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Open File Report 5332 (Vol. 1 of 2)

Feasibility of Small Scale Gold Mining in Northwestern Ontario (parts of the Districts of Kenora, Rainy River and Thunder Bay)

by

James N. Neilson and R.C.E. Bray

1981

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The reserve tonnages and ore grades reported in this study were calculated from public information and data on file in the regional offices of the Ministry of Natural Resources. They have not been checked by the Ministry.

The opinions expressed in the report are those of James Neilson & Associates, Inc., and are based on the best available data. They are not to be construed as in any way reflecting opinions or policies of the Ministry of Natural Resources or the Ministry of Northern Affairs.

For exact locations of prospects and occurrences, the reader may refer to Mineral Deposits Circular 16 and its accompanying Chart A - "Gold Deposits: Kenora-Fort Frances Area" (Ministry of Natural Resources, 1976).

FEASIBILITY OF SMALL SCALE GOLD MINING
IN NORTHWESTERN ONTARIO

TABLE OF CONTENTS

	Page
Table of Contents	iv-viii
1. Acknowledgments	ix
2. Objectives of the Study	1
PART I - INVENTORY OF GOLD RESERVES	
3. Historical Perspective	4
3. 1. Perspective on Prices	5
3. 2. Early Mining Efforts	8
4. Gold Occurrences in Northwestern Ontario	9
4. 1. Geological Framework	10
4. 2. Mineralization	13
4. 3. Distribution of Ore Deposits	14
4. 4. Ore Categories	15
4. 5. Mineral Associations	16
5. Estimated Reserves	18
5. 1. Estimated Reserves	18
5. 2. Dilution and Other Factors	20
6. Inventory of Gold Reserves by Area and Sub-Area	21
6. 1. Shoal Lake - Lake of the Woods	21
6. 2. Dogpaw and Kakagi Lakes	29
6. 3. Rowan and Atikwa Lakes	33
6. 4. Upper and Lower Manitou Lakes	36
6. 5. Eagle and Wabigoon Lakes	40
6. 6. Dinorwic - Dyment Area	43

Page

6. 7. Pipestone Lake - Manitou Stretch 46
6. 8. Mine Centre Area 49
6. 9. Minnitaki Lake - Sioux Lookout 52
6.10. Sapawe - Atikokan Area 55
6.11. Moss Lake - Shebandowan Area 59

PART II - ECONOMICS OF SMALL SCALE GOLD MINING

7. Introduction 62

8. The Concept of Small Scale Mining and Milling 63
8. 1. Potential for Small Scale Operations 63
8. 2. Mining Regulations 64
8. 3. Environmental and Labour Considerations 65
8. 4. Metallurgical Considerations 65

9. Small Scale Mining Technology 67
9. 1. Parameters Related to Selection of a Mining System 67
9.1.1. Shape, Size, and Position of the Ore Deposit 67
9.1.2. Distribution of Gold Values 67
9.1.3. Rock Strength 68
9.1.4. Economic Factors 69
9.1.5. Cash Flow 70
9.1.6. Market Conditions 70
9.1.7. Health and Safety 70
9.1.8. Other Considerations 71
9. 2. Mining Methods 71
9.2.1. Shafts 72
9.2.2. Declines 73
9.2.3. Open Pits 74
9.2.4. Open Cuts 74
9.2.5. Stoping Methods 75

10. Technology of Small Scale Milling 77
10.1. Milling Methods and Procedures 77

	Page
10. Technology of Small Scale Milling	77
10.1. Milling Methods and Procedures	77
10.1.1. Crushing and Grinding	77
10.1.2. Gravity Separation	78
10.1.3. Concentration	79
10.1.4. Extraction Processes	79
11. Capital and Operating Cost Estimates	81
11.1. Mining	81
11.1.1. Shaft Mining	81
11.1.2. Decline Mining	83
11.1.3. Open Pits	84
11.1.4. Open Cuts	85
11.2. Milling	86
11.2.1. Capitalization of Equipment	86
11.3. Engineering, Project Overhead, and Related Costs	89
11.4. Operating Cost Estimates	91
11.4.1. Underground Mining	91
11.4.2. Surface Mining	91
11.4.3. Milling	91
11.5. Capital Cost Summary	92
11.6. Production Costs	94
12. The Custom Milling Concept	95
12.1. Private vs Public Ownership	96
12.1.1. Private Milling Services	96
12.1.2. Public Milling Services	99
12.2. Custom Milling Capacities	100
12.3. Location	101
13. The Portable Mill Concept	103
13.1. Private vs Public Ownership	103
13.2. Capital Costs	104

Page

14. The Heap Leaching Concept 106
    14.1. Leaching Methods 107
        14.1.1. Heap Leaching 107
        14.1.2. Vat Leaching 108
        14.1.3. Recoveries 108
    14.2. Limitations 109
    14.3. Capital and Operating Costs 110

15. Infrastructure 110
    15.1. Water Supply 111
    15.2. Power Sources 111
    15.3. Transportation 112
    15.4. Municipal Facilities 114
    15.5. Communications 114

PART III - CONCLUSIONS

16. Summary and Conclusions 115
    16. 1. Gold Occurrences 115
    16. 2. Classification of Reserves 117
    16. 3. Exploitation of Potential Ore Deposits 117
    16. 4. Capital and Operating Costs - Mining 118
    16. 5. Treatment Method 119
    16. 6. Capital and Operating Costs - Milling 120
    16. 7. Custom Milling 120
    16. 8. Portable or Semi-Portable Mills 121
    16. 9. Heap Leaching 121
    16.10. Mining and Milling Alternatives 122
    16.11. Contract Mining 123
    16.12. Positive Aspects of Small Scale Mining 124

17. References 130

Page

Tables:

1	Identified Regional Gold Reserves	19
2	Shoal Lake-Lake of the Woods	23
3-A	Shoal Lake-Lake of the Woods	25
3-B	Shoal Lake-Lake of the Woods	26
3-C	Shoal Lake-Lake of the Woods	27
3-D	Shoal Lake-Lake of the Woods	28
4	Dogpaw and Kakagi Lakes Area	30
5	Dogpaw and Kakagi Lakes Area	32
6	Rowan and Atikwa Lakes Area	34
7	Rowan and Atikwa Lakes Area	35
8	Upper and Lower Manitou Lakes	37
9	Upper and Lower Manitou Lakes	39
10	Eagle and Wabigoon Lakes Area	41
11	Eagle and Wabigoon Lakes Area	42
12	Dinorwic-Dyment Area	44
13	Dinorwic-Dyment Area	45
14	Pipestone Lake-Manitou Stretch	47
15	Pipestone Lake-Manitou Stretch	48
16	Mine Centre Area	50
17	Mine Centre Area	51
18	Minnitaki Lake-Sioux Lookout Area	53
19	Minnitaki Lake-Sioux Lookout Area	54
20	Sapawe-Atikokan Area	57
21	Sapawe-Atikokan Area	58
22	Moss Lake-Shebandowan Area	60
23	Moss Lake-Shebandowan Area	61
24	Estimated Capital Cost Summary: Mining & Milling	93
26	Portable and Semi-Portable Mills	105

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Volume 1

FEASIBILITY OF SMALL SCALE GOLD MINING

in

Northwestern Ontario

(parts of the Districts of Kenora,

Rainy River and Thunder Bay)

-Text-

by

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FEASIBILITY OF SMALL-SCALE GOLD MINING IN NORTHWESTERN ONTARIO

2. OBJECTIVES OF THE STUDY

The Northwestern Ontario region is the locus of several formerly active gold-mining districts. With beginnings in the late 1870s and early 1880s, these districts flourished around the turn of the century and up to about 1910. Prospecting and mining activity continued sporadically through the 1920s and 1930s and, following World War II, up to the present time. A resurgence of interest has been evident for the past two or three years and greatly expanded developments are in the making.

