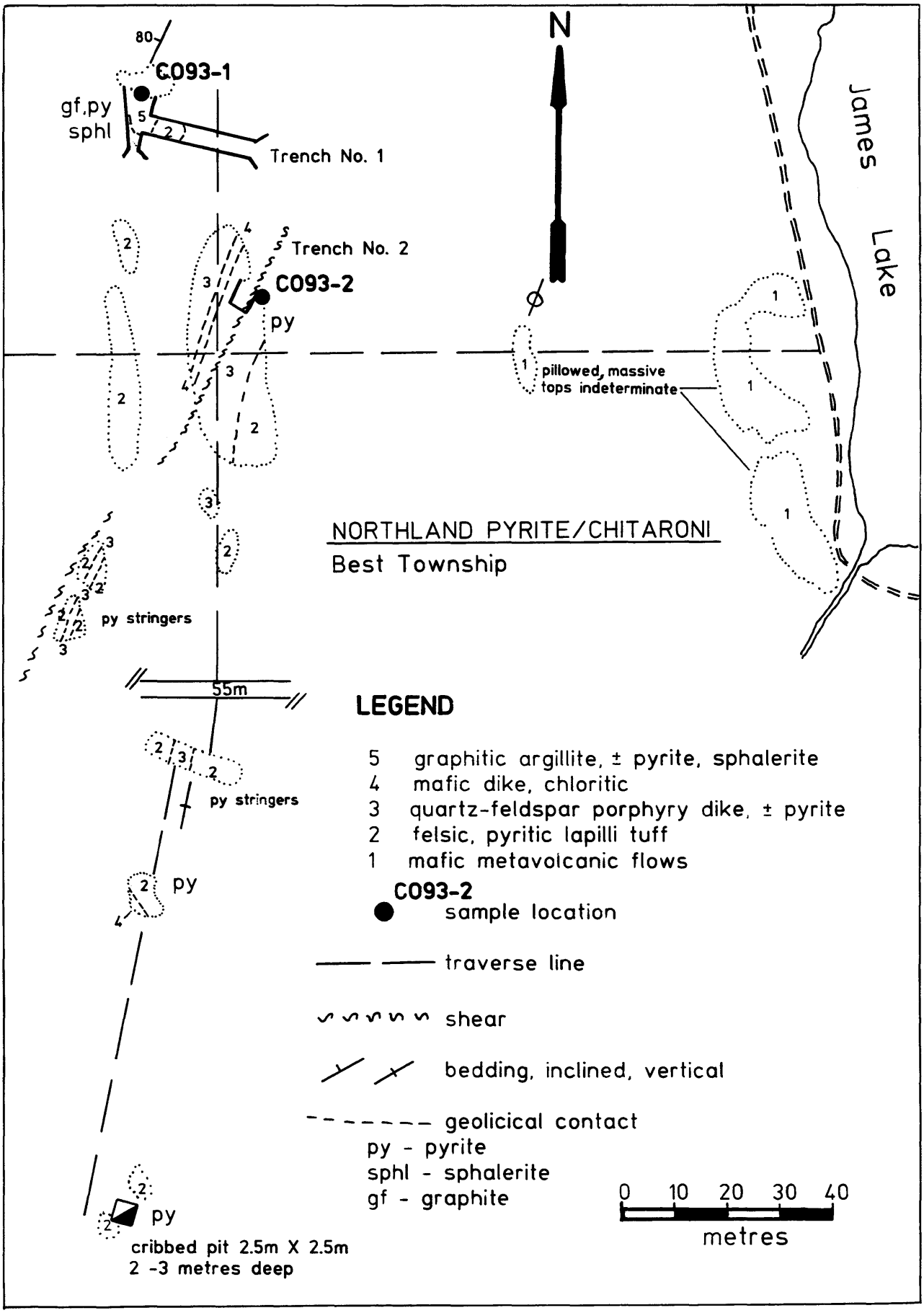

N
James Lake
80
C093-1
gf,py
sphl
Trench No. 1
Trench No. 2
C093-2
py
pillowed, massive
tops indeterminate
NORTHLAND PYRITE/CHITARONI
Best Township
py stringers
55m
py stringers
py
py
cribbed pit 2.5m X 2.5m
2 -3 metres deep
LEGEND
5 graphitic argillite, ± pyrite, sphalerite
4 mafic dike, chloritic
3 quartz-feldspar porphyry dike, ± pyrite
2 felsic, pyritic lapilli tuff
1 mafic metavolcanic flows
C093-2
sample location
traverse line
shear
bedding, inclined, vertical
geolicical contact
py - pyrite
sphl - sphalerite
gf - graphite
0 10 20 30 40
metres

Figure CO-6

Exploration targets are Volcanogenic Massive Sulphide (VMS) lenses similar to the Northland Pyrite deposit but containing economic concentrations of copper and zinc.

During 1993, a program of hand stripping at the south end of the Northland Pyrite property's main zone, extending south onto the Chitaroni claims (see figure CO-6) revealed the presence of a graphitic, argillaceous unit within the felsic fragmental rocks. Visible sphalerite and chalcopyrite were observed in this unit. Low reported assay results suggest the zinc and copper mineralization is sporadic. Additional work is scheduled for 1994.

LACARTE AND MACCALLUM, HARE LAKE GOLD OCCURRENCE

Tyrrell Township
UTM: 496450E, 5275350N
NTS: 41P/11NE
MDI: T 1544

Background Information:

The staking of seven (7) unpatented claims (1146156, 1146157, 1146441, 1146442, 146638, 1146639 and 1146640), occurred in April 1990, following the re-opening of the peripheral lands adjacent to the Temagami Land Caution. Prospecting that same year, by partners LaCarte and MacCallum, lead to the discovery of a gold occurrence immediately west of Hare Lake, on the property's eastern boundary. This is now referred to as the Hare Lake gold occurrence. The partners have also carried out a significant amount of exploration activities on the western claims (see J.C. Ireland *et al*, 1991, 1992).

The Hare Lake gold occurrence is located approximately 200 ft northwest of the No.2 post of claim 1146157, in the area of a small gossan stained bedrock knoll. This previously has been described as a carbonate and quartz veined, grey and pink porphyry dyke in contact with a carbonate altered, pyritic volcanic.

An 14 ft deep, irregular, 14 by 12 ft pit was reported to have been put down through overburden and bedrock to test this site. Additional stripping, trenching and a 102 ft long diamond drill hole (No.1) was subsequently completed in 1991. This

drill hole was collared immediately north of the main pit. Continued blasting of this pit, as well as stripping and trenching, has continued intermittently through 1992 and 1993. The occurrence was visited in June, 1993 by J.C. Ireland and R.V. Zalnieriunas. The occurrence was subsequently mapped and sampled by R.V. Zalnieriunas and S. Dalley in August, 1993 (see Figure CO-07).

Mr.LaCarte reported that the partners have entered into an agreement with the owner of the adjoining claim, R.G. Komarechka, to amalgamate the property with his Hare Lake Property. This consists of nine (9) contiguous claims stretching south and east of Hare Lake and northwards to Highway 560. Trenching and stripping operations were carried out on the Komarechka claims this past summer.

Occurrence Geology:

The property geology is still poorly defined, but is more complex than that implied by current government maps. Topographic features and some preliminary work by J.C. Ireland and H.L. Lovell (personal communications) suggests the presence of a regional, southwest trending, D2 fold structure. This structure appears to close to the southwest. An apparent fold nose is developed southwest of the occurrence. This structure overprints the regional, southeast- trending isoclinal folds of the area. A feldspar porphyry plug, which hosts the gold occurrence, may sit in the axial trace of this secondary fold structure.

The feldspar porphyry is multi-phased, with a distinct, late and minor granophyric component. Locally it is extensively sericitized, accompanied with pyrite development. Maximum alteration is developed at the eastern extent of the porphyry body, where it is in contact with a narrow, north-trending graphitic schist band. Pyrite in the area of maximum alteration makes up 40 to 50% and occurs as very coarse irregular clots and fine- to medium-grained disseminated grains and threads. Pyrite content decreases to 2 to 5% at the observed northern and western boundaries of the feldspar porphyry body.

Typical pinkish-grey weathering, fine-grained trachybasalt breccia, pillowed trachybasalt flows and minor interflow sedimentary rocks outcrop north and west of the occurrence. The trachybasalts are similar to those described by Carter in MacMurchy, Knight and northern Tyrrell townships. (see Carter 1977 and 1987).

Bedding strikes to the east-southeast and dips steeply south. Stratigraphic tops appear to be to the south.

A north-northwest trending lineament passes along the west shore of Hare Lake and is probably the expression of a shear or fault structure. This feature is oriented parallel to, and is roughly on strike with the Sturgeon River Fault system to the south. The presence of a fault system under this lineament is further supported by the presence of minor, west trending, quartz-filled tension gash veins (1 m long by 3 cm thick), and a north-northwest trending, cross-cutting, pyritic and weakly graphitic schist band exposed at the occurrence.

Mineralization:

The purpose of the June visit was to re-examine the occurrence's blast pit, which was now reported to be producing large gold nuggets, some of which were still in place. An examination of the pit revealed a sub-horizontal ledge, approximately 0.4 m^2 in size at the pit's eastern wall. The top cap of this ledge is composed of an approximately 1 cm thick, white, medium grained quartz-carbonate veinlet. The veinlet strikes westerly and dips 10°N. Clearly visible on surface are fourteen irregular splashes of coarse-grained gold, as well as some erratically distributed, disseminated fine-grained gold. Coarse gold occurs as leaf and irregular drusy masses which range in size from 3 by 1 cm to ½ by ½ cm. It was estimated visually that about 1 troy ounce of gold was exposed on this surface. No other visible gold specks were noted in a cursory examination of the other stacked veinlets which are exposed in cross-section on the pit's walls. Mr.LaCarte claims that each flat veinlet exposed in the pit has yielded gold as it has been uncovered.

Native gold is hosted in a series of conjugate, 2 to ½ cm thick quartz-carbonate veinlets, arranged to form a three dimensional, box-like stockworks. Sub-horizontal veinlets are spaced at a sub-metre scale while at least two subvertical veinlet set orientations (roughly striking N-S and E-W) appear to be spaced more at metre-scale intervals. All veining shows a pronounced pale green sericite-pyrite-carbonate ± green mica wall rock alteration. Much of the gossan developed on the porphyry south of the pit appears to be a reflection of this alteration.

The is highly magnetic. Disseminated magnetite was noted and reported in drill

Sample No. RZ93:	1	2	3	4	5	6	7	8
Au (o.p.t.)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu (ppm)	1033	1844	120	30	383	590	65	27

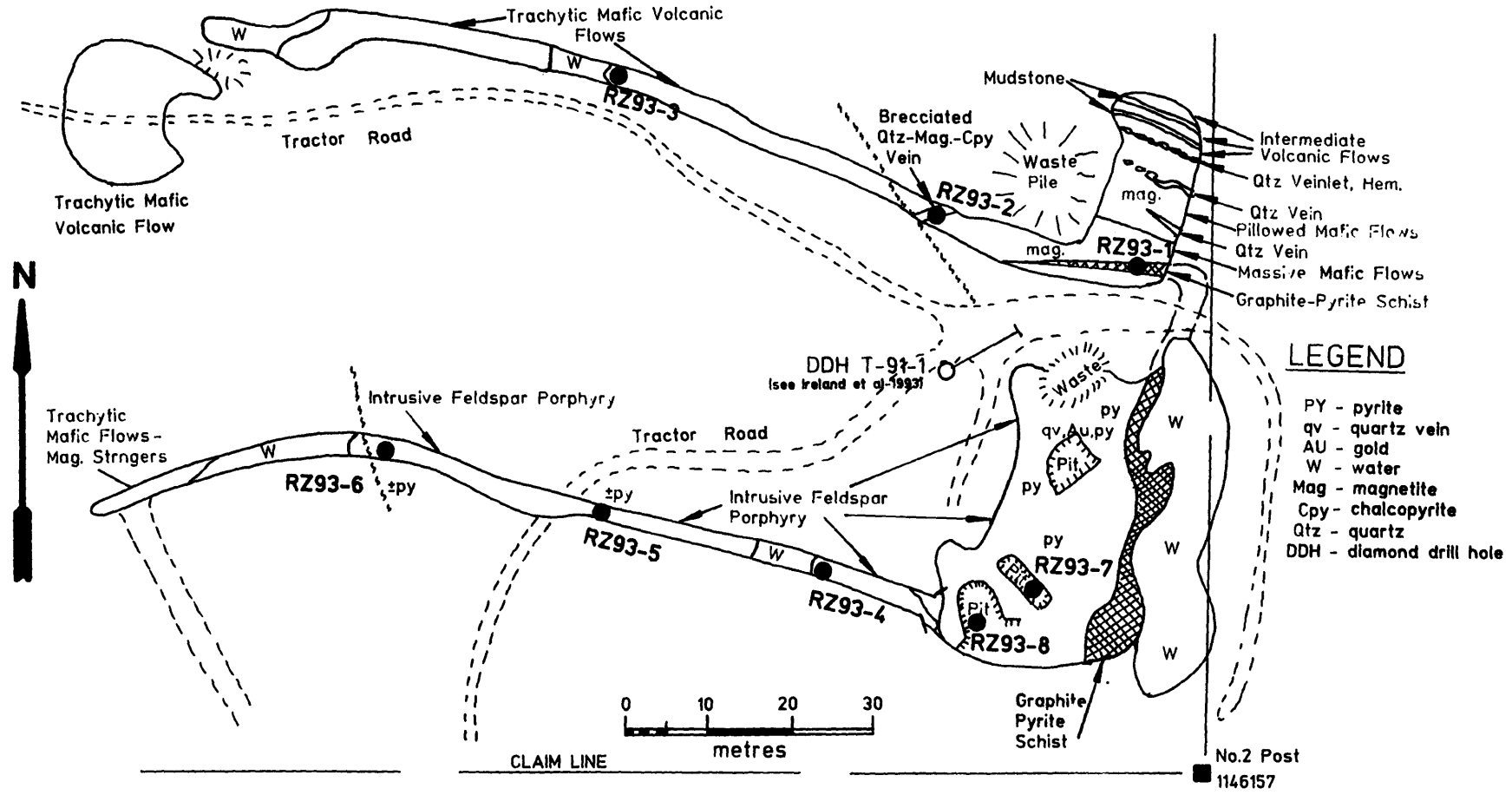


Figure CO-7 LaCarte - McCallum Property
Tyrrell Township

core from the feldspar porphyry. A zone of intense magnetite stringer development occurs over a distance of 10 to 15 m in the surrounding volcanics, immediately marginal to the feldspar porphyry body. At present it is unclear whether this magnetite alteration is associated with the veining and related alteration, or with another alteration event.

Sampling in 1993 consisted of collecting eight bedrock samples peripheral to the main pit. Previous sampling of the pit in 1992 had returned values of 0.01 to 0.04 ounces Au per ton (see Ireland *et al* 1993). All 1993 samples returned gold assays of <0.01 ounces Au per ton. A significant pattern of copper enrichment was defined at the margins of the feldspar porphyry. Values of 383 to 590 ppm Cu were found in the western extent of the porphyry. A value of 1844 ppm Cu was returned from a quartz-magnetite-chalcopyrite zone in the surrounding volcanics. A sample of fresh looking trachybasalt returned a value of 120 ppm Cu. The core zone of strongest pyrite development in the feldspar porphyry returned values which ranged from 65 to 26 ppm Cu.

SPECIAL PROJECTS:

Copper Mineralization in the Huronian: A Re-Evaluation

In 1993, staff of the Cobalt Resident Geologist office began a preliminary evaluation of several copper occurrences in the South Shining Tree area, located about 25 km southeast of the village of Shining Tree. The three occurrences visited in 1993 are located in Browning, Dufferin and North Williams townships (figure CO-8). These prospects were initially staked by J. Tindale and R. Annett and are currently being evaluated by Asquith Resources Incorporated.

Regional Geology

The South Shining Tree area straddles the northwest edge of the Cobalt Embayment. Rocks of the area are characterized by significant post-depositional structural activity. The extent and intensity of the deformation, however, is poorly defined due to extensive glacial drift cover.

The area is underlain by Mesoarchean (2.5 Ga) mafic to intermediate metavolcanic rocks and basement granitoid rocks of the foliated tonalite suite (tonalite to granodiorite), unconformably overlain by Proterozoic (2.45 Ga) Huronian sediments. These have been subsequently intruded by Paleo- to Mesoproterozoic (2.4 to 1.14 Ga) diabase sills and dikes represented, from oldest to youngest, by the Matachewan, Nipissing and Abitibi type dikes.

The dominant structural feature in the area is a series of sub-parallel, north-northwest trending faults related to the Sturgeon River - Upper Wanapitei lineaments. A subordinate set of west-northwest and east-northeast trending faults are also present in the area, suggesting block faulting.

Local Geology

Copper mineralization is hosted in Proterozoic-aged Huronian quartz arenite and quartz-pebble conglomerate of the upper Lorrain Formation. Chalcopyrite, chalcocite, bornite, malachite, azurite pyrite and hematite occur as fine disseminations associated with wide spread silicification, bleaching, hematization, and possibly potassic metasomatism. Some possible organic material may be associated with mineralization at the North Williams township site. The mineralization appears to be stratabound or strataform. Detailed descriptions of the Browning and Dufferin townships occurrences are given below. Only a brief description of the North Williams Township occurrence is available as the showing consists only of a 1.5 m by 1.5 m outcrop with a small blast pit.

Dufferin Township Property
UTM: 5247650E, 498500N
NTS: 41P/06NE
MDI: n/a

The Dufferin Township occurrence (Site 2, figure CO-8) was originally evaluated as a silver-cobalt prospect in 1968. Three vertical diamond drill holes totalling about 200 m were completed by W. Sutherland to test the mineralized zone located at the lower contact of a Nipissing diabase sill. Copper mineralization was noted in all three drill core logs, over a lateral distance of approximately 300 m. No

assays were reported and no further work was done on the property once it fell under the Temagami Land Caution in 1973.

When the lands peripheral to the Caution boundary came open in 1990, the small mineralized exposure was examined by partners J. Tindale and R. Annett. They purchased the existing claim and staked several additional claims. The property was subsequently transferred to Asquith Resources Incorporated. Late in 1992, the showing was stripped, opened up with blast pits and the mineralized zone sampled. Assays up to 1.0 % Cu were reported.

Local geology is dominated by Proterozoic quartz arenite and pebbly conglomerate of the Huronian Supergroup, intruded by Nipissing diabase sills and dikes. A large inlier of Archean granitoids is exposed about 1.5 km east of the occurrence. A prominent north-northwest trending regional fault lineament, part of the Upper Wanapitei fault system, is located about 300 m east of the occurrence. Outcrop is sparse to the west due to extensive swamp and sand plain.

The copper occurrence is located near the contact between Lorrain Formation sediments and an overlying Nipissing diabase sill. Limited stripping to date has exposed the mineralized sediments over an area 20 m by 5 m. Finely disseminated chalcopyrite and pyrite are erratically distributed through several 0.5 m to 1.0 m thick quartz arenite and quartz pebble conglomerate beds striking 050° and dipping 045° northwest, beneath a prominent Nipissing diabase ridge. One of the 1968 diamond drill holes, collared approximately 30 m west of the stripped area and drilled vertically, encountered 1 m of diabase before intersecting the mineralized sediments. The diabase-sediment contact is not exposed on surface.

Average total sulphide ranges from 3 % to 5 %, primarily as fine disseminations but locally forming small (5 cm to 15 cm) clots and swirls of semi-massive sulphide. Chalcopyrite has been selectively remobilized into numerous conjugate joint sets during an apparent silicification event. Joints are either silica flooded or vuggy with drusy silica rinds exhibiting terminated quartz crystals. A prominent zone of pink feldspar enrichment, possibly related to intrusion of the diabase sill, trends roughly parallel to bedding, but is not confined to specific bed units.

The quartz arenite and quartz pebble conglomerate weather to a bleached white, with no obvious indication of mineralization. When broken, the rocks exhibit a 5

mm to 10 mm deep weathered rind and a well defined green, malachite-stained subsurface. A composite sample collected across the mineralized exposure averaged 0.24 % copper and 62.38 parts per million cobalt. No significant gold or silver values were obtained (Geoscience Laboratories, Sudbury).

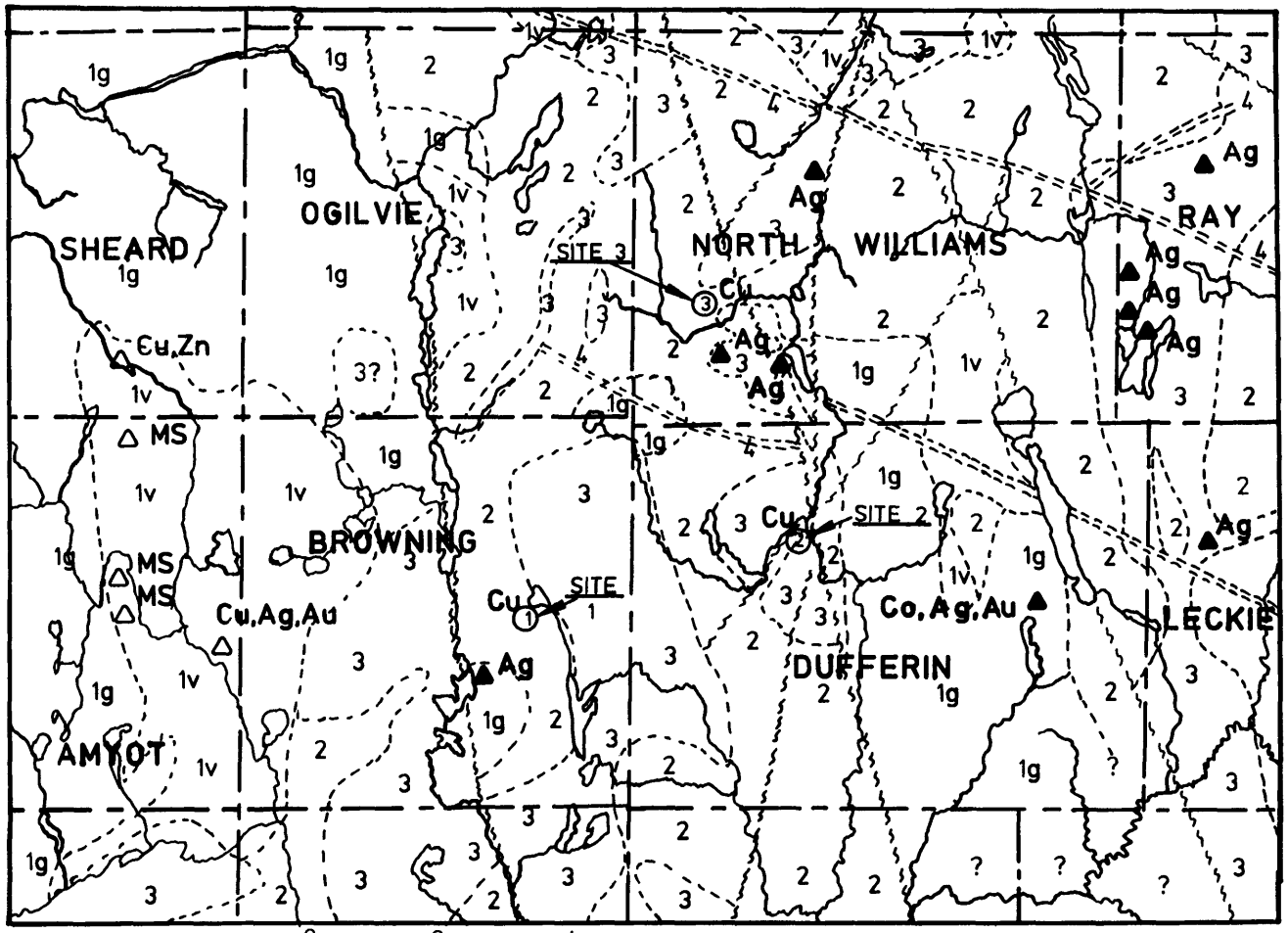
Browning Township Property
UTM: 5245400N, 492000E
NTS: 41P/06NE
MDI: n/a

The Browning Township occurrence (Site 1, figure CO-8) had been known to local trapper and prospector R. Annett for many years but it's remoteness made evaluation difficult. Recent logging opened up the area and the occurrence was staked. The claims were subsequently transferred to Asquith Resources Incorporated Late in 1992, partners J. Tindale and R. Annett blasted a pit and sampled the mineralized zone. Assays greater than 1 % Cu were reported.

Local geology is dominated by Proterozoic quartz arenite and quartz-pebble conglomerate of the Huronian Supergroup, intruded by Nipissing diabase sills and dikes. A small inlier of Archean granitoids is exposed about 1 km southwest of the showing. A prominent north-northwest trending regional fault lineament is located 1 km west of the showing. Outcrop is sparse to the east due to extensive swamp and sand plain.

The copper occurrence is hosted in clean, pale grey to pale green, massive-bedded quartz arenite with minor pebbly quartz arenite and quartz pebble conglomerate beds. The sediments are locally rusty weathering, exhibit variable hematite and malachite staining and have developed an extensive 050° trending vertical fracture pattern. Bedding strikes 030° and dips 060° to the southeast. Three copper mineralized zones are known on the property. Only one, the primary showing, has been evaluated to date by staff of the Cobalt Resident Geologist office.

Mineralization consists of mottled zones of copper oxides (malachite and minor azurite) and hematite. Zones of finely disseminated chalcopyrite, chalcocite and possibly bornite are locally present. Preliminary evaluation indicates the copper mineralization is associated with a broader zone of pervasive silicification.



LEGEND

4	Olivine Diabase (Late Proterozoic)
3	Nipissing Diabase (Mid Proterozoic)
2	Cobalt Group Sediments (Early Proterozoic) (unsubdivided)
1g	Archean Granitoid Rocks (unsubdivided)
1v	Archean Volcanic Rocks (unsubdivided)

fault

△ ▲ mineral occurrance, new, known

① Study Site

Ag - silver	mineralization
Au - gold	" "
Cu - copper	" "
Co - cobalt	" "
MS - massive sulphide	" "
Zn - zinc	" "

Figure CO-8 Location and Geology of 1993 Study Sites -

Late in 1993, the primary showing was stripped, washed and channel sampled by Asquith Resources Incorporated.. On the main stripped area, copper mineralization is exposed over an area 30 m by 10 m. Assay results of channel samples taken by the partners over 5 m intervals on this area were mixed, ranging from 40 ppm to 1800 ppm Cu. Selected grab samples, collected earlier by staff of the Cobalt Resident Geologist office, from a small blast pit on this zone returned values of 1.028 % and 0.229 % Cu (Geoscience Laboratories, Sudbury).

North Williams Township Property
UTM:525395N, 496825E
NTS:41P/06NE
MDI:n/a

The North Williams Township copper occurrence (Site 3, figure CO-8) was exposed during construction of a high-voltage electric power transmission line in the early 1960's. It had been known locally as a pyritic quartz arenite and had been assayed for gold with no success. Late in 1992, Tindale and Annett put down a small blast pit, exposing a 15 cm thick quartz-pebble conglomerate unit within the quartz arenite. Strike and dip of the sediments is uncertain due to the limited exposure. The conglomerate unit is well mineralized with thin, discontinuous, pyrite-chalcopyrite bands as well as disseminated chalcopyrite, bornite, pyrite and possible organic matter. A grab sample from the conglomerate unit returned assay values of 0.85 % Cu, less than 5 ppm Co, less than 0.01 ounces Au per ton and less than 0.1 ounces Ag per ton (Geoscience Laboratories, Sudbury).

NORTHERN ONTARIO DEVELOPMENT AGREEMENT (NODA) ACTIVITIES

Industrial Minerals and Building Stone in the Districts of Nipissing, Parry Sound and Sudbury (Ontario) - C. Marmont

Studies conducted by Chris Marmont in 1993 completed a three year Northern Ontario Development Agreement (NODA) programme to evaluate the economic potential of industrial minerals and building stone in the district of Parry Sound and

parts of the districts of Nipissing and Sudbury. Results of the first two year's activities have been reported by Marmont (1991, 1992a, 1992b, 1993).

This year's study focused primarily on industrial minerals associated with metasedimentary gneisses, particularly orthoquartzites and metapelites within the Grenville geological province. A lesser amount of time was spent investigating potential building stone occurrences (Marmont, in prep.).

In the Cobalt Resident Geologist's District, the metasedimentary gneisses extending from the Grenville Front Tectonic Zone south of Lake Temagami, to Highway 17 East at Mattawa, were evaluated by Marmont for their industrial mineral potential. Areas of specific interest included the massive, micaceous orthoquartzite gneisses underlying much of Clarkson, Garrow and McAuslan townships, some 40 km northeast of North Bay, and kyanite-bearing metapelitic gneisses, located approximately 30 km northeast of North Bay, in Butler and Antoine townships.

A potential building stone occurrence, located near the southwest shore of Kootisinimigo (Bear) Lake in Notman Township, was examined in 1993. The rock is described as a coarse-grained, foliated, white granitic gneiss. Coarse microcline and plagioclase comprise 65 percent and interstitial quartz 25 percent of the rock. Biotite (7%) and hornblende (3%) are the mafic minerals present. Jointing is weak to moderate at 060° and 180° near the southeast end of the exposure and little jointing was observed to the northwest. Foliation trends northeast at approximately 030°. Approximately 65 to 70 percent of the outcrop examined was considered to have good building stone potential.

ONTARIO GEOLOGICAL SURVEY ACTIVITIES

Geochemical Dispersion Studies of Abandoned Tailings Sites
R. Jackson (1993) *in* Summary of Field Work and Other Activities 1993, by the Ontario Geological Survey, edited by C.L. Backer, B.O. Dressler, H.A.F. DeSouza, K.G. Fenwick, J.W. Newsome and L. Owsiacki, Ontario Geological Survey Miscellaneous Paper 162, 318p.

A multi-media geochemical study was initiated around abandoned tailings sites in

the Gowganda, Matachewan and Kirkland Lake areas. The project is regional in scope with each area consisting of approximately 70 km^2.

The study by R. Jackson (1993) of the Ontario Geological Survey, will determine the degree and extent of metal dispersion down the drainage system from individual tailings sites. Considerable emphasis will be given to establishing the natural and the background levels for the metal-rich geological environment that exists around the mineral deposits in these areas. Natural barriers to dispersion will be identified. The long term stability of tailings will be compared for the various storage methods employed.

Sample media will include lake waters, lake sediments, stream waters, stream sediments, and stream sediment substrate (ie. humus, peat, glacial overburden). The metals of primary interest are Cu, Pb, Zn, Co, Ni, Fe, Mn, Mo, Cd, Ag, As, Se, and Hg.

During the 1993 field season, the regional lake sampling was completed in all three areas. Stream sampling was completed in the Gowganda area.

Sediment-Hosted Sulphide Mineralization In Metasedimentary Subprovinces

J.R. Parker (1993) *in* Summary of Field Work and Other Activities 1993, by the Ontario Geological Survey, edited by C.L. Backer, B.O. Dressler, H.A.F. DeSouza, K.G. Fenwick, J.W. Newsome and L. Owsiacki, Ontario Geological Survey Miscellaneous Paper 162, 318p.

Initial data on rocks, structure, alteration, style and type of mineralization was obtained by J.R. Parker of the Ontario Geological Survey during the 1993 field season from three selected sulphide occurrences located within metasedimentary subprovinces in Ontario. The study focused on; 1) the Hurdman Township zinc occurrence near Smooth Rock Falls, Cochrane District (Opatica Subprovince), 2) the Bug Lake copper occurrence near Kenora, Kenora District (English River Subprovince) and 3) the Pense Township zinc occurrence east of Engelhart, Temiskaming District (Pontiac Subprovince).

The Pense Township zinc occurrence lies within the Cobalt Resident Geologist's District. The occurrence is situated within an east trending, south dipping sequence of tholeiitic to komatiitic matabasalt flows interlayered with fine-grained turbiditic metasedimentary rocks, mafic tuff and carbonaceous interflow metasedimentary rocks. Metamorphic grade is upper greenschist to amphibolite. Alteration is subtle, consisting of albitization and chloritization of the mafic metavolcanic rocks.

Three styles of sulphide mineralization was observed;

1) Surface Trench: disseminated to semi-massive pyrrhotite-pyrite (5 to 30%) in coarse-grained, black amphibolite,

2) Surface Trench: disseminated to semi-massive pyrrhotite-pyrite (5 to 25%) with minor chalcopyrite and sphalerite (less than 1%) in carbonaceous interflow metasedimentary rocks,

3) Diamond Drill Core: disseminated to semi-massive (2 to 50%) combined pyrrhotite-pyrite sphalerite-chalcopyrite with minor galena distributed along layers and foliation within thinly laminated, moderately foliated, silica-rich, biotitic, fine-grained metasedimentary rocks at the contact between clastic sedimentary rocks and chloritic, weakly biotitic and garnetiferous flows or talc-chlorite-tremolite schist.

Exploration Guidelines

At Pense Township, sulphide mineralization is hosted by silica-rich metasedimentary rocks at a contact between clastic metasedimentary rocks and mafic to ultramafic metavolcanic rocks. Other metasediment-metavolcanic contacts in the area should be explored for similar mineralization. A possible angular discordance between silica-rich metasedimentary rocks and layering in the metavolcanic rocks suggests that diamond drill targets oblique to contacts should also be considered.

ACADEMIC ACTIVITIES

Ontario Geoscience Research Grant 399: Structure and Emplacement Mechanics of the Round Lake Batholith

R.M. Harrap and H. Helmstaedt
Department of Geological Sciences
Queen's University, Kingston, Ontario.

R. M. Harrap, Queen's University Graduate Student, continued his field studies of the Round Lake Batholith in 1993. This work is in part funded by the Ontario Geoscience Research Grant Program.

The Archean Round Lake Batholith comprises a 3200 km^2 tonalite-granodiorite igneous complex, bounded to the north and east by metavolcanic assemblages of the Abitibi Supergroup and to the south and west by Proterozoic sedimentary rocks of the Huronian Supergroup.

Mapping of the batholith in 1992 and 1993 by R. Harrap has established the spatial distribution of five distinct phases based on petrological and structural grounds. Four of these phases represent subdivision of a previously identified single 'old phase' predicated on the presence of foliation. The other previously identified 'young phase' included all occurrences of unfoliated to mildly foliated, xenolith-bearing granodiorite within and marginal to the 'older phase' batholith.

The 'old phase' is now subdivided as hornblende-tonalite, biotite-leucotonalite, biotite-granodiorite and hornblende-granodiorite domains. All these rocks are at least mildly foliated, and exhibited clear cross-cutting relations provide insight as to the relative timing of the intrusive sequence. The hornblende- and biotite-tonalite domains occur as margin parallel panels along the north-central and south-central margins of the batholith. The biotite-granodiorite domain occurs as an ovoid body forming the eastern termination of the batholith. The hornblende-granodiorite occurs as two small stocks near the northwest and southwest margins of the batholith.

The 'young phase' hornblende-granodiorite occurs as three stocks that intrude the older phases of the batholith and marginal Archean metavolcanic rocks. It is generally unfoliated, contains abundant mafic xenoliths and makes up 40% of the exposure of the batholith.