The region contains some 31 former producing mines; more than 80 well-explored prospects; and about 300 other documented gold occurrences. Several of the past producers such as Duport, Mikado, Regina, and Wendigo mines were substantial operations in their day with good grades, operating depths to as great as 1500 feet, and treatment facilities of as much as 300 tons per day. They were never known for large ore reserves but this fact was offset by relatively high grades in the order of 0.25-0.50 oz. per ton or, in isolated cases, by grades running to 1.0 oz., or more, per ton. Many of the ores were free-milling and required only simple treatment by crushing, gravity separation, and mercury amalgamation. Some ore deposits were associated with sulphides (commonly pyrite) and required flotation concentration followed by cyanidation. A few were arsenious and this usually necessitated a roasting stage.

Many of the region's former operations were plagued with a variety of problems some of which will be elaborated upon in the body of the report. It will suffice to say that they may be summarized as inadequate financing; inadequate exploration and development prior to production; low gold prices; economic instability of the times;

and difficulties related to lack of access, transportation, and power generation.

The recent escalation of gold prices obviously introduced an entirely new dimension to the gold mining potential of Northwestern Ontario. Quite apart from the current high prices, the attractiveness of the region is enhanced by several factors: (1) the geology of the region is now well understood; (2) access and haulage are greatly improved by new road construction; (3) new and improved mining methods (and equipment) are in vogue; and (4) new milling technologies are available in portable or semi-portable units. Provision of adequate power remains a problem.

Many of the old gold properties could be rehabilitated if high capital expenditures for mining, milling, and refining facilities could be minimized. Certainly, several of the known gold deposits of the region, both those formerly worked and others incompletely explored, appear to have potential for early development as relatively small-scale operations using either on-site, portable or semi-portable, milling units or centralized custom milling facilities. *

The general purpose of this investigation, therefore, is (1) to delineate the potential tonnages and grades of gold deposits in the several districts which might be developed on a small-scale basis and (2) to evaluate the economic feasibility of developing a number of these deposits to the point of production through a wise choice of mining and milling alternatives.

---

* The authors of this report define "small-scale" operations as being in the range 5-200 tpd; anything larger (say, 300 tpd or more) properly fits into a more permanent, longer-life concept.

The objective of Part I of the study is a compilation of the potential gold deposits based on a search of the records, assessment files, etc. in the Regional and/or Resident Geologists' offices in Kenora, Thunder Bay, and Sioux Lookout; and from published literature as well as from company records when available. Some files contain old reserve estimates based on highly variable information. These usually were insufficient for our purposes and so we attempted to evaluate and project these data into reserve figures that may provide some basis for individual assessment of a property's potential for development. Where possible, we have included a brief outline of the type of ore occurrence, host rock association, sampling history, and brief notes on the history of past production (see Appendices A-K in Volume II).

The objective of Part II is to review the economic parameters of small-scale mining and milling in a general, non-site-specific manner. This includes considerations of capital and operating costs for various mining alternatives, milling methods and less conventional methods of treatment such as heap leaching. In addition, the feasibility of introducing custom milling facilities is examined as well as a review of local transportation costs, road construction costs, and so forth.

PART I - INVENTORY OF GOLD RESERVES

3. HISTORICAL PERSPECTIVE

Prospecting activities for gold have been pursued in Northwestern Ontario since the early 1880s, and even earlier, and literally hundreds of occurrences have been discovered during the ensuing 100 years. All of the discoveries were abandoned eventually either during an early stage of development or after varying, and generally sporadic, periods of production.

Studies of old records - usually quite sketchy in regard to detail - indicate that prospecting commenced first in the Lake of the Woods area. A renewal of activity was evident from about 1890 to approximately 1906 with the fields of interest extending into the Kakagi Lake area, the Manitou Lakes district, and Mine Centre. Another surge of activity took place immediately prior to, and following, World War I. Sporadic efforts to revive development occurred in the 1920s and again from about 1936 to 1941. Many old properties were optioned towards the close of World War II but the economics of the day did not afford much encouragement for continued development. Further attempts to revive some of the properties were renewed at intervals in the 1950s, 1960s and in the early 1970s. An entirely new interest has been generated since the mid-1970s following the recent increases in the value of gold and at the present time (1980) a new appreciation of the mining potential of the region has come to the fore.

A prime objective of this study, therefore, is to put this potential into perspective and to provide guidelines for would-be developers.

It can be said, quite literally, that Northwestern Ontario has had its ups and downs as a gold-producing region. This is understandable for several reasons. Firstly, the geological occurrence of gold was not well understood prior to the turn of the century. Secondly, Northwestern Ontario was then a frontier region with rudimentary communications apart from the recently constructed transcontinental railroads. There were few roads and travel in the hinterland was mainly by water. Thirdly, there were no local sources of capital for development and it is interesting to note that the early mining enterprises were supported by funds generated in Toronto, Montreal, Winnipeg, Buffalo, Rochester, Minneapolis, and even Arizona and Great Britain.

Followed by page 8.

3.2. Early Mining Efforts:

Perusal of the old records, assessment reports, and the like going back to the 1880s and up to the onset of World War I reveals an historical similarity amongst nearly all properties. The discovery of a gold-bearing quartz vein followed a common scenario: domestic or foreign investors provided funds, organized a company, and sold and distributed common, and occasionally, preferred shares; stripping and trenching was undertaken not so much to indicate the extent of mineralization or to search for other veins but rather to select the most promising site for a shaft; a shaft was then sunk to 30 or 40 feet, or sometimes deeper, and a small amount of drifting or cross-cutting might be performed. However, even before any lateral work was undertaken, and certainly prior to the proving up of any ore reserves, a mill was installed consisting of 2-, 5-, or 10-steam stamps, blankets, and a mercury amalgamation rig. All of this equipment was powered by steam boilers and on-site electrical generating units; a large part of the field effort was expended in cutting and hauling wood for the boilers. Nearly all of the rock from shaft-sinking, drifting, stoping, etc. appears to have been put through the stamps. If the company was fortunate in its endeavours, one or two hundred ounces of gold might be recovered. By that time, the company had usually exhausted its treasury and went into bankruptcy - there to remain until some more enterprising person re-staked the property many years later, and often repeated the cycle.

The failure to develop ore reserves prior to planned production is perhaps the most obvious short-coming of most of the early operations but it must be remembered that geological understanding of gold mineralization was rudimentary at the time (and only beginning to be understood in the western States); diamond drilling was in its infancy; sinking, drifting, and raising was customarily done with hand steel; geophysical exploration methods were virtually unknown; and geochemical methods were completely unknown. Property exploration was a pick and shovel affair and some of the trenches and test pits put down in the 1890s and early 1900s approached the dimensions of small mines. Many of these old excavations are still to be seen.

In addition to the several circumstances cited above, other factors also contributed to the uneven history of gold production in the region. The turn of the century was a period of economic instability and several cycles of business recession are on record. These must have had quite direct effects on mining activity in general and on mining investment in particular. The Klondike finds in the Yukon diverted many gold miners from Ontario in 1898 and later, in 1910-12, still others were attracted to the new mineral discoveries at Cobalt, Porcupine, and elsewhere in Northern Ontario. One of the current problems likely to face developers of the 1980s is the chronic shortage of experienced miners in Northwestern Ontario.

4. GOLD OCCURRENCES IN NORTHWESTERN ONTARIO

Rock exposures are abundant throughout the region and since access through the lakes and inlets was relatively easy, it is not surprising that the region as a whole was extensively prospected for gold, as well as for other metals during the past 100 years. The construction of paved highways in recent years together with a network of timber and other bush roads has made overland access much easier than before. An example is the 1980 opening of the Manitou Access Highway which provides a direct road connection between Highways 17 and 11. This opens up a section that previously could only be reached by water routes or by air.

4.1. Geological Framework

The geology of the region is favourable for gold occurrences. Belts of volcanics, tuffs, and old sedimentary rock types occur throughout the region and these rocks are intruded by, or associated with, small porphyry masses as dikes and sills. There are several major structural "breaks" or fault zones along which gold occurrences appear to be concentrated and shearing is present in the rocks adjacent to these zones of faulting. Such shear zones are frequent loci of gold deposition.

Perusal of any published small scale geological map such as the Ontario Department of Mines and Northern Affairs' Map 2199, West Central Sheet, at 1 inch to 16 miles, indicates clearly the distribution of the sedimentary-volcanic belts in relation to the igneous and metamorphic rocks of the region. The gold deposits are almost invariably associated with the sedimentary-volcanic types.

The sedimentary and volcanic rocks are the oldest rocks in the region and are Archean in age. They occur in several easterly trending eugeosynclines of which three are of special significance in this study. One extends from Lake of the Woods through Kakagi Lake - the Manitou Lakes - Minnitaki Lake and on through Sturgeon Lake. Another synclinal zone extends from Rainy Lake through Mine Centre to the Atikokan area and beyond. A third follows an eastward trend through the Shebandowan Lake area.

These rocks, although possibly not all of the same age, were involved in the Kenoran Orogeny during which they were folded, faulted, metamorphosed, and intruded by granitic rocks. The major zones of shearing in the volcanic belts probably were initiated during the late phases of this orogeny, although some of the structural deformation may have actually occurred much later in time.

The volcanic-sedimentary assemblage reached great thicknesses within individual belts of as much as 25,000-50,000 feet. In general, the volcanic segment (considered to be the older of the two, as a rule) comprises about 80% of the whole, by volume. The oldest volcanics are basaltic in composition but the younger extrusives consist of intermediate to acidic lavas, tuffs, and pyroclastic breccias. The intermediate to acidic phases are thought to represent localized strato-volcanic accumulations built on basic (mafic) lavas. This cycle is repeated in some areas.*

Archean sediments consisting of interbedded greywacke and shale (or argillite), conglomerates, iron formation, quartzite, and limy rocks appear to have been deposited contemporaneously with the more acidic volcanics during a late stage of the volcanic-sedimentary sequence. Much of the sedimentary material probably was derived by erosion of the older volcanic rocks.

Sills, dikes, and irregularly-shaped intrusions of gabbro, diorite, and more acidic types occur in places within the volcanic-sedimentary sequence. These intrusions were probably contemporaneous with the volcanism and especially with the later acidic phases of volcanic activity. Quartz-feldspar porphyries as sills and stocks are particularly noteworthy because many of the gold occurrences are clearly related to these late-stage intrusions. Serpentinized ultrabasic rocks (norite, pyroxenite, peridotite) occur as masses in the volcanics and may be associated with major faulting during an early stage of the Kenoran tectonic cycle.

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* Although outside the region under discussion, this type of volcanic stratigraphy is reminiscent of the Keweenaw Peninsula of Michigan where acidic rhyolite (or felsite) lenses of convex section occur within the more basic basaltic lavas of the Portage Lake Lava Series of Keweenawan age.

During the Kenoran Orogeny, all of the older rocks were subjected to a complex sequence of events that included folding, shearing, metamorphism, and intrusion of batholithic masses of granitic rocks ranging in composition from granodiorite and trondhjemite to quartz diorite, quartz monzonite, granite, syenite, quartz-feldspar porphyry, aplite, and pegmatite. The intrusive masses are large and they compressed the older volcanic-sedimentary sequences into narrow, sheared belts which are granitized and gneissic in places.

All of the Archean rocks are metamorphosed to greater or lesser degree, varying from the greenschist to amphibolite facies. The development of chlorite and sericite is very common in the meta-volcanics and some sericitized zones probably represent sheared felsic volcanics. Gneissic areas may include granulite rocks although they are not too common in this region.

Most of the old volcanic belts are characterized by steeply inclined regional faults which may have linear expression at the surface. The most prominent of these linear features is the Cameron Lake fault zone which trends southeast from Lake of the Woods through Dogpaw and Cameron Lakes and thence curves northeastwards through the Manitou Lakes. A high proportion of the region's gold occurrences is clustered along, and adjacent to, this regional structure. Other large scale faults are associated spatially with the gold deposits of the Mine Centre and Shebandowan districts.

Deep erosion followed the Kenoran Orogeny and younger Precambrian sediments were deposited in basins in the eastern part of the region along with late-Precambrian diabase intrusions. These younger Aphebian, Helikian and Keweenawan rocks are not related chronologically to gold deposition although they may physically obscure gold deposits in some places.

4.2. Mineralization

As noted above, the gold deposits of Northwestern Ontario show a close relationship with the Archean volcanic belts where most, but not all, of the deposits occur in the mafic and/or felsic lavas and tuffs; in the sediments associated with them; or with the acidic intrusive bodies that intrude them. Structure and stratigraphy also play a part in localization of deposits and either one or the other may be more significant in a given area.