Emplacement of the Round Lake batholith caused intense schistosity to mylonitic foliation in the metavolcanics near the margin to rare, weakly developed foliation less than 500 m away from the contact. There is no discernable metamorphic aureole around or within this strained contact. Macroscopic shear indicators demonstrate batholith-up sense of motion on all borders of the batholith. The 'young phase' hornblende-granodiorite cuts marginal metavolcanic rocks as dikes, small oblate bodies and massive stocks. These stocks are ringed by amphibolite facies contact metamorphic aureoles.

Field relationships within the batholith record a complex and decipherable igneous and structural history, and emplacement style varies systematically across the batholith. The entire range, from classic igneous intrusion in the western portion of the batholith to structural diapirism in the eastern portion, is found, indicating a possibly protracted and undoubtedly complex origin for the batholith as a whole.

DIAMOND DRILL CORE STORAGE PROGRAM

No diamond drill core was processed by the Cobalt Resident Geologist's office during 1993. Some drill core is still being stored off site at the Kirkland Lake and Timmins Drill Core Library facilities or off site storage sites.

An unspecified amount of diamond drill core was stored at the Cobalt Core Storage facility in 1993 for Golder Associates Limited. This core was collected as part of the Hazardous Lands Abatement Program in the Town of Cobalt, financed by Ministry of Northern Development and Mines.

At the end of 1993, 21,216.09 m of drill core from the Cobalt Resident Geologist District was in storage at the Cobalt core storage facility. This remains unchanged from the previous year. The majority of the stored core trays were re-labelled this summer with aluminium tags by Experience '93 students.

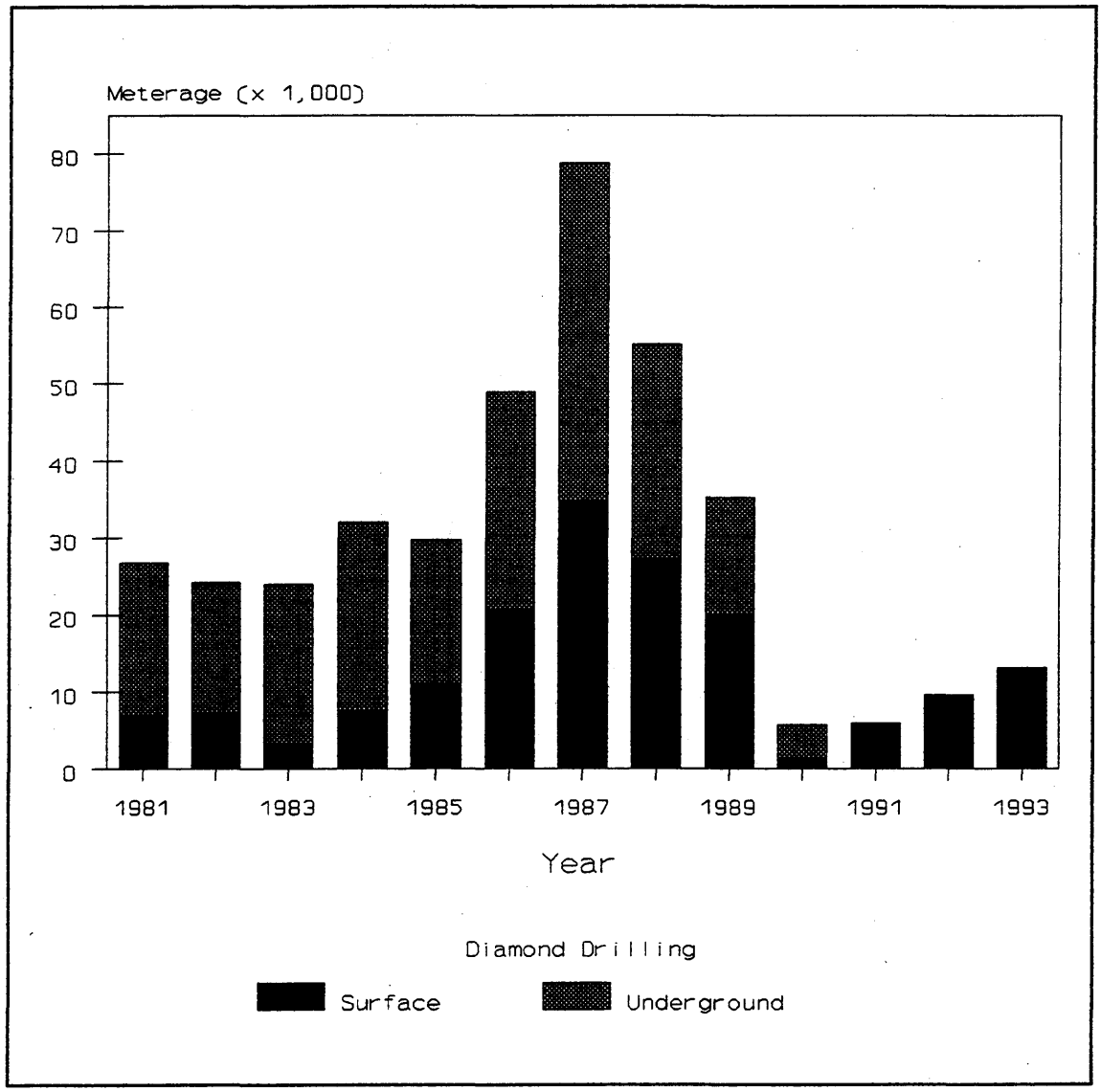


Figure CO-3 Diamond Drilling in the Cobalt Resident Geologist's District

Base metal mineralization is widely documented in and around the Cobalt silver mining camp, associated with paleo-valleys at the base of the Huronian sediments (R. Thompson, 1961-6, p.28) . Widespread chalcopyrite, sphalerite and galena mineralization, associated with low-grade silver, occurs at surface within the Kerr Lake Arch in Coleman Township. Similar style mineralization occurs at depth in the Silverfields mine, beneath Diabase Mountain, also in Coleman Township (Silverfields Mine Assessment Files, Cobalt). Along the east boundary of the Cobalt Embayment, numerous copper occurrences, documented but passed over in the search for silver, require re-evaluation for their base metal potential (R. Thompson, 1968).

Diamonds:

Over the last few years, it has become apparent that the kimberlite pipes which have been discovered to date in the region are spatially associated with north-trending deep faults. In the Kirkland- Larder Lake area, one of these faults is represented by the Lake Victoria Lineament. In the Cobalt area, another such fault is probably the northward projection of the Rib Lake Lineament. The kimberlite pipe in Guigues, Quebec, sits almost directly on the trace of the main Hudson Bay Paleolineament (Kutina, 1971). These and other related north trending lineaments of Kutina's geofracture have been described by Kutina and Fabbri (1972).

Kimberlite pipes identified to date in northeast Ontario appear to be spatially associated with the series of northwest trending faults which mark the northern limits of the Lake Timiskaming graben. (Lovell and Caine, 1970). These are the Quinze Dam and Cross Lake Fault zones.

The intersection of these north and northwest trending faults appear to mark the foci of kimberlite intrusions. The identification of these fault sets, on surface, establishes an empirical prospecting net, in which fault intersections delimit high priority target areas . As only a few of these target intersections have received attention to date, prospectors are encouraged to investigate other similar fault intersections.

The location of kimberlite pipes is not believed to be controlled by near surface structures. This is due to the rapid mode of emplacement which has been proposed

TABLE CO-3 Exploration Activities in the Cobalt Resident Geologist's District - 1993

ABBREVIATIONS LIST

AEM	Airborne electromagnetic survey
AGP	Airborne geophysical survey
AGR	Airborne gravity survey
AMG	Airborne magnetic survey
ARA	Airborne radiometric survey
ARES	Airborne resistivity survey
AVLF	Airborne VLF-EM survey
Airphoto	Aerial imagery interpretation
AS	Assaying and analysis
AD	Auger drilling in overburden
Beep	Beep Mat survey
Blast	Surface blasting
Bulk	Bulk sampling
Comp	Compilation studies and reports
DD	Diamond drilling
DDH	Diamond drill hole
DGP	Downhole geophysics
DPEM	Downhole pulse EM survey
Dewater	Dewatering of U/G workings
Dig	Digitization of base maps
EM	Ground electromagnetic survey
Env	Environmental studies
GC	Geochemical survey
GL	Geological survey
GP	Geophysical survey
Grav	Ground gravity survey
Grid	Control grid establishment
HLEM	Horizontal-loop EM survey
Ind	Industrial mineral testing & marketing
IP	Induced polarization survey
Line	Linecutting activities
Man	Manual surface work
Mag	Ground magnetometer survey
Met	Metallurgical testing
Micro	Microscopic studies
OC	Open cut
OMIP	Ontario Mining Incentive Program
OPAP	Ontario Prospectors Assistance Program
P	Prospecting
PEM	Pulse electromagnetic survey
PD	Percussion drilling
Pit	Pitting activities
Rad	Ground radiometric survey
R/C	Reverse circulation drilling
Rd	Road, trail or access construction
Rehab	Rehabilitation work
Remote	Remote imagery interpretation
Res	Ground resistivity survey
RS	Regional survey
SA	Surface assaying
Samp	Sampling
SD	Sonic drilling
Seis	Seismic survey
SP	Self potential survey
S/S	Shaft sinking
Str	Stripping activities
Tr	Trenching activities
U/G	Underground development
U/WGP	Underwater geophysics
UTEM	University of Toronto EM survey
VLEM	Vertical-loop EM survey
VLF	Very low frequency EM survey

NO.	AREA	COMPANY / INDIVIDUAL	TOWNSHIP(S)	EXPLORATION WORK
1	CO	Bethlehem Res. & Goodgold Res.	Bucke	AMG, Samp, 4 DDH
2	CO	Ewanchuck, J.	Bucke	P
3	CO	Gallo, E.	Bucke	OPAP - P, till Samp
4	CO	KWG Resources Inc.	Bucke	AMG, 11 R/C, 2 rotary hammer holes
5	CO	Vera Cruz Minerals Corp.	Bucke	Samp ?
6	CO	Langis Silver & Cobalt Mining	Casey	14 DDH (16,236 ft)
7	CO	Ager, Stewart & Chitaroni	Casey, Harris	Tr
8	CO	Falconbridge Ltd.	Cobalt area	AEM, AMG, GL, GC
9	CO	Sudbury Contact ML	Cobalt area	Samp
10	CO	Agnico-Eagle ML	Coleman	17 DDH (3,287 ft)
11	CO	Falconbridge Ltd.	Coleman	5 DDH (2,409m)
12	CO	O'Reilly, D.G.	Coleman, Gilles Limit	OPAP - P, Str, Beep, GP?
13	CO	Tundra Granite and Marble Inc.	Dymond	P, Samp, Bulk, Ind (limestone)
14	CO	Falconbridge Ltd.	Lorrain	PEM, 1 DDH (649m)
15	CO	Gore, J. (East Claim Gp)	South Lorrain	OPAP - P, Str, Samp, VLF, Beep
16	CO	Gore, J. (West Claim Gp)	South Lorrain	OPAP - P, Str, Samp, VLF, Beep
17	CO	Lickley & Smirle	South Lorrain	P, GP
18	CO	Oxbow Lake Syndicate	South Lorrain	P
19	EN	Dugas & Dugas	Brethour	Samp
20	EN	Dunn & Spooner	Bryce	HLEM
21	EN	Dunn, G.	Bryce	P, till Samp
22	EN	Gereghty, G.	Bryce	OPAP - Mag, VLF
23	EN	Gondor & Atkins	Bryce, Robillard	OPAP - P, Samp
24	EN	Arriscraft Corp.	Earlton area	RS (limestone)

TABLE CO-3 (continued)

NO.	AREA	COMPANY / INDIVIDUAL	TOWNSHIP(S)	EXPLORATION WORK
25	EN	Marshal, F.	Ingram	1 DDH (1214 ft)
26	EN	Joutel Resources	Pense	1 DDH (approx. 500 ft)
27	EN	Tyranex Gold Inc.	Pense	Rd, HLEM, Mag, 3 DDH
28	EN	Martin, Harlan & Lawrence	Robillard	Tr
29	EN	Dunn & Korba	Tudhope	OPAP - P, Str, Tr, HLEM
30	EN	Pelangio Larder M.L.	Tudhope	Mag
31	GE	Morris & Pinkerton	Farr	P, Samp
32	NB	Central Ontario Natural Stone	Clarkson	Ind, Rd, Samp, quarry initiated
33	NB	Komarechka, R.	Mattawan	Samp
34	NB	Komarechka, R.	Parkman	Samp
35	NB	Komarechka, R.	Poitras	GL, Samp
36	NB	Thorne Brilliant Stone Quarry	Poitras	Rd, Samp
37	NB	Lashbrook, R.	Stewart	Ind, Samp
38	ST	Asquith Res.	Amyot, Sheared	GL, Samp, P
39	ST	Annett, R.	Asquith	OPAP - 2 DDH
40	ST	Ferderber, H.	Asquith	OPAP - P, GL
41	ST	Asquith Res.	Browning	P, Str
42	ST	Jumping Mouse Syndicate	Burrows	10 DDH (500m)
43	ST	Tittley, H.	Burrows	OPAP - P, GL, GP
44	ST	Falconbridge Ltd.	Burrows, Kemp	P, GC, GP
45	ST	Campbell, R.	Cabot	OPAP - VLF, Mag, P, GL
46	ST	Jonpol Res.	Cabot	IP, Str, Tr, SA
47	ST	Parres, J.	Churchill	VLF
48	ST	Ferderber, R.	Connaught	OPAP - P, SA, GL, GP
49	ST	Mullan, G.	Connaught	OPAP - P, SA, GL, GP
50	ST	Noranda Expl.	Connaught	DD, Tr, Rd, GP
51	ST	Asquith Res.	Duffrin	P, Str
52	ST	Forbes, C. / Premier Res.	Fawcett	OPAP - 2 DDH
53	ST	INCO Ltd.	Fawcett	Comp
54	ST	Rapski, J.	Fawcett	VLF
55	ST	Royal Oak Mines Inc.	Fawcett, Asquith	GL
56	ST	Garvey, R.	Fawcett, MacMurchy	OPAP - GP, P
57	ST	Donovan, P.	Leonard	OPAP - P, Str, SA
58	ST	LaCarte & MacCallum	Leonard	P
59	ST	Pilger, Pilger & Pilger	Leonard	Rd
60	ST	Decker, A.	MacMurchy	Str
61	ST	Watts, H.	MacMurchy	OPAP - GP, P
62	ST	Whelan, J.	MacMurchy	OPAP - P, Tr, Mag, VLF, Blast
63	ST	Annett, R.	MacMurchy, Fawcett	VLF, Mag
64	ST	Tindale, J.	MacMurchy, Fawcett	OPAP - P, VLF, Mag, 1 DDH (254 ft)
65	ST	Asquith Res.	North Williams	P, Str
66	ST	Komarechka, R.	Tyrell	Mag, HLEM
67	ST	LaCarte & MacCallum	Tyrell	Str, Tr, DD
68	ST	Londry & Mullan	Tyrell, MacMurchy	OPAP - GC
69	TE	Beecham, A.	Best	OPAP - P, GC, GL, Tr
70	TE	Chitaroni, G.	Best	OPAP - Str, GL, GP
71	TE	McClemens, A.	Best	OPAP - Str, GP, GC, Beep
72	TE	Tanney, B.	Best	P
73	TE	Larond, D.	Cassels	P, GP, Samp
74	TE	Forster, J.	Milne	P, Ind
75	TE	Blake, F.	Strathy	Tr, Blast
76	TE	Goddard, D.	Strathy	OPAP - P, Samp
77	TE	Granges Inc.	Strathy	GL, Str
78	TE	Westin, B.	Strathy	Mag, VLF, Tr, Samp
79	TE	Falconbridge Ltd.	Strathy, Cassels	GL, PEM,
80	TE	Fisher, P.	Strathy, Lutterworth	OPAP - P, GL, GP, STR
81	TE	Falconbridge Ltd.	Temagami area	AGP, GL, GC

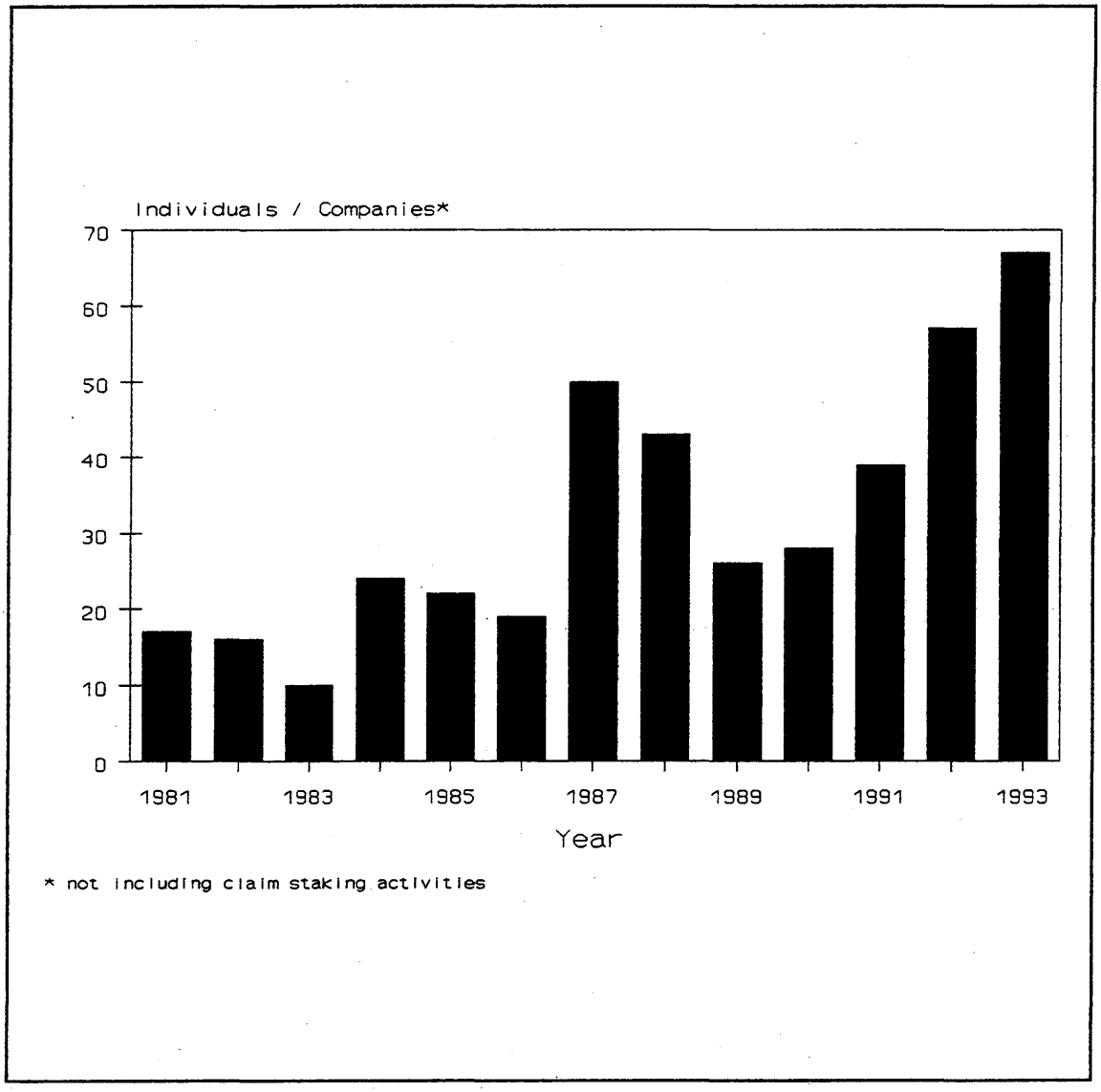


Figure CO-4 Exploration activity in the Cobalt Resident Geologist's District.

TABLE CO-4 Assessment Reports Received at the Cobalt Resident Geologist's Office - 1993

ABBREVIATIONS LIST FOR THE COBALT R. G. O.

AEM	Airborne electromagnetic survey	Man	Manual surface work
AGP	Airborne geophysical survey	Mag	Ground magnetometer survey
AGR	Airborne gravity survey	Met	Metallurgical testing
AMG	Airborne magnetic survey	Micro	Microscopic studies
ARA	Airborne radiometric survey	OC	Open cut
ARES	Airborne resistivity survey	OMIP	Ontario Mining Incentive Program
AVLF	Airborne VLF-EM survey	OPAP	Ontario Prospectors Assistance Program
Airphoto	Aerial imagery interpretation	P	Prospecting
AS	Assaying and analysis	PEM	Pulse electromagnetic survey
AD	Auger drilling in overburden	PD	Percussion drilling
Beep	Beep Mat survey	Pit	Pitting activities
Blast	Surface blasting	Rad	Ground radiometric survey
Bulk	Bulk sampling	R/C	Reverse circulation drilling
Comp	Compilation studies	Rd	Road, trail or access construction
DD	Diamond drilling	Rehab	Rehabilitation work
DDH	Diamond drill hole	Remote	Remote imagery interpretation
DGP	Downhole geophysics	Res	Ground resistivity survey
DPEM	Downhole pulse EM survey	RS	Regional survey
Dewater	Dewatering U/G workings	SA	Surface assaying
Dig	Digitization of base maps	Samp	Sampling
EM	Electromagnetic survey	SD	Sonic drilling
Env	Environmental studies	Seis	Seismic survey
GC	Geochemical survey	SP	Self potential survey
GL	Geological survey	S/S	Shaft sinking
GP	Geophysical survey	Str	Stripping activities
Grav	Ground gravity survey	Tr	Trenching activities
Grid	Control grid establishment	U/G	Underground development
HLEM	Horizontal-loop EM survey	U/WGP	Underwater geophysics
Ind	Industrial mineral testing & marketing	UTEM	University of Toronto EM survey
IP	Induced polarization survey	VLEM	Vertical-loop EM survey
Line	Linecutting activities	VLF	Very low frequency EM survey

LOCATION	FILE NAME	COMMODITY	RPT. TYPE	WORK PERFORMED	WORK DATE	FILE NO. (S)	
ASQUITH	ASQUITH RES. LTD. / ASARCO	AU	ASSESS	P, GL, GC, Str, SA, Mag	1990		63.6156
ASQUITH	JAYDEEMAR EXPLORATION LTD	AU	ASSESS	P, SA, 4 DDH(396.4')	1991-1992	2.14839	-
ASQUITH	STRIKE MIN. & T & H RES.	BM	ASSESS	Mag, HLEM, PEM	1992	2.14757	
AULD	WELSH SILVER PROP.	AG	DONATED	GL	1961		
BEAUCHAMP	CHITARONI, GINO	BM	ASSESS	AMG, AVLF	1992	2.14771	
BEST	CHITARONI, GINO	BM	ASSESS	AMG, AVLF	1992	2.14778	
BRYCE	MORRIS, EWANCHUCK&SWANSON	AU	ASSESS	GL, VLF, GC, Tr, Str, SA	1992	2.14864	
BRYCE, TUDHOPE	EWANCHUCK & SWANSON	AU	ASSESS	GP, GL, Tr, 3 DDH(603')	1991	2.15136	63.6256
BUCKE	COBALT CONTACT MINES	AG	DONATED	GL	1993		
BUCKE	COB-SIL ORE MINES	AG	DONATED	GL	1951		
BUCKE	EDWARDS & WRIGHTS		DONATED	GL			
BUCKE	FALCONBRIDGE LTD.		ASSESS	1 DDH (129.84m)	1989		
BUCKE	JOHNSON CLAIM GROUP	AG	DONATED	DD	1957-1961		
BURROWS	COMINCO LTD.	BM	ASSESS	Mag, HLEM	1991	2.14722	
BURROWS	TITTLEY, H.Z.	AU, BM	ASSESS	Mag, IP, SP, GL, Str, P	1991-1993	2.15084	
BURROWS et al	FALCONBRIDGE LTD.	CO, AG, NI, BM	ASSESS	GC	1993	2.15023	
CABOT	MULLAN & OBRADOVICH	BM	ASSESS	Mag, VLF, GL	1992	2.14863	
CABOT	POLLOCK, JOHN A.	AU, BM	ASSESS	Str, Tr, Samp	1993		
CHURCHILL	MULLAN, GLENN J.	BM	ASSESS	Mag, VLF, GL, HLEM, P	1992	2.1478	
CHURCHILL	PARRES, JAMES R.B.	AU, BM	ASSESS	VLF	1993	2.15081	
CHURCHILL et al	SUCHANEK, CHRIS	AU, BM	ASSESS	RS(GL), P	1991		63.6273
COLEMAN	BRADY LAKE MINES		DONATED	GL			
COLEMAN	FALCONBRIDGE LTD.	AU, AG. CU, PB	ASSESS	5 DDH (2,409.15m)	1993		
COLEMAN	LUCKY CREEK MINING CO.	AG	DONATED	GL	1956		

TABLE CO-4 (continued)

LOCATION	FILE NAME	COMMODITY	RPT. TYPE	WORK PERFORMED	WORK DATE	FILE NO. (S)	
COLEMAN	MENSILVO MINES	AG	DONATED	GL	1953		
COLEMAN	PENN-LAKE MINE, GLEN LAKE	AG	DONATED	GL	1963		
COLEMAN	SILVER BANNER MINE	AG	DONATED	GL	1956		
COLEMAN, GILLIES LT	GLEN LAKE SILVER MINES	AG	DONATED	GL	1963		
COLEMAN, GILLIES LT	HIHO SILVER MINES	AG	DONATED	GL	1965		
COLEMAN, LORRAIN	BRADY CROSS LAKE SILVER	AG	DONATED	GL	1968		
CONNAUGHT	COPPERQUEST / NORANDA	BM	ASSESS	IP	1992	2.14811	
CONNAUGHT	NORANDA EXPL. CO. LTD.	AU, BM	ASSESS	1 DDH (236.5m)	1993		
DUFFERIN	ANNETT, ROY	BM	ASSESS	GL, Mag, VLF	1992	2.14725	
FARR	MOREAU, LEON	AG, AU	ASSESS	Str	1991		
FARR	TIARA MINES LTD.	AG	DONATED	GL, DD	1955		
FAWCETT	INCO LTD.	BM	ASSESS	GL, GP, DPEM, DD, GC	1991-1993	2.15152	
FAWCETT	MULLAN, GLENN J.	AU, BM	ASSESS	GL, Mag, VLF	1992	2.15034	
FAWCETT	RAPSKI, JOHN P.	CU, NI	ASSESS	VLF	1993	2.15035	
FIRSTBROOK	BENNER, R.	AG	DONATED	DD	1951-1983		
GILLIES LIMIT	ARMSTRONG, M. & WATTS, G.	AG	DONATED	GL	1962		
GILLIES LIMIT	COPPER-MAN MINES LTD.	AG	DONATED	GL	1963		
GILLIES LIMIT	CUNNINGHAM, L.	AG	DONATED	GL	1961		
GILLIES LIMIT	HIHO SILVER MINES	AG	DONATED	GL	1963-1965		
GILLIES LIMIT	RYERSON MINING & DEV.	AG	DONATED	GL	1968		
GILLIES LIMIT	RYERSON MINING & DEV. LTD	AG	DONATED	GL	1965-1967		
GILLIES LIMIT	TALENT SILVER MINES	AG	DONATED	GL	1955		
GILLIES LIMIT	WILLIAMSON PROP.	AG	DONATED	DD	1965-1966		
COLEMAN, GILLIES LT	CUNNINGHAM, L.	AG	DONATED	GL	1961		
INGRAM	MARSHALL, FOSTER	BM	ASSESS	1DDH (330')	1991		63.6268
INGRAM	MARSHALL, FOSTER	BM	ASSESS	2 DDH (899')	1992		
JAMES, TUDHOPE	OBRADOVICH, TOM	AU	ASSESS	AMG, AVLF	1991	2.14170	
JOAN	JOAN TEMAGAMI ML	AG	DONATED	GL	1956		
KELVIN	MULLAN & OBRADOVICH	AU, BM	ASSESS	GL, P, Mag, VLF	1992	2.14797	
KELVIN	TINDALE, JOHN L.	BM	ASSESS	GL, HLEM	1992	2.14857	
KELVIN	TINDALE, J.L.	BM	ASSESS	1 DDH (298 FT)	1992		
KEMP	NORANDA EXPL. CO. LTD.	BM	ASSESS	Mag, HLEM	1992	2.1487	
LEONARD	DONOVAN & INGNAM	AG, BM	ASSESS	Mag, VLF, GL	1992	2.1499	
LORRAIN	ALCOURT MINES LTD.	AG	DONATED	GL	1963		
LORRAIN	LAKE LORRAIN MINE	AG	DONATED	GL	1963		
LORRAIN	MARCH MINERALS LTD.	AG	DONATED	GL	1964		
LORRAIN	NASCO SILVER MINES LTD.	AG	DONATED	GL	1965		
MACMURCHY	OBRADOVICH, TOM	AU	ASSESS	AMG, AVLF, VLF, Mag, P	1991	2.14171	63.6259
MACMURCHY, FAWCETT	ANNETT, ROY		ASSESS	VLF, Mag	1993	2.15014	63.2846
MACMURCHY, TYRRELL	LONDRY & MULLEN	AU	ASSESS	GC	1993	2.15089	
MACMURCHY, TYRRELL	MULLEN, DAVID V.	AU	ASSESS	P, Samp	1990	2.14145	
MCAUSLAN	PILGER, JOHN	IND	ASSESS	RS(GL)	1992	2.15064	
NATAL	CLARK, A. JENNIFER	AU	ASSESS	GP, GL, GC, DD, Str	1991-1992		63.6253
NATAL	CLARK, E.	AU, BM	ASSESS	GL, Mag, VLF	1991	2.14769	
NICOL	CONS. MORRISON EXPL.	AG	DONATED	GL	1980		
NICOL	SILVER BAR MINES	AG	DONATED	GL	1955		
PENSE et al	ELLGRIN, F.H.	BM, AG	ASSESS	GC, VLEM, Grav, VLF, P	1991		63.6276
ROBBILARD	MARTIN, HARLAN & LAWRENCE	BM, AG	ASSESS	Tr	1993		
SMYTH	DEMERS, J.	AG	DONATED	GL	1953		
SOUTH LORRAIN	CHITARONI, ALBERT	BM	ASSESS	5 DDH (275'), P	1992		
SOUTH LORRAIN	CHITARONI, ALBERT	BM	ASSESS	AMG, AVLF	1992	2.14818	
SOUTH LORRAIN	CUNNINGHAM, L.		DONATED	GL	1968-1983		
SOUTH LORRAIN	GORE, JOHN A.	AG, BM	ASSESS	DD, P, TR	1992		
SOUTH LORRAIN	MILLERFIELDS SILVER CORP.	AG	DONATED	GL	1966		
SOUTH LORRAIN	NEWCO SILVER MINES LTD.	AG	DONATED	GL	1965		
SOUTH LORRAIN	NEWCO SILVER MINES LTD.	AG	DONATED	GL	1965		
SOUTH LORRAIN	NOCANA MINES	AG	DONATED	GL	1963		
SOUTH LORRAIN	PENNAQUE PROPERTY	AG	DONATED	GL	1987		
SOUTH LORRAIN	PRICE-BRADLEY (BULLDOG)	AG	DONATED	GL	1968		
SOUTH LORRAIN	SILVER BELLE MINES	AG	DONATED	GL	1963		
SOUTH LORRAIN	SILVER TOWER MINES LTD.	AG	DONATED	GL	1965-1966		
STRATHY	WEBSTER, JAMIESON&JAMIESON	AU, BM	ASSESS	GL, Mag, VLF, IP	1992-1993	2.15017	
STRATHY	WESTIN, BJARNE R.	AU	ASSESS	Mag, VLF, GC, P	1993	2.14974	
STRATHY, CASSELS	FALCONBRIDGE LTD.	AU, AG, BM	ASSESS	GL, PEM,	1993	2.15112	
TUDHOPE	DUNN, GARY C.	AU	ASSESS	VLF, P	1991		
TUDHOPE	EWANCHUCK, SWANSON&MORRIS	AU	ASSESS	GL, GP, GC, 5 DDH(777')	1992	2.14859	
TUDHOPE	KORBA, EDWARD, J.	AU	ASSESS	GL, P	1991		63.6206
TUDHOPE	PELANGIO LARDER M.L.	AU, BM	ASSESS	Mag	1993	2.14983	
TYRRELL	KOMARECHKA, ROBERT G.	AU, BM	ASSESS	Mag, HLEM	1992-1993	2.14998	
TYRRELL	LACARTE & MACCALLUM	AU	ASSESS	DDH (320')	1992		

35 townships 75 ind./companies 95 reports

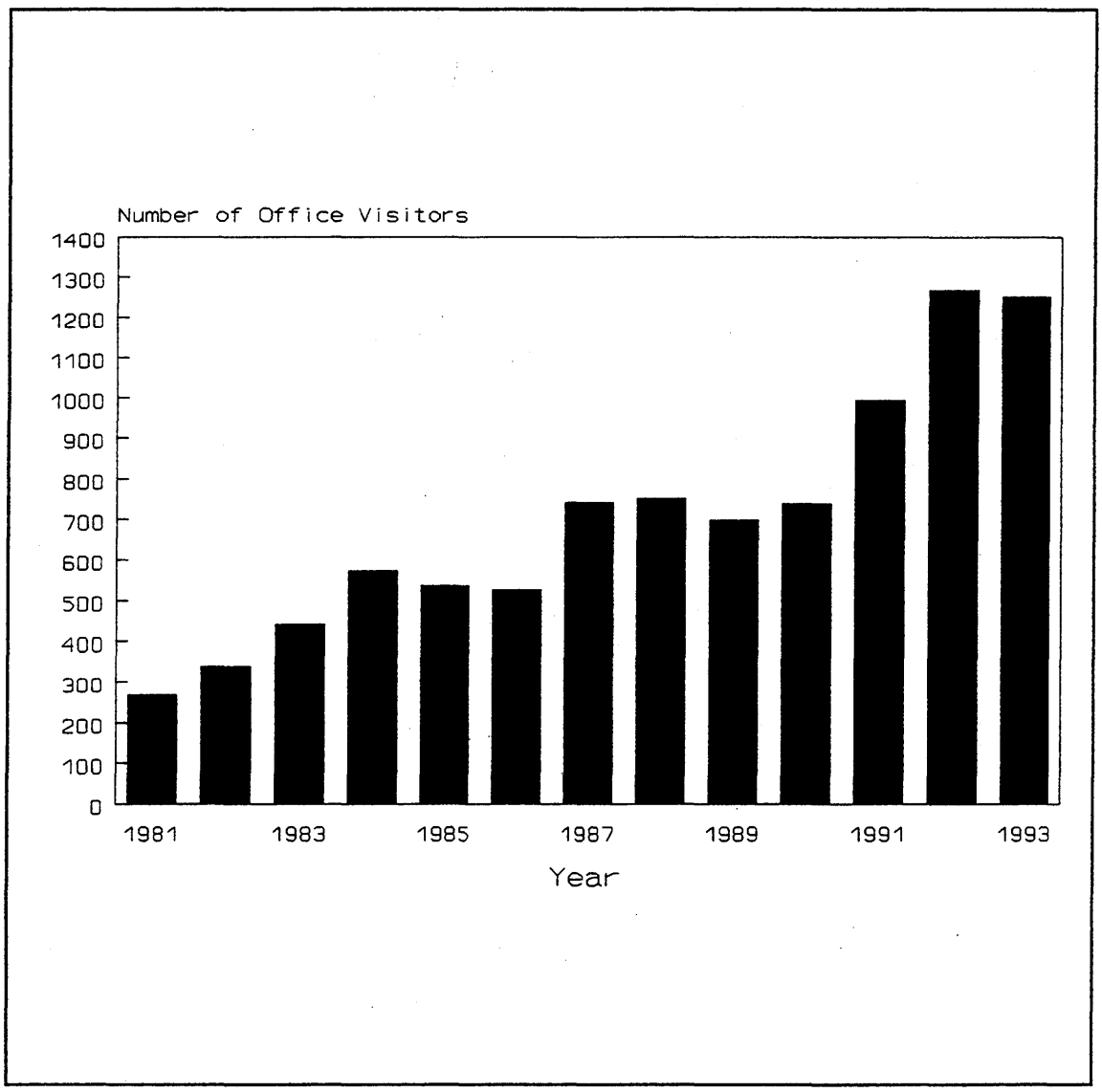


Figure CO-5 Client services - number of visitors to the Cobalt Resident Geologist's office.

for diatreme models. Some workers in the diamond exploration field, however, have proposed that the contacts to bodies such as the Nipissing Diabase sills may prove to be fruitful in locating additional kimberlite bodies. This may be due to the migration of diabase and kimberlite magma along common conduits, at mid-crustal depths, or, minor deflection of kimberlite emplacement by massive diabase bodies to external boundaries. (K.Barron, personal communications)

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THE SAULT STE. MARIE RESIDENT GEOLOGIST'S DISTRICT - 1993

G. Bennett(1), E. J. Leahy(2), Ann Wilson(3)

1. Resident Geologist, Sault Ste. Marie, Ontario Geological Survey
2. Staff Geologist, Sault Ste. Marie, Ontario Geological Survey. Staff Geologist, London, Ontario Geological Survey

INTRODUCTION

The Sault Ste. Marie Mining Division had no mine closures in 1993. However the generally poor performance of most sectors of the economy in general led to declining Ontario Government revenues which resulted in retrenchment in other areas.

In April, the Ministry of Northern Development and Mines Elliot Lake office was closed and in June budget reductions led to the announcement that the Wawa Resident Geologist's office would be closed in December and also that the staff of the Sault Ste. Marie Drill Core Library would be laid off in November. As a result of these cut-backs the Resident Geologist's Office staff for the Sault Ste. Marie Mining Division has been reduced to three from a total of nine permanent staff in 1991.

Not all news was bad however. There were continuing reports of a potentially important gold discovery being explored by Hemlo Gold Mines Limited on the east shore of Dayohessarah Lake in Hambleton Township. In December, 1993, the Ontario Geological Survey released information regarding the discovery of alluvial diamonds near Wawa. Claim

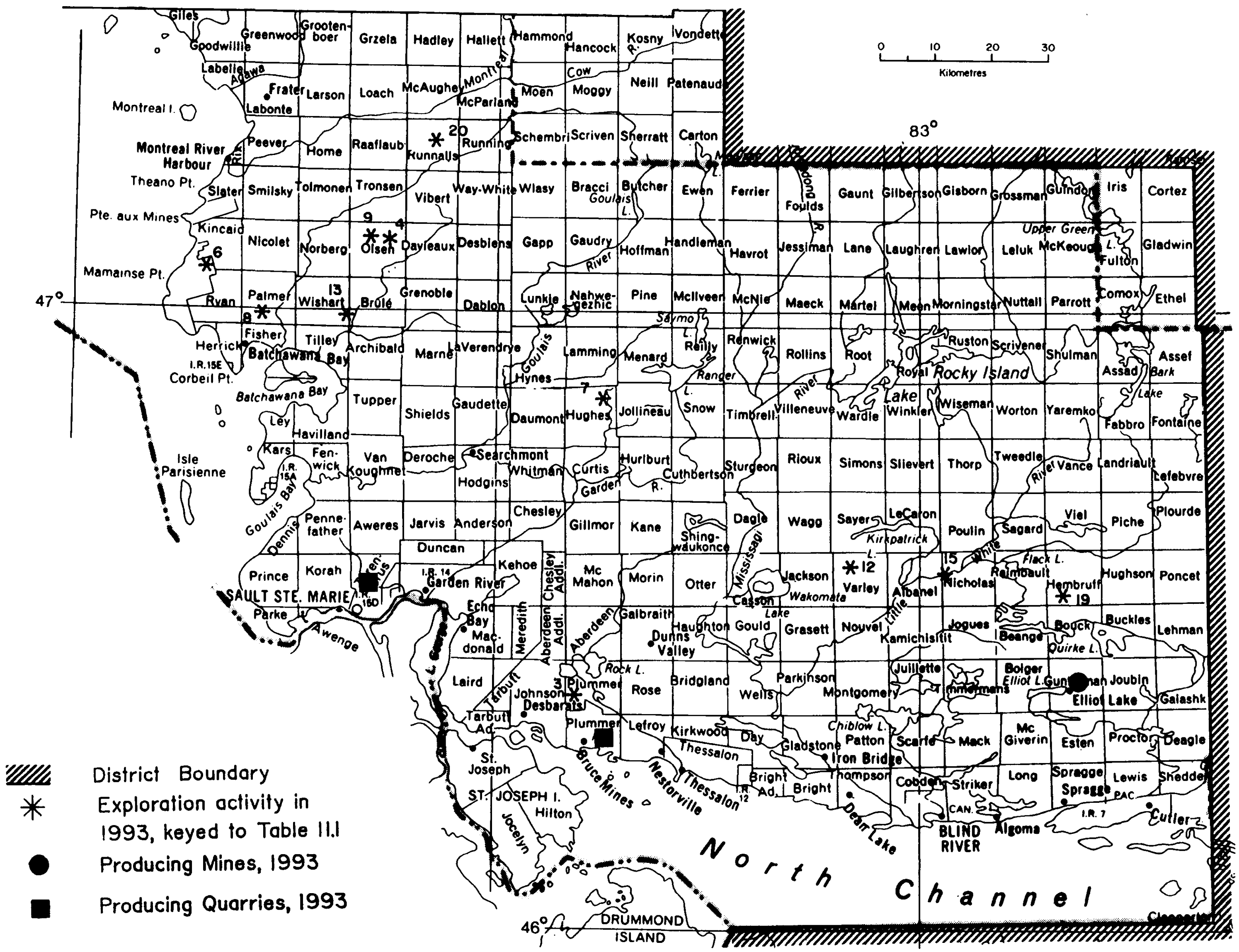


FIGURE 1a: Sault Ste. Marie Resident Geologist's District

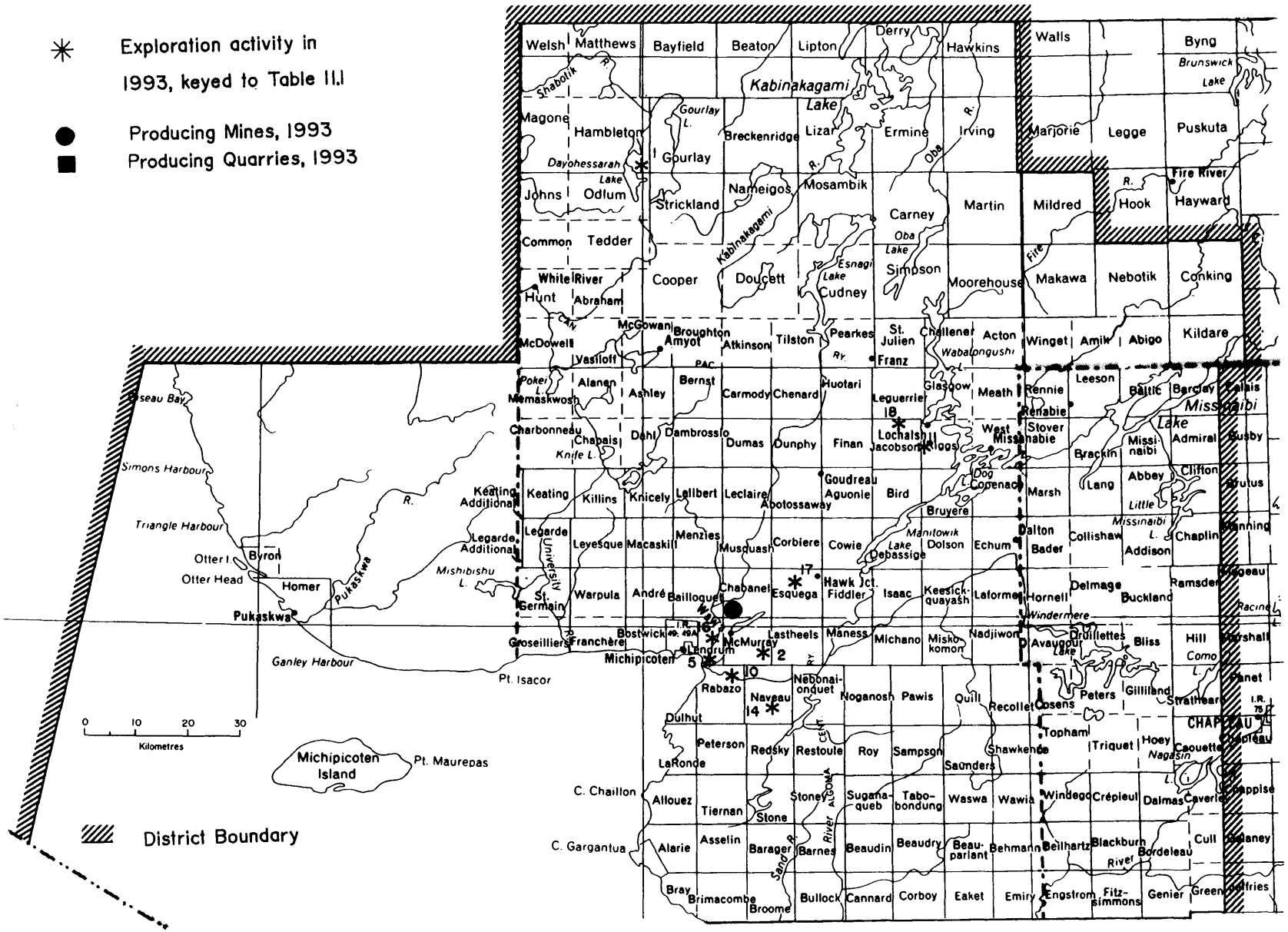


FIGURE 1b: Sault Ste. Marie Resident Geolo st's District

staking activity in the Sault Ste. Marie Mining Division increased significantly from the 1992 level.

MINING ACTIVITY

Algoma Ore Division

The Algoma Ore Division of the Algoma Steel Corporation continued mining siderite iron ore at the George W. MacLeod Mine at Wawa in 1993.

The 1993 operation was unique in that a fluxed sinter was produced for Algoma Steel and tolled sinter was produced for three U.S. steel companies. A summary of 1993 operations is given below:

	gross tons
Total sinter produced	1,094,936
Superfluxed sinter	790,711
Low flux sinter - ASI	100,525
Tolled sinter	203,700

Raw Materials Used

Siderite (from MacLeod Mine)	875,649
Limestone	255,090
Reverts/oxides	454,370
Subgrade fines	13,174

The average mine ore was 34.89 percent Fe and 8.12 percent SiO2

Total Tons Blasted	626,755
Long hole drilling	137,009 feet
Total drifting	4,088 feet
Total raising	631 feet

(A.L. Stevens, Mine Manager, G.W. MacLeod Mine. personal communication, January 1994).

Rio Algom Limited

The remaining uranium mine in the Elliot Lake camp is the Stanleigh Mine of Rio Algom Limited. The Stanleigh Mine is scheduled to cease production in 1996 when the contract to supply U3O8 to Ontario Hydro is fulfilled.

During 1993, the Stanleigh Mine milled 1,005,240 tons of ore which yielded 1,817,948 lbs of U3O8.

About 75 percent of the ore was mined between the 3,000 and 3,500 foot levels heading to the east. Most ore was extracted from the main reef with minor ore from the lower reef.

The eastern ore boundary on the 3,000 - 3,500 level has been determined. On the west side, mining took place in Stanleigh reserves up to the property boundary of Geomaque Explorations Limited. (R. Henderson, Rio Algom Mines Limited, personal communication, January 1993).

ONTARIO TRAP ROCK LIMITED

Ontario Trap Rock Limited commenced its fourth year of quarrying operations at Bruce Mines in April, 1993. The material quarried is Nipissing diabase, often referred to as trap rock. Sales in 1993 totalled over 300,000 tons.

During 1993, staffing at office and quarry, including full and part-time people, varied from 20 to 35. Products produced included material for railway ballast, rock wool insulation production, filter bed stone, armour stone, road surfacing, and landscaping. As required, products are transported by truck, rail or water.

Ontario Trap Rock Limited is a Canadian corporation with both Canadian and American participation. James Bourque of Sault Ste. Marie, Michigan, is President; B. Hamilton of Bruce Mines is General Manager; D. Smith of Sault Ste. Marie, Michigan, is Marketing Co-ordinator.

ROOT RIVER SANDSTONE QUARRY

During 1993, E. Kosiba, operator of the Root River Sandstone Quarry in the City of Sault Ste. Marie, continued to supply local demand for red Jacobsville sandstone. Most of this was used for fireplace construction and landscaping. In May, the Staff Geologist and Danielle Spethmann, an Industrial Minerals Research Assistant with the Ministry of Northern Development and Mines, were given a tour of the operation by Mr. Kosiba. At this time two workmen were preparing slabs which were loaded to four feet high on pallets measuring 3 feet by 4 feet. On the property there is a previous quarrying site, probably operated about fifty years ago.

EXPLORATION ACTIVITY

The number of exploration projects undertaken in the Sault Ste. Marie Mining Division in

1993 was down significantly from the number reported in 1993; however the number of claim units recorded in the Sault Ste. Marie Mining Division in 1993 was double that in 1992 (1657 claim units vs. 816 claim units in 1992).

There were 11 OPAP grants with a total value of $96,400 provided to prospectors in the Sault Ste. Marie Mining Division in 1993. The location of the following exploration projects is keyed to Figure 1.

Akiko Gold Resources Limited, Gold Giant Minerals Inc. (1) The legal dispute over the claim ownership of the Dayohessarah Lake area (White River project) was settled in the spring of 1993. (The Northern Miner, April 26, 1993, p.3). Gold Giant Minerals and Akiko Gold Resources have an option to acquire the claims subject to the right of Hemlo Gold Mines Limited (45.3 % owned by Noranda Inc.) to earn a 50% interest by spending $500 000, and making cash payments of $250 000 to the staking group.

The property is underlain by a sequence of deformed pillowed metavolcanic flows, mafic metavolcanic tuffs and 3.5 m wide quartz porphyry sills. All rock units are crosscut by late northwest-trending diabase dikes.

The rocks have been metamorphosed to upper greenschist and lower amphibolite grade.

The main showing consists of a 200 m wide, northwest-trending deformation zone that has been traced along strike for over 600 m. Some reports indicate that the zone can be traced for over 1 km along strike. The deformation zone is strongly altered to sericite and chlorite.

Quartz veins, up to 40 cm wide contain up to 10% sulphides and some visible gold. Mineralization consists of 5% pyrite, 2-3% galena, trace molybdenite, arsenopyrite, chalcopyrite and fuchsite. The mineralization occurs along foliation planes, within fracture patterns and within shear zones defined by sericite alteration. Angular, quartz-rich boulders

containing pyrite, arsenopyrite, molybdenite, galena and fuchsite have been traced in a northwest trend approximately 500 m southwest of the exposed vein mineralization.

Gold values ranging from 0.2 oz Au/t over 15 m to 0.76 oz Au/t over 24 m have been returned from the property. Assays up to 13 oz Au/t also have been reported from grab samples.

Hemlo Gold Mines Limited has moved a drill onto the site preparatory to beginning an extensive exploration program. Hemlo Gold Mines presumably will not start their drilling program until mid-June.

Prior to this discovery, no significant mineralization had been reported in the Dayohessarah Lake greenstone belt. Similarities between the geology of the Hemlo greenstone belt and the Dayohessarah Lake belt exist, although the nature of the relationship between the two has yet to be investigated.

The Northern Miner of November 15, 1993 reported that the first phase of a drilling program by Hemlo Gold Mines Limited intersected 0.5 oz. Au per ton over 12.5 feet. The first phase of drilling was comprised of six holes totalling 2,624 feet. The first phase of drilling was intended to test the Sugar Zone to a depth of 100 m over a 900 m strike length (Canada Stockwatch, January, 18, 1994). The second phase of drilling began in mid-January, 1994 (The Marathon Mercury, Jan. 15, 1994).

Joan Barry (2)

Joan Barry of Wawa holds 7 unpatented claims which include the Golden Reed prospect in McMurray Township, Wawa. In 1993 Ms. Barry conducted line cutting, geological mapping and diamond drilling (one hole of 262 feet) on the Golden Reed gold prospect in McMurray. The work was funded by OPAP.

BHCM Explorations Inc. (3)

BHCM Explorations Inc., a newly formed company out of Bruce Mines, has been investigating the building and decorative stone potential of some of the various coloured sedimentary rocks of the Huronian Supergroup to be found along the north shore of Lake Huron area. Of particular interest has been the purple quartzites and red and white jasper conglomerate of the Lorrain Formation (Al Brown, personal communication, January 1994).

Ronald Bridge (4)

Ronald Bridge cut grid lines followed by a scintillometer survey on his eight claim unit gold prospect in Olsen Township (R. Bridge, personal communication, January 1994).

C. Clement (5)

Mr. C. (Mickey) Clement of Wawa completed one drill hole on his two claims adjacent to Highway 17 in southeast Lendrum Township about 5 km south of Wawa. One drill hole drilled in the fall of 1993 intersected a 42.3 foot wide zone of sheared quartz veining. The gold bearing zone found in 1991 drilling was not intersected. This work was funded under OPAP. (undated summary report by S. Sears, Consulting Geologist, Wawa, 1994).

F. Doran (6)

F. Doran staked several claims over an area of "daisy stone", a glomeroporphyritic basalt, in Kincaid Township and presented the property to interested parties. He is also working on a copper occurrence in the McDonell Mining Location and a copper/cobalt showing in Palmer Township (F. Doran, personal communication, January 1994)

Dennis Fleming, Yves Desjardins and T. Fleming (7)

Dennis Fleming, Yves Desjardins and T. Fleming with OPAP financial assistance, continued the work of stripping, trenching and sampling on their Cu, Ag, Zn, Bi property in Hughes Township. This property was visited by representatives from Noranda and Cominco Ltd. in 1993 (D. Fleming, personal communication, January 1994).

Frank Longpre (8)

Frank Longpre undertook prospecting, line cutting, geological mapping, sampling and assaying on his gold prospect in Palmer Township (F. Longpre, personal communication, 1993).

Ivan Murphy, Elwood Goodmurphy (9)

During 1993, Ivan Murphy and Elwood Goodmurphy undertook line cutting followed by an E.M. and Magnetometer Survey of 13 claims on their gold prospect in Olsen Township (I. Murphy, personal communication, January 1994).

Monk Gold and Resources Limited (10)

Monk Gold and Resources Limited holds 46 claims in Rabazo Township. Considerable surface exploration and drilling has been done on this property since 1983. During January and March 1993, a secondary ramp using the east drift was extended approximately 50 m about 6 m under the main drifting. (Seymour Sears, Consulting Geologist, Wawa, personal communication, 1994).

Noranda Exploration Company Limited (11)

By March 1993, Noranda Exploration Company Limited had completed a drilling program on a 43 claim group optioned from Vega Explorations Limited in the Godin Lake area, Jacobson Township. The drill program was designed to test the proposed existence of a continuous gold bearing zone which includes the previously known Laughlin, McColl, Three-Mile Post and Archibald gold occurrences.

U. Pellerin (12)

U. Pellerin undertook additional prospecting, stripping, and trenching along with sampling and assaying on his copper occurrence in Varley Township (U. Pellerin, personal communication, January 1994).

N. Pipoli, J. Ralph (13)

Nick Pipoli and Jim Ralph did some preliminary prospecting, sampling and assaying on their copper property in Wishart Township. This is the former Caputo-Just property. Pipoli and partners also entered into an option agreement with a Quebec based group, Serge Lavoir and Company, on their 32 claim gold prospect in Palmer Township (J. Ralph, personal communication, January 1994).

Reed Lake Explorations Limited (14)

According to the terms of an agreement with the Algoma Central Railway, Reed Lake Explorations Limited has the mineral rights to all ACR controlled land in Naveau Township. In 1993 Reed Lake Explorations Limited explored an area around Two Mile Lake in Naveau Township approximately 15 km southeast of Wawa.

The work was done to evaluate the potential of a deformation zone and included 22 km of line cutting over two areas where anomalous gold values were discovered during a reconnaissance survey performed in 1992. Ground magnetometer and electromagnetic (VLF) surveys, geological mapping, soil geochemical sampling, mechanical stripping, channel sampling and prospecting were carried out over the two areas. A quartz-ankerite zone with the West Grid gold occurrence is reported to be controlled by a complex fold system. The deformation zone around this fold system was traced for four kilometres in a southeastward direction.

Additional work was done on a quartz stockwork within a quartz porphyry body identified in 1992. (personal communication and unpublished summary reports provided by S. Sears, Sears-Barry Associated, Wawa, G. Babcock, President, Reed Lake Explorations Limited, 1994)

A. Roy (15)

Art Roy holds about 100 claims in three groups in Albanel and Nicholas Townships where good copper values over interesting lengths and widths have been obtained. Work in 1993 included trenching, sampling and assaying plus additional staking (A. Roy, personal communication, January 1994).

S. Sears (16)

Seymour Sears of Wawa holds a 6 claim property near Trembley Siding, Lendrum Township. Ground magnetometer and electromagnetic and geological surveys were conducted over the property in 1993 in an attempt to locate a reported gold occurrence in the area.

Sediment sampling for kimberlite indicator minerals was also done in the fall of 1994. A summary report by Mr. Sears dated January 1994, states that several areas containing possible chrome diopside were identified. Microprobe analysis is planned to verify the identification. The work was supported by OPAP funding.

Soocana Explorations Limited(17)

Soocana Explorations Limited holds the mineral rights to most of Esquega Township under an agreement with the Algoma Central Railway Limited.

The purpose of Soocana's 1993 work in Esquega Township focused on evaluating the Rooster Lake base metal/gold occurrence and the Bukell Copper occurrence. A total of 24 km of line cutting was done along with ground magnetometer and VLF electromagnetic and TX-27 electromagnetic surveys. Geological mapping, prospecting, mechanical stripping, sampling and assaying was also completed.

It was determined that the zinc, lead and gold mineralization at the Rooster Lake showing was associated with the sheared contact between a quartz porphyry and felsic volcanics. However, a gossan zone over four feet thick prevented effective sampling of the mineralization.

The Bukell Copper/Silver zone was traced over a distance of 1200 m. A press release by Soocana Explorations Limited reported that grab samples from the Bukell showing assayed in excess of 2 percent Cu and 1 ounce of silver per ton. A new occurrence at the northern end of the Bukell zone contained in excess of 2 percent copper, 24 grams of silver and 852 ppb gold per ton.

Soocana is also planning an exploration program for diamonds on the property. Sixteen kimberlite targets have been identified from geophysical data. (Press release provided by S. Sears, Soocana Explorations Limited, personal communication, January 1994).

Spirit Lake Explorations Limited (18)

Spirit Lake Explorations Limited completed a 3000 foot diamond drill program on the Edward's property, a minor past producer in Jacobson Township. The drill program was designed to test high-grade gold mineralization in the New North and Shaynee Zones. These zones lie to the west and east, respectively, of the Porphyry and Carbonate Zones which are the main mineralized zones. This project was funded by the Ontario Mineral Incentives Program.

A. Tims (19)

A. Tims continued detailed prospecting on his claim group in Hembruff Township in the Ompa Lake greenstone belt (A. Tims, personal communication, January 1994).

Tri Origin Explorations Limited (20)

In 1993, Tri Origin Exploration Limited undertook a twelve hole diamond drilling program on its 120 claim gold property in Runnalls Township in the north central part of the Batchawana greenstone belt. This was followed by some down-hole electromagnetic surveys. Anomalous gold values were reported - Hole 15 intersecting a 24 metre-thick pyritic zone with gold values up to 1.94 grams per tonne. A 1990 drill hole on the property intersected 7.2 grams Au over 0.7 m (Northern Miner, October 25, 1993). Follow up drilling is planned

Table 1. Exploration Activity Sault Ste. Marie Resident Geologist's Office

No	Company/Individual (Property Name)	Township	Exploration
1.	Akiko Gold Resources Ltd., Gold Giant Mins. Ltd.	Hambleton, Odlum Twps. (Au)	stripping, sampling, drilling
2.	Barry, Joan	McMurray Twp. (Au)	Mapping, sampling, drilling
3.	BHCM Explorations Inc.	North Shore of L. Huron (stone)	Prospecting
4.	Bridge, Ronald	Olsen Twp.(Au)	Scintillometer survey
5.	Clement, C.	Lendrum Twp. (Au, diamonds)	Drilling, panning, assaying
6.	Doran, F.	Kincaid, Palmer, McDonell Mining. Loc. (stone)	Prospecting
7.	Fleming, D, Desjardins, Y., and Fleming, T.	Hughes Twp ((Cu, Ag, Zn, Bi)	Stripping, sampling, trenching
8.	Longpre, Frank	Palmer Twp.(Au, Cu)	diamond drill holes, assays
9.	Murphy, I, Goodmurphy E.	Olsen Twp.(Au)	Line cutting, ground mag survey

10.		Monk Gold and Resources Limited		Rabazzo Twp (Au)		Drifting	
11.		Noranda Exploration Co. Ltd.		Jacobsen Twp. (Au)		Drilling	
12.		Pellerin, U.		Varley Twp. (Cu)		Prospecting, trenching, assaying	
13.		Pipoli, N., Ralph, J.		Palmer Twp. (Cu)		prospecting, assaying	
14.		Reed Lake Explorations Ltd.		Naveau Twp. (Au)		VLF-EM, geol. mapping, sampling	
15.		Roy, A.		Albanel, Nicholas Twps.(Cu)		Trenching, sampling, assaying	
16.		Sears, S.		Lendrum Twp. (Au)		Mag, EM and geol. surveys	
17.		Soocana Explorations Ltd.		Esquega Twp.(Au, base metals)		Ground Mag, EM. geol. surveys	
18.		Spirit Lake Explorations Ltd.		Jacobsen Twp. (Au)		Drilling	
19.		Tims, A.		Hembruff Twp. (Cu)		Prospecting	
20.		Tri-Origin Explorations Ltd.		Runnalls Twp. (Au)		Drilling	

(Northern Miner, November 29 1993).

Alluvial Diamonds in the Wawa Area

While panning for gold on his claims just south of Wawa (location 4, Figure 1) during the summer of 1991, prospector C. (Mickey) Clement recovered two "heavies" from his pan which he, quite reasonably, thought might be quartz weighted by hidden gold. In the fall of 1993 Mr. Clement showed one of the stones to Wawa consultant Seymour Sears, who recognized that it may in fact be a diamond. Mr. Sears sent the stone to Dr. Ron Sage of the Ontario Geological Survey, Precambrian Geoscience Section, who in turn forwarded it to the Royal Ontario Museum for verification as a diamond of 1.05 carat weight. A few days later Mr. Clement brought forward a second stone which was similarly verified as a diamond of 1.13 carat. The diamonds were found to be of industrial quality.

Mr. Clement was uncertain of the exact location where he panned the stones but thought they probably came from sand in a point bar on the Dead River (an ox-bow on the Michipicoten River just west of Highway 17 and from alluvium associated with Wawa Creek just east of Highway 17.

Following the identification of the stones, Dr. Tom Morris and Dr. Ron Sage of the Ontario Geological Survey, travelled to Wawa and collected five, twenty-five kilogram samples from each of the two locations reported by Mr. Clement.

The ten samples were sent to a commercial laboratory specializing in the extraction and identification of kimberlite indicator minerals. The results of the analysis showed that four of the five samples collected from the point bar of the Dead River were found to contain kimberlite indicator minerals, including one G10 pyrope garnet. One sample from Wawa Creek contained one grain of chrome diopside.

It was noted that the G10 garnet had a partial kelyphitic rim suggesting a short distance of transport in an abrasive environment.

The question remains as to the location of the primary source of the Clement diamonds. A local source is suggested by:

a. The high concentration of kimberlite indicator minerals (including diamonds) at the Dead River location. Fluvial and most forms of glacial transport should disperse erosion products from a small source area. The greater the distance, fluvial or sub-glacier transport, the more dispersion there should be.

b. The easily eroded kelyphitic rim on the G10 garnet.

c: The total of nine low-chrome diopside grains recovered from the ten samples. Diopside is relatively susceptible to chemical and physical erosion.

On the other hand, the presently observed distribution of kimberlite minerals might have resulted from the transport, on or within glacier ice, of a large intact block of possibly frozen, diamontiferous weathered kimberlite (blue ground) from a more remote region of

northern Ontario to a site near Wawa.

Until additional sediment sampling is carried out in the Wawa area, it may not be possible to fully evaluate the area's potential for kimberlite pipes. (R. Sage, T. Morris, C. Clement, Personal Communications, 1993 and 1994. Unpublished poster display notes, and unpublished explanatory notes by T. Morris and R. Sage, Ontario Geological Survey.)

DEPOSITS WITH RESERVES NOT BEING MINED

The discovery of the large Hemlo gold deposits in the early 1980's, coupled with a period of relatively high gold bullion prices in 1986 and 1987, and flow-through financing, led to the high level of mineral exploration in the Michipicoten greenstone belt throughout most of the 1980's. This exploration in turn led to the development of new developed prospects with significant reserves and three additional underground mining operations. Although the downturn in gold prices in 1989 eventually forced the closure of all operating mines in the Michipicoten belt, an increase in gold bullion prices might allow one or all of these deposits to return to commercial operation.

NAME: Eagle River - Developed Prospect - 323 claims HELD BY: Hemlo Gold Mines Inc.(60%), Central Crude Ltd.(40%) Western Quebec Mines has recently reported it will acquire control of the Central Crude Ltd. by the purchase of Hemlo Gold Mines 48% holding in that company.

LOCATION: 47 deg. 58"35" 85 deg. 27'20" Mishibishu Lake area

REPORTED RESERVES: 2.24 million tons @ 0.25 oz. Au per ton proven and probable

reserves.

COMMENT: Gold in quartz veins in 1 to 5 m wide eastwest striking shear zones in a diorite intrusion. Decline to 330 vertical feet below surface begun in 1989. Report by Hemlo Gold Mines recommended delaying production until gold prices improve.

SOURCE: NM June 3, 1991; NM Jan 24, 1994; CMH 1993-1994

MDI NUMBER: TB 1955

NAME: Edwards Mine - Past Producer. 45 claims

HELD BY: Spirit Lake Explorations Limited

LOCATION: Jacobson Twp.

REPORTED RESERVES: Preliminary drilling indicates 277,000 tons. @ 0.55 oz. Au per ton to 600 feet.

COMMENT: Spirit Zone is 500 ft. south of Edwards Mine shaft. Quartz veins and silicified sections 1 to 2 m wide in mafic volcanics.

SOURCE: NM Sept. 21, 1992; CMH 1993-1994. MDI NUMBER: A0080

NAME: Granges - Developed Prospect - 10,732 ha

HELD BY: Granges Exploration Ltd (50%) & MacMillan Gold Corp. (50%)

LOCATION: 48 deg. 07'00" 85 deg. 27'00", Mishibishu Lake area:

REPORTED RESERVES: 1,569,000 tons @ 0.12 oz Au per ton, drill indicated, cut and diluted.

COMMENT: Very fine grained gold in sheared, silicified zone in Archean volcanic rocks.

SOURCE: CMH 1993-1994, NM June 19, 1989. MDI NUMBER TB 1949

NAME: Kremzar Mine - Past Producer - 929 ac.

HELD BY: Canada Tungsten Inc. (In 1993 Canamax Resources amalgamated with Canada Tungsten Mining Corp and Minerex Resources Ltd. to form Canada Tungsten Inc.)

LOCATION: Finan Township

REPORTED RESERVES: Proven and probable reserves 181,944 tons @ 6.27 gpt; possible reserves 107,645 tons @ 7.95 gpt. Kremzar Mine and Island zone proven, probable and possible reserves of 514,000 tonnes @ 0.19 oz. Au per tonne.

COMMENT: 230 ft spiral ramp and 450 tpd mill on care and maintenance since 1990.

SOURCE: CMH 1993-1994, NM Jan 7, 1991 MDI NUMBER:A0077

NAME: Lochalsh - Prospect

HELD BY: Canada Tungsten Inc. (In 1993 Canamax Resources Amalgamated with Canada Tungsten Mining Corp and Minerex Resources Ltd. to form Canada Tungsten Inc.)

LOCATION: 48 deg. 17'30" 84 deg. 26'00" Finan Township, 950 meters east of Magino Mine.

REPORTED RESERVES: Proven and probable 77,200 tonnes @ 5.3 gpt; possible 147,550 @ 5.1 gpt

COMMENT: Gold in silicified quartz sericite schist.

SOURCE: NM Jan 7, 1991; CMH 1993-1994 MDI NUMBER: A 0504

NAME: Magino Mine - Past producer - 55 claims

HELD BY: Muscocho Explorations Ltd 50% & McNellen Resources Ltd 50%

LOCATION: Finan Township

REPORTED RESERVES: 673,927 tons @ 0.163 oz Au per ton to 500 ft.level

COMMENT Mined 767,736 tons from Oct. 1988 to Sept. 1992. 700 tpd mill on care and maintenance. Gold in shear zones in Archean granodiorite pluton.

SOURCE: CMH 1993-1994 MDI NUMBER: A 0075

NAME: Magnacon Mine - Developed Prospect - 26 claims.

HELD BY: Muscocho Expl., Windarra Min. & Flanagan McAdam Resources Inc.

LOCATION: Mishibishu Lake area.

REPORTED RESERVES: Proven 110,353 tons @ 0.35 oz. Au per ton, 86,716 tons probable @ 0.31 oz Au per ton; 83,889 possible @ 0.26 oz. Au per ton, 1,115,515 @ 0.17 oz. Au per ton inferred.

COMMENT: Gold in sheared and silicified Archean volcanics rocks. Decline to 600 level with drifting on 6 levels. Mill operations began in June 1989 but did not reach commercial production. 600 tpd mill on care and maintenance

SOURCE: NM Apr. 23, 1990, CMH, 1991-1992 MDI NUMBER: TB 0522

NAME: Surluga/Citadel - Past Producer.

HELD BY: Citadel Gold Mines Limited (41% interest in 203 claims; 100% interest in mill).

LOCATION: McMurray Township, 47 deg. 59'20" 84 deg. 45'00"

REPORTED RESERVES: 385,000 ton @ 0.21 oz. Au per ton. "Preliminary reserves" estimated at 810,500 tons @ 0.114 oz Au per ton.

COMMENT: Gold occurs in quartz stringers and lenses in granitic pluton. Mill on care and maintenance status.