It appears that the gold mineralization was associated with a late stage of Archean volcanism - a stage when felsic lavas were being extruded and felsic intrusives were being emplaced. It is thought that the solutions carrying gold were concentrated in a late magmatic phase of the volcanism and that they were physically emplaced in upper levels of the crustal rocks both within, and along, the margins of the metavolcanic-metasedimentary belts.

Detailed studies of the mineralization in several deposits in the Kakagi Lake - Manitou Lakes district leads to a concensus regarding the shear zone type of gold occurrence. This is believed to have taken place in phases: (1) shearing of the Archean lavas by regional folding producing zones of schistosity; (2) injection of quartz into the schists (probably several episodes over time) leading to rigidity and brittleness; (3) renewal of shearing accompanying further regional deformation which, in turn, produced fracture cleavage in the brittle felsic volcanics and/or quartz porphyry sills intrusive into them. At several localities, carbonate as calcite or ankerite was injected into the fracture cleavage planes or into the earlier-formed quartz-filled fractures. The final phase (4) appears to have been introduction of gold-bearing solutions into the fracture zones by solution and replacement of the carbonates under appropriate physical and chemical controls.

Fracturing and mineralization undoubtedly occured repeatedly. Gold may have been introduced in several stages but in most cases it probably was one of the last minerals to be deposited - generally after pyrite, chalcopyrite, pyrrhotite, galena, or sphalerite.

No doubt there are variations to this postulated mode of mineralization but it does seem to fit many of the observed occurrences in the region. The principal variations lie in the type of host rock affected.

4.3. Distribution of Ore Deposits

Quartz porphyry and quartz-feldspar porphyry sills and small elongate intrusives are keys to mineralization in the Sioux Lookout and Mine Centre areas. Mineralized quartz-filled tension fractures a few inches to a foot or more in width occur at the margins of the porphyry and make mineable ore zones. The mineralization may be quite high grade in the narrow quartz veins but considerably lower (0.20 - 0.15 oz.) over mineable widths; however, these widths may be as much as 12-, 16-, or even 20-ft or more in some deposits and this fact has significant tonnage implications.

The Manitou Lakes area is characterized by strong shears in mafic metavolcanics and, in places, sericite- and carbonate-bearing zones which may represent sheared tuffs originally. Mineralized, narrow quartz veins and stringers arranged en echelon occur in the shear zones and were mined at several locations in the early years of this century. The former operators invariably had difficulty in maintaining an ore supply ahead of their milling requirements because of insufficient underground exploration and development. Operations were seldom conducted more than a few hundred feet beneath the surface and little if any exploratory drilling was done below 500 feet. Ore grades averaged around 0.20 oz/ton and, if a lower grade should be acceptable, quite large tonnages might be developed in the future, at depth.

Deposits in the Kakagi and Rowan Lakes area, both east and west of the regional Cameron Lake fault zone, are also characterized by mineralization in shear zones in the metavolcanics. Here too there are important tonnage implications at relatively low grades (0.15-0.20 oz.) at depth below levels hitherto tested.

Further northwest, the Shoal Lake and High Lake occurrences as well as those close to the town of Kenora appear to be mainly quartz-filled fractures in volcanics essentially more or less peripheral to the Canoe Lake quartz diorite intrusion and the Longbow Lake - Dogtooth Lake granitic batholith.

Our studies of a large number of property plans and sections indicate that many ore deposits contained ore shoots which often had a significant rake. Some shoots, such as those at the old Mikado Mine, had a flat rake of only about 30 degrees. Apparently, the former operators at this property as well as those at the Regina Mine near Sioux Narrows either failed to recognize these facts or else did not appreciate their significance and thus did not extend their workings to intercept the ore shoots on their lower levels. Presumably, these properties as well as others in the region have considerable reserves of unmined raking ore which, however, would need to be confirmed by exploratory drilling.

4.4. Ore Categories

As requested by the Ministry, we have adopted a four-fold classification of ore reserves which diverges somewhat from the normal engineering assessments of "ore". Proven (measured), probable (indicated), and possible (inferred) are terms understood by most persons according to customary usage in the industry. They are used in this report. A fourth category, "speculative" (or "highly inferred"), has been adopted for ore which may reasonably be assumed to be present on the basis of geological indications or from records of past operations but which has not been verified in any detail. The same justification applies to our usage of "speculative grade".

"Weighted average" grades were calculated whenever possible rather than arithmetic averages.

The tabulated tonnage and grade estimates presented should be viewed in the light of reasonable uncertainty. Obviously, "speculative" tonnages and grades project "ore" in a more liberal manner than we are normally accustomed to do.

4.5. Mineral Associations

Gold may have a variety of mineral associations and these usually determine the type of treatment required for extraction of the gold.

The simplest is the gold-quartz association which is characteristic of many small high grade occurrences in the region. Crushing and grinding followed by recovery of the gold particles by gravity separation (jigs, Wilfley tables, blankets, etc.) and mercury amalgamation may be sufficient to recover a high proportion of the gold. This is an old process but it is still applicable in some of the high grade free-milling occurrences. In the old days, crushing by steam stamps did not liberate all of the gold and so tailings losses were unduly high. In consequence, old tailings dumps may be attractive from the point of view of re-treatment: we estimate that some tailings deposits will run 0.10-0.15 oz/ton, or higher. (Surprisingly, a few are known to run as high as 0.30 oz/ton.) Modern treatment of run-of-mine ore by crushing, grinding in ball mills with classifiers, concentration on shaker tables, and amalgamation will produce a concentrate with 85+% gold recovery.

The gold-pyrite association is very common and especially in the shear zone type of deposits. Depending upon the mode of association, treatment usually required concentration of the gold and sulphides plus cyanidation to extract the gold. The gold may or may not be intimately associated with the pyrite and, so far as we are aware, little work has been done to investigate the actual type of association.

In other regions, gold is frequently contained within the cleavage planes of the pyrite and this necessitates very fine grinding for liberation.

More complex associations of gold with pyrite, chalcopyrite, pyrrhotite, galena, or sphalerite also are common. Again, concentration of the sulphides by flotation is required plus cyanidation to extract the gold. Depending upon the amount and proportions of the sulphides present, it may be possible in some cases to produce two or more flotation concentrates leading to the recovery of copper, lead, or zinc. The sale of such concentrates to base metal operators may be quite feasible at certain localities. The history of the Maybrun Mine at Atikwa Lake revolved around attempts to produce copper from small tonnage-low grade sulphide deposits containing some gold but to the relative exclusion of gold recovery. At present, it would seem more feasible to regard the Maybrun occurrences primarily as gold deposits carrying small amounts ($\pm$1.0%) of copper, and to mine them primarily for the gold, with copper as a byproduct.

A few occurrences, notably in the Shoal Lake-Lake of the Woods area, contain arsenopyrite and this normally necessitates roasting to eliminate the arsenic. This was done in the former operations but not always with great success.

Some gold occurrences with scattered distribution through the region contain some bismuth mineralization as well as molybdenum and/or tungsten. None seems important so far as recovery is concerned. Amounts are very small and the only molybdenum known to occur in recoverable quantities is in association with scheelite in granitic rocks in the Shoal Lake-High Lake area near the Manitoba border. These deposits are presently under development.