SOURCE: NM, March 5, 1990, CMH 1993-1994. MDI NUMBER A0090

RESIDENT GEOLOGIST'S STAFF ACTIVITIES

The staff of the Sault Ste. Marie Resident Geologist's office consists of G.(Gerry) Bennett, Resident Geologist; E.J.(Ted) Leahy, Staff Geologist and Brenda Fremlin, Administrative Assistant.

The Wawa office was staffed by A.C. (Ann) Wilson, Staff Geologist, until September 1993 and Barbara Leschishin, Administrative Assistant, until the closure of the office on December 3rd. The Elliot Lake geology office was staffed by Mike Hailstone.

Paul Morra, former Claims Inspector, assisted with aspects of the Wawa office closing in the fall and winter of 1993.

PROPERTY DESCRIPTIONS

Glenrock Gold Mines Prospect

In 1953, Glenrock Gold Mines Limited, did trenching, assaying and diamond drilling on a cobalt and gold prospect in central Palmer Township. Channel samples from the trenches returned promising gold values (up to 0.44 opt over 3.5 feet with significant amounts of cobalt (up to 1.69%) and copper (up to 0.9%). Diamond drilling by Glenrock Gold Mines Limited, in 1953, intersected similar mineralization but values were much lower than those in the trenches and the claims lapsed. The Glenrock showing was included in the property

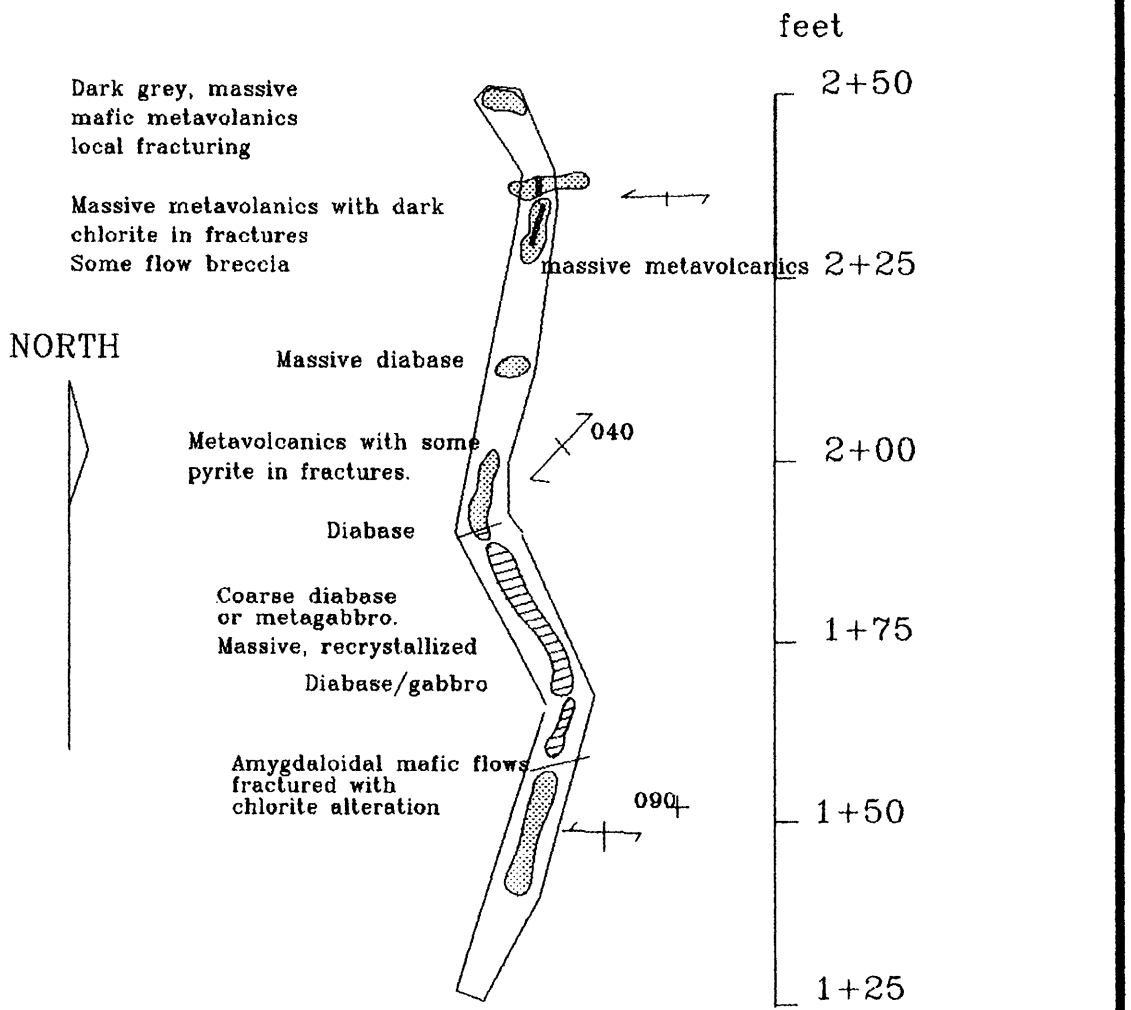


FIGURE 2 : A sketch of the east trench on the Glenrock showing. Palmer Township.

of Aurogin Resources Limited optioned by Hemlo Gold Mines Limited (Noranda Mines Limited) in 1991.

Hemlo Gold performed soil geochemical surveys, geological mapping, stripping, trenching and assaying over seven areas on the property, one of which was the Glenrock showing. (Assessment Files, Resident Geologist's office, Sault Ste. Marie.)

The writer visited the property in the fall of 1991 with J. Walmsley, then Drill Core Library Geologist at the Sault Ste. Marie Drill Core Library. Figure 2 is a sketch of the most easterly trench. The trench is about 3 m (8 feet) wide, cut in till by a back hoe by Hemlo Gold Mines Limited in the summer of 1991. The figure is based on notes and sketches made by the writer in 1991.

Tribag Type Breccia Occurrence

An outcrop of chalcopyrite bearing breccia occurs about 800 m northwest of Mamainse Lake in the northwest portion of Palmer Township. It is not known who found the breccia but it was partly stripped and sampled by Hemlo Gold Mines Limited in 1991.

A geological sketch map of the mineralized breccia and associated rocks is shown in Figure 3.

The host rocks are grey weathering, massive, medium to coarse grained, mafic metavolcanic rock or gabbroic intrusion. The Archean metavolcanics are very dark grey to black on freshly broken surfaces locally cut narrow quartz veins and very thin seams of chalcopyrite. The veining in the mafic metavolcanics appears to be cut by all of the other rocks in the outcrop.

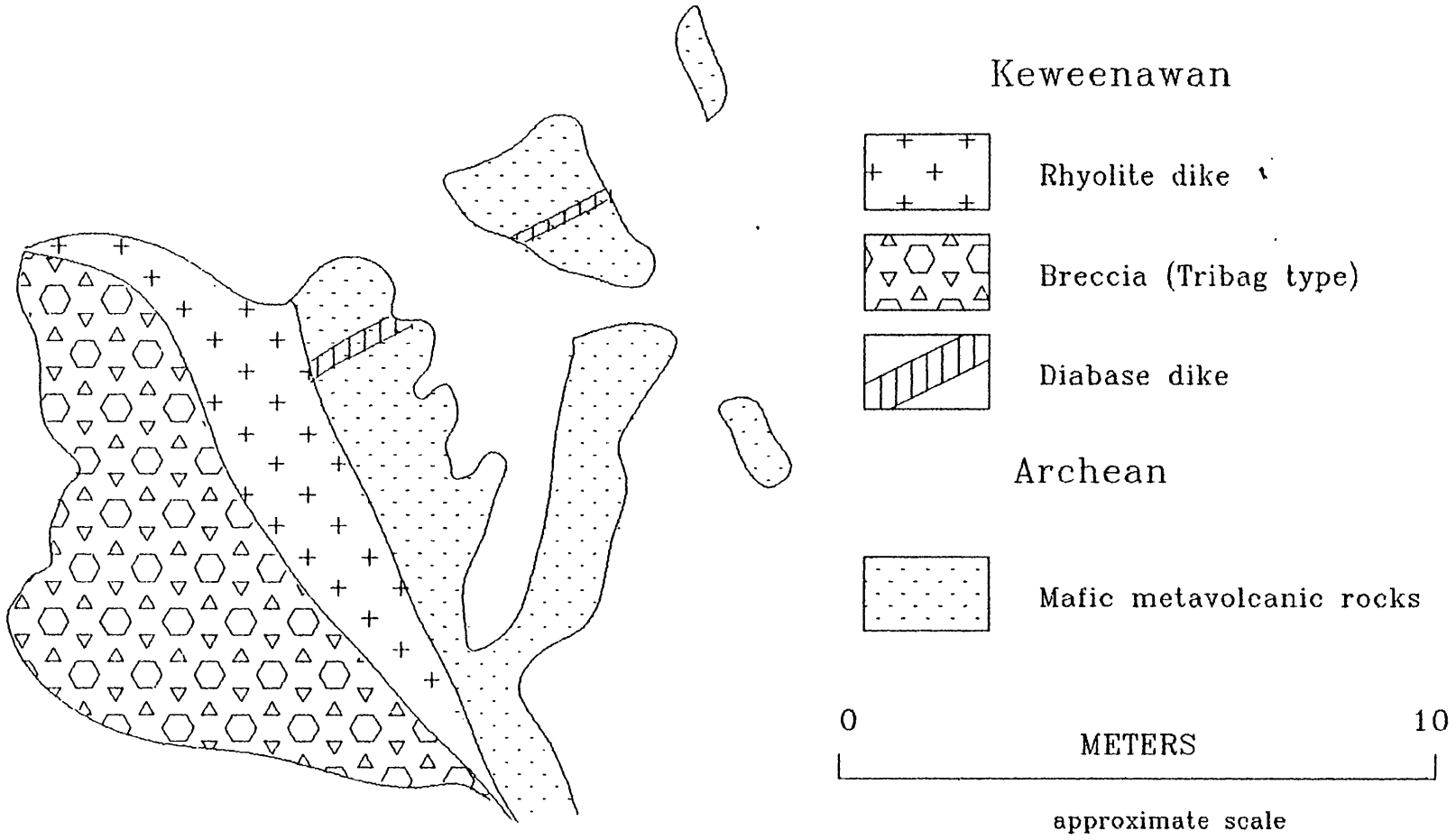


FIGURE 3 : Tribag type breccia Mamainse Lake area

A thin dark grey weathering mafic dike with a diabasic texture cuts the mafic metavolcanics and is in turn cut by the rhyolite.

A massive, pink to purplish, felsic dike, a meter or so wide, intrudes the mafic volcanics at about 140 degrees. The felsic dike is massive and resembles Keweenawan felsic dikes in the area which are referred to locally as "felsite".

The breccia consists almost entirely of angular fragments of the metavolcanics up to 20 centimetres across. A few breccia fragments are subrounded and some are elongated (3 by 20 cm) and splintery. A few pale fragments may be those of an earlier felsite or altered mafic metavolcanics. The matrix of the breccia, which is generally less than 10 percent of the rock, is made up of grey quartz with local blebs of chalcopyrite and malachite.

Assays are not available but were apparently too low to warrant further investigation.

WAWA STAFF GEOLOGIST'S ACTIVITIES

A. C. (Ann) Wilson, Staff Geologist at the (now closed) Wawa office gave a presentation to grades 6,7 and 8 at St. Joseph's school, Wawa and led field trip for students, parents and teachers of grades three and four of a Wawa school. During the summer of 1993 Ms. Wilson led a field trip for students of Millsaps College of Jackson, Mississippi and also for a group of three visiting geologists from Australia. She also made an evening campfire presentation at Wakami Lake Provincial Park and gave a slide presentation to

campers at Lake Superior Provincial Park. The Wawa Staff Geologist completed editing the preliminary map and Open File Report of the Kabinakakagami Lake area in 1993. Ann made a reconnaissance of abandoned mine hazards near Wawa with staff of the Ministry of Natural Resources and continued to add description of mineral occurrences to the Mineral Deposits Inventory (MDI) In April, 1993 Ms. Wilson conducted a weekend prospecting course for local residents and in May led a field trip for course participants. In April she gave an oral presentation at the MNDM Regional Mines and Minerals Geoscience Symposium at Sudbury and attended a workshop on diamonds at Sudbury following the symposium. The Wawa Staff Geologist made a presentation to the Michipicoten First Nation concerning the geology of their reserve and in August gave a short course on practical prospecting to interested members of the Gros Cap Band.

THE SAULT STE. MARIE DRILL CORE LIBRARY PROGRAM

John Walmsley filled the position of Drill Core Library Geologist until September 1993, when, having been declared surplus, he left the Ministry of Northern Development and Mines to take a contract position with the Department of Natural Resources, Canada.

Tony Plackitt acted as Drill Core Library Assistant until November 1993. Paul Morra assisted clients of the Drill Core Library as time permitted.

In the fall of 1993 a contract was let to construct an area for outside storage of drill core on Fish Hatchery Road, Sault Ste. Marie. The work was completed in November, 1993. Future donations of drill core will, in most cases, be stored at this outdoor site.

SAULT STE MARIE STAFF GEOLOGIST'S ACTIVITIES

During 1993, much of the Staff Geologist's((E.J.L.) time was taken up with routine office matters including discussions with prospectors, company geologists, consultants, rock hounds, the general public and various government personnel. Advice was given on rock and mineral identification, assays, exploration maps and reports, and assessment files, in addition to other topics.

In the phasing out period of the Wawa Resident Geologist's office, the Staff Geologist spent two days as acting Resident Geologist in the Wawa office. Following the transfer of the Wawa mining files and other assets, considerable time was spent incorporating this material into the Sault Ste. Marie office system.

During 1993, the Staff Geologist served on the Copper Town Committee which is undertaking the Simpson Shaft mining tourism project at the Town of Bruce Mines. He is also a member of the Sault Ste. Marie Prospector's Association serving on the phone committee.

In land use planning matters, the Staff Geologist provided input to the Megisan Lake Environmental Assessment, the Official Plan for Tarbutt and Tarbutt Additional Township, reviewed subdivision proposals for Gaudette, Grasett, Shedden, St. Joseph Island Planning Area, Township of North Shore, Thessalon, and attended a meeting re the City of Sault Ste. Marie Official Plan and a meeting re the Mississagi Land Settlement.

EDUCATIONAL ACTIVITY

As a means of providing instructional and educational information to the public, the Staff Geologist undertook the following activities in 1993: 1) made a presentation to students at St. Paul's elementary school; 2) made an outdoors presentation, with activities, to students

of White Pines high school; 3) prepared a display for Mining Awareness Week which was set up at Station Mall; 4) assisted on an on-demand basis throughout the summer with the Simpson Shaft mining tourism project at the town of Bruce Mines; and 5) loaned out samples, maps and literature to teachers and students as requested.

MINE HAZARDS

The Staff Geologist took part in investigations of several mine hazard concerns in 1993. These include:

1. the Sill Lake Silver-Lead Mine in Vankoughnet Township where on-going vandalism of mine buildings as well as temporary safety measures was causing concern. In the fall of 1993, the Ministry of Natural Resources undertook to remove all surface structures and equipment and do a general clean up of the mine site. It is planned to remedy the tailings pond area in 1994.
2. the Campbell-Dukes copper occurrence in Plummer Additional Township was visited, accompanied by Mr. Paul Morra, Mining Claims Inspector, in early 1993. The reported 60 foot deep shaft, measuring 4 feet by 6 feet at the collar, was completely water filled as were several nearby pits and trenches. These workings were flagged with coloured tape and not considered to be a high priority hazard site at this time.

   The Campbell-Dukes occurrence is reported to contain 33,000 tons of 1.2% Cu (file Plummer 0016). A grab sample taken by the Staff Geologist assayed

less than 0.01 Au oz/ton and less than 0.1 Ag oz/ton.

On the same day as the above inspection, a visit was made to a supposed mine hazard within the Town of Bruce Mines on the request of the town foreman. The hazard turned out to be an old water-well site which was being undermined by an adjacent fast-flowing creek.

The owner was advised to remedy this.

3. the old Ophir (Havilah) Gold mine site in Galbraith Township was inspected on two occasions in 1993, the first time to take Pat Bolger and Mario Morin of the Mine Site Reclamation Section to get an overview of possible hazards on the property, and the second visit with Paul Morra, former Mining Claims Inspector, to tie in the workings exposed on surface. From these visits it was possible to relate these workings to a plan and section drawing prepared in 1937 by North Huron Gold Mines, Limited, a previous owner of the property. Remnants of old fencing indicated that these old workings had been fenced in at least three times in the past but in 1993 these fences were all knocked down or rusted away. The main shaft and upper level adit are open. The upper level adit presents a particularly hazardous situation with a large overhang of strongly sheared rock and broken-off pieces littering the floor. It is known that teachers have been taking students on field trips to this dangerous site.

The Ophir gold occurrence is reported to have been discovered in 1889. There appears to be two main quartz veins known as the "fissure vein" and the "chimney vein", cutting through the country rock, which is Nipissing diabase. Two grab samples taken from broken material on the upper adit floor by the Staff Geologist assayed 0.24 and less than 0.01 Au oz. per ton.

4. the Staff Geologist took both M.N.D.M. and M.N.R. employees to inspect the surface workings of the old Mamainse Copper Mine in the McDonell Mining Location. Because of the proximity of these workings to Highway 17, it was decided to begin investigative and remedial work on this site as soon as possible. At various times, overseen by Mr. Harvey Walsh and Mr. Dave Holla of M.N.R., or by Mr. Paul Morra of M.N.D.M., the site was surveyed, ten air track holes put down, the east shaft filled with gravel and the western shaft capped. Further investigative work was undertaken and will be continued in 1994.

5. the contract was awarded for the final installation of fencing around mine workings within the Town of Bruce Mines. This job should be completed by March 1994 and represents the final phase of an investigation and remediation of mine related hazards within the town begun in 1985. Over this time span, the project involved site mapping, ground probing radar investigating, magnetometer surveying, existing fence upgrading, road closing, bridge building, air trac drilling, diamond drilling and new fence building. The Staff Geologist has been involved with this from the beginning.

SAULT STE. MARIE RESIDENT GEOLOGIST'S ACTIVITIES

Approximately 56 percent of the Resident Geologist's time during the past year was spent in administrative matters, including meetings and report writing. Approximately 14 percent of the Resident Geologist's time was available for geological and field related activities and about 15 percent was related to client services. The remaining time was directed

toward land use planning and public education.

During 1993 the Resident Geologist was a member of the Information Technology Subcommittee, the Text Database working group and participated in the Information Resource Management (IRM) workshops held in Sudbury in January of 1993. He attended meetings of the Uranium Resources Assessment Group (URAG) in Elliot Lake in the spring of 1993.

The Resident Geologist made four visits (one underground) to the Stanleigh Mine of Rio Algom Limited in Elliot Lake and one visit to the George W. MacLeod Mine at Wawa.

The Resident Geologist made visits to four active mineral exploration properties and three inactive occurrences. He led field trips for the International Geological Congress, University of Portsmouth, U.K., and the Algoma University College of Sault Ste. Marie.

The Resident Geologist contributed text and maps describing paleoweathering surfaces in the Thessalon area for the field trip guide for the International Geological Congress project 317 (Prasad et. al, 1994,in Press).

In March of 1993, John Walmsley, former Drill Core Library Geologist and the Resident Geologist, assisted by Paul Morra, former Claims Inspector, Tony Plackitt, former Drill Core Library Assistant, organized and presented a five unit "Discover Prospecting" course at the Sault Ste. Marie Resident Geologist's Office.

In April the Resident Geologist made an oral presentation at the Mines and Minerals Division

Geoscience Symposium at Sudbury. He attended a work shop on diamond exploration which followed the symposium.

The Resident Geologist made oral presentations on local geological subjects to the Kiwanis Club in March 1993, and in April to a youth group at the Sault Ste. Marie Museum and also to a local grade school.

The Resident Geologist gave advice and wrote short descriptions of geological features for Environmental Youth Corp projects in the Elliot Lake and Searchmont areas.

Work was begun on guides for self guided geological tours for Highway 17 along the east shore of Lake Superior (almost complete), Highway 108 in the Elliot Lake area (early stages), a St. Joseph Island fossil locality (almost complete) and the Horn Lake Hiking Trail in Elliot Lake (almost complete). The latter is a continuation of the work of Mike Hailstone. These guides are to include photographs, drawings, as well as text and are intended for use by high school students, teachers and the general public.

From September to December 1993, the Resident Geologist spent two days per week in the Wawa area attending to office and field duties.

SUGGESTIONS TO PROSPECTORS

Following the termination or expiry of exploration agreements with Algoma Central Properties Inc.(a wholly owned subsidiary of the Algoma Central Railway) many of the ACR

controlled townships in the Wawa and Sault Ste. Marie areas are now (February 16, 1994) available for prospecting for the first time in about ten years. Much of this area is prime prospecting ground. Since the Algoma Central Properties regulations differ considerably from those of the Ontario Government, prospectors should contact the office of Algoma Central Properties at Sault Ste. Marie for copies of the regulations and current land status.

The recent recovery of diamonds and kimberlite indicator minerals near Wawa has understandably stimulated the interest of many local prospectors. However, it should be noted that:

a. The presence of kimberlite pipes in the Wawa area has yet to be established.

b. Kimberlite is an especially difficult rock to identify by its physical characteristics alone. Any prospector who feels that he or she has discovered an occurrence of kimberlite should take large, representative samples for proper identification by experts.

c. The most effective means of exploring for kimberlite seems to be a combination of regional sampling of basal tills for kimberlite indicator minerals. Analysis of large scale magnetic maps is also thought to be an effective tool. Because the systematic search for kimberlite indicator minerals generally requires substantial financial resources and expertise in more than one branch of geoscience, such surveys are generally not the recommended activity for independent prospectors.

This does not mean that the search for kimberlite is beyond the scope of

independent prospectors. The recent recovery of the diamonds in the Wawa area was made by an observant prospector, not a well funded corporation.

The Sault Ste. Marie Resident Geologists Office has samples of fresh and weathered kimberlite and samples of kimberlite indicator minerals are available for reference. Texts and publications pertaining to diamonds and kimberlites are available at most Resident Geologist's offices. Prospectors should learn as much as possible about the nature and distribution of this rare rock.

ONTARIO GEOLOGICAL SURVEY ACTIVITIES

T.F. Morris and R. P. Sage of the Ontario Geological Survey collected ten, 25 kg samples of river alluvium in the Wawa area in an attempt to verify the discovery of two industrial grade diamonds in the area. (see "Alluvial Diamonds in the Wawa Area", in this report).

RESEARCH BY OTHER AGENCIES

Dr. David Hughes and graduate student Kirsty Tomlinson of the University of Portsmouth, England, spent four days in the Sault Ste. Marie and Thessalon areas in August of 1993. They collected samples of Huronian volcanic rocks as part of a comparative study of the volcanic rocks of Ontario.

SELECTED PUBLICATIONS RECEIVED

Byron, M and Whitehead R.E. 1993. Lithogeochemical Study of the Archean Volcanic Rocks of the Whiskey Lake Greenstone Belt, Algoma District, Ontario; Open File Report 5837,

51p. With 5.25 inch diskette containing ASCII and .WK1 data files.

Jackson, S.L. 1993. Precambrian Geology of the Aberdeen Lake Area, Open File Map 205, scale 1:20 000.

Rogers, M.C. 1993. Geology of the Ompa Lake Area, District of Sault Ste. Marie; Open File Report 5864, accompanied by maps P.3215 and P. 3216.

Sage, R. P. 1993. Geology of the Herman Lake Alkalic Rock Complex, District of Algoma. Open File Report 5421, 80p.

Sage, R.P. 1993. Geology of Chabanel, Esquega, Lastheels and McMurray Townships, District of Algoma; Ontario Geological Survey Open File Report 5586 462p. Accompanied by maps P. 2439, P. 2441 and P.2442 and a 5.25 inch high capacity data diskette containing Wordperfect 5.0 geochemical files.

Sage, R.P. 1993. Geology of Abotossaway, Corbiere, Leclaire and Musquash Townships District of Algoma; Ontario Geological Survey Open File Report 5587 308p. Accompanied by maps P. 2568, P. 2607 and P.2636, OFM 223 and OFM 224 and a 5.25 inch high capacity data diskette containing Wordperfect 5.0 geochemical files.

Sage, R.P. 1993. Geology of Aguonie, Bird, Finan and Jacobson Townships, District of Algoma; Ontario Geological Survey Open File Report 5588 286p. Accompanied by maps P.3168, P.3170 and P. OFM 217 and OFM 218 and a 5.25 inch high capacity

data diskette containing Wordperfect 5.0 geochemical files.

Sage, R.P. 1993. Geology of Killins, Knicely and Lalibert Townships, District of Algoma; Ontario Geological Survey Open File Report 5589 141p. Accompanied by maps OFM 219, OFM 220 and OFM 221.

Wilson, A.C. 1993. Geology of the Kabinakagami Lake Greenstone Belt, 80 p. Open File Report 5787 with preliminary map.

SUDBURY RESIDENT GEOLOGIST'S DISTRICT - 1993

M. Cosec[1], W. Meyer[2], B. Gates[3]

[1]Staff Geologist, Sudbury District, Ontario Geological Survey
[2]Resident Geologist, Sudbury District, Ontario Geological Survey
[3]NODA Geologist, Sudbury District, Ontario Geological Survey

Mining and exploration activities continued in 1993 at relatively the same levels as the previous year, despite lower nickel prices due to an oversupply of the metal on world markets. The production of nickel, copper, and precious metals by Falconbridge Limited and Inco Limited dominate mining activities in the area. A total of 17 underground nickel-copper-precious metals mines and one open pit graphite mine were in operation. Inco Limited suspended operations at the Levack Mine in September, but announced the reopening of the lower workings of the Garson Mine in 1994. Falconbridge Limited announced that full production from the Craig Mine, originally scheduled for 1994, has been deferred at least until 1995, due to poor nickel prices.

Nickel production from all area mines was estimated to be approximately 274 million pounds in 1993, up slightly from 266 million pounds in 1992 (MNDM 1993).

The Mineral Sector Analysis Branch recently calculated total production from the Sudbury area from 1881 to 1991 inclusive. They report production of approximately 18.6 billion pounds nickel and 18.2 billion pounds copper from 856 million tons of ore hoisted. Value of production, including that of at least 10 other by-product commodities, totals over $117 billion.

Commodity prices fell from the previous year. The average price of nickel for 1993 was US$2.40 compared to an average of US$3.18 per pound in 1992. The yearly high and low were US$2.87 per pound and US$1.82 per pound respectively. Copper averaged US$0.87 per pound in 1993 compared to US$1.04 in 1992.

The low metal prices forced both Falconbridge Limited and Inco Limited to cut costs by extending the annual shutdowns of operations. Falconbridge Limited also offered an early retirement package to approximately 200 employees.

Despite these difficulties, development of known ore bodies and exploration for new ore continued.

Inco Limited resumed deep diamond drilling on the Victor property, where 20 to 40 million t of high-grade ore have been outlined between 5000 and 8500 feet below surface. A 6000-foot deep exploration shaft is under consideration.

In November, Falconbridge Limited announced high nickel, copper, and platinum group metals values in a borehole intersection approximately 8000 feet below surface on the Nickel Rim property. This is adjacent to Inco Limited's Victor property.

Exploration for gold and platinum group metals continued outside the Sudbury Igneous Complex.

Applied Carbon Technology Incorporated continued graphite production from its Graphite Lake open pit mine near Huntsville. In December, the company installed a new semi-autogenous grinding mill and drying circuit with a maximum capacity of 3000 tpd.

Other industrial minerals produced in the district include silica, dolostone, and various types of building and landscape stone products. Prospecting for dimension stone, and evaluation of selected sites also continued at a brisk pace. Representative dimension stone samples from the district were exhibited on nine occasions in Ontario, United States, Germany, and Italy. Jarvis Resources Limited completed installation of saws and polishers at their new, $2 million, 18 000 square foot processing plant in Lively.

Ontario Prospectors Assistance Program (OPAP) grants were awarded to 25 individuals in the district totalling approximately $243 000. Ontario Mineral Incentive Program (OMIP) grants totalling $449 000 were awarded to two companies.

Funding through the Canada-Ontario Development Agreement (NODA) enabled two industrial mineral projects to continue in the district.

For one week in November, additional seismic reflection survey lines were completed across the South Range of the Sudbury Structure under the LITHOPROBE program.

During 1993, staff organized and hosted the Northeast Region Mines and Minerals Division Geoscience Symposium. Annual prospector training classes were taught, and a collection of poster sessions and talks were delivered to a variety of groups.

On April 30, 1993, the Resident Geologist's office, as well as the Mining Recorder's office, was relocated to 933 Ramsey Lake Road.

The Algonquin Resident Geologist's office in Dorset was closed in 1993, and the district was divided between Resident Geologists' offices in London, Tweed, Cobalt, and Sudbury.

In 1994, Sudbury will host the Fourth Annual Canadian Institute of Mining, Metallurgy, and Petroleum Field Conference, from September 19 through 21, at the Sheraton Caswell Hotel.

MINING ACTIVITY

Metal Mining

Falconbridge Limited

Falconbridge Limited produced copper, nickel, and precious metals from six operating mines in the Sudbury District (see Figure 1). Production in 1992 was 78.0 million pounds of nickel and 82.9 million pounds of copper from 2.64 million tons of ore hoisted (Giancola 1993). Production figures for 1993 were unavailable at time of writing. The company achieved a profit of US$29 million for 1992, up from US$21 million in 1991. Its 1992 average realized nickel price was US$3.30 per pound.

In 1993, Falconbridge Limited operated the following mines in the Sudbury district: Fraser Mine, production capacity 1.0 million tons per year; Lockerby Mine, production capacity 400 000 tons per year; combined Onaping Mine and Craig Mine, production capacity 1.1 million tons per year; Strathcona Mine, production capacity 300 000 tons per year; and, Thayer Lindsley Mine, production capacity 120 000 tons per year (The Sudbury Star, April 6, 1992). Full production from the Craig Mine, originally scheduled for 1994, has been deferred at least until 1995, due to low nickel prices. Current mining operations are via the Onaping shaft.

All ore is concentrated at the Strathcona Mill, which has a milling capacity of approximately 10 000 tons per day. The concentrate is trucked to the company's smelter at Falconbridge. Copper-nickel matte is then shipped from the Falconbridge smelter to the company's nickel refinery in Norway.

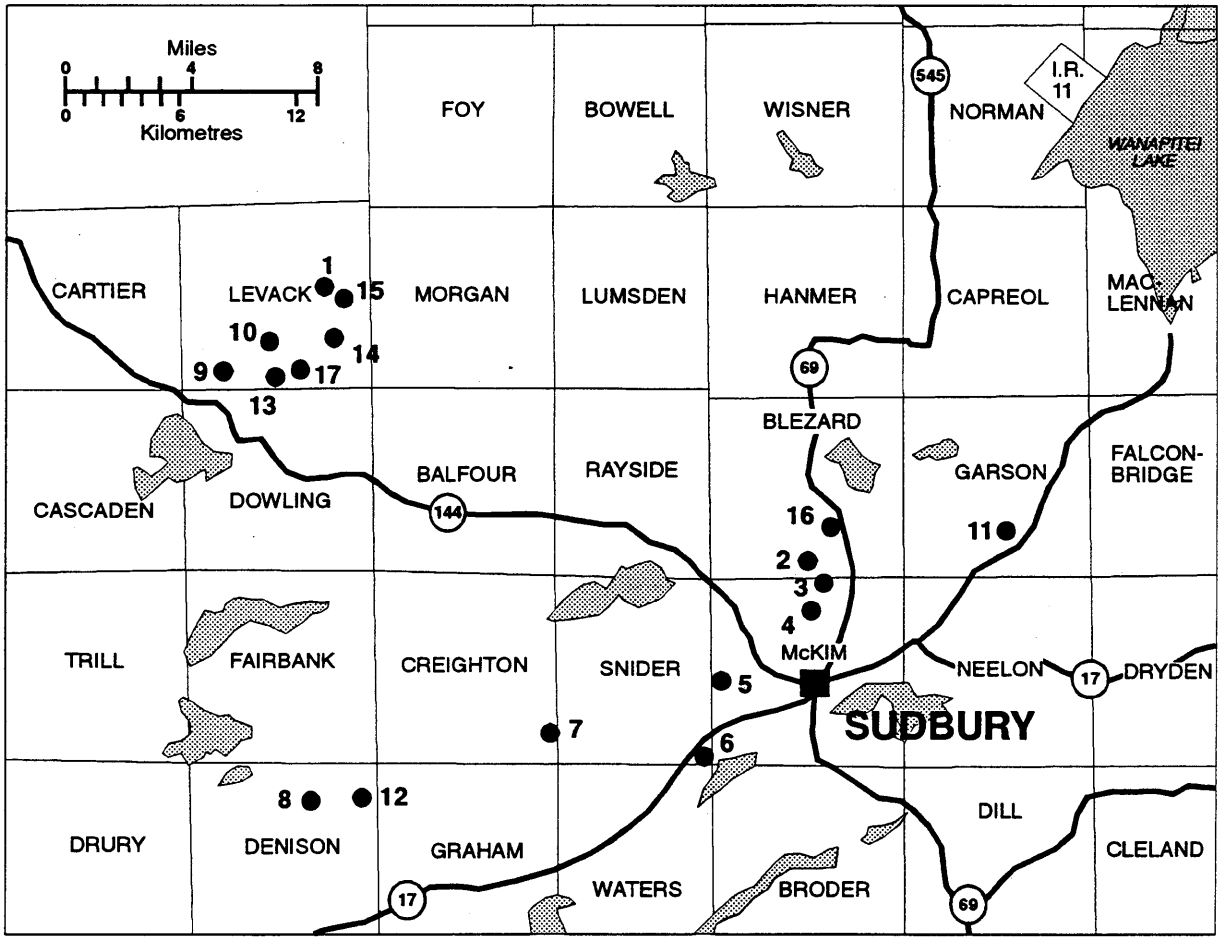
Falconbridge Limited's Sudbury operations shut down for six weeks from the middle of December 1992 and all of January 1993, and again for two weeks in July. During 1993, Falconbridge Limited employed approximately 2100 persons at its Sudbury operations.

In August, Falconbridge Limited achieved sulphur dioxide emission reduction targets set for 1994 under the provincial "Countdown Acid Rain" program.

Inco Limited

Inco Limited reported a net profit of US$28.2 million for 1993, compared with a net loss of US$17.6 million for 1992. This gain was due, in part, to the sale of Inco Limited's 61.8% share in TVX Gold Incorporated for US$289 million. In 1992, TVX Gold Incorporated produced 314 000 troy ounces of gold from six mines in Chile, Brazil, and North America. Inco Limited's average realized nickel price in 1993 was US$2.72 per pound, compared with US$3.38 per pound in 1992. The company reported

FIGURE 1. Producing Mines in the Sudbury Area



Inco Limited

(Ni,Cu,Co,Au,Ag,PGM,Se,Te,SO_2,H_2SO_4)

1) Lower Coleman
2) Little Stobie
3) Stobie
4) Frood
5) Copper Cliff North
6) Copper Cliff South
7) Creighton
8) Crean Hill
9) McCreedy West
10) Levack
11) Garson

Falconbridge Limited

(Ni,Cu,Co,Au,Ag,PGM,H_2S)

12) Lockerby
13) Onaping
14) Fraser
15) Strathcona
16) Thayer Lindsley
17) Craig

that its break-even price for nickel in 1993 is expected to be between US$3.00 and US$3.10 per pound.

Within the Sudbury area during 1993, Inco Limited operated eleven underground mines, two mills, one smelter, two refineries, three sulphuric acid plants, one liquid sulphur dioxide plant, one oxygen plant, and one strip rolling mill for coinage blanks.

The operating mines and their daily rated capacities are as follows: Copper Cliff North Mine, 3400 tons per day; Copper Cliff South Mine, 4400 tons per day; Crean Hill Mine, 2780 tons per day; Creighton Mine, 5200 tons per day; Frood Mine, 5050 tons per day; Garson Mine, currently small amount of production from 400-foot level workings; Levack Mine, 2850 tons per day; Little Stobie Mine, 400 tons per day; Lower Coleman Mine, 2700 tons per day; McCreedy West Mine, 2700 tons per day; and, Stobie Mine, 12 600 tons per day (MNDM 1993) (See Figure 1).

All of Inco Limited's Sudbury ore was milled at the Clarabelle Mill at a current capacity of 45 000 tons per day. The Copper Cliff Mill provides flotation facilities used to separate bulk copper-nickel concentrate produced by the Clarabelle Mill.

Inco Limited announced it will reopen the lower levels of the Garson Mine. Production is expected to start by April 1994, with an expected capacity of 2000 tons per day by 1995 (refer to Advanced Exploration below). The Garson Mine will replace production from the Levack Mine which closed in June, 1993, and the Frood No. 3 and McCreedy West mines, which are scheduled to close in the last quarter of 1995.

The Levack Mine was expected to continue for another three years, but was closed ahead of schedule because of low grades and low metal prices. The mine produced approximately 14 million pounds of nickel and 7 million pounds of copper annually. Since commencing production in 1914 (suspended in the 1930's), an estimated 66 million tons of ore have been mined.

Inco Limited demolished their 40-year old pyrrhotite iron ore plant in Copper Cliff. The operation had been decommissioned in 1980, and was costing the company $31,000 annually in property taxes. The Levack Mine plant and the Frood-Stobie Mill complex are expected to be demolished as well.

During the summer, all operations were shut down for five weeks. A shutdown of eight weeks also occurred from late December 1993 to the end of February 1994.

The company announced plans for a $67 million tailings disposal facility behind Meatbird Lake in Walden. The area would provide tailings storage until the year 2001. Environmental improvements, regreening, and local rehabilitation continued throughout the Sudbury area, particularly between Copper Cliff

and the former Murray Mine townsite.

Inco Limited employed approximately 7300 persons during 1993 at its Ontario operations.

Industrial Minerals Production

Several industrial mineral commodities were produced in 1993. These included silica, dolostone, graphite, building stone, flagstone, landscape stone, and several varieties of coloured aggregate (Table 3).

The number of industrial mineral producers in the district was greatly enhanced with the incorporation of much of Parry Sound and Muskoka areas into the Sudbury Resident Geologist's district. Many of these are seasonal operations.

Unimin Canada Limited operates the Badgeley Island high-grade silica quarry, 4 km west of the village of Killarney. Annual production is approximately 430 000 tons. The coarse silica is shipped to Midland, Ontario and Ashtabula, Ohio, for further processing into silica sand for the glass industry.

Standard Aggregates Incorporated operates a large quarry on the Mississagi Strait, in Dawson Township, at the western tip of Manitoulin Island. Massive dolostones of the Amabel Formation are excavated in a single lift of about 17 m. In 1993 the quarry shipped 1 940 983 tonnes, of which 70% is construction aggregates and 30% is metallurgical stone, to United States and Canadian markets. The stone is shipped by lake freighters from a dock adjacent to the quarry.

Applied Carbon Technology Incorporated (the former Cal Graphite operation) continued working towards full production at their Graphite Lake open pit mine and mill in Butt Township. The mill operated at a rate of only about 1500 t per day, despite a maximum capacity of 3000 t per day. After milling and separation, the final product contains approximately 95% carbon. A major new milling procedure, facilitated by the installation of a semi-autogenous grinding mill and drying circuit, commenced operation on December 13, 1993. This is part of a $4 million capital improvement plan (A. Menard, Applied Carbon Technology Incorporated, personal communication, 1994).

During the year, the company mined 358 215 tonnes of ore grading 2% graphitic carbon. The mine operates with a proven reserve base of 6.4 million t, part of a 30 million t proven, probable, and possible reserve. The company also operates a 90 000 square-foot blending, packaging, and distribution facility at Brocton, New York.

Carman Construction Incorporated produced 120 000 tons of silica from a quarry it operates on a seasonal basis near Alban

in Delamere Township. The material is used as smelter flux at Inco Limited's Copper Cliff smelter. The company also operated a small silica quarry near Lake Panache in Roosevelt Township, the material from which is sold as exposed aggregate by custom order only.

Hercules Stone Limited extracted a small amount of Silurian Manitoulin Formation limestone from the Foxey Quarry in Gordon Township on Manitoulin Island. This rock is used as curbing, walkways, and in landscaping. The company also extracted and processed several tons of breccia from Aylmer Township. This breccia consists of relatively small angular fragments of laminated Gowganda Formation siltstone in a hydrothermal quartz and carbonate matrix. It is brownish buff to pink, with minor chalcopyrite and bornite. This property was recently purchased from J. J. Billoki. This material has previously been used locally as an ornamental facing stone.

Crea-Mac Construction Limited and Coloured Aggregate Limited respectively, extracted and distributed several thousand tons of pink feldspar as coloured aggregate for southern Ontario markets. The company utilizes a four-stage crushing unit, and produces several sizes of materials. The feldspar is quarried from a large feldspar-quartz-biotite pegmatite dike in Ratter Township. Black aggregate is also produced from a small quarry in River Valley, as well as white aggregate purchased from the Unimin Canada Limited silica quarry on Badgeley Island.

Manex Granit Incorporated resumed seasonal production at their "Midnight Blue" quarry site in Casimir Township, after a one year hiatus. The site was developed in 1991 and a small amount of stone was extracted for marketing. In November 1993, quarrying commenced at the company's "El Tigre" property near Port Carling.

Allstone Quarry Products Limited began the quarrying of large slabs of orange and black schistose gneiss from their property in Bigwood Township. The rock is primarily used for commercial landscaping in the Toronto area. The operation is partially funded through various training programs and employs approximately 50 students seeking careers in the stone industry.

Jarvis Resources Limited commenced production from various limestone quarry properties in Parkin Township. The company completed installation of saws and polishers in mid-1993, and is now able to produce slabs and tiles of various sizes, as well as curb stones and accent pieces.

The most prominent flagstone producer is Mill Lake Quarry Limited in Parry Sound which has been in production for over 80 years. The stone is quarried during the non-winter months and a selection of flagstone products, with thicknesses ranging from 0.5 to 4 inches, is produced. Splitting of the stone continues during the winter. Colours are in the pink to grey range. The

quarry employs six full-time employees and several seasonal workers. The Ministry of Transportation requires part of the quarry for a highway intersection. The company and ministry continue to negiotiate a settlement.

Manitou Stone (Canada) Incorporated attempted to quarry nodular anorthosite from the Shakespeare-Dunlop differentiated mafic intrusion in Shibananing Township. Unfortunately, the intense jointing hindered extraction of large blocks suitable for shipping. The company also met with poor results in an attempt to quarry red granite from the Algoma Plutonic Domain in Beebe Township. A site underlain by contorted gneisses in Falconer Township is currently being considered for development in 1994.

The City of Toronto contracted Amsen Quarries Limited to cut and transport a granite outcrop from Doe Lake in Muskoka, to a park in Yorkville, where it will be reassembled. The owner of the property on which the outcrop was situated received $1500.

Considerable amounts of sand and gravel were also extracted by numerous companies throughout the Sudbury District.

Advanced Exploration

Underground exploration and development continued at most producing mines in the Sudbury area throughout the year. Development properties of notable interest are mentioned below.

Falconbridge Limited

Overall plans for the next ten years at Falconbridge Limited will focus primarily on locating and defining high-grade copper-platinum group metals deposits in the footwall of the North Range of the Sudbury Igneous Complex. Expenditures of $2 to $5 million dollars per year will be incurred on surface and underground exploration, and an equivalent amount will be spent on the development of any new discoveries (P. Johannessen, Falconbridge Limited, personal communication, 1994).

At the Craig Mine in the North Range, reserves of 13.5 million t containing 2.00% Ni and 0.74% Cu have been outlined within nine zones over a strike length of 1000 m lying between 650 m and 1700 m below surface (Moore and Nikolic 1992). Commissioning of the mine, scheduled for August 1993, has been postponed until 1995 due to the low price of nickel.

Also in the North Range, the Powderhouse Zone, a high-grade copper-platinum group metals deposit, located between the Fraser and Strathcona mines, is currently in the development stage.

Production from the Lockerby Depth Zone at the Lockerby Mine, developed in 1992, has been postponed. Current work includes drifting into the Lockerby East Zone, where underground

diamond drilling will continue. The Lockerby East Zone is a relatively small orebody.

Advanced exploration at the Thayer Lindsley Mine wound down during 1993, although extensions of the orebody are still being sought from underground.

Inco Limited

Inco Limited continued with development of the lower levels of the Garson Mine, which were shut down in 1986 due to ground control problems. Some 4.8 million tons of ore grading 1.58% Ni and 1.09% Cu lie between the 3800-foot level and 4200-foot level. This ore is currently being developed as Phase I. A further 14.7 million tons of proven ore grading 1.86% Ni and 1.35% Cu below the 4200-foot level are being developed for Phase II. Development and mining will take place from a system of ramps from the No. 2 shaft.

In 1985, the Garson Mine produced ore at a maximum rate of 3800 tons per day. By April 1994, Inco Limited expects to resume hoisting ore from the 4100-foot level. By 1995 this should be at a rate of 2000 tons per day. The muck will partially replace production from three mines, namely the Levack Mine, which closed in June 1993, the Frood No. 3 Mine, and McCreedy West Mine, both of which are scheduled to cease production in the last quarter of 1995. By that time, the Garson Mine will be the fourth largest producer in the Sudbury area. Total cost of the project is estimated to be $40.1 million (Whiteway 1993).

Discovered in 1891, production commenced at the Garson Mine in 1908. It was shut down in 1932 but reopened in 1936. After suspension of operations in the deep workings in 1986, a small amount of production took place from an open pit, and via a ramp from the open pit to the 400-foot level. To date, approximately 50 million tons of ore have been raised. A geological overview of the Garson orebody is presented by Ball (1993).

In June 1993, Inco Limited announced the resumption of the McCreedy East Mine development project which had been suspended in September 1991. The Main Zone has proven and probable reserves of 29.5 million t grading 1.58% Ni, 2.27% Cu, and 2.45 g PGM/t. The New Zone, located 1 km west of the Main Zone, contains proven and probable reserves of 6.2 million t grading 0.9% Ni, 9.9% Cu, and 13.4 g PGM/t (MNDM 1993). The mine is expected to commence production in 1995 at 7000 tons per day, for 20 to 40 years.

Inco Limited held a public information session in October 1993 outlining plans for advanced exploration and development at the Victor property. Plans include sinking a shaft to a depth of 6000 feet, 10 000 feet of lateral development, and 270 000 feet of underground diamond drilling. The company has budgeted $40 to $50 million for the project. A decision on the project is

pending.

Adjacent to the Victor property, Falconbridge Limited has announced the discovery of rich copper-nickel-platinum group metals mineralization at a depth of about 8000 feet on its Nickel Rim property. The ore-bodies on these properties may be continuous. Any eventual undergound development may involve a joint venture agreement between the two companies.

EXPLORATION ACTIVITY

The Sudbury Resident Geologist's district encompasses approximately 38,000 square km. This includes a 46% increase in territory that was part of the former Algonquin Resident Geologist's district that was closed in September 1993. Refer to Figure 2.

Geologically, the area is underlain by rocks of Archean, Proterozoic, and Paleozoic age. The Grenville Front bisects the district into roughly equal, but geologically dissimilar parts.

Exploration by major mining companies outside the Sudbury Igneous Complex declined somewhat from 1992. Prospecting and grass-roots exploration by individuals, however, increased slightly from 1992 levels, particularly in gold-bearing soda-metasomatized Huronian rocks east and north of Wanapitei Lake, and near Whitefish Falls. Exploration for various types of stone (building stone, flag stone, coloured aggregate, etc.) was carried out by at least 20 individuals and companies. Five diamond wire saws operated in the district in 1993 to remove blocks for testing and marketing.

High-grade quartz vein and orthoquartzite deposits have been popular exploration targets over the last few years. The material is required as flux for local smelter operations and in the manufacture of silicon metal by SKW Canada Incorporated of St. Laurent, Quebec. The latter company requires material with a purity greater than 98% SiO_2.

Several exploration projects are highlighted below. For a detailed summary of exploration in the district, please refer to Table 1 and Figure 2. In this report, a claim unit refers to a single forty-acre unit.

Table 2: Summary of Claims Recorded and Assessment Work Credit

Year	Claims Recorded	Claims Cancelled	Claims Active	Geotechnical Survey (Dollars)	Physical Survey (Dollars)
1993	696	1332	6092	448 740	441 100

	355 blocks				
1992	1127 355 blocks	212	6852	293 286	
1991*	1237 137 blocks	2179	6158	44 750	67 600
1990	2576	2068	7458	35 097 (man days)	14 309 (man days)
1989	761	1615	6510	58 605 (man days)	25 255 (man days)

* with the new Mining Act in effect June, 1991, assessment work requirements changed to dollar value
**numbers refer only to the Sudbury Mining Recorder's Division

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Applied Carbon Technology Incorporated

Applied Carbon Technology Incorporated (formerly Cal Graphite Corporation) completed extensive exploration on the Sheehan Zone, located 2.5 km northeast of the operating Graphite Lake open pit mine. Geological, topographical, and ground VLF geophysical surveys were completed, as well as a 125-hole, 50 000 foot diamond drilling program (Applied Carbon Technology Incorporated, Mid-Year Report 1993). This deposit is situated adjacent to Algonquin Provincial Park.

Emerald Isle Resources Incorporated and Stralak Resources Incorporated

Emerald Isle Resources Incorporated and Stralak Resources Incorporated completed stripping, trenching, geological mapping, diamond drilling, and bulk sampling on their 800-acre garnet property in Street Township. The property is underlain by a quartz-feldspar-biotite-garnet gneiss. A subunit within the gneiss is reported by the company to contain almandine garnet, grading 40 to 90% over a width of 50 to 100 feet, for a length of over 800 feet. Both companies hold a 50% interest in the property.

Beneficiation tests were recently completed with favourable results. The garnet is being considered for use as an abrasive in waterjet-cutting technology.

Ontario Quarries Incorporated

Ontario Quarries Incorporated commenced stripping and diamond drilling of their "Harama Marble" prospect (Brady option) in Parkin Township. Drilling away from, and to the east of, the colourful breccia zone has indicated a relatively fractured grey and buff siliceous limestone grading to calcareous quartzite, which is intruded by several late mafic dikes. The company has

been using its two diamond wire saws to remove quarry blocks.

D. Brunne, R. Stringer, R. Bald

An extensive exploration program of detailed geological mapping and lithogeochemical surveying was conducted over this fairly large claim group in Curtin Township. The property includes the former Upsula, Bousquet, and Howry Creek gold mines. The area is underlain by Gowganda Formation argillite intruded by a Nipissing diabase dike. The mapping has revealed that the intrusion is differentiated. Some phases of the intrusion are copper, nickel, and platinum group metals enriched, particularly near Casson Lake where combined platinum and palladium values greater than 2000 ppb were found in grab samples (Cosec 1991).

A ground electromagnetic survey discovered a mineralized shear zone through both the argillite and diabase. Assays from this zone gave values in the one ounce Au per ton range.

Work is expected to continue in 1994, and will focus on locating similar structures.

Flag Resources (1985) Limited

Flag Resources (1985) Limited continued with their long-term diamond drilling program throughout the year.

In January, the company completed two diamond drill holes on the "South Boundary Zone" in Rathbun Township. The first hole, drilled to a depth of 685 feet, encountered highly fractured rock for the last 100 feet. The second hole was drilled to a depth of 1050 feet. Both holes intersected silicified and hematized Gowganda Formation argillite for much of their lengths.

In February, diamond drilling commenced on the western peak of the Wanapitei magnetic anomaly in Mackelcan Township. The hole intersected elongated clasts of Sudbury breccia in Lorrain Formation quartzite, two thin (2 inches and 10 feet) magnetic diabase dikes, and numerous magnetite seams up to one-quarter inch wide. The source of the magnetite may represent low temperature fluids associated with local late faults in the area. The hole was stopped at 2715 feet. A single 1000-foot diamond drill hole was completed south of Jones Lake in Mackelcan Township in September. The hole intersected 0.03 to 0.05 ounce Au per ton over 10 feet within 166 feet of finely disseminated sulphides. The host rock is Sudbury breccia in Lorrain Formation arkose and quartzite.

In December, deepening of a 1700-foot hole commenced near Wolf Lake in Mackelcan Township. Magnetite seams were encountered from surface to a depth of 2000 feet, and from 2100 to a depth of 2300 feet, the depth of hole at the time of writing. Brecciation appears prevalent after a depth of 2155

TABLE 1: EXPLORATION ACTIVITY, SUDBURY RESIDENT GEOLOGIST'S DISTRICT, 1993

Number	Company/Individual	Township (s)	Work Performed	Commodity
Gp - Geophysical DD - Diamond Drilling P - Prospecting		Gc - Geochemical Str - Stripping Bk.S. - Bulk Sample		Gl - Geological Tr - Trenching
1	Applied Carbon Technology Inc.** (Cal Graphite Corporation)	Butt	Gp, DD	graphite
2	Allstone Quarry Products Inc.	Bigwood	Str, Tr, Bk.S.	stone
3	Amsen Quarries Limited	Franklin	Str, Bk.S.	stone
4	Asquith Resources Incorporated	Welcome Lake area	Gp, Gc	Cu, Pb, Zn
5	Atkinson, D.	Cardwell	Pr	stone
6	Atkinson, F.*	Baxter	Str, Gc, DD	graphite
7	Bain, D.*	Craig, Gilbert	P, Gl, Gp, Gc	Au, Cu, Zn
8	Barry, A.*	Baldwin	P, Str, Gc	Ni, Cu, PGM
9	Barry, L.	Norman	P, Str, Tr, Gc	Ni, Cu, PGM
10	Bharti Laamanen Mining Incorporated	Botha Rhodes	P, Str, Tr, Gl, Gc Gl, Gp	Au, Pb, Zn, Cu Cu, Pb, Zn
11	Boulard, V.	Parkin	Gp, P, Str, Tr	stone
12	Bradley, D.	Scadding	P	Au
13	Brady, J.	Fraleck	Gp	Au, Cu
		Muldrew, Henry, Loughrin	P, Str, Bk.S.	stone
14	Brady, J., Brady, M.	Parkin, Hart, Ermatinger	P	Au, Ag, Cu, Pb, Zn

Number	Company/Individual	Township (s)	Work Performed	Commodity
15	Brisson, A.	Hutton	P, Gc	Au
16	Brunne, D., Stringer, R.*, Bald, R.*	Curtin	P, Str, Gl, Gp, Gc	Ni, Cu, PGM
17	Butella, C.*	Roosevelt	P, Gl, Gp, Gc	Au, PGM
18	Cameco Corporation	Porter	Gl, Gc, Gp	Au
19	Clement, Y.*	Scadding	P, Str, Gc, Gp, Gl	Au, Cu
20	Clifton Associates	Dryden	DD, Gc	stone
21	Emerald Isle Resources Incorporated/ Stralak Resources Incorporated	Street	P, Str, Tr, Gc, Bk.S., DD	garnet
22	Ewanchuk, J.	Lyman	Gp, Gc	diamond
23	Falconbridge Limited	Drury Levack Maclennan Sudbury Basin Wisner	DD DD DD DD, Gl, Gc, Gp Gp	Ni, Cu, PGM Ni, Cu, PGM Ni, Cu, PGM Ni, Cu, PGM Ni, Cu, PGM
24	Fielding, C., Jr.	Tilton, Halifax	P	stone
25	Flag Resources (1985) Limited	Rathbun Mackelcan	DD DD	Ni, Cu, PGM Au
26	Gallo, E.*	Loughrin	P, Str, Gc	diamond, Au
27	Gervais, R.	Roberts	P	Au, Cu, Pb, Zn
28	Graham, R.*	Scadding, Street	P, Gc, Gp	Au
29	Hammerlund, G. E.	Stobie	P	Au, Ni, Cu, PGM
30	Hercules Stone Limited	Aylmer	Bk.S.	stone
31	Hinse, G.	Cosby	Str, Bk.S.	stone
32	Houle, J.	Muldrew	Str, Tr	stone

Number	Company/Individual	Township (s)	Work Performed	Commodity
33	Huycke, J.*	Moncrieff	P, Str, Gl, Gp	PGM
34	Iltsopoulos, G.	Goshen, Sale	Str, Tr	stone
35	Inco Exploration & Technical Services Incorporated	Gerow, Boon Norman	DD DD	Ni, Cu, PGM Ni, Cu, PGM
36	Inco Limited	Sudbury Basin	DD, Gl, Gc, Gp	Ni, Cu, PGM
37	Jarvis Resources Limited	Parkin	Str, Tr, Bk.S.	stone
38	Komarechka, R.	Eden	Gc, Str, Tr	silica
39	Lackstrom, E.	Ratter Tennyson, Marquette, Secord	P, Gc P	feldspar stone
40	Lahaie, G.	Waldie	P, Str, Bk.S.	stone
41	Leblanc, A.	Janes	Str, Tr, DD, Gc	silica
42	Maki, A., Hanninen, T.*	Marquette	P, Str, Tr, Gc, Gl	Au, Ni, Cu, PGM
43	Maki, O.	Hutton, Parkin	P, Gc	Au
44	Maki, R., Maki, A.	Laura	P	Au
45	Mandziuk, Z.*	Sinclair, McMurrich	P, Gc, Str, Gl	stone
46	Manex Granit Incorporated	Casimir, Monck	Str, Bk.S.	stone
47	Manitou Stone (Canada) Limited	Shibananing, Beebe, Falconer	Str, Bk.S.	stone
48	Naples, K.	Foster	P, Gc	Au
49	O'Leary Malarctic Mines Limited	Hutton, Parkin	P, Gc	Au
50	Ontario Quarries Inc.**	Hutton, Parkin	Str, Tr, Gl, DD	stone
51	Palkovits, M.	Davis	P, Gc	Au, Cu

Number	Company/Individual	Township (s)	Work Performed	Commodity
52	Patrie, D.	McPhail	P	Au, Cu
53	Pilkey, D.*	Scadding	P, Gc, Str, Gp, Gl	Au, Cu
54	Positano, J. J.	Henry	Str	stone
55	Poupore, T.	Scadding, Grigg Street, Loughrin	P, Str P, Gc	stone garnet
56	Prior, D.	Gerow	Gl, Gc	Au, Cu, Pb, Zn
57	Racicot, F.	Freeman	P	stone
58	Rauhala, J.	Waters	Gp	Au
59	Rieux, M., Miron, T.	Rhodes, Botha	P, Str, Tr, Gc	Au, Cu, Pb, Zn
60	Ringuette, G. E.	Lyman	DD	diamond
61	Rose, E.	North Bay area	P, Gc	stone, feldspar
62	Salo, G.	Dieppe Louise	P P	Au Ni, Cu, PGM
63	Sheehan, V.	Butt	Gl	graphite
64	Stringer, E.*	Mongowin	P, Str, Gc	Au
65	Teck Exploration Limited	Sheppard, McCarthy	Gp	Ni, Cu, PGM, Au
66	Tindale, J.*	Unwin	G., Str, Gc	Co, Ag
67	Tracanelli, H.*	Moncrieff	P, Str, Gl, Gp	PGM
68	Trusler, J.*	Carling, Burton, McDougall	Gl, Gc	stone
69	Westin, B., Ewanchuk, J.	Lyman	P	diamond
70	Williams, J. D.*	Street, Davis	P, Gl, Gp, Gc	Au
71	Mclean, P.*	Croft	Gl, Gp	diamond

Number	Company/Individual	Township (s)	Work Performed	Commodity
72	Mannella, B.*	Laurier	Str	graphite
73	Atkinson, J.*	Baxter	P, Str, Gl	graphite
74	Wickern, A, Wickern, B.*	Ryerson	Str, Gl	stone

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*OPAP **OMIP

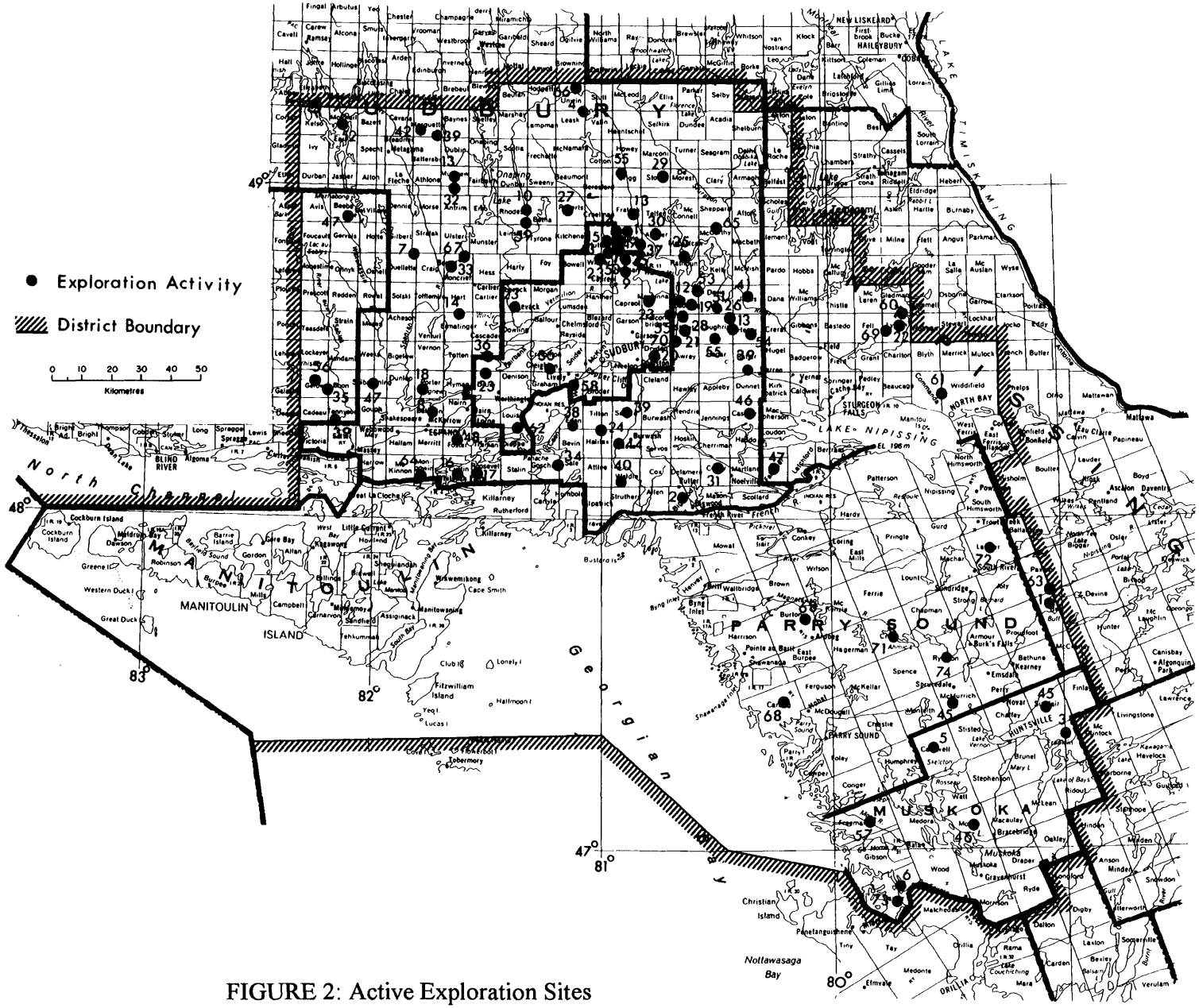

FIGURE 2: Active Exploration Sites

feet. The hole is entirely within Lorrain Formation arkose and quartzite.

Inco Exploration and Technical Services Incorporated

Inco Exploration and Technical Services Incorporated conducted mineral exploration in several townships underlain by the Sudbury Structure, the majority of work being concentrated on long-held patented ground. Exploration consisted of stripping, trenching, geological, geochemical, and geophysical surveys, as well as diamond drilling.

Approximately 5000 m of diamond drilling was completed on property underlain by the East Bull Lake differentiated mafic intrusion (Gallo option) in Boon and Gerow townships. The drilling failed to intersect the anticipated footwall (felsic intrusive rocks of the Algoma Gneiss Domain), at an expected depth of 1000 m. Core from this program was studied by D. Peck of Laurentian University as part of his work on the Nipissing-Huronian Magmatic Belt.

Late in the year, diamond drilling commenced near the Whistle Mine in Norman Township in hopes of intersecting PGM-rich mineralization, similar to that encountered at the Victor Mine.

Falconbridge Limited

Falconbridge Limited conducted exploration on several properties in the Sudbury area in 1993. Much of this work was done on long-held patented and leased ground, thus, detailed information is considered proprietary and confidential.

On the Sudbury Igneous Complex, diamond drilling was concentrated in Trill, Drury, Levack, and Wisner townships, producing results sufficiently significant to warrant future exploration in these areas.

Falconbridge Limited signed an exploration agreement with Inco Limited, which will allow Falconbridge Limited to explore the Vermilion Member of the Onwatin Formation for copper-zinc deposits on claims held by Inco Limited. Diamond drilling has already commenced in the "Mid-Zone", located between the Errington and Vermilion properties, as well as east of, and along strike of the Errington property. Results to date have been encouraging, with values of up to 10% Zn over narrow widths (T. Barnett, Falconbridge Limited, personal communication, 1994).

PROPERTY VISITS

T. Hanninen, A. Maki

T. Hanninen completed a program of prospecting, stripping,

trenching, geological mapping, and lithogeochemical sampling on the Boot Lake property in Marquette Township. An overview of the history and geology of the property is presented in Meyer et al. (1993). A detailed geological description of the property is given in Clement (1993).

Geological mapping in 1992 and 1993 revealed the property is underlain by a differentiated Archean mafic intrusive complex.

The mafic complex consists of nine distinct phases of gabbroic lithologies. For the most part, the gabbro is medium- to coarse-grained melanocratic and medium-grained mesocratic. Felspar porphyritic and glomeroporphyritic phases also occur. The gabbro is relatively massive in character, but locally exhibits crude layering or differentiation (Clement 1993). All phases of the gabbro have undergone a significant amount of uralitization and saussuritization. The mafic complex itself is relatively small, approximately one by two km, trending north-northwest. The glomerophorphyritic phase may in fact be a Matachewan-type dike.

The mafic complex is intruded by felsic plutonic rocks of the Algoma Plutonic Domain. These rocks appear to be coarse-grained alkali-feldspar granites and granodiorites. Coarse-grained pegmatitic dikes emanating from the granite were observed to intrude the gabbro at the southern limit of the gabbro in northern Battersby Township. Gabbroic xenoliths and zones of assimilation at the felsic-mafic contact also indicate the gabbro pre-dates the emplacement of the granitic pluton. Radiometric age determinations by Rb/Sr whole rock isochron and U/Pb zircon methods indicate that the granitic rocks were emplaced at least 2.5 Ga and possibly as early as 2.7 Ga (Card 1979).

During the 1993 season, 30 lithogeochemical samples were collected by T. Hanninen containing finely disseminated sulphide mineralization (usually less that 1%), quartz-calcite-epidote veining, and alteration. The samples were analyzed for Au, Pt, and Pd. This work failed to yield any anomalous values, and did not repeat values of up to 0.11 ounce Au per ton obtained from a sulphide-bearing epidote vein in 1991.

A minor amount of packsack diamond drilling was also conducted by T. Hanninen and A. Maki, but failed to intersect any significant zones of mineralization.

Further exploration may focus on locating zones of PGM mineralization within the gabbro, as well as conducting regional prospecting to identify similar structures in the area.

J. Brady

J. Brady continued with grass-roots exploration on several of his properties during the year. Prospecting and

lithogeochemical sampling were conducted on several interesting gold and base metal claims in eastern Parkin Township. In western Parkin Township recent road construction has exposed finely disseminated to fairly massive sulphide mineralization over a length of approximately 1 km. The mineralization, predominantly pyrite, is hosted in Archean felsic to intermediate tuffaceous rocks. Chalcopyrite, pyrrhotite, and sphalerite were observed in small amounts within the massive sulphide. Little previous work has been completed south of this showing and future exploration is recommended in this area.

J. Brady also commenced stripping and bulk sampling of a building stone prospect on the common boundary of Henry and Loughrin townships. The property hosts a late mafic (gabbro) plug, the size of which has not been fully exposed. The gabbro appears differentiated, with textures ranging from fine-grained ophitic to coarse-grained granophyric. The fine-grained phase polishes well to a lustrous black.

To the west of the gabbro stock is a fine- to medium-grained monzonite(?). It pre-dates the gabbro, but its relationship to the surrounding host paragneisses is unknown. The size of this felsic body has also not been defined. When polished, the rock appears deep red.

Density of the jointing in both units may be favourable to permit extraction of small- to medium-sized quarry blocks.

RECOMMENDATIONS FOR EXPLORATION

The Sudbury area offers many exploration opportunities for prospectors and junior and senior mining companies. Some of these, because of their cost, are only within reach of well-financed companies, but every year new surface showings worth further investigation are being found. These, and new ideas which are being developed, continue to offer the prospector opportunities to find that promising showing which he can stake, upgrade, and offer for option.

The Wanapitei magnetic anomaly is an area of an intense anomalous magnetic signature northeast of Wanapitei Lake. Its size (60 by 30 km) and oval shape makes it similar to that which accompanies the Sudbury Structure. However, its intensity is several times greater than that of the Sudbury Structure.

Due to extensive Huronian metasedimentary rock cover, the anomaly cannot be explained by the rocks at surface, and drilling to date suggests that its source must lie at considerable depth. Being so similar in size and shape, and proximal to the Sudbury Igneous Complex, suggests that there may be a mafic intrusion at depth which is genetically related to the Sudbury event, and which, similarly, may host copper-nickel-platinum group metals sulphide deposits. The anomaly has intrigued exploration

geologists and the scientific community for several decades.

The exploration target thus becomes a hypothetical, post-Huronian intrusion, similar in size and age, to that of the Sudbury Structure. In all likelihood it has an irregular upper surface, so that at any one point the top may lie within Huronian rocks, or below Huronian rocks deep within underlying Archean granites and greenstones.

The point to be made is that the top of this hypothetical intrusion is the first-order exploration target, and not the Huronian-Archean unconformity. Questions such as "How thick is the Huronian cover at this point?" are often asked, but may not be relevant.