There is very little mention of telluride minerals in the old assessment files. This is surprising because tellurides are of fairly common occurrence in most gold camps in Ontario. It may be that they were not recognized during former operations. Also, since there is seldom any reference to silver minerals (either native, or otherwise) in the literature, it is possible that reported silver recoveries may be directly related to Au-Ag telluride associations.

There would seem to be considerable scope for good mineralogical (and metallurgical) research in this region since it is apparent that little work of this nature was done in the past.

5. ESTIMATED RESERVES

5.1. Estimated Reserves

Table I is a summary of estimated gold reserves in the region under review and it includes all known mines, prospects, and occurrences.

Proven ore reserves total 61,180 short tons with a weighted average grade of 0.33 oz/ton. These proven reserves occur only in the Duport and Atiko (Sapawe) mines and represent unmined portions of the formerly-worked ore bodies.

Reserves in the probable category total 2,766,610 short tons with a weighted average grade of 0.18 oz/ton.* Actual grades are in the range 0.20-0.38 oz/ton but a large tonnage of low grade material indicated in former operations at the Maybrun Mine lowers the overall average. This single large tonnage reserve of approximately one million tons is probably amenable to low cost heap leaching.

Most of the probable reserves occur in former producing, or near-production, mines where sufficient work was done to place them in this category. For example, the Sioux Lookout area shows a total of

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* All tonnages are reported as "short tons" (i.e., 2000 lb.), and "ounces" are Troy ounces.

approximately 690,000 tons in the probable category and the bulk of this tonnage is in the Windfall-Goldlund ore bodies which are currently approaching production decisions. These deposits have been, and are being, thoroughly explored although neither of these properties is technically in past-producer ranks.

Similar comments apply to individual reserves of possible ore at Windfall-Goldlund and elsewhere in the Minnitaki Lake-Sioux Lookout area. Other considerable tonnages of possible ore exist in the Manitou Lakes area, Rowan-Atikwa Lakes, Shoal Lake-Lake of the Woods, and Eagle-Wabigoon Lakes areas.

Speculative ore reserves are postulated on less reliable information and are based in part on sparse published reserve figures and in part on our own assessment of rather incomplete geological data and calculations based on these data. They do, however, provide some idea of the tonnages and grades that might reasonably be expected if all the known prospects and occurrences in the region were adequately explored. Some of these prospects (including several in the Mine Centre Area) are currently under investigation and preliminary results substantiate our postulated reserve estimates.

5.2. Dilution and Other Factors

Little attempt has been made to estimate dilution factors or to establish cut-off grades, except in a few instances. However, dilution must be considered, especially in narrow ore zones. We estimate that dilution will run from 10% to 20% in individual ore deposits and likely will be in the 15%-20% range in most shear zone occurrences, possibly even in excess of these percentages. The establishment of cut-off grades is peculiar to each ore deposit and will depend on difficulties of mining, depth, hoisting costs and other factors affecting operating costs. Obviously, the lowest cost alternatives of mining (and milling) should be examined for each deposit in order to depress the cut-off figure.

An observation perhaps worth noting is that much of the exploration drilling done in the 1930s and later (generally on optioned properties) gave rather questionable results. Our studies of a large number of such programs suggest that hole spacing was usually too great; hole locations were not as well chosen as they might have been; footages drilled were generally insufficient; core diameters were too small to give reliable assay results; and, in most cases, drillholes were not carried to sufficient depth to outline mineable bodies. Evaluation of the old records should be tempered by these observations.

In the sections that follow, no attempt has been made to pinpoint the present ownership of individual properties as this would be beyond our terms of reference. Many properties are known to be held under patent; others have reverted to the Crown and presumably are open to acquisition by staking or leasing; and a few currently are under option to major mining companies whose activities are reported in the technical press from time to time. In this connection, it should be pointed out that surfaces ore dumps and old tailings deposits do not accrue to the staker or leaser of mining claims: their acquisition must be negotiated with the Government by tender under Section 73 (2) of the Mining Act.

6. INVENTORY OF GOLD RESERVES BY AREA AND SUB/AREA

6.1. Shoal Lake-Lake of the Woods

Tables 2 and 3, A,B,C, and D; & Appendix A

The old Duport property has by far the greatest potential of any single property in the Shoal Lake area with ore reserves in proven, probable, and possible categories. It could probably support its own flotation/cyanidation mill. Some arsenopyrite content in the ore points to a roasting requirement in all likelihood. This property currently is under development (N. Miner, November 6, 1980).

In overall potential, the Duport Mine is followed by the Purdex Prospect and the Cornucopia, Kenricia, and Mikado Mines. The Purdex ore is underground and is attractive for its grade of 0.32 oz/ton; it could be mined by a decline development.

The Cornucopia, Kenricia, and Mikado properties contain varying quantities of unmined ore whose feasibilities for recovery would have to be determined. Several possess old tailings deposits which might be acquired for re-treatment, possibly by heap leaching. The Kenricia, and some other old mining operations in the region, is now surrounded by more recent cottage developments and any resumption of mining activities would encounter difficult social and environmental problems.

The old Pine Portage prospect reported one of the highest ore grades in the region (2.0 oz, or better, per ton). The property has been re-examined several times in recent years and some diamond drilling was done; however, none of these records are available in Government files. The Pine Portage prospect currently (1980) is under development and may be a good candidate for a small scale (10-tpd) portable milling operation. Simple gravity separation and amalgamation may be sufficient for extraction, although this may run counter to present environmental constraints.

Several other prospects with fair potential for development are listed in Table 2.

In addition, Table 3 lists more than 100 individual gold occurrences (an unusually large number) in the Shoal Lake-Lake of the Woods area about which little is known. Most were acquired during the Lake of the Woods "Gold Rush" of the 1890s and, presumably, most contained some gold indications. Information usually is quite sparse