Zones of intense albite alteration are found in an area broadly coincident with that part of the Sudbury Structure which lies outside the Sudbury Igneous Complex, and which is characterized by areas of intense brecciation. Rocks most commonly affected are sedimentary rocks of the Huronian Supergroup and Nipissing diabase.

The soda alteration zones have been dated at about 1.7 Ga (Schandl et al. 1992), and thus are younger than the Sudbury Structure by about 150 million years. Whether or not there is a genetic link between the two events remains to be established.

The alteration zones are mostly fine-grained and pink or tan coloured, and are easily recognized. They are variably associated with brecciation, further alteration characterized by coarsely crystalline calcium-magnesium-iron carbonates, chlorite, sulphides, and magnetite. Anomalous metal concentrations most commonly found are gold, copper, cobalt, and nickel. A deep hole drilled in 1992 by Flag Resources (1985) Limited intersected about 300 m of albitized rock with green chromium-rich micas. Lead and zinc do not appear to be associated with these alteration zones, and platinum group metals have not been detected either.

Two small past producers, the Scadding gold mine in Scadding Township, and the Norstar gold/copper mine in Davis Township, were closely associated with soda alteration zones. Remapping of many old showings east of Wanapitei Lake (Gates 1991) has shown that most old showings are associated with ubiquitous albite alteration, a phenomenon not appreciated years ago. These alteration zones continue to be an easily recognizable and attractive exploration target for prospectors and exploration companies.

Building stone exploration continues to garner interest, particularly south of the Grenville Front. Alternative stone applications such as flagstone and other landscape uses should be considered for rocks with high fracture densities.

CANADA-ONTARIO NORTHERN ONTARIO DEVELOPMENT AGREEMENT ACTIVITIES

Industrial Minerals Assessment of Manitoulin Island

A program to evaluate the economic potential of industrial minerals on Manitoulin Island began in June, 1992. The program is part of the Industrial Mineral and Economic Development component of the Canada-Ontario Northern Development Agreement (NODA) signed in November, 1991.

The study area encompasses the mainland mass of Manitoulin Island. A literature review and sampling in 1992 confirmed that the Amabel Formation offers the best potential for economic industrial minerals deposits, for both high purity-chemical grade dolostone and high quality aggregate (Gates 1993).

The 1993 program consisted of resampling core from five diamond drill holes drilled by the Ontario Geological Survey from 1978 to 1980. The five holes from the western portion of Manitoulin Island were collared on potentially high quality dolostone but previous sampling was restricted to only a few one or two inch split samples per hole. The selected core was quartered and sampled in approximately ten-foot sections. The majority of the total of 88 surface samples are from the western half of the island which is underlain by high-quality dolostone, but limited access has resulted in gaps of two to three km in the previous sample density. Sample locations were located to provide coverage on a one km spacing.

In December a total of 128 m of HQ size core was collected from seven vertical diamond drill holes. Three holes totalling 55 m were drilled at the south end of the Wikwemikong Unceded Indian Reserve. Chert was encountered in all holes beginning at depths ranging from 6.4 to 16.7 m. A single hole was drilled at an interior location west of Lake Mindemoya, to test stone quality for potential use as a central aggregate source for Manitoulin Island. It encountered the Fossil Hill Formation at 5.5 m. One hole was drilled east of Lorne Lake in Burpee Township, and two holes were drilled north of Burnt Island in Robinson Township. The holes range in depth from 16.8 to 22.8 m and all three ended in massive, high-quality dolostone.

Geochemical analysis will determine chemical purity, and aggregate testing will be conducted on selected holes to determine aggregate quality. Field work in 1994 will be limited to specific site investigations.

Industrial Minerals and Building Stone in the Districts of Nipissing, Parry Sound, and Sudbury

C. Marmont completed the third and final year of field work to evaluate the economic potential of industrial minerals and building stone in the District of Parry Sound, and parts of the

Table 3: Industrial Mineral Production, 1993
Sudbury Resident Geologist's District

Company	Township	Commodity
Allstone Quarry Products Inc.	Bigwood	stone
Amsen Quarries Ltd.	Franklin	stone
Applied Carbon Technology Incorporated	Butt	graphite
Boothby Quarry	Finlayson	stone
Carman Construction Limited	Delamere/Goschen	silica
Crea-Mac Construction Ltd., Coloured Aggregate Ltd.	Ratter	stone
Ethier Sand and Gravel Ltd.	Dill	stone
Fowler Construction Company Ltd.	Macaulay, Sinclair	stone
Fraser Quarry	Finlayson	stone
Hercules Stone Ltd.	Gordon, Aylmer	stone
International Quartz Ltd.	Ryerson	stone
Jeffery Quarry	Ryerson	stone
Manex Granite Inc.	Casimir, Monck	stone
McDonald Quarry	Finlayson	stone
Mill Lake Stone Quarry Ltd.	McDougall	stone
Rock Lake Granite	Proudfoot	stone
Standard Aggregates Incorporated	Dawson	dolostone
Unimin Canada Ltd	Badgely Island	silica
Tasso Lake Stone	Finlayson	stone
Ted Boyes and Sons Construction Ltd.	Ryerson	stone

districts of Nipissing and Sudbury. The study area is limited to areas underlain by Grenville-age rocks.

Field work during 1993 focussed on industrial minerals associated with metasedimentary gneiss, particularly metapelite. Refer to Marmont (1993) for a detailed report.

RESIDENT GEOLOGIST'S STAFF AND ACTIVITIES

STAFF

The following staff were assigned to the Sudbury Resident Geologist's office in 1993.

1. W. Meyer, Resident Geologist
2. M. Cosec, Staff Geologist
3. T. Livingstone, Administrative Assistant
4. B. I. Gates, Industrial Minerals Geologist. B. Gates was on contract from January to December as an Industrial Minerals Geologist in the NODA program.
5. Jianguo Gao, Senior Field Assistant. J. Gao was on contract from May to August providing very competent field assistance to B. Gates.
6. M. Ernsting, Experience '93. M. Ernsting, hired under the Experience '93 program from July to September, was a general assistant to all staff.
7. P. Trapper, a placement student from Cambrian College, joined us for several weeks during the summer. P. Trapper acted as a general office/field assistant for both the Resident Geologist's and Mining Recorder's offices.

ACTIVITIES

Staff of the Resident Geologist's office responded to approximately 4700 telephone calls and 1900 visitors to the office. Inquiries concerned mineral occurrences, sample identification, mineral potential, assessment work, general geology, government programs, land use planning, and many more topics.

In March, W. Meyer attended the Prospectors and Developers Association Convention as a representative of the Ministry of Northern Development and Mines.

The first quarter of 1993 was largely devoted to planning the 13th Annual Northeast Mines and Minerals Division Geoscience Symposium for which our office was responsible, and preparing for our office relocation.

W. Meyer presented a talk to the Sudbury Geological Discussion Group in March entitled "Reflections on an Image taken from Apollo 17". This talk was also presented to campers at the Grundy Provincial Park in August.

The Northeast Mines and Minerals Division Geoscience Symposium was held at the Sheraton Caswell Hotel April 20 and 21. Dr. Chris Jennings, of SouthernEra Resources Limited, presented an interesting and very well received talk on diamonds to open the Symposium. A total of 67 posters were presented by government agencies, industry, and individual prospectors. Approximately 250 people attended the event from as far west as British Columbia and east from Quebec. A short course in kimberlite exploration, held for one day after the Symposium, drew 50 registrants.

The Resident Geologist's and Mining Recorder's offices were relocated to 933 Ramsey Lake Road, 3rd Floor, Sudbury, ON P3E 6B5, on April 30th.

Throughout May, staff presented 18 hours of prospector classes covering basic geology, map reading, rock and mineral identification, exploration techniques, claim staking, and assessment work requirements. A field trip to the Archean Benny greenstone belt was well received by the participants of the course. Staff wish to once again thank Cambrian College for use of their facilities, and several guest speakers.

Resident Geologist offices across the province received Beep Mats in May. Initial training for using the machine was provided by P. Gaucher. The Beep Mat was in constant use from the end of May until the end of November by our client group. Most reports have been positive.

B. Gates attended the Manitoulin Trade Fair in May. The booth featured a description of the Industrial Minerals Assessment of Manitoulin Island project, general geology of the Island, industrial mineral potential, and representative fossils. A total of 7500 people attended the Trade Fair in Little Current, a small community whose population numbers 1100.

In June, staff took students and staff from the University of Leicester, U.K., on a tour of the Sudbury Structure.

In July, staff tended our office display at the 11th Annual Sudbury Gem and Mineral Show at the Carmichael Arena.

In August, staff provided 20 of the Ministry's summer students a tour of the Sudbury Structure.

In October, B. Gates and J. Gao jointly wrote a paper entitled "Middle Silurian Mudmound and Bioherms from the Amabel Formation, Manitoulin Island, Ontario". B. Gates presented the paper at the Canadian Paleontology Conference and Canadian Sedimentology Research Group Seminar, held at the Willet Green Miller Centre.

M. Cosec organized a field trip for students and teachers from Bishop Strachan School and Upper Canada College to Inco

Limited's tailings and land reclamation activities, as well as the geology of the Sudbury Structure.

In November M. Cosec presented a talk hosted by the Prospectors and Developers Association, Sudbury Branch, entitled "A History of Gold Mining in the Sudbury Area".

The office poster at the Ontario Mines and Minerals Symposium in Toronto in December was entitled "Mining, Development, and Exploration Activities in the Sudbury Resident Geologist's District". A poster by B. Gates entitled "Industrial Minerals Assessment of Manitoulin Island" was also shown.

The Sudbury Resident Geologist's office maintains an outdoor core storage facility. During the year, a relatively small amount of core was acquired from C. Fielding, Sr., from his properties in Louise and Dieppe townships.

GEOLOGICAL AND GEOPHYSICAL RESEARCH

The Sudbury area saw an unusually large number of research projects conducted in 1993. Several reasons can be given for this. It is probably fair to say that Sudbury research benefitted from the recession. Research funds were scarce everywhere, and funds for travel to exotic places even scarcer.

After 100 years, the Sudbury area continues to offer challenging problems. Most parts are easily accessible, and the city is centre of a distinct research community through two major mining companies, Laurentian University, and the Ontario Geological Survey which moved its operations to Sudbury from Toronto in 1992. Numerous spin-off projects have also been stimulated by the LITHOPROBE seismic reflection survey carried out in 1991.

In October, a one day meeting was held in the Willet Green Miller Centre auditorium under the title "Sudbury Symposium '93 - Current Work". This was sponsored by the Sudbury Geological Discussion Group, Falconbridge Limited, Inco Exploration and Technical Services Incorporated, and the Ministry of Northern Development and Mines. Sixteen speakers discussed results of research programs or work in progress.

At the December 1993 Mines and Minerals Symposium held in Toronto, 14 poster displays out of 85 displayed work done wholly or in part within the Sudbury Resident Geologist's District.

The two meetings suggest that in 1993 there were at least 25 research programs being carried out in the Sudbury Resident Geologist District.

Of these, 18 programs dealt with various aspects of the geology of the Sudbury Structure. Other programs dealt with Huronian stratigraphy and structure near Massey, industrial

minerals and building stone, the mineral potential of lower Huronian gabbro-anorthosite intrusions, and the geochemical signature in glacial debris of Ni-Cu-PGE minerals.

In October, additional seismic reflection surveys were carried out under the LITHOPROBE program. The lines crossed the south range of the Sudbury Igneous Complex west of the Creighton mine, and east of the Little Stobie mine. This work was funded by the federal government, Falconbridge Limited, and Inco Limited. At year end, results and interpretations had not been published.

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Southeastern Resident Geologist's District - 1993

by S. van Haaften(1) and P.W. Kingston(2)

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(2) Resident Geologist, Southeastern Ontario District, Ontario Geological Survey - Precambrian Geoscience Section

Introduction

In 1993 there were 33 active mining operations and 15 mills and plants operating in the Southeastern Resident Geologist's District. With one exception - the Chromasco magnesium metal plant in Ross Township - all produce industrial minerals, stone or stone products, and all, with the exception of the underground talc mine of Canada Talc Limited, are open pit operations.

Two new granite producers came on stream in 1993. In addition, there are numerous quarries producing construction aggregate which are regulated by the Ontario Ministry of Natural Resources under the Aggregate Resources Act.

Advanced exploration was carried out on an industrial mineral prospect, an underground gold prospect, and a building stone prospect. Construction of a new industrial mineral milling/processing plant was under way.

Exploration for gold, zinc, industrial minerals, and dimension stone continued in 1993, largely with the assistance of government incentive programs including the Ontario Prospector's Assistance Program and the Ontario Mineral Incentive Program.

Mining Activity

Mining activity in the Southeastern Resident Geologist's District in 1993 is summarized in Figure 1 and Table 1.

The largest producers are the three cement companies - Lafarge Canada Incorporated, Saint Lawrence Cement Company Limited, and Essroc Canada Incorporated (formerly Lake Ontario Cement) - with production capacities ranging from 1 million to 1.9 million tonnes of cement per year. All, with the exception of St. Lawrence, quarry limestone at the plant site. Limestone at the St. Lawrence quarry near Colborne in Cramahe Township is shipped by barge to the Clarkson plant near Oakville for processing.

Other major operators, in terms of production and employment, are Timminco Limited (magnesium metal), Unimin Canada Limited (nepheline syenite), Steep Rock Resources Incorporated (calcium carbon-

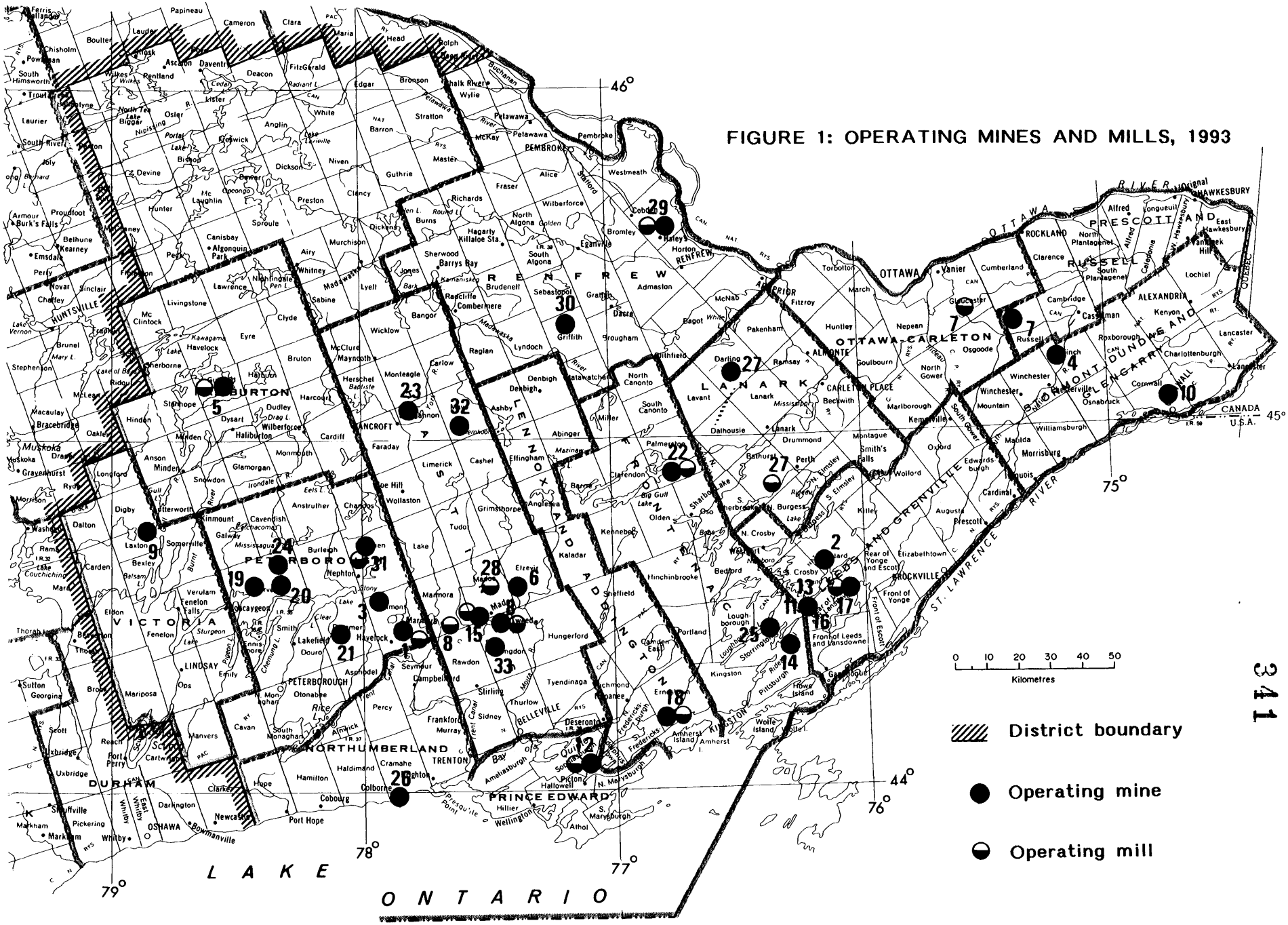
FIGURE 1: OPERATING MINES AND MILLS, 1993
0 10 20 30 40 50
Kilometres
District boundary
Operating mine
Operating mill
LAKE ONTARIO
CANADA
U.S.A.
RENFREW
LANARK
OTTAWA-CARLETON
PRESCOTT AND RUSSELL
STORMONT DUNDAS AND GLENGARRY
LEEDS AND GRENVILLE
HASTINGS
PETERBOROUGH
VICTORIA
HALIBURTON
NORTHUMBERLAND
PRINCE EDWARD
DURHAM
HUNTSVILLE
BURTON
ANCROFT
PEMBROKE
RENFREW
ALMONTE
CARLETON PLACE
ARNPRIOR
OTTAWA
BROCKVILLE
KINGSTON
BELLEVILLE
TRENTON
PETERBOROUGH
LINDSAY
OSHAWA
ST. LAWRENCE RIVER
OTTAWA RIVER
46°
45°
44°
79°
78°
77°
76°
75°

Table 1: Mining activity in 1993
in the Southeastern Resident Geologist's District
(numbers keyed to Figure 1).

MAP NUMBER	COMPANY/ INDIVIDUAL (MINE NAME)	TOWNSHIP (COMMODITY)	MINING ACTIVITY
1	3 M Canada Inc. (Havelock Quarry)	Belmont (Trap Rock)	Roofing granules and HL-1 aggregate are produced.
2	Arriscraft Corporation (Elgin Quarry)	Bastard (Sandstone)	Silica sandstone is mined for the manufacture of reconstituted sandstone. Raw material is shipped to Cambridge, Ontario for processing.
3	Belrose Minerals Corp. (Belmont Quarry)	Belmont (Dimension Stone)	Granite blocks for dimension stone are produced, also custom-made stone steps, benches, and other objects are made with quarrying tools, and decorative stone pieces for landscaping use are offered for sale.
4	Blair, A.L., Contruction Ltd. (Blair Quarry)	Finch (Lime)	Agricultural lime is produced from this limestone construction aggregate quarry.
5	Bolender's Ltd. (Bolender [Eagle Lake] Quarry)	Guilford (Dolomitic marble)	Terrazzo chips, poultry grit, landscaping stone, white cement blocks and white sand are produced.
6	Byer, J.L. (Bridgewater Mine)	Elzevir (Trap Rock)	Trap Rock is produced for use in the manufacturing of rock wool.
7	Canada Brick Manufacturing Ltd. (Russell Quarry)	Russell, Gloucester (Clay Products)	Clay brick is produced from red shale. The quarry is in Russell Tp, and the plant is in Gloucester Tp.
8	Canada Talc Ltd. (Henderson Mine)	Huntingdon (Talc, Dolomite)	Talc products, and ground and crushed dolomite products including terrazzo chips are produced from this mine. This company operates mills at the mine site and at Marmora.
9	Central Ontario Natural Stone (Red Deer Road Quarry)	Laxton (Limestone)	Grey, buff and black limestone are produced as flagstone.
10	Cornwall Gravel Company Ltd. (Cornwall Quarry)	Cornwall (Limestone)	Rough blocks of black limestone for dimension stone are produced on demand from thick upper beds of this construction aggregate quarry.

Table 1 continued: Mining activity in 1993 in the Southeastern Resident Geologist's District (numbers keyed to Figure 1).

MAP NUMBER	COMPANY/ INDIVIDUAL (MINE NAME)	TOWNSHIP (COMMODITY)	MINING ACTIVITY
11	Easton Minerals Ltd. (Straw Hill Quarry)	Rear of Leeds and Lansdowne (Granite)	Decorative red granite aggregate is produced from this quarry. The company also has a currently-inactive industrial minerals processing mill at Northbrook in Kaladar Township.
12	Essroc Canada Inc. (Picton Quarry)	Sophiasburg (Cement)	This is a cement plant with an on-site limestone quarry.
13	Granimar Quarries Ltd (Gananoque Quarry)	Rear of Leeds and Lansdowne (Granite)	Red granite ("Rideau Red") for building and monumental stone.
14	Hughes, W. (Hughes Quarry)	Pittsburgh (Silica sandstone)	Silica is mined and sold for the production of Portland cement.
15	I.K.O. Industries Ltd. (I.K.O. Quarry)	Madoc (Trap Rock)	Trap Rock is mined for roofing granules and HL-1 aggregate. An on-site mill and colouring plant were under construction during 1993.
16	Kingston Red Granite Co. Ltd. (Kingston Red Granite Quarry)	Rear of Leeds and Lansdowne (Granite)	Decorative red granite aggregate is produced.
17	Kingston Stone Products Ltd. (Ellisville Quarry)	Rear of Leeds and Lansdowne (Sandstone)	Sandstone building blocks (ashlar), and flagstone are cut by diamond saw in a plant on site.
18	LaFarge Canada Inc. (Bath Quarry)	Ernestown (Cement)	This is a cement plant with an on-site limestone quarry.
19	Nelson Windover Quarries (Windover [Buckhorn] Quarry)	Harvey (Limestone)	Grey limestone is quarried as flagstone.
20	Ormell Sand and Gravel Ltd. (Ormell Quarry)	Harvey (Limestone)	Flagstone is produced seasonally at this quarry.
21	Payne, E.W. (Payne Quarry)	Dummer (Limestone)	Flagstone is produced seasonally from this quarry.
22	Ram Petroleums Ltd. (Ram Petroleums Quarry)	Palmerston (Tremolite)	Tremolite-rich rock containing minor mica and talc is quarried and milled, and sold as "Clarendite", a mineral filler.
23	Rasmussen, P. (Princess Sodalite Mine)	Dungannon (Gemstones)	Sodalite is mined, and sold for mineral specimens. There is a rock shop on site.

Table 1 continued: Mining activity in 1993 in the Southeastern Resident Geologist's District (numbers keyed to Figure 1).

MAP NUMBER	COMPANY/ INDIVIDUAL (MINE NAME)	TOWNSHIP (COMMODITY)	MINING ACTIVITY
24	Redstone Quarries Ltd. (Redstone Quarry)	Harvey (Limestone)	Red and grey limestone are produced as flagstone, and grey limestone as armour stone.
25	Rideauview Contractors Ltd. (Sloan Quarry)	Storrington (Sandstone)	Buff and red sandstone are produced as ashlar and flagstone.
26	Saint Lawrence Cement Co. Ltd. (Colborne Quarry)	Cramahe (Cement)	This is a limestone quarry. The rock is barged to the Clarkson plant near Oakville for processing.
27	Steep Rock Resources Inc. (Tatlock Quarry)	Darling (Calcitic Marble)	High-purity, fine-grind calcite for fillers, plus other grades of calcite, and marble chips. The mill is west of Perth.
28	Stoklosar Marble Quarries Ltd.	Madoc (Marble)	Marble chips (terrazzo) are produced at this mill, from 8 marble and limestone quarries in Madoc, Huntingdon, Marmora and Lake Townships.
29	Timminco Ltd. (Timminco Metals Quarry)	Ross (Magnesium)	Magnesium is produced from high-purity dolomite marble which is mined at this location. Strontium and calcium are produced from purchased limestone and celestite.
30	Two Island Marble Corp	Griffith (Dimension Stone and chips)	White dolomitic marble was mined in recent years for dimension stone, and cut at the company's finishing plant in Dacre. In 1993 a large quantity of white marble was quarried, crushed, and stockpiled at the quarry site.
31	Unimin Canada Ltd. (Blue Mountain quarry)	Methuen (Nepheline Syenite)	Nepheline syenite is mined from a quarry in this township and processed in two mills. Magnetite is also produced.
32	Upper Canada Stone Company Ltd. (Mayo Marble Quarry)	Mayo (Dolomitic Marble)	White marble is quarried and sold as crushed marble, and for landscaping stone, decorative stone and white cement blocks.
33	Wimpey Minerals Canada Ltd. (Crookston Quarry)	Huntingdon (Limestone)	Rough dimension stone blocks, and armour stone blocks, are produced on demand.

ate), 3M Canada Incorporated (roofing granules), Canada Talc Limited (talc and dolomite), and IKO Industries Limited (roofing granules).

Two new granite producers came into production in 1993 in south-eastern Ontario.

Kingston Red Granite Company Limited, a new company on the mining scene this year opened a quarry in a striking red granite north of Seeley's Bay, near Straw Hill about 20 miles northeast of Kingston. This quarry produces stone for the landscape, architectural precast, and construction trades, in addition to armour stone, aggregates and sands. The company maintains stockpiles of product, and has a loading and weigh scale facility nearby on the main highway.

Belrose Minerals Corporation began operations in 1993 at the Belmont Granite Quarry north of Havelock which had previously been mined by Rock of Ages Corporation in the early 1980s. Large pink granite blocks were quarried and shipped to dimension stone cutting plants for processing into cut panels suitable for building cladding. At the quarry, the quarry master will cut granite steps, benches and other items suitable for use in the garden, using a drill, plugs and feathers. Pieces of granite with naturally-eroded surfaces are also offered for sale.

I.K.O. Industries Limited's traprock operation west of Madoc which began production in 1992, continued to be developed during 1993. I.K.O. Industries Limited is an integrated roofing products manufacturer who established this mining operation to provide roofing granules for use on its asphalt shingles. During 1993 uncoloured roofing granules were produced, along with HL-1 aggregate for asphalt road surfacing. The crushing plant was operational in 1993. A new natural gas pipeline between Stirling and Madoc was built in late 1993. This pipeline will supply gas to the Village of Madoc and IKO Industries Limited. The gas is required to fire the furnaces in the new high-tech granule colouring plant which IKO are now constructing. Coloured ceramic coatings are fired on the greyish-black trap rock granules in order to provide the complete colour range of granules commonly found on asphalt roofing shingles. Expenditures on the whole operation to date are about $12 million, with total expenditures when the colouring plant is finished likely to be well over $15 million.

Advanced Exploration and Development Activity

Exploration activities are summarized in Figure 2 and Table 2.

Canadian Mono Mines Incorporated pumped out the already-existing underground workings at their Bannockburn gold prospect north of Madoc where previous work had outlined reserves of 225,000 tonnes grading 9.15 grams of gold per tonne (0.267 ounces of gold per

ton). They extended the workings by drifting on the 75-foot level.

Ram Petroleums Limited, owner of the wollastonite deposit in Olden Township, completed a large diameter drilling project to confirm reserves estimated from the first drilling 2 years ago. Ram also completed a test pit and removed a 150 ton bulk sample. The sample is being test-milled in batches in several different mills to assess the best process for producing high aspect ratio particles.

The Northern Miner (January 24, 1994) reported that the estimated reserve of Ram's property is more than 2.7 million tons grading 32% wollastonite, 63% calcite and 5% diopside to a vertical depth of about 75 metres. Company president Robert Opekar was quoted as saying that "one hundred percent of the wollastonite recovered from the milled sample has an aspect ratio (i.e. crystal length to thickness) of greater than 17-to-1 ".

Spruce Ridge Resources Limited this year drilled three additional holes in the Cooper Gold property near Cooper, about 12 miles northeast of Madoc. This is a 50/50 joint venture between Spruce Ridge Resources and Lakefield Minerals Limited, which optioned the property from a local mine developer. This property contains a strong, nearly vertical vein up to 11 feet true width, and contains 29,132 tons grading 0.23 ounces of gold per ton across a true width averaging 7.3 feet as a result of drilling by Lakefield Minerals outlining an ore shoot with a strike length of 135 feet and a vertical extent of over 375 feet. Additional holes confirmed the vein and grade at 510 and 675 feet below surface. The new drilling was designed to add tonnage to the known ore zone by testing along strike to the north and down-plunge. Grades are generally in the 0.2 to 0.4 ounces of gold per ton range, with some intersections as high as 0.98 ounces of gold per ton (see Company Prospectus , April 13, 1993 and Northern Miner, May 31, 1993, page 3).

During the year, ownership of the Pacific Coast Mines Limited (US Borax Limited /Rio Tinto) wollastonite property near Seeley's Bay, some 15 miles northeast of Kingston was transferred to another wholly-owned subsidiary, U.S. Silica Limited. Exploration is proceeding at a slower pace, but the Company did blast a 15 ton sample for metallurgical test purposes from a small test pit, and a larger sample is planned.

The Ontario Ministry of Environment and Energy have been carrying out an extensive program of surveying and surface "exploration" in an attempt to accurately locate all the old mine workings and associated mine hazards at the abandoned Deloro Gold Mine and Arsenic Refinery at Deloro. They also tried out ground-penetrating radar but with little success. Dozens of old workings and shafts were identified. Chris Dupont, contracted by MNDM's Mining and Land Management Branch managed a program of 1900 feet of diamond drilling to intersect the identified crown pillars to

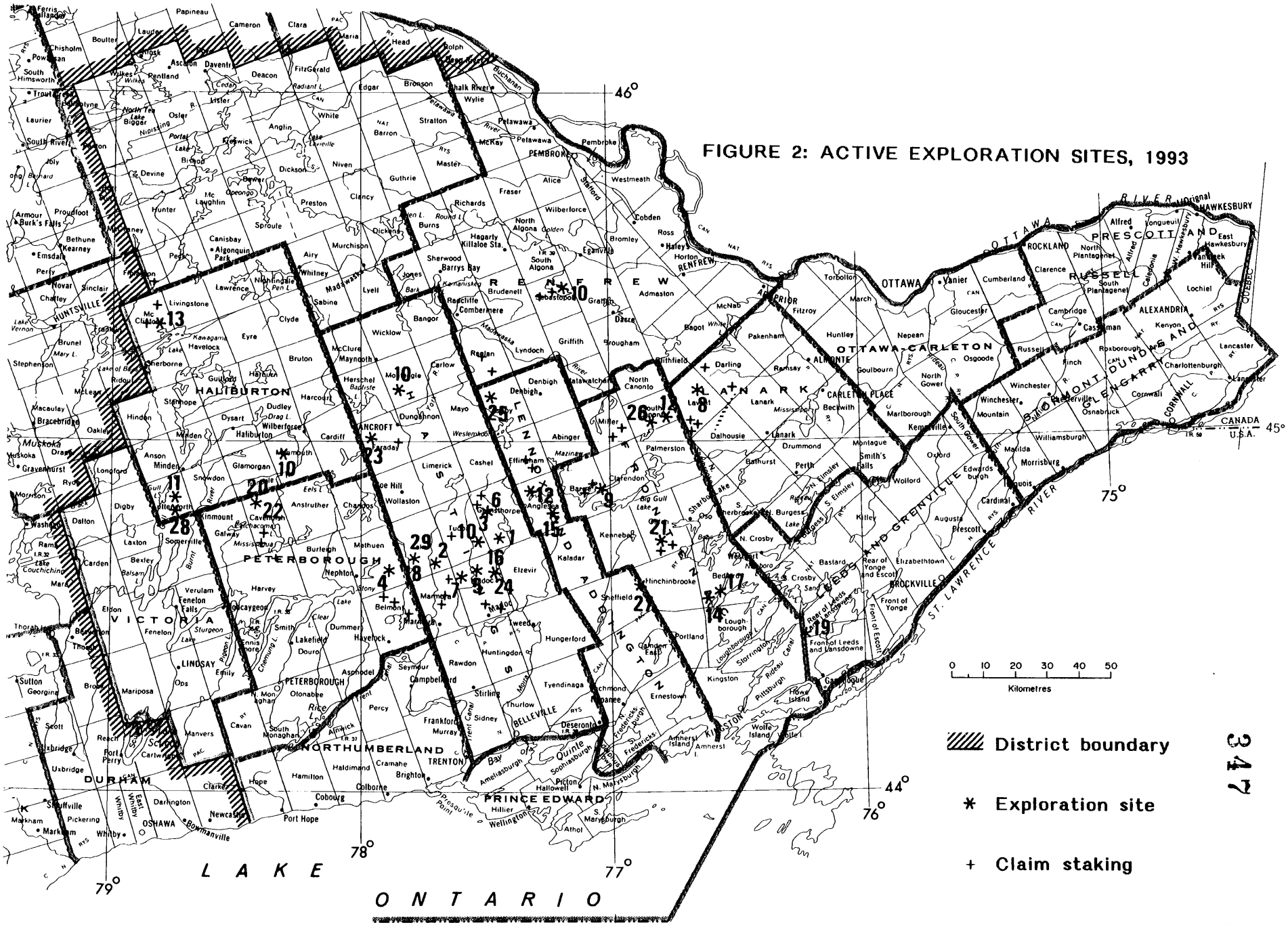
FIGURE 2: ACTIVE EXPLORATION SITES, 1993
District boundary
Exploration site
Claim staking
0 10 20 30 40 50
Kilometres
LAKE ONTARIO
HALIBURTON
PETERBOROUGH
VICTORIA
DURHAM
NORTHUMBERLAND
PRINCE EDWARD
RENFREW
LANARK
OTTAWA-CARLETON
PRESCOTT AND RUSSELL
LEEDS AND GRENVILLE
STORMONT, DUNDAS AND GLENGARRY
OTTAWA RIVER
ST. LAWRENCE RIVER
CANADA
U.S.A.
46°
45°
44°
79°
78°
77°
76°
75°

Table 2: Exploration activity in the Southeastern Resident Geologist's District (numbers keyed to Figure 2).

Abbreviations

DD ..... Diamond Drilling
GL ..... Geological survey
GC ..... Geochemical survey
GM ..... Ground magnetic survey
VLF-EM ..... Very low frequency electromagnetic
Str ..... Stripping
Tr ..... Trenching

MAP NUMBER	COMPANY/ INDIVIDUAL (OCCURRENCE NAME)	TOWNSHIP (COMMODITY)	EXPLORATION ACTIVITY
1	1886 Holdings Ltd.	Grimsthorpe, Marmora (Dimension Stone)	GL
2	Abolins, U.	Lake	VLF-EM, GC
3	Beeseley, T., Laidlaw, C.J.	Grimsthorpe (Au)	Prospecting
4	Brown, W.A., Brown, W.J.	Methuen (Dimension Stone)	Str, test block quarrying.
5	Canadian Mono Mines Inc. (Bannockburn gold)	Madoc (Au)	Dewatering, drifting, raising and sampling from 75-foot level.
6	Dillman, R.J.	Grimsthorpe (Au)	GL, GP GM, VLF-EM
7	Fogal, R.	Madoc (Au)	GL, GC, GM, VLF-EM
8	Gleeson, C.F.	Lavant (Au)	DD
9	Hardie, D.A., Hardie, A.A.	Barrie (Au)	DD, Tr
10	Harper, S.E., Sharpmin Developments Inc.	Monmouth, Sebastopol (Apatite), Monteagle (Feldspar), Tudor (Au)	Tr, Str, analyses, prospecting
11	Jackson, R.G., Soever, A.T. (Buller Lake)	Lutterworth (Zn)	GL, GC
12	Johnson, W.	South Cananonto, Anglesea (Au)	DD, GL, prospecting
13	Jones, F.E.	McClintock	Drilling, blasting, bulldozing.
14	Kennedy, W.S. (Richardson Mine)	Bedford (Feldspar)	Analyses
15	MacLachlan, J., Proctor, A.	Anglesea (Au)	Prospecting, GC, GM, VLF-EM, Tr, beep mat survey.