Shoal Lake - Lake of the Woods

Kenora Mining Division

TABLE 2

SUMMARY	Estimated Tonnage & Grade in Reserves					
MDC #/Prospect	Proven	Probable	Possible	Speculative	Location & Mineability	Suggested Milling Method
#4/Ambrose Prospect	-	-	-	2,600/0.71	Open cut to -40' w/Air-Trac	Portable flot/cyan. (10 tpd)
#25/Blindfold Mng.Gp.	-	-	-	1,600/0.89	Shaft to -100' (resuing?)	Portable flot/cyan. (10 tpd)
#40/Duport Mng.Co.	27,000/0.36	210,000/0.36	482,000/0.36	-	Shaft to -375' - shrinkage	Roasting + flot/cyan.(500 tp
#56/Cornucopia Mine	-	28,000/0.50	-	-	Shaft to -650' & raise	Portable flot/cyan. (50 tpd)
do. Tailings	-	-	-	15,000/ ?	Tailings w/Payloader	Heap leaching pad
#101/Gold Mountain	-	-	-	100,000/0.04	Open pit to -125'	Heap leaching pad
#127/Hopkins/Heintzman	-	-	-	11,000/0.23	Open cut to -50' w/Air-Trac	Custom milling of flot. conc
#142/Kenricia Mine:						
#1 Vein	-	-	10,900/0.68	-	Shaft to -530+' w/stoping	Portable flot/cyan. (50 tpd)
#3 Vein	-	-	28,125/0.15	-	do.	do.
#183/Mikado Mine:						
N. lens	-	-	5,200/0.56	-	Shaft to -560' - shrinkage	Port. flot/cyan. (10-20 tpd)
S. lens	-	-	6,100/0.69	-	do.	do.
Tailings (offshore)	-	-	-	6,400/0.09	Tailings (in lake)-dragline	Heap leaching pad
#233/Pine Portage	-	-	2,100/2.05	-	Shaft to -100'(?)	Port. amalgam. or flot/cyan.
#239/Purdex Prospect	-	-	76,500/0.32	-	U/G - decline w/scooptram	Portable flot/cyan. 50 tpd)
#281/Sultana Mine	(Insufficient data for reliable estimates)				Shaft to -600+'	Portable flot/cyan.
#292/Thrasher (P-218)	-	-	-	4,500/0.16	Open cut to -40' w/Air-Trac	Port. or custom flot/cyan.
Total Est. Reserves:	27,000/0.36	238,000/0.38	610,925/0.36	126,100/0.09		

Ranking Overall:

1. Duport Mng.Co.
2. Purdex Prospect
3. Cornucopia Mine
4. Kenricia Mine
5. Mikado Mine
6. Pine Portage Prospect
7. Gold Mountain Prospect
8. Hopkins-Heintzman Prospect
9. Ambrose Prospect
10. Blindfold Mng.Gp.
11. Thrasher (P-218)
12. Sultana Mine

Note: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

but a few of these occurrences probably have some potential for exploration and development. Many appear to have an erratic distribution of mineralization but this is to be expected in gold occurrences and therefore some of these properties deserve consideration for examination, re-sampling, and perhaps further exploration by mapping, geophysical and geochemical surveys, and diamond drilling. Several may be shown to have the potential to become small producers with portable, on-site, milling units or as suppliers of feed to a central custom mill.

Shoal Lake - Lake of the Woods

Kenora Mining Division

Data Insufficient for Grade & Tonnage Estimates:

TABLE 3-A

MDC #/Prospects & Occurrences	Remarks
#5/Ash Bay Occurrence	Three exposures of qtz vein, 8"-20" wide; best assay 0.19 oz. Little potential.
#10/Bardyke Occurrence	Oxidized shear zone. Geophysics & stripping, 1961. No information re results.
#12/Barymin Occurrence	Volcs. & metaseds. intruded by qtz/felds. porphyry. Surveyed in 1953. Results unknown.
#14/Bath Island Occurrence	No data since 1898.
#21/Blackburn-Pattison Occurrence	Ten veins reported: 12 shafts. Low values. Examined by Sylvanite.
#22/Black Fox Occurrence	No information.
#23/Black Jack Prospect	Production of 50 tons (1893) ran 0.33 oz/ton. Examined by Sylvanite and rejected.
#24/Black Sturgeon Prospect	Qtz. veins at granite/schist contact. Data sparse but geology favorable.
#29/Boulder Island Occurrence	No data since 1880-90 period. Closed due to boundary dispute.
#30/Brae Breest Occurrence	Lowgrade assays from 1936 drilling; 0.05-0.10 oz/ton.
#32/Bullion Occurrence	No information.
#33/Bullion No. 1 Occurrence	Qtz. vein, 1' wide, carries v.g.. Also Mo(?) Geophysics by HBOG.
#34/Bullion No. 2 Occurrence	V.g. and Mo. Two shafts to 75' & 115', 300' lateral. Workings should be resampled.
#36/Burley Prospect	Unique site on artificial island near Sultana. Shaft to 302' (1899); intersect. vein(?).
#39/Cameron-Earngey Occurrence	This is a Cu showing(1956-58). Carries low Au values.
#41/Cameron Occurrence	No data re geology. Grabs: 0.51 oz Au, 0.40 oz Ag, 2.1% Cu, 0.21% Zn.
#43/Caribou Occurrence	Prospected 1892 & 1920. No assays or other information.
#46/Champion Mine	Former small producer (at 0.46 oz/ton). Shaft, adit, & 800+' lateral. Ore length 100 ft.
#51/Climax Occurrence	No work since 1892. No information re assays or dimensions.
#60/Cronlund Occurrence	Erratic high values (0.55 oz) in channel samples from 5 veins in shear zone. Potential.
#61/Crown Point Mine	Produced 100 oz (1900) from 150 tons. Fire destroyed main shaft (1900). No other data.
#63/Dead Broke Occurrence	Explored 1893. Qtz. vein assayed 0.20 to 3.8 oz/ton from 18" qtz. vein.
#69/Echo Bay Occurrence	Au in pyritized, altered tuff. Assays to 0.30 oz. Dump ran 0.27 oz/ton. No other data.
#70/Echola Occurrence	Shaft to 100 ft (1903). No other information.
#71/El Diver Occurrence	Shaft to 102 ft (1892). Milled 60 tons. Scant potential.
#73/Electrum Lake Occurrence	Sparse data. Possibly 2500 tons at 0.30 oz/3 ft. + 10,000 tons at 0.63 oz/4 ft.
#74/Electrum Occurrence	En echelon veins in folded & faulted andesites. May be arsenious.
#75/Electrum Prospect	Extensive shallow drilling in past but no results available.
#78/Escheweiler Occurrence	Nothing known. Shaft to 100 ft. in 1904.
#80/Fish Island Occurrence	Closed in 1892 due to boundary dispute. Had 30' shaft. No other data.
#84/Fox Island Occurrence	Sparse information.
#85/Fox Lake Occurrence	Sparse information. Au reported on panning.
#86/Francoeur Occurrence	Drilling gave erratic & inconclusive results.
#93/Gauthier (Pipestone Pen.) Occurrence	Narrow veins ran 0.04 & 0.34 oz/ton. Some small tonnage potential.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION
RESIDENT GEOLOGIST'S
FILES, KENORA

Shoal Lake - Lake of the Woods

Kenora Mining Division

Data Insuficient for Grade & Tonnage Estimates:

MDC #/Prospects & Occurrences	Remarks
#97/Gold Coin Occurrence	Examined 1897, 1928, 1964, 1968. DD-indicated 0.33 oz/5' & 0.34 oz/11.4'.
#98/Gold Creek Occurrence	Old work (1892). Sampling (1932) returned good values up to 0.42 oz/ton. Potential.
#99/Gold Hill Mine	Highgrade producer (1886-93) at 4.95 oz/ton. Four small shafts. Needs examination.
#110/Golden Horn Mine	Old producer (1904-07) at 0.19 oz/ton. Narrow qtz. veins. Had underground development.
#112/Golden Reef Prospect	Two shafts (1902) w/some development on 2 levels. Au irregularly distributed in veins.
#117/Great Granite Occurrence	Au & Bo in 70-ft shaft at granite-greenstone contact. No assays available.
#118/Great Northwest Occurrence	Complex geology (1903). Qtz. w/Py in shear. No assays.
#120/Hatmaker Lake Occurrence	Prospect potential. Vein: 312' x 3'-18' wide ran 0.20 oz/22'. Dump: 1.12 oz Au + Ag, Cu.
#121/Hawmendale Occurrence	Two test pits to 15' & 25'. Bulk samples: 0.29 & 0.58 oz. No other information.
#122/Hay Island Prospect	Reputed to be first Au discovery in region (1879). Plant destroyed by fire.
#123/High Lake Occurrence	Essentially Cu occur. w/Cp, Mo, some Au. Intersection, 26.5',reported at 0.25 oz/ton.
#124/Hilly Lake Occurrence	Extensive trenching (1939) & sampling (ca.1950) gave high values. Needs exploration.
#125/Homestake Occurrence	No assay data. Mined 50 tons in 1892.
#126/Hopkins-Heintzman (Miner's Zone)	Erratic values up to 0.25 oz reported in qtz. vein in metabasalt.
#129/Imperial Prospect	Old shaft to 110' + some lateral work on 2 levels. Qtz. in shears near qtz. dior. contact
#131/Indian Joe Prospect	Shaft + lateral. Five zones reported. Qtz. w/Py in sheared greenstone.
#134/Shoal Lake Narrows Occurrence	Very little information. Mineralized rock panned gold.
#135/Cash Island Occurrence	Shaft in altered basalt. Qtz. from old dump assayed 0.01 oz/ton.
#136/Cranston Occurrence	Qtz. in sheared volcs. Assays: tr - 0.01 oz.
#137/James Clay Ward Occurrence	No information on record.
#138/Jenny Leigh Occurrence	Shaft to 50 ft (1898). No other data.
#140/Kenopo Prospect	Explored (1937-39 & 1958) w/DD, IP, Mag, EM. Sample results low w/erratic high values.
#141/Kenopo Prospect (Electrum Pits)	This prospect has similar conditions to MDC #140.
#147/Lac Labelle Gp. Occurrence	Very erratic values: 0.01-0.92 oz. Veins, 2-3 ft. wide.
#155/Location CR 21-3 Occurrence	Sparse data but samples from qtz. assayed 1.12 oz/ton.
#157/Cameron-Dyberg Occurrence	Veinlets & stringers in andesite/gabbro. Mainly a Cu showing.
#168/Macassa Occurrence	DD in 1961. Shears in andesite w/qtz. stringers. No assay information.
#169/Machin Occurrence	Qtz/carb. veins in felsic metavolcs. One DDH (1967). No assays.
#176/Master Jack Occurrence	Shaft to 110' (1897) w/100' lateral. No other information.
#179/Medicine Lodge Occurrence	Shaft to 38' (1897). Qtz. vein in shaft said to extend 1800'. No other data.
#186/Minerva Occurrence	Produced 28 tons selected ore (1885) at 2.72 oz/ton. Drilled (1949), assays 0.25-1.0 oz.
#188/Monarch Occurrence	Free Au reported in 1898 test pits. One-ft. qtz. vein.
#190/Muton Long Lac Occurrence	No data in files.
#191/McCallum, F. Occurrence	No information.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Shoal Lake - Lake of the Woods

Kenora Mining Division

Data Insufficient for Grade & Tonnage Estimates:

TABLE 3-C

MDC #/Prospects & Occurrences	Remarks
#195/McIntyre Porcupine Occurrence	Three DDH (1961) intersected sheared qtz. porphyry. No assays available.
#200/Nankipoo Occurrence	No information.
#206/Nonesuch Prospect	Production of 500/600 tons ran 0.32 to 3.20 oz/ton. Qtz. veins in porph. and greenstone.
#207/Norah Occurrence	Explored 1898-1900. Highgrade reported. Grabs from dump ran 0.30 oz. Fair prospect.
#211/Nor-Penn Occurrence	Good prospect. Sampled (1950): 0.34 oz. & lower. Zone 150' x 600'. Mapped + geochem.
#214/Norway Occurrence	No information.
#215/Novasade Occurrence	Sampled by Sylvanite w/low values.
#217/Oliver Severn Occurrence	Seven qtz. veins, up to 50' x 8" wide. No real potential indicated.
#219/Olympia Mine	Produced 332 oz. Au (1906-15) at 0.20 oz/ton. Five shafts + 3 tunnels. Values low.
#220/Ontario Occurrence	No information.
#221/Ophir Mine	Mined 6089 tons (1893-1911) at ± 0.20 oz/ton. Needs resampling. Good potential.
#223/O'Sullivan, J.J. Prospect	Considerable exploration, surface & U/G. Qtz. veins, 4'-8', in schist. Has interest.
#225/Page Occurrence	Trenched & sampled by Sylvanite (1944). Negligible results.
#237/Popham-Byberg Occurrence	No information.
#238/Princess Occurrence	Sparse data. Said to have free gold (1897).
#240/Quarry Island Occurrence	No Au reported. Was actually site of granite building stone quarry.
#242/Queen Bee Occurrence	No new data since 1899. Shaft to 30 ft. Two veins reported.
#244/Rajah Occurrence	No work done since 1894. No information in files.
#253/Royal Occurrence	Very sparse information. Free gold reported.
#257/Johnson Occurrence	Same location as MDC #244 (Rajah Occur.).
#260/San Antonio Occurrence	Low Au values in drilling; 0.04 oz/ton. Little potential.
#264/Scotty Island Occurrence	No information available.
#265/Scramble Prospect	U/G development, 1894-1910. Sampling required. Dump samples run 0.33 oz/ton.
#267/Sentinel Occurrence	Two shafts (1898). Grab samples, low (0,11 oz). Potential appears low.
#269/Sirdar Prospect	Shaft, adit, & 500' drifting. No assays. Needs sampling, surface & U/G.
#270/Sirdar Point Occurrence	Same circumstances as MDC #269 (Sirdar Prospect).
#273/Standard Occurrence	High assays (1.25 oz) reported (1896) in 26-ft wide lode over 150-ft length.
#274/Stella Prospect	Adit & 4 shafts (1897-1900). Au & sulphides in shear zone. Highgrade reported.
#288/Sylvanite Occurrence	Sampled by Sylvanite (1944). Poor results.
#290/Thrasher, J. Occurrence	Extensive trenching & pitting. Scattered highgrade assays. Needs systematic work.
#291/Thrasher-Williams Occurrence	Only low values reported in sampling. Has slight potential.
#293/Three Friends Occurrence	Qtz. vein in old shaft (1890-91). Re-sampled 1936 w/low values. Arsenious.
#296/Toronto & Western Occurrence	Two shafts. Little information. Adjoins Mikado Mine.
#297/Treasure Prospect	Small production (1898-1900). Four DDH (1949) showed v.g. Potential for small tonnage.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST's FILES, KENORA

Shoal Lake - Lake of the Woods

Kenora Mining Division

Data Insufficient for Grade & Tonnage Estimates:

TABLE 3-D

MDC #/Prospects & Occurrences	Remarks
#298/Triggs Prospect	Shaft to 225' w/826' lateral work (ca. 1900). Assays 0.50-1.00 oz/ton. Good prospect.
#299/Triumph Occurrence	Shaft to 226' w/one level. No other data.
#303/Tycoon Occurrence	No information in files.
#305/Victoria Island Occurrence	Grab samples ran tr-0.01 oz/ton. Arsenic reported.
#314/Waite, J.H.C. Occurrence	Narrow veins over 400-ft. length carry low Au values. No other data.
#318/Wendigo Mine	Ore exhausted, 1900-51. Produced 67,423 oz. (0.33 oz/ton). Other veins deserve sampling.
#320/Western Peninsula Occurrence	Qtz. vein, 2"-8" wide x 130' length. Test pit assayed 0.13 oz/ton.
#322/White Partridge Bay Occurrence	Shaft of unknown depth (1936), minor stripping, narrow veins, low assays (0.06 oz/ton).
#324/Winnipeg Consolidated Occurrence	No work since 1884-93. Reports of v.g. & tailings said to run 0.54 oz/ton.
#325/Witch Bay Occurrence	Two shafts (100'). Qtz. vein, 18". Low values.
#327/Yellowgirl Occurrence	Zone 5' x 800'. Low assays. Scant potential.
#329/Yum Yum Occurrence	Shaft to 86' (ca. 1898). Seven veins. #3 vein assayed 0.94-1.00 oz. May have potential.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

6.2. Dogpaw and Kakagi Lakes

Tables 4 and 5; and Appendix B.

This area contains a number of significant prospects which received considerable exploratory attention many years ago and which have been investigated at intervals in more recent years by drilling programs and geophysical surveys. They include the old Canadian-Arrow, Caswell-Williams, and Dogpaw Lake prospects as well as half a dozen more other prospects of some merit. Developed tonnages are somewhat limited but weighted average grades (before dilution) are quite good at 0.24-0.30 oz/ton. Several prospects (e.g., the Combined, and Wensley Prospects) which did not rate much attention in earlier times appear to have good potential for sizeable deposits of speculative ore.

An interesting feature in this area is the potential for development of several properties by underground declines or ramps with low cost, trackless equipment. Several major mining companies (Noranda, Sherritt-Gordon, etc.) are known to have substantial interests in the Dogpaw-Kakagi Lakes Area and, undoubtedly, mechanized mining methods are under consideration by them together with feasibility studies of centralized custom milling facilities.

It may be noted that the prospect with the least potential in Table 4 (at least in our opinion) - the Frobisher Prospect - consists of a small tonnage of good grade ore in narrow pod-like lenses in a well-defined vein system. The ore is ranked in the "probable" category because it was carefully explored by closely-spaced drillholes to shallow depths. It appears to us that this property which is fairly accessible to Highway 71 might serve as a suitable demonstration test site for narrow open cut mining using an Air-Trac drilling rig and a backhoe excavator. This suggested, if unconventional, method will be discussed in some detail in Part II of this report.

Dogpaw & Aaskagi Lakes Area

Kenora Mining Division

TABLE 7

SUMMARY	Estimated Tonnage & Grade in Reserves					
MDC #/Prospect	Proven	Probable	Possible	Speculative	Location & Mineability	Suggested Milling Method
#1/Abraham Occurrence	-	-	-	4,150/ ?	Narrow open cut to - 40'	Custom or port.flot/cyan(20 tpd)
#9/Bag Lake Prospect	-	-	-	22,500/0.25	Decline to -150' w/scooptram	Custom flot/cyan. (25-50 tpd)
#37/Burnt Prospect	-	-	-	-	Data too sparse for estimates	-
#44/Caswell-Williams	-	13,750/0.21	-	-	Shaft to -125' w/shrinkage	In situ flot/cyan.(75-100 tpd)
	-	25,300/0.28	20,250/0.28	45,500/0.28	To -225' & -450'	do.
#52/Combined Prospect	-	-	-	240,000/0.30	Open pit to -40' w/Payloader	Portable flot/cyan.(150-200 tpd)
#66/Dogpaw Lake	-	30,000/0/30	70,000/0.30	80,000/0.30	Shaft or decline to -600'	In situ flot/cyan.(100-200 tpd)
#89/Frobisher Prospect	-	3,500/0.27	-	-	Narrow open cuts w/Ai -Trac	Portable amalgam/cyan.(10-20tpd)
#173/Martin, F.M.	-	-	-	14,000/0.15	Narrow open pit to -75'	Custom flot/cyan.(25-50 tpd)
#175/Mascott Prospect	-	-	-	-	No data for estimates	Portable gravity jig + amalgam.
#185/Milree Syndicate	-	-	-	32,500/0.12	Decline to -325' w/shrinkage	Custom flot/cyan.or leaching
#209/Noranda(Cdn Arrow)	-	99,650/0.43	-	-	Decline to -600' w/shrinkage	Custom(?) flot/cyan. (100 tpd)
#210/Martin-Kenty	-	-	-	46,500/0.15	Ore shoot to -350'/decline	Custom flot/cyan. (50-100 tpd)
	-	-	-	21,000/0.15	Ore shoot to -350'/decline	do.
#247/Regina Mine	-	-	6,000/0.41	3,600/0.57	Shaft + shrinkage in mine	Portable flot/cyan. (25-50 tpd)
	-	-	-	4,800/0.43	do.	do.
	-	-	-	11,250/0.40	do.	do.
	-	-	8,000/0.15	-	Tailings w/Payloader/dragline	Heap leaching pad
#268/Sewell Prospect	-	-	40,000/0.25	-	#1 Zone: decline to -100'	Custom or port. flot/cyan(100tpd
	-	-	12,000/0.07	-	#2 Zone: open pit to -40'	Heap leaching pad
#287/Sylvanite(Jessie L.)	-	50,000/0.10	-	-	Open pit to -100'	Heap leaching pad
#319/Wensley, E. Prosp.	-	-	-	320,000/0.20	Decline or shaft to -400'	Custom or port. flot/cyan(200tpd
	-	-	-	16,200/0.15	do.	do.
	-	-	-	61,250/0.20	do.	do.
Total Est. Reserves:	-	222,200/0.30	156,250/0.26	919,100/0.24		

Ranking Overall:

1. Wensley, E. Prospect
2. Combined Prospect
3. Dogpaw Lake Prospect
4. Noranda (Cdn. Arrow)
5. Caswell-Williams
6. Regina Mine
7. Sewell