Table 2 continued : Exploration activity in the Southeastern Resident Geologist's District (numbers keyed to Figure 2).

MAP NUMBER	COMPANY/ INDIVIDUAL (OCCURRENCE NAME)	TOWNSHIP (COMMODITY)	EXPLORATION ACTIVITY
16	McBride, D.E.	Madoc (Au)	GL, GC, GM, VLF-EM
17	Menard, A.G.	Bedford (Graphite)	GL
18	Osiel, M.	Lake (Au)	Prospecting, analyses
19	Pacific Coast Mines Inc.	Pittsburgh, Rear of Leeds and Lansdowne (Wollastonite)	GL, DD, beneficiation tests
20	Pitman, P.W.	Cavendish (Zn)	GL, GC, GM, VLF-EM
21	Ram Petroleums Ltd (Hawley)	Olden (Wollastonite)	DD, beneficiation testing, bulk sampling
22	Rapski, J.	Cavendish (Au)	Prospecting, analyses
23	Senator Stone Supply Ltd	Faraday (Dimension Stone)	DD, test block extraction
24	Spruce Ridge Resources (Cooper Gold/ Talc)	Madoc (Au)	DD
25	Stewart, R.V.	Ashby (garnet, sillimanite, Au, Zn, Ni, Cu)	GL, analyses
26	TMF Mineral Resources (Summit Lake Iron)	South Canonto (Magnetite)	Diamond Drilling, beneficiation tests, marketing research
27	Wagg, C. (Slave Lake Zinc)	Sheffield and Hinchinbrooke (Zn)	Overburden Drilling
28	Webster, B.	Lutterworth (Zn)	Gravity, Induced Potential and Resistivity surveys.
29	Wilkinson, S.J.	Lake	GL, GC

gather data for ground stability over old stopes at five of the gold mines on the Deloro property which operated from 1880 to 1905.

Tundra Granite and Marble Incorporated and Senator Stone Supply Limited completed stripping of a new marble prospect in Faraday Township a few miles west of Bancroft. This is the white, peach and pinkish-red marble property west of Bancroft that was drilled in 1992 under OMIP. The Company brought in a wiresaw and opened a 20 x 30 x 12 foot test quarry and removed 3 large test blocks. The marble in the test quarry is medium grained and pale pink to salmon in colour. A tile with a bush hammered finish was on display at the OGS Geoscience Seminar in Toronto. The Company seem quite pleased with the quality of the stone.

The Richardson Feldspar Mine underwent continuing exploration during the year. There are good development possibilities for the very pure quartz core in this pegmatite. The present owner drilled the property a couple of years ago. Some recent analyses this year are quite promising. A typical analysis of acid washed quartz (in ppm) is : MnO 3, MgO 1, Fe2O3 16, CaO 59, Al2O3 120, TiO2 20. The best analysis is 230 ppm total impurities.

Resident Geologist Staff Activities

Services

The Resident Geologist and his staff in the Tweed office provide a consultative technical service to people engaged in both mineral exploration and mining development in southeastern Ontario. This service involves consultations conducted both in the office and in the field and use of the Resident Geologist's library, files, and computer systems.

We provide comprehensive data on all known past mining and exploration activities in the Southeastern Resident Geologist's District, and monitor ongoing exploration and development. We also maintain contact with other government ministries and agencies on concerns that might have an impact on exploration or mining.

The Resident Geologist's clientele also use the diamond-drill core library, for examining archived drill core and for logging newly-drilled core. Geological maps and reports, claim maps, and prospectors' licenses are sold by the Resident Geologist's secretary.

Staffing

In December of 1993, P.W. Kingston was the Resident Geologist, S. van Haaften was the Staff Geologist, and C.M. Neal was the Secretary. Mrs. Neal went on maternity leave late in 1993, and S. Ryan is filling in for her.

V.C. Papertzian was Drill Core Library Geologist until April 1993, when all Drill Core Library staff in the province were declared surplus. In December 1993 he accepted a position with the Ministry of Consumer and Commercial Relations at the Land Registry Office in Belleville.

P. LeBaron was a contract employee from January through September, 1993. He acted as Staff Geologist from January until March, 1993 while S. van Haaften was seconded to the Assessment Files Research Information (AFRI) project which has automated assessment files access at the Mines and Minerals Information Centre in Toronto. Then, from April to September, P. LeBaron performed core library work, preparing to move much of the core to the off-site storage facility.

J.M. Ridgway worked on a contract basis from January to May and from October through December, 1993 compiling data for the provincial Mineral Deposit Inventory (MDI) database. W. Kelly of Nepean, Ontario was awarded the contract to move drill core to the off-site storage, which he did with a crew of men in October and November, 1993.

Activities related to Re-Organization

1993 saw major changes in the Southern Ontario MNDM field organization. All the Drill Core Library staff in the province were declared surplus in April, and in May it was announced that the Regional Specialist's office in Bancroft and the Algonquin District Resident Geologist's office in Dorset would be closed, with all the associated staff and also the Regional Manager position for Southern Ontario being declared surplus. It was also announced that the Southern Ontario Mining Recorder's office would cease to exist, with only the Recording Clerk position in Toronto being retained to provide Mining Lands services. The Mining Recorder in Sudbury, Roy Denomme, now covers Sudbury and Southern Ontario Mining Districts.

The office closures and staffing cuts significantly influenced the activities of remaining Tweed staff. Some activities which resulted from the organizational changes are described below.

All Bancroft mineral deposit files and many of the library materials were brought to Tweed prior to the closing of the Bancroft office. The Southeastern District was expanded to cover a large part of the former Algonquin (Dorset) District, and the relevant assessment files and mineral deposit files were brought to Tweed. The Bancroft and Dorset mineral deposit files are being merged into Tweed's, and MDI database records are being modified or created to reflect the changes to Tweed's information base. This work is being funded through the Jobs Ontario initiative.

Also with Jobs Ontario funding, all of Bancroft's diamond-drill core was moved to the off-site storage facility located at the

former Ministry of Transportation sand dome site about 3 km south of Tweed on Highway 37. Core which had been stored outside at the Tweed MNDM office on pallets, or in the old Lynx core building, was also moved to the off-site storage facility. At the off-site storage facility, the core is stored on pallets which are keyed to a computer database located in the Resident Geologist's office. Clients can use the off-site core outdoors, at the storage facility. Core which remains in the drill-core library building attached to the Resident Geologist's office can be used indoors.

Other Activities

In addition to providing regular office and field services, the Resident Geologist and staff undertook other activities.

P.W. Kingston and S. van Haaften served on the Mines and Minerals Information Technology Committee. P.W. Kingston also served on the Land Use Planning for Mineral Resources Committee and Ministry of Municipal Affairs' land use planning "Core Team".

The Resident Geologist and Staff Geologist visited selected mineral prospects and active mines. Field trips and mine visits were arranged for representatives of the MNDM Mineral Development and Rehabilitation Branch.

Land Use Planning became an increasingly prominent part of the Tweed office's activities during 1993. In addition to P.W. Kingston's involvement in the "Core Team" and the Land Use Planning for Mineral Resources Committee, the Tweed office worked on the Algonquins of Golden Lake Land Claim information, the Madawaska Highlands planning area, and Official Plans for Peterborough County, the Regional Municipality of Ottawa-Carleton, and Belmont Township.

In public education and mining awareness activities, all Tweed staff plus H. Meyn, MNDM's Regional Specialist set up a booth and sold publications at the Bancroft Gemboree. MNDM also sponsored M. Back, mineralogist at the Royal Ontario Museum, to provide mineral identification services at the Gemboree.

During Mining Week in June, the Tweed Office held an Open House which was well attended by local people. The Ontario Mining Association kindly provided us with brochures, handouts and Mining Week T-shirts which were most welcome. We held the Open House at the Tweed Resident Geologist's Office and Core Library during June 3 and 4 of Mining Week. Members of the public were given tours of the facilities, shown equipment, and given brief talks on local geology, the role of the Ministry, and the importance of mining to the Ontario economy. Two school groups visited the office, one from Tweed and one, a class of 32 grade 5 students, from Belleville. Both were given 1-hour tours and also pamphlets and brochures on mining in Ontario. In all we had 73

visitors to our facility for the Open House.

We started our Spring Prospectors' Class during Mining Week, and held the first two classes on June 2 and 3. The course was taught by S. van Haaften, P.W. Kingston, V.C. Papertzian, Mining Recorder R. Charnesky, Recording Office Clerk D. Jollymore, and Claims Inspector D. Leaper. This course comprised six three-hour, evening classes given at the MNDM office over a three-week period, and was attended by 24 aspiring prospectors. They also attended a Saturday field trip during which a model mining claim was staked. Two past-producing mine sites were visited providing opportunities for good mineral collecting as well as for studying the local geology and for demonstrating the Beep Mat as well as the magnetometer as exploration tools.

At the Mines and Minerals Symposium in Toronto, December 1993, P.W. Kingston and S. van Haaften presented a poster display titled "Exploration and Mining Activity 1993 in Southeastern Ontario". P.W. Kingston together with W.F. Caley, E.M. Deveau and D. Goski of the Technical University of Nova Scotia presented a poster display at the Symposium titled "Kyanite as a Refractory Phase in Ceramic Matrix Composites". There was a gratifying amount of interest in our posters.

In February, 1993, P. Kingston, P. LeBaron, and V.C. Papertzian set up and manned a geologicial/mining display at the Ontario Science Centre GEOFEST for a day and entertained and talked to several hundred children. Our subject was centered around the uses of minerals and how most everyday things have a mineral origin. We also had drill core, drill bits and a core barrel, and a mine model showing drill holes and orebodies. Two static displays illustrated mineral exploration and development in Southeastern Ontario.

March was designated as Heritage Month in Tweed and we were asked to provide a mineral and stone display as well as mining historical data to the local Tweed Historical Museum. We filled 3 display cases as well as providing larger samples. The display was on for the month.

We provided a poster display and staff for Careers Night in May, at the Stirling Senior Public School. This event was attended by approximately 160 grade 6-8 students, and about 240 parents, siblings, and interested persons. P. Kingston, S. van Haaften and P. LeBaron were kept busy by a surprising number of enquiries. We also handed out ministry pamphlets and material provided by the Ontario Mining Association.

In April, for Earth Day, S. van Haaften provided four talks/demonstrations to 4 classes totalling nearly 100 children in grades 1-3 at the Tweed junior public school. The sessions centered around identifying simple minerals and the role minerals play in our everyday lives. S. van Haaften also gave 2 sessions to 4 classes in groups of two to nearly 90 grade 3-4 children at

an elementary school in Cobourg. A school in Peterborough asked us to give a lecture on geology to their grade 5 class, so S. van Haaften spoke to 25 students for about 2 hours. S. van Haaften also spent half a day each at a schools in Trenton and Bancroft, talking to about 100 students in grades 4 to 7 at each school. At all schools the presentations were very enthusiastically received.

P. Kingston and S. van Haaften, along with T. Muir of MNDM's Mineral Sector Analysis Branch were invited to attend the Land O' Lakes Chamber of Commerce Symposium on Chinese Trade and Investment Opportunities in the Mining, Forestry, Agricultural, and Tourism Sectors. The Symposium took place on June 24th, 1993. The Chinese delegation, Chamber of Commerce, Ministry Staff and invited industry delegates met at the MNR McChesney Lake Junior Ranger Camp courtesy of MNR. The opening remarks were given by the Honourable Bill Vankoughnet, MP. About 20 invited industry delegates, and 15 government and chamber of Commerce staff spent the day being given 2 1/2 hours of presentations by the Chinese on opportunities/ investments/ exports in mining, forestry, tourism, and agriculture. This was followed after lunch by a group discussion on the four sectors, allowing industry people to direct specific questions to the Chinese delegates.

S. van Haaften and P. Kingston arranged a 2-day field trip for D. Constable and D. Spethmann of the MNDM Mineral Development Section, to see current developments in building stone in southeastern Ontario. We visited the Eastern Stone Products Limited pink granite quarry in Belmont Township northeast of Peterborough. This quarry is producing beautiful, perfectly rectangular 20-plus ton blocks. Many have been shipped and sold into Quebec and the USA. Production will stop for the winter months but will resume in March 1994. The contractor doing the quarrying is extremely knowledgeable and efficient. We also visited the Granimar Quarries at Straw Hill and the Kingston Red Granite Company Limited quarries nearby, some 20 miles north of Kingston. Granimar was not in production at the time of the visit but Kingston Red Granite have stockpiles of armour stone and crushed and sized chips for decorative applications. We also visited the Cornwall Black marble (limestone) quarry just north of Cornwall. This stone is an excellent intense black when polished, but it is only suitable for interior applications. The final stop was at the Two Island Marble property in Griffith Township, west of Renfrew.

The South Hastings County Waste Management Master Plan has been under preparation for many years, as local municipalities search for a new household waste landfill site. MNDM staff have on several occasions supplied relevant environmental geology information requested by the Plan's steering committee, their consultants, and the general public. In October 1993, S. van Haaften was invited and took part in "walkover" inspections of the three candidate landfill site areas which had been identified.

Recommendations for Exploration

The following commodities are recommended for exploration at this time because of current economic and demographic factors which mean that there is good market demand at present.

Wollastonite

Global demand for wollastonite is forecast to grow at an annual rate of 10%. None is at present produced in Canada. Wollastonite is essentially a skarn mineral and prospecting should concentrate on calcitic, siliceous marbles located within the thermal metamorphic aureoles surrounding high-temperature plutons such as gabbros.

The composition of the siliceous carbonates provides the elemental components in intimate contact to form the wollastonite, and the high temperatures associated with gabbro intrusions along with the structural dislocations at the edges of the intrusion provide respectively the energy to drive the development of wollastonite and the conduits to allow escape of the carbon dioxide whose continual removal from the system is necessary for the reaction to proceed to completion. In areas of high regional metamorphism, the periphery of late intrusions that post-date the regional high grade metamorphic event should also be investigated.

Muscovite, Sillimanite, and Staurolite

Fine-grained muscovite mica is a mineral in demand as a functional filler and is found in the pelitic schists of the Flinton Group rocks near Tweed and near Fernleigh which also host garnet, sillimanite, kyanite, staurolite, feldspar, and magnetite deposits. Sillimanite is used in the manufacture of acidic refractories. Staurolite is in demand as a silica-free sandblasting sand. The relative abundance of the minerals varies along and across strike. An economic deposit may exist where the grain size of the constituent minerals is sufficiently coarse to allow the production of several mineral products and co-products. Exploration should be focussed on the pelitic schists of the Clare River synform and Fernleigh-Ardoch areas where sillimanite, staurolite and muscovite occur in sufficient quantities (>60 % combined) and coarseness to warrant consideration as co-products.

Dolomite

Dolomite fillers enjoy good markets in Europe but less so in North America suggesting there are good local market opportunities for aggressive developers and marketers of this mineral. Prospecting efforts for high purity dolomite should include Griffiths, Mayo, Olden, and Ross townships.

High Purity Calcite

High purity, high brightness, pure white calcite (marble) is always in strong demand, especially at the low end of the market for products such as chips, decorative aggregate, golf trap sands, and ground fillers. Several good deposits of white marble are well documented and opportunities exist in many of the marble belts for locating additional ones. Work done by the Ministry in Tweed has identified several dozen undeveloped prospects.

Building Stone

Southeastern Ontario hosts marbles and granites with a wide variety of colours and textures with potential applications as dimension stone and decorative aggregate.

Base Metals and Gold

Base metals and gold continue to be strong targets for exploration with several interesting new zinc and gold deposits and prospects having been found in the last decade. Much promising ground remains underexplored, especially for zinc in the marble belts. A new large tonnage, low grade gold deposit was discovered a few years ago in a very small strongly sheared and altered satellite intrusion peripheral to the Deloro pluton. Exploration should be directed to this type of skarn gold occurrence in Marmora, Madoc, Rawdon and Huntingdon Townships as this type of mineralization has only recently been recognized in this part of the Grenville Province.

Southwestern Resident Geologist's District - 1993

B.H. Feenstra[1] and A.C. Wilson[2]

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INTRODUCTION

Salt production in the province, all from mines and brine fields in this region, remained strong except for the closure of 1 brine field and another chlorine plant in Sarnia. To be more competitive at its Goderich salt mine, Sifto Canada Inc. is employing bench mining and mechanical scaling techniques at this mine operation. Gypsum production in the province, all from mines in this area, remained at about the same as last year.

There was an overall decline in quarrying for building stone and brick shale. The new provincial sales tax on rough building stone products impacted quarry operations in the region. Buff limestone deposits in the area should remain attractive targets for exploration and development with the continuing strong demand for these dimention stone products.

The high-clacium limestone and high-magnesian dolostone deposits in the region west of the Niagara Escarpment should form prime targets for exploration and development of new raw material sources to supply expanding markets in environmental pollution abatement products. Formosa Environmental Aggregates Ltd. is already actively developing 1 of these deposits in the Formosa Reef Limestone.

Industry announced 2 future "greening" projects: 1 involving the use of synthetic gypsum, resulting in the planned closing of a gypsum mine; the other including possible development of part of a salt mine as an industrial waste storage site which could alleviate landfill concerns.

The Resident Geologist's office handled more land use plan submissions requesting basic geoscience and thematic mineral resource information than at any time previously. With changing land use priorities adversely impacting near-surface mineral development of properties across the region, particularly in the Niagara Escarpment and Greater Toronto Area, exploration for and underground development of industrial mineral resources and space for other uses below the land or underneath the adjacent Great Lakes is becoming more and more attractive.

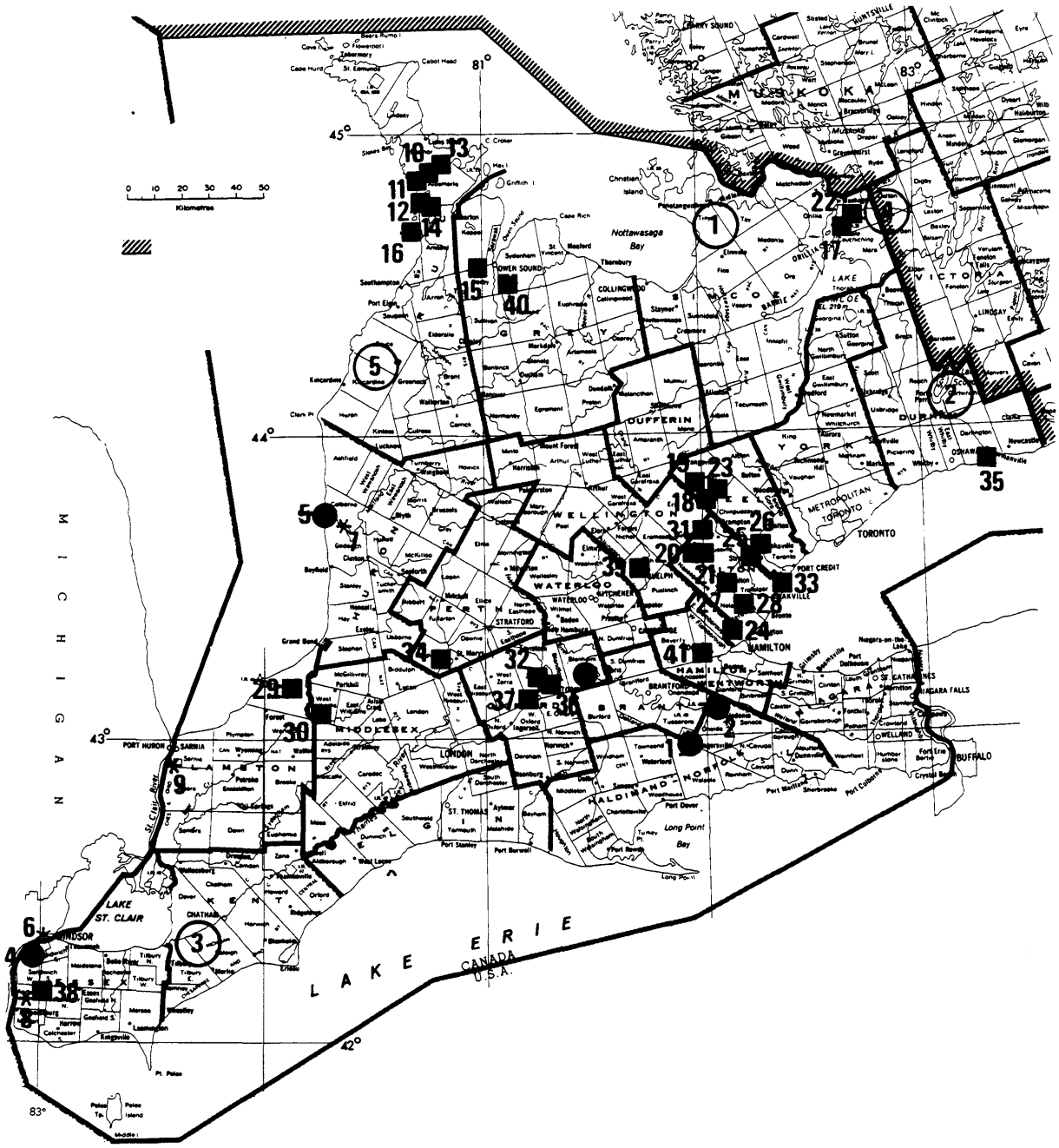

Figure 1. Southwestern Resident Geologist's District - 1993.

EXPLANATION

Mining/Quarrying Activity in 1993

● **Producing Mines**

Gypsum -

1. Canadian Gypsum Company, Hagersville Mine
2. Domtar Gypsum, Caledonia No. 3 Mine
3. Westroc Industries Limited, Drumbo Mine

Rock Salt-

4. The Canadian Salt Company Ltd., Ojibway Mine
5. Sifto Canada Inc., Goderich Mine

***Producing Brine Wells**

Fine Salt

6. The Canadian Salt Company Ltd., Windsor Field
7. Sifto Canada Inc., Goderich Field

Chemical Salt

8. General Chemical Canada Ltd., Anderdon Field
9. Dow Chemical Canada Inc., Moore Township Field

■ **Producing Quarries**

Building Stone - Dolostone

10. Allen Bridge Landscaping, Emerson McLay Quarry, Albemarle Tp.
11. Amsen Quarries Ltd., Mar Quarry, Albemarle Tp.
12. Amsen Quarries Ltd., Wiarton Quarry, Amabel Tp.
13. Arriscraft Corporation, Adair Marble Quarries, Albermarle Tp.
14. Ebel Quarries Inc., Ebel Quarry, Amabel Tp.
15. Owen Sound Ledgerock Ltd., Owen Sound Quarry, Keppel Tp.
16. Owen Sound Ledgerock Ltd., Wiarton Quarry, Amabel Tp.

Building Stone - Limestone

17. Speiran Quarries Ltd., Speiran Quarry, Rama Tp.

Building Stone - Sandstone

18. Credit Valley Sandstone Company Limited, Terra Cotta Quarry, Chinguagousy Tp.
19. Deforest Brothers Quarry Ltd., Deforest Brothers Quarry, Caledon Tp.
20. Hilltop Stone and Supply Inc., Hilltop Stone and Supply Quarry, Esquesing Tp.
21. Rice and McHarg Quarries Ltd., Rice and McHarg Quarry, Esquesing Tp.

Building Stone - Gneiss

22. Rama Stone Quarries Limited, Rama Stone Quarry, Rama Tp.

Clay Products - Shale

23. Brampton Brick Ltd., Cheltenham Quarry, Chinguacousy Tp.
24. Canada Brick, Aldershot Quarry, Nelson Tp.
25. Canada Brick, Britannia Quarry, Mississauga
26. Canada Brick, Cooksville Quarry, Mississauga
27. Canada Brick, Milton Quarry, Esquesing Tp.
28. Canada Brick, Tansley Quarry, Nelson Tp.
29. Coultis and Sons Ltd., Thedford Quarry, Bosanquet Tp.
30. Martin Clay Products Ltd., Arkona Quarries, West Williams Tp.
31. Martin Clay Products Ltd., Georgetown Quarry, Esquesing Tp.

Cement - Limestone, clay and shale

32. Lafarge Canada Inc., Woodstock Quarry, Zorra Tp.
33. St. Lawrence Cement, Clarkson Quarry, Mississauga
34. St. Marys Cement Company, St. Marys Quarry, Blanshard Tp.
35. St. Marys Cement Company, Bowmanville Quarry, Darlington Tp.

Lime - Chemical, metallurgical, filler grade limestone

36. BeachviLime Limited, Beachville Quarries, Zorra Tp.
37. Global Stone Corporation, Ingersoll Quarry, Zorra Tp.
38. General Chemical Canada Ltd., McGregor Quarry, Anderdon Tp.

Lime - Chemical, metallurgical, filler grade dolomite

39. Guelph DoLime Limited, Guelph Quarry, Guelph Tp.
40. Owen Sound Dolomite, Sydenham Quarry, Sydenham Tp.
41. Redland Quarries Inc., West Flamborough Tp.

Location of OGS Field Party in 1993

1. D. K. Armstrong
2. P. J. Barnett
3. M. A. Rutka and M. C. Birchard
4. D. Rowell
5. R. I. Kelly
6. J. E. Tilsley, P. R. Nicholls and C. L. Baker*

* no field component to this project

MINING ACTIVITIES

During 1993, a total of 5 mines and 4 brine fields were operational in the Southwest District. Also present in the district are 32 licenced quarries for rough and dimension stone products, shale for the manufacture of bricks and other industrial clay products as well as crushed stone for cement, lime, chemical, metallurgical, and industrial filler products.

GYPSUM

Canadian Gypsum Company

The Canadian Gypsum Company operates the Hagersville Mine near Hagersville, Ontario. Production, to the end of 1993, was 425 000 tonnes which is approximately 67% of capacity (S. J. McCarroll, Canadian Gypsum Company, personal communication, 1994). The mine, mill and associated wallboard plant employs 280 workers.

Gypsum is mined from the Salina E Unit. Total gypsum thickness at the mine is approximately 1 to 1.5 m. The unit is 25 to 35 m below the surface.

The company employs room and pillar mining techniques. The mine is accessible both by ramp and shaft.

Domtar Gypsum

Domtar Gypsum operates the Caledonia No. 3 Mine at Caledonia. The mine is accessible by a twin ramp system and the company uses continuous mining methods to extract the gypsum. The mine and wallboard plant employ a total of approximately 100 employees.

Gypsum is extracted from the Salina B Unit which, in the vicinity of the mine, is more 20 to 25 m below the surface.

Westroc Industries Limited

In July 1993, Westroc Industries Limited announced the planned closure of its Drumbo Mine by mid-1995. The decision to close follows an agreement that was signed between Westroc and Ontario Hydro, in July 1993, to use a new source of lower-cost material known as desulphogypsum (DSG) (*Kitchener-Waterloo Record*, July 16, 1993, p.B6).

The Salina A-2 Unit hosts the gypsum which, in the vicinity of the mine, is approximately 1.7 m thick and is mined at a depth of 116 m. In 1993, 171 000 tons of gypsum was mined and sent to the company's wallboard plant in Mississauga (K. Scheifele, Westroc Industries Ltd., personal communication, 1994).

SALT

The Canadian Salt Company Ltd.

The Canadian Salt Company Ltd. operates the Ojibway Mine at Windsor. The mine extracts salt from the 7.5 m thick Middle F Unit of the Salina Formation, which is approximately 295 m below surface.

The mine has 1 production shaft for hoisting the mined rock salt in 12 tonne skips to surface for milling, storage and shipping. The graded rock salt products are sold mainly for de-icing purposes; coarse, higher purity salt is sold for water softening, and the remaining 'fines' are sold to the chloralkali industry. Total production for 1993, was 2.2 million tonnes of rock salt (R. Ellis, The Canadian Salt Company Ltd., personal communication, 1994).

The Canadian Salt Company Ltd. also produces saturated salt brines by solution mining techniques at their brine well operations at Windsor. Saturated salt brines are evaporated to produce high-purity, fine, granular salt for food-grade, chemical and agricultural purposes. Approximate production of fine salt, for 1993 , was 150 000 tonnes (R. Ellis, The Canadian Salt Company Ltd., personal communication, 1994).

Sifto Canada Inc.

At the Goderich Mine, Sifto Canada Inc. mines and mills the 30 m thick A-2 Unit salt bed of the Salina Formation, at a depth of 520 to 540 m below Lake Huron. Two production shafts are used to hoist the rock salt to surface storage facilities. Total production for 1993 was 3.3 million tons, slightly above last year's production (D. Dickie, Sifto Canada Inc., personal communication, 1994).

The rock salt is used primarily for de-icing of roads. Other uses include: water softening, feed salt and the chlor-alkali industry.

The Goderich Mine employs a stress relief method of mining, by which, multiple, large parallel rooms are advanced, leaving only small yield pillars between them, and by diverting internal stresses to large, abutment pillars. The current mining height is set at 13 m and the room width is set at 18 m. The company plans to eliminate hand-scaling at the mine and is currently converting to the more competitive practices of overcutting, bench mining and mechanical scaling. The room height will ultimately increase to approximately 18 to 18.5 m and room widths will remain the same (D. Dickie, Sifto Canada Inc., written communication, 1994).

Sifto also operates a brine field near their Goderich

underground mine site. The company employs solution mining techniques to produce saturated salt brines which are evaporated to produce high-purity, fine, granular salt. Approximately 100 000 tonnes of fine salt were produced by the company in 1993.

General Chemical Canada Ltd.

General Chemical Canada Ltd. operates brine wells in 2, Unit B, Salina Formation salt beds in Anderdon Township, north of Amherstburg. In 1993, 866 809 tons of salt were extracted and processed for use in the manufacture of soda ash and calcium chloride products at the company's Amherstburg plant facilities (N. Zuk, General Chemical Canada Ltd., personal communication, 1994).

Dow Chemical Canada Inc.

In June 1993, Dow Chemical Canada Inc. ceased the production of salt from its brine field in Moore Township. Total production to the end of June was 191 400 tons (K. Ploetner, Dow Chemical Canada Ltd., personal communication, 1994).

The company also closed its chlorine manufacturing facilities in Sarnia in 1993. Approximately 300 jobs have been affected by this closure.

BUILDING STONE

LIMESTONE AND DOLOSTONE

Allen Bridge Landscaping and Cut Stone

Blocks of grey dolostone from the Eramosa Member are extracted from the Emerson McLay Quarry in Albemarle Township. The seasonally operated quarry markets its products for landscaping applications.

Amsen Quarries Limited

Amsen Quarries Limited owns the Mar Quarry in Albemarle Township (inactive in 1993) and the Wiarton Quarry in Amabel Township. The company extracts brown dolostone from the Eramosa Member to produce a variety of landscaping products.

Arriscraft Corporation

Adair Marble Quarries, a division of Arriscraft Corporation, operates 2 quarries in Amabel Township, south of the town of Hope Bay. The company extracts bluish-grey dolostone blocks from the Amabel Formation and processes the stone at their plant in Cambridge. Adair Marble is marketed as an architectural stone throughout Canada and the United States. Both quarries were

inactive during 1993.

In addition to natural stone, Arriscraft Corporation also manufactures structural stone at its Cambridge plant. The manufactured calcareous sandstone masonry is made by heating and pressing a mixture of natural sands, hydrated quicklime, and coloured pigments, using a process developed by the company in 1956. Annual production of the manufactured stone product is approximately 200 000 tonnes per year.

In 1993, Arriscraft Corporation, received a $1 million loan guarantee from the Ontario Development Corporation to help it expand into new United States markets. The company estimates that it will add approximately 100 staff over the next year as a result of new business ventures. Arriscraft projects annual export sales, over the next 3 years, will reach $8 million, a 150% increase over 1993 levels (*Kitchener-Waterloo Record*, October 8, 1993, p.12).

Ebel Quarries Inc.

In 1993, Ebel Quarries Inc. extracted 10 000 tons from the Eramosa Member, at their quarry site in Amabel Township on the Bruce Peninsula (G. Ebel, Ebel Quarries Ltd., personal communication, 1994).

The company produces: cladding slabs, paving stone, steps; coping, sills and wall stone, as well as: random and cut paving stones, drywall, steps, curbing, and pool and wall coping as landscaping products.

In 1994, the company plans to produce blocks from the marble beds, as well as from an underlying creamy beige unit. Production from these units will further diversify the products that the quarry sells (G Ebel, Ebel Quarries Ltd., personal communication, 1994).

Owen Sound Ledgerock Limited

Owen Sound Ledgerock Limited operates the Owen Sound Quarry (Keppel Township) and 2 quarries near Wiarton in Amabel Township. The company extracts brown dolostone from the marble unit of the Eramosa Member, and markets the cut and polished stone as the Eramosa marble. The stone is used mainly for exterior architectural products and for interior residential work such as fireplaces and kitchen counters.

In 1993, the company also cut blocks of the St. Bee Red Sandstone, from England, the New Brunswick Sackville Red Sandstone and the Credit Valley Sandstone. All of these rock types were used in the restoration work at the Ontario Legislature Building in Toronto.

Owen Sound Ledgerock operates the only year-round building

stone quarries in the district.

Speiran Quarry

The Speiran Quarry is located in Ramara (formerly Rama) Township, on the east side of Highway 169. The quarry is owned by Carson Speiran who operates the quarry seasonally for the production of landscape stone and retaining walls. The limestone is the pale grey, microcrystalline limestone of the Gull River Formation (Derry, Michener, Booth and Wahl and Ontario Geological Survey 1989).

GNEISS

Rama Stone Quarries Limited

Pink to red, medium- to coarse-grained, granite gneiss is seasonally extracted from the company's quarry site in Ramara (formerly Rama) Township on the east side of Lake Couchiching. The stone is a popular decorative gravel and also is used as a veneer stone (Marmont 1991).

SANDSTONE

Credit Valley Sandstone Company Limited

The company owns quarry sites in both Terra Cotta and Inglewood, and operates a building stone retail outlet at Concord. Both sites have been evaluated for the building stone potential of both the grey and reddish-brown phases of the Whirlpool Formation sandstone. Both sites will be developed simultaneously (L. Norrie, Credit Valley Sandstone Company Ltd. personal communication, 1994).

Deforest Brothers Quarry Ltd.

The Deforest Brothers Quarry is located in Caledon Township, west of Inglewood. The company extracts grey, reddish-brown and mottled Whirlpool Formation sandstone and markets the "Credit Valley Sandstone" as flagstone, masonry stone and ledgerock.

Hilltop Stone and Supply Inc.

The company operates a stone quarry in Esquesing Township, near the town of Halton Hills. Hilltop Stone and Supply markets grey Whirlpool Formation sandstone for flagstone, coping, coursing, steps and masonry stone. The Hilltop Quarry is a seasonal operation (K. Galbraith, Hilltop Stone and Supply Inc., personal communication, 1993).

Rice and McHarg Quarries Ltd.

The Rice and McHarg Quarry is located in Esquesing Township,

south of the village of Limehouse. Grey to buff "Credit Valley Sandstone" is seasonally quarried from the Whirlpool Formation. The rock is marketed as flagstone and masonry stone.

SHALE

Brampton Brick

Brampton Brick Ltd. operates the Cheltenham Quarry in Chinguacousy Township, near the town of Caledon. The shale is used in the production of brick at the company's Snelgrove Plant, north of Brampton. In 1993, an estimated 221 000 tons of shale were extracted from the quarry (B. Ferguson, Brampton Brick Ltd., personal communication 1994).

Canada Brick

Canada Brick operates 4 quarries western part of the Greater Toronto Area (GTA). Queenston shale is extracted at 3 sites for the production of bricks at on-site plants at Burlington and Mississauga, as well as the company's flue lining, sewer pipe, structural tile and terra cotta plant in St. Thomas. Georgian Bay shale is quarried at the Cooksville site.

The 4 operating quarries are: the Britannia Quarry (Mississauga); the Cooksville Quarry (Mississauga); the Tansley Quarry (Burlington) and the Milton Quarry (Milton). A fifth quarry, the McFarren Quarry (Mississauga) is being decommissioned by the company and will be redeveloped as a housing subdivision.

A sixth quarry, the Aldershot Quarry, is under licence by the company and represents approximately 25 to 30% of the licenced shale reserves in the province. This site is currently inactive, but is expected to be reactivated within the next 8 years.

Canada Brick reports that their 1993 production was approximately 18% less than their 1992 production (J. Storer-Folt, Canada Brick, personal communication, 1994)

Martin Clay Products Ltd.

The company extracts shale from the Middle Devonian Arkona Formation at their quarry in West Williams Township, at Parkhill. In March 1993, a fire at the company's brick plant caused and estimated $1 million damage (*The London Free Press*, March 29, 1993, p.A7). Production of brick and brick veneer still had not resumed by the end of the year.

CRUSHED STONE - LIME, CHEMICAL, METALLURGICAL AND PULVERIZED STONE PRODUCTS

BeachviLime Limited

BeachviLime Limited quarries a 25 m section of the high-purity limestone of the Lucas Formation at Beachville. The limestone is used for the production of quicklime, hydrate, flux stone and pulverized stone at their on-site facility.

A subsidiary of the company, Guelph DoLime Limited, operates a quarry near Guelph, where they extract high-purity dolomites of the Eramosa and Guelph formations. Guelph DoLime produced calcined lime, hydrated lime, flux stone and agricultural stone products at their on-site plant.

Global Stone Corporation

Global Stone Corporation, which acquired Stelco's Ingersoll works in 1992, quarries a 33 m section of the Lucas Formation consisting of 28 m of high-calcium limestone overlain by 7 m of sandy limestone. The high-calcium limestone is used for on-site production of a quicklime and metallurgical flux stone. Ontario Ministry of Transportation (MTO) specification stone is also supplied for asphalt and concrete end-uses. Other end-uses include: raw feed for cement manufacture, granular road base materials, agricultural limestone, armour stone and gabian stone (G. Garton and D. Bowman, Global Stone Corporation, personal communication, 1994).

General Chemical Canada Ltd.

General Chemical Canada Ltd. operates the McGregor Quarry in Anderdon Township, 10 km northeast of Amherstburg. The company extracted 744 633 tons of limestone and 1 077 576 tons of dolomite from the site in 1993 (N. Zuk, General Chemical Canada Ltd., personal communication, 1994).

The high-purity limestone is used for calcining and the manufacture of soda ash at the company's Amherstburg plant.

Redland Quarries Inc.

High-purity dolomite, from the Eramosa and Guelph formations, are quarried at the company's quarry at Dundas. The company, formerly known as Steetley Quarry Products Inc., uses the crushed stone to produce various dolime, flux stone and pulverized stone products at their on-site plant.

CRUSHED STONE - CEMENT PRODUCTS

Lafarge Canada Inc.

Lafarge Canada quarries and blends limestone from the Middle and Lower Devonian-aged: Lucas, Amherstburg and Bois Blanc formations, for the production of grey portland cement at its Woodstock area plant.

St. Marys Cement Company

St. Marys quarries limestone and dolomitic limestone from an 18 m section of Middle Devonian-aged rocks at the site of its cement plant at St. Mary's. A second plant, at Bowmanville, is supplied by a quarry in Darlington Township. The company extracts limestone from the Middle to Upper Devonian Lindsay Formation at this site.

EXPLORATION ACTIVITY

There were 2 Ontario Prospectors Assistance Program (OPAP) grants to individuals for diamond prospecting work to be carried out in part within this district in 1993, and one company received Ontario Mineral Incentive Program (OMIP) assistance for an industrial mineral project. The total value of these grants was about $60 000.

Formosa Environmental Aggregates Ltd., Greenock Township

Formosa Environmental Aggregates Ltd., with OMIP assistance, completed the following exploration and development work on its calcium-rich, high-purity limestone property of 107 hectares (265 acres) in the Formosa Reef Limestone, west of Walkerton, in Greenock Township, Bruce County:

1. diamond drilling program (grade and reserves);
2. core sampling and analysis;
3. overburden drilling program;
4. environmental impact studies; and
5. quarry site plans.

The company is now in the process of applying for a South Bruce County Official Plan Amendment, a change in Zoning to M2 Extractive Industrial from Greenock Township, and a quarry license under the Aggregate Resources Act (R. Goad, Formosa Environmental Aggregates Ltd., personal communication, 1993).

Standard Aggregates Inc.

Standard Aggregates Inc. completed a diamond drilling program at their Guelph Pit operation, Guelph-Cambridge area, Guelph Township. The work was carried out to assess the construction aggregate, chemical stone, and building stone potential of the Guelph, Eramosa, and Amabel formations (D. Hewson, Standard Aggregates Inc., personal communication, 1993).

Milton Limestone

Milton Limestone, a division of Lac Minerals Ltd., planned a diamond drill program at a property in the Amabel Formation, west of the Niagara Escarpment Plan Area (NEPA). The Company is planning a large quarry operation to replace the current one at Milton that is located inside the NEPA (J. Spiteri, Milton Limestone, personal communication, 1993).

RESIDENT GEOLOGIST'S STAFF ACTIVITIES

Location

The office of the Southwestern District Resident Geologist is located in the main provincial government building at 659 Exeter Road near Highway 401 in London. Construction of new, more user-friendly facilities at the same site began in the fall of 1993. Facilities adjacent to the new site include the Petroleum Resources Centre of the Ministry of Natural Resources, and the Geotechnical Section and Soils and Aggregates Testing Laboratory of the Ministry of Trans-portation.

Staffing

The Southwestern District office is staffed by B.H. Feenstra, Resident Geologist; A.C. Wilson, Staff Geologist, formerly at Wawa, replacing M. Garland-Kruys since September 1993; and P.I. Smith, Administrative Assistant. C. Tanglis was employed as Geological Assistant during the summer.

Activities

The Mines and Minerals Division reorganized in 1993. The Ontario Geological Survey, Branch of the Division, currently includes all head office (Sudbury) and regional geoscientists and their support staff. The program of the Southwestern District Resident Geologist is now part of the Survey's Sedimentary and Environmental Geoscience Section.

Resident Geologist's Office staff provided geoscience and mineral resource related advisory services to more than 300 clients visiting the South-western District office, and responded to more than 1000 tele-phone inquiries. The office also sells maps and reports pub-lished by the Mines and Minerals Division, and provides services required to obtain prospector's licences.

The Resident Geologist, accompanied by the Geological Assistant, visited the Formosa area property of Formosa Environmental Aggregates Ltd. in Greenock Township, Bruce County, to examine quarry exploration and development work by the company at their calcium-rich, high-purity limestone deposit in the Formosa Reef Limestone. They also visited the Guelph Pit prop-erty of Standard Aggregates Inc., in the Guelph-Cambridge, area to examine diamond-drill core of the Guelph Formation, Eramosa Member, and Amabel Formation underlying the gravel pit and to assist in the assessment of their construction aggregate, chemical stone and/or dimension stone quarrying potential.

The Staff Geologist visited the decommissioned McFarren Quarry of Canada Brick in Mississauga to sample a reported occurrence of anomalously high concentrations of copper, up to 6300 ppm, in the Georgian Bay Formation near the contact with the

overlying Queenston Formation.

To assist Ontario Hydro with its requirements for the purchase of environmental (acid rain abatement) limestone products for use at the Lambton Generating Station's wet-scrubbing, flue-gas desulphurization project, the Resident Geologist provided information on several potentially suitable calcium-rich, high-purity limestone deposits and producers in southwestern Ontario. These limestone deposits in the Lucas Formation and Formosa Reef Limestone must meet very high specifications for: chemical purity, organic carbon content, chemical oxygen demand, radioactive elements, gradation, and limestone flour reactivity. The German wet-scrubbing system to be installed at Lambton Generating Station has stringent requirements. Synthetic gypsum; by-product of the scrubbing operation, is to be used for wallboard manufacturing at the Mississauga plant of Westroc Industries Limited.

To assist with the ongoing, restoration of the Legislative Assembly of Ontario, the Resident Geologist provided the architect and restoration stone consultant with field assessments and recommendations concerning potentially suitable reddish brown sandstone from quarry sources in the Whirlpool (Credit Valley Sandstone) and Grimsby formations.

The Resident Geologist, accompanied by the Geological Assistant, visited all 9 building stone quarries producing "limestone" in the Bruce Peninsula, as well as all 5 sandstone quarry operations in the Georgetown-Inglewood area of the Niagara Escarpment.

Staff at the Goderich Mine of Sifto Canada Inc. conducted an underground tour of the rock salt mining facilities for staff of the Resident Geologist's office and the Petroleum Resources Centre of the Ministry of Natural Resources. The tour allowed examination of salt structures as well as the newly employed bench mining and mechanical scaling techniques.

The following detailed, site-specific geological investigations were carried out during the summer by the Resident Geologist with help from the Geological Assistant (Feenstra 1993):

1. Surficial geological mapping of the Cape Rich and Sucker Creek areas of the Militia Training and Support Centre, Meaford to complete coverage of the entire Owen Sound NTS map area at a scale of 1:50 000.

2. Detailed stratigraphic assessment and sampling of the Quaternary deposits and Paleozoic bedrock in trench excavations near Redwing in the Beaver Valley south of Thornbury. This project assisted in the paleo-Indian archaeological studies being conducted in the Collingwood - Owen Sound area by Dr. Peter Storck, Royal Ontario Museum.

3. A detailed evaluation of the stratigraphy and correlation of glacial drift sequences, and gypsiferous, Salina Formation bedrock exhibiting solution and collapse structures, in diamond drill core and bore hole samples provided by Golder Associates Ltd. from a proposed gravel pit site near the Grand River, south of the Town of Paris.

   The Resident Geologist also completed drafting and submission of the preliminary map of the Quaternary geology of the Markdale area.

The Southwestern District office handled a total of 40 land use plan submissions consisting of Official Plans and Official Plan amendments from selected upper tier regions and counties such as Bruce, Halton, Peel, York, Hamilton-Wentworth, and Oxford, local municipalities (Brampton, Burlington, London, and Mississauga), and the towns or townships of Brantford, Clarington (Newcastle), Collingwood, Hay, Haldimand, London, McGillivray, Mersea, Mono, and Paris. Office staff also provided geological advice concerning numerous Niagara Escarpment Plan Area amendments, input to Environmental Assessment of highway projects, and special requests from other agencies such as the Waterfront Regeneration Trust. Much time and effort was spent during 1993 by all geological staff on: 1) the preparation of the requested plan input and review information concerning pertinent Mines and Minerals Division policies and guidelines; 2) basic and thematic geoscience aspects of the mineral resources and their potential for development; and 3) plan review meetings with staff of other provincial ministries and agencies, municipal planning departments, consultants, and industry.

To assist with the review of a proposal by Maitland Resources to develop part of the operating Goderich salt mine as a storage and disposal site for solid, bulk industrial waste materials, the Resident Geologist participated in environmental assessment of the proposal. He also reviewed the requirements for information on the geological, hydrogeological and geological engineering characteristics of the repository rock formations. As of December 1993 the company has temporarily suspended this project for economic reasons.

The Resident Geologist's office was contacted regarding the following concerns related to industrial development over or adjacent to gypsum mine workings:

1. The Town of Haldimand expressed concerns over the possible collapse of several holding tanks at a waste oil recycling and repository plant built very close to an area of the Caledonia No. 1 gypsum mine. These workings are subject to roof collapse and sinkhole formation in the clay-rich glacial overburden. This mine has been inactive since the early 1950's, but is still attended to by the mining company, and detailed plans of the workings exist.

2. A group of citizens from the Paris-Brantford area expressed concerns over the proposed development of a large gravel pit operation located adjacent to and possibly over the workings of the former Paris Plaster Mine. This mine was opened in the mid 1800's, operated for more than 50 years, and closed in the early 1900's. Mine entry was through tunnels excavated in clay-rich Port Stanley Till at the foot of the Grand River bank. Drift mining of the gypsum bed in the underlying bedrock (Salina Formation) was carried out below thick glacial drift overburden. Mine inspections during the 1890's, reportedly, noted frequent collapses of the tunnels.

   This mine is difficult to locate precisely in the field, due to the absence of any formal plan, presence of a thick cover of slumped glacial drift that masks any opening, or the apparent lack of any other unambiguous surface feature.

In both cases, the Resident Geologist with help from the Geological Assistant, provided background information; conducted site visits; and organized liaison meetings with the pertinent municipalities for Mines and Minerals Division staff involved in inspect-ion, rehabilitation engineering, and land use policy and plan-ning. The Resident Geologist was subpoenaed to the Ontario Mu-nicipal Board hearing in the case of the proposed gravel pit - Paris Plaster Mine concern.

The second phase of the Abandoned Mines Hazards Abatement Program was completed by Patrick Chance and Associates in the fall of 1993. Information from the field visits and literature compilation will be entered into the provincial Abandoned Mines Inventory System database.

Historical mining activities in the Southwestern District were highlighted in 1993 through field trips to former gypsum works in the Grand River area. These field trips were conducted by the Resident Geologist and the Geological Assistant, in co-operation with members of the Grand River Heritage Mines Society. The Grand River will be designated as a "Heritage River" in 1994. The society is preparing information for tourists commemorating the historical importance of this waterway. Included in this will be the role the river played in the 1793 discovery of gypsum and subsequent mining, milling (since the early 1800's), and transportation.

The Resident Geologist co-authored with M.A. Rutka (Ontario Geological Survey, Sudbury), and M. Birchard (Unocal Canada Exploration Limited, Calgary), a poster presentation on the facies, geochemical analysis, and resource evaluation of the limestone and dolomite deposits of the Lucas Formation. The samples were obtained from drill hole cores in the subsurface of the London-Sarnia-Windsor-adjacent Lake Erie area of the Southwestern District (Rutka and Birchard 1993). This poster, as well as one by the Staff Geologist on the current mining

activities in the Southwestern District, were presented at the annual Ontario Mines and Mineral Symposium in Toronto.

ONTARIO GEOLOGICAL SURVEY ACTIVITIES - SOUTHWESTERN ONTARIO

A detailed account of the work conducted by the Ontario Geological Survey in the Southwestern Resident Geologist's District can be found in *Summary of Field Work and Other Activities - 1993*, Ontario Geological Survey, Miscellaneous Paper 162. The locations of these projects are shown on Figure 1.

Paleozoic Mapping - Lake Simcoe area

D. K. Armstrong is involved in a multi-year project mapping the Paleozoic geology of the Lake Simcoe area. The project is designed to investigate the suitability of, and the alkali-carbonate reactivity of, the Middle Ordovician limestones for their potential for use as aggregate. The information will also be of use in the land use planning process.

Oak Ridges Moraine area - parts of Scugog, Manvers and Newcastle townships

P. J. Barnett completed the second year of a multi-year investigation of the Oak Ridges Moraine. This study is designed to examine the Quaternary sediments of the moraine, as well as, the area surrounding it. Results of the investigation will be beneficial for resolving land use planning issues arising in the Oak Ridges Moraine area.

Carbonate Resource Evaluation - Southwestern Ontario

M. A. Rutka and M. C. Birchard (Unocal Canada Exploration Limited, Calgary) have completed a 2-year study of the Middle Devonian Lucas formation (Detroit River Group).

Aggregate Resource Mapping - Rama and Mara townships

D. Rowell completed field investigations of sand, gravel and potential bedrock resources of Rama and Mara townships, Simcoe County. Aggregate resource maps for the area are expected to be published in 1994.

Aggregate Resource Mapping - southern Bruce County

R. I. Kelly completed the evaluation of the sand, gravel and bedrock resources of 11 townships in southern Bruce County. The results of this investigation will be useful for land use planning decisions.

Radon Gas Investigations - southwestern Ontario

J. E. Tilsley and P. R. Nicholls (Aurora Environmental Surveys Limited, Aurora) and C. L. Baker completed a follow-up to a 1992 study, the results of which showed a strong relationship between radon concentrations and oil and gas fields in the vicinity of Wallaceburg. This study sought to develop a data base that would evaluate the suitability of the radon gas sampling technique as an oil and gas exploration tool.

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--- 1993b. Drift thickness, Walkerton area; Ontario Geological Survey, Map P.3202.

--- 1993c. Drift thickness, Kincardine area; Ontario Geological Survey, Map P.3203.

--- 1993d. Drift thickness, Wingham area; Ontario Geological Survey, Map P. 3204.

--- 1993e. Bedrock topography, Lucknow area; Ontario Geological Survey, Map P.3206.

--- 1993f. Bedrock topography, Walkerton area; Ontario Geological Survey, Map P.3207.

--- 1993g. Bedrock topography, Kincardine area; Ontario Geological Survey, Map P.3208.

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OIL AND GAS EXPLORATION AND DEVELOPMENT ACTIVITY IN ONTARIO IN 1993

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There was a significant increase in all classes of oil and gas drilling activity in Ontario in 1993, after record-setting lows were recorded in 1992. A total of 147 permits to bore, drill, or deepen a well were issued in by the Ministry of Natural Resources in 1993, compared to only 100 in 1992. Statistics on leasing and geochemical and geophysical surveys are not yet available.

Drilling results have been reported for a total of 105 wells, compared to only 77 wells in all of 1992. These results consisted of 42 exploratory wells, 43 development wells, and 20 in other classes ("service"). This is considerably more than the previous year when 36 exploratory, 32 development, and 9 service wells were drilled. The 1993 exploratory drilling resulted in 14 wells completed as gas producers and 7 wells completed as oil producers (Table 1, Fig.1). Development drilling resulted in 6 wells reported to be oil producers, 22 as gas producers, and 5 wells completed for production of both oil and gas. This is an impressive success rate of 50% for exploratory drilling and 77% for development drilling.

As in the previous 10 years, exploration for and development of Ordovician oil reservoirs was the most active play in Ontario, with drilling reported to be complete at 18 exploratory wells and 11 development wells. The Ordovician exploratory drilling is reported to have resulted in 7 new oil producers with an additional 4 wells suspended pending further evaluation. Development drilling of Ordovician targets resulted in 5 new oil producers and 5 wells capable of production of both oil and natural gas. As in the previous year Essex County was the focus of most of the Ordovician exploratory drilling, accounting for all of the successful exploratory wells. Five of these wells were apparent new pool discoveries; Telesis et al. 34372 Mersea 2-241-NTR, Telesis et al. 34716 Mersea 3-3-V, Telesis et al. 34611 Mersea 6-243-NTR, Telesis et al. 34612 Mersea 4-240-STR, and Telesis et al. 34633 Mersea 1-5-IV. The Telesis et al. 34631 Mersea 8-5-IV well was a successful exploratory extension to the Mersea 3-4-IV pool, and the Telesis et al. 34647 Mersea 7-5-VI well was a successful exploratory extension of the Mersea 3-6-V pool. All of these wells were drilled in an area northwest of the Hillman oil pool. Several are located on a probable strike extension of the fault structure which hosts the Hillman pool. The other discoveries are in close proximity and are probably hosted by related structures. Accurate delineation of the inter-relationships of these new discoveries will require further drilling.

Ordovician development drilling was divided between Essex and Kent County. In Essex County 3 wells were completed as oil producers in the Mersea 8-16-VIII pool (Goldsmith) and 3 wells in the newly discovered Rochester 1-17-II EBR pool were completed as oil producers. Two of these wells were horizontal wells; Ram Talisman #2 Horizontal #1 Mersea 16-VIII and PPC Lakewood Horizontal #1 Rochester #7H. These are the first horizontal wells drilled in Ontario. Details on the results of the Ram Talisman well, the first one drilled, are not yet known, but it is reported to be capable of production of both oil and gas. The PPC Lakewood well is expected to produce at an initial rate of 160 m^3 of oil (1000 barrels) per day according to the operator.

There are now 6 producing oil wells in the Rochester pool. Most of these wells are also capable of producing natural gas and will be completed for natural

gas production when a gas processing plant has been constructed. According to Paragon Petroleum Corporation, the operator of the pool, as of Nov. 18, 1993 daily production from vertical wells in the pool was 145 m^3 of oil per day (914 barrels) in addition to the expected production from the horizontal well.

In Kent County 2 development wells were completed as oil producers in the Romney 3-8-II pool, and one well in the same pool was a successful deepening of an existing oil producer.

There was a further increase in the drilling of Cambrian targets in 1993, reaching a total of 15 exploratory tests and 13 development wells, compared to a total of 19 wells in 1992 and only 7 in 1991. Eighteen of these wells were drilled in the Innerkip gas pool, making this by far the most active single play in the province in 1992. Seventeen of the wells; 12 development and 5 exploratory, were completed as gas producers. One well, DGC P2-4 Wilmot 3-30-IV, was drilled on the northern edge of the pool and is reported as a gas show-suspended. Gas production in the pool is derived from a thin horizon of porous Cambrian sandstones lying directly on the Precambrian basement. The pool was discovered in 1961 and was originally developed by a total of 9 wells.

Immediately northwest of the Innerkip pool the Gason "A" East Zorra 29-XVII new pool wildcat was completed as a gas producer in a successful Cambrian exploratory test. Two other exploratory wells were subsequently completed as gas producers testing for extensions to the discovery. Additional wells were being drilled at the time of writing. Southeast of the Innerkip pool, 3 km northeast of the abandoned Gobles oil and gas pool, the DGC P2-8 Blenheim 1-15-IV well was completed as a gas producer in another successful Cambrian new pool wildcat. One additional exploratory well was subsequently completed as a gas producer testing for an extension to the discovery. The second well is only 1 km northeast of the Gobles pool.

Three additional wildcats were drilled in the search for Cambrian pools. One well explored an area northwest of Innerkip, 1 well was drilled to the northeast, and 1 well tested a location near the City of Brantford. All these wells reported shows of gas but have either been plugged and abandoned or are suspended.

There were 5 exploratory and 8 development tests of Silurian Guelph-Salina targets in 1993. One of the exploratory wells was reported to be a gas producer; Rothsay et al. Sombra 2-18-XV. Development drilling resulted in 1 oil producer in the Grand Bend oil pool, and 1 gas well in each of the Morpeth and Silver Creek fields offshore Lake Erie. One other development well was a successful deepening of a producing gas well and another was a re-entry of an abandoned gas well.

Development drilling of Silurian Clinton-Cataract sandstone targets resulted in 6 new gas wells; 5 in the Haldimand field, and 1 in the Clear Creek field beneath Lake Erie. There were also 3 successful Clinton-Cataract exploratory wells in 1993. Two of these wells were completed as gas producers in extensions of the Haldimand gas field, and 1 well as a gas producer in an extension of the Lincoln gas field.

There was 1 dry exploratory test of a Devonian target in 1993.

Two natural gas injection/withdrawal wells and 1 observation well were completed in the former Edys Mills gas pool which was designated as a natural gas storage pool in 1992. There are now 22 former gas pools in the subsurface of southwestern Ontario which have been designated as natural gas storage pools by the Ontario Energy Board. Twenty-one storage pools were in operation at the time of writing. Winter demand for natural gas in Ontario exceeds the capacity of the natural gas pipelines from western Canada. The shortfall is made up by injection of natural gas into the storage pools in the summer, and withdrawal of the stored gas in winter to meet winter peak demand. Total working capacity of the active storage pools in Ontario is approximately 5.8 billion m^3 (203 bcf).

The other classes of wells drilled in 1994 include 1 brine disposal, 14 stratigraphic tests, 1 solution mining, and 1 petroleum product storage well. Sifto #10 Brine Well Goderich 2-Maitland was completed as a solution mining well by Sifto Canada Inc in July at their solution mining site on the outskirts of the town of Goderich. Amoco Sarnia 9-Block B was completed as a petroleum product storage well by Amoco Canada Petroleum Company in July at their Sarnia refinery. General Chemical drilled a stratigraphic test, General Chemical Strat Test Anderdon 9-II, into the Salina Group east of their salt solution mining opperation near Amherstberg in December of 1993. The first attempt at drilling this well resulted in a lost hole. The Ontario Geological Survey drilled 12 diamond drill holes in the Lake Simcoe area testing the Ordovician stratigraphy. One brine disposal well, Imperial 830 Enniskillen 1-8-17-II, was drilled by Charles Fairbank Oil Properties Ltd in July. It was a deepening of a well drilled in 1962.

Oil production in Ontario in 1993 totalled 253,539.3 m^3 valued at $37.3 million. This is a 13% increase in volume from the previous year and is a new record for annual production for Ontario. The increase is due to production from the newly discovered Ordovician pools described above. Annual oil production has tripled since 1983, and is due entirely to production from newly discovered Ordovician pools in Essex and Kent Counties.

Totals for production of natural gas in Ontario are not available. It is likely that natural gas production increased compared to the previous year due to new production from the Innerkip gas field and solution gas from Ordovician oil pools.

There were several other developments in 1993 relevant to oil and gas exploration and development in Ontario. Telesis Oil and Gas, a major operator in Ontario, was put up for sale by British Gas in 1993. The successful buyer will be announced early in 1994. There were an increased number of inquiries about investment and exploration opportunities in Ontario from companies and investors from outside the province in 1993. A Denver-based company is promoting the use of iodine geochemistry as a hydrocarbon exploration technique. The technique has not previously been widely used in Ontario and has attracted considerable interest. If successful it could improve exploration success rates and result in an increase in exploration. In addition, the introduction of horizontal drilling technology to Ontario has the potential to improve recoveries and production rates from Ontario oil and gas reservoirs.

The increased drilling of Cambrian targets has been precipitated by the impressive success record achieved in exploratory and development drilling of extensions to the Innerkip natural gas field. From 1991 to 1993 inclusive 27 development and 11 exploratory wells have been drilled testing for extensions to the field. All but one of these wells has been completed for natural gas production. Wildcat tests for new pools outside the Innerkip field increased in 1993. It is expected that this trend will accelerate in 1994 as interest in the the Cambrian play broadens.

TABLE 1. Successful exploratory wells in southwestern Ontario, 1993.

Map No.	Latitude Longitude	Well Name	Target	Metres Drilled	Class Status	Compl. Date
ESSEX						
1	42 05 38.0 82 37 24.0	Telesis et al 34716 Mersea 3-3-V	Ordovician	1064.5	NPW OPGS	1993 08 24
2	42 04 55.0 82 36 26.5	Telesis 34633 Mersea 1-5-IV	Ordovician	895.0	NPW OP	1993 10 24
3	42 04 29.0 82 36 29.5	Telesis et al 34631 Mersea 8-5-IV	Ordovician	889.1	NPW OPGS	1993 07 29
4	42 05 57.0 82 36 37.0	Telesis et al 34647 Mersea 7-5-VI	Ordovician	1030.0	NPW OPGS	1993 09 05
5	42 02 59.0 82 34 45.5	Telesis et al 34612 Mersea 4-240-STR	Ordovician	876.2	NPW OPGS	1993 06 26
6	42 04 17.0 82 35 2.0	Telesis 34372 Mersea 2-241-NTR	Ordovician	900.0	NPW OPGS	1993 07 07
7	42 03 37.0 82 35 37.0	Telesis et al 34611 Mersea 6-243-NTR	Ordovician	876.0	NPW OPGS	1993 07 19
HALDIMAND						
8	42 58 54.0 79 48 10.0	Tunney #1 North Cayuga 1-18-1 NTR	Clinton-Cataract	214.8	NPW GP	1993 09 20
LAMBTON						
9	42 45 44.0 82 20 07.5	Rothsay et al Sombra 2-18-XV	Salina-Guelph	673.5	NPW GP	1993 07 22
LINCOLN						
10	43 04 53.0 79 44 17.0	Tompa #1 Caistor 6-23-III	Clinton-Cataract	137.0	NPW GP	1993 03 26
OXFORD						
11	43 15 50.5 80 40 19.5	DGC/Innerkip #14 Blandford 1-3-X	Cambrian	878.0	NPW GP	1993 06 26
12	43 17 46.5 80 42 43.0	DGC P2-1 (MY-PA) Blandford 3-6-XIII	Cambrian	883.0	NPW GP	1993 10 26
13	43 13 33.0 80 38 06.0	Gason et al #1 Blenheim 8-2-VII	Cambrian	884.0	NPW GP	1993 03 24
14	43 11 04.0 80 32 58.0	DGC P2-6A (Granclare) Blenheim 1-15-II	Cambrian	882.0	NPW GP	1993 12 20
15	43 12 32.5 80 33 36.0	DGC P2-8 Blenheim 1-15-IV	Cambrian	885.0	NPW GP	1993 08 27
16	43 13 11.0 80 35 50.5	DGC P2-5A Blenheim 7-19-VI	Cambrian	890.0	NPW GP	1993 11 23
17	43 15 19.0 80 37 36.0	Gason et al #3 Blenheim 6-21-IX	Cambrian	865.5	NPW GP	1993 06 15
18	43 18 27.8 80 44 41.2	Gason "A" E. Zorra 29-XVII	Cambrian	884.0	NPW GS	1993 03 26
19	43 16 24.0 80 44 42.0	DGC P2-2 (Kramer) East Zorra 2-23-XVI	Cambrian	895.0	NPW GP	1993 10 27
20	43 17 51.5 80 46 33.0	DGC P2-3 East Zorra 1-29-XV	Cambrian	893.5	NPW GP	1993 11 12
WENTWORTH						
21	43 9 40.0 79 47 42.0	DiSabatino #1 Binbrook 7-2-Blk 4-1	Clinton-Cataract	100.2	NPW GP	1993 11 26

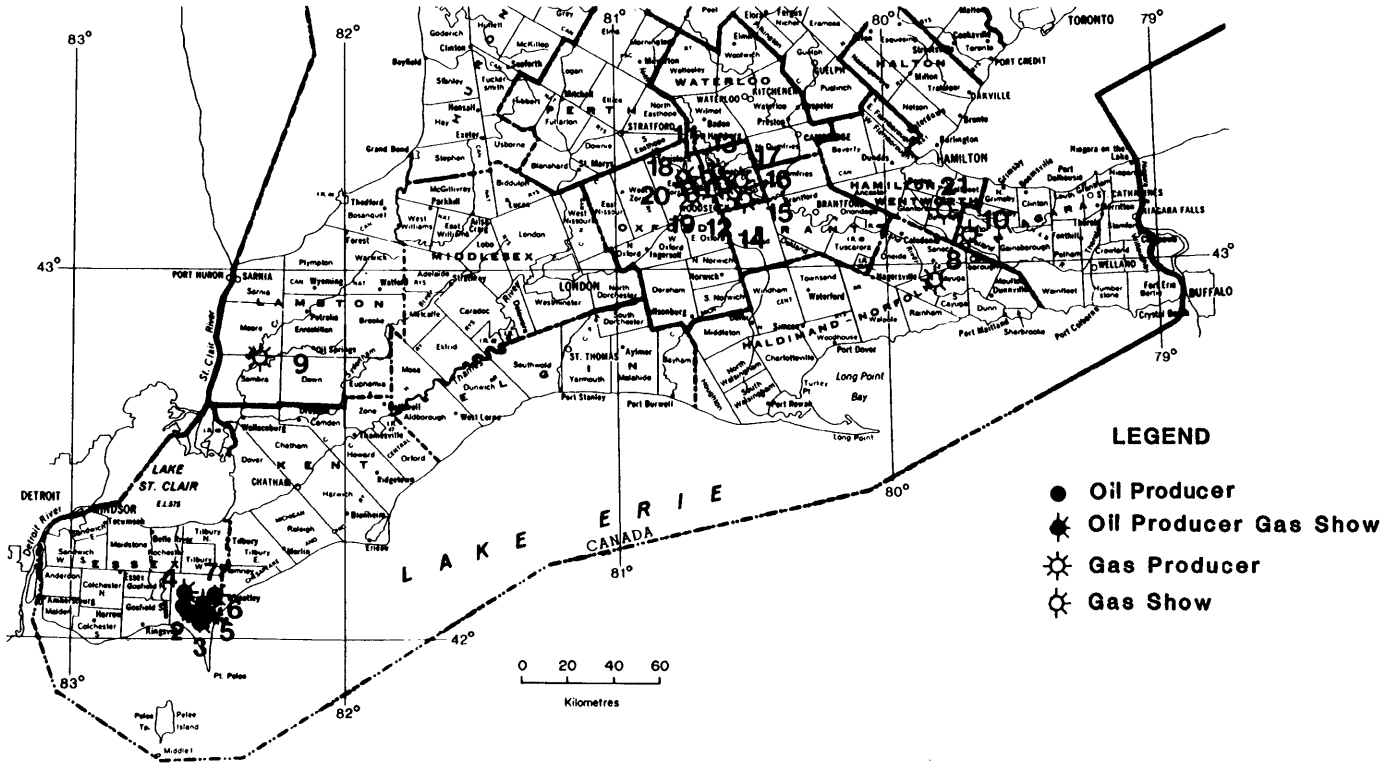

Figure 1. Successful oil and gas exploratory wells in Ontario in 1994. Numbers refer to Table 1.

CONVERSION FACTORS FOR MEASUREMENTS IN ONTARIO GEOLOGICAL SURVEY PUBLICATIONS

Conversion from SI to Imperial			Conversion from Imperial to SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
			LENGTH		
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709 7	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
			AREA		
1 cm@	0.155 0	square inches	1 square inch	**6.451 6**	cm@
1 m@	10.763 9	square feet	1 square foot	**0.092 903 04**	*m@
1 km@	0.386 10	square miles	1 square mile	2.589 988	km@
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
			VOLUME		
1 cm#	0.061 02	cubic inches	1 cubic inch	**16.387 064**	cm#
1 m#	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m#
1 m#	1.308 0	cubic yards	1 cubic yard	0.764 555	m#
			CAPACITY		
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
			MASS		
1 g	0.035 273 96	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 75	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 62	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	**907.184 74**	kg
1 t	1.102 311	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 908 8**	t
			CONCENTRATION		
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

	Multiplied by	
1 ounce (troy) per ton (short)	20.0	pennyweights per ton (short)
1 pennyweight per ton (short)	0.05	ounces (troy) per ton (short)

Note: Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries, published by the Mining Association of Canada in co-operation with the Coal Association of Canada.

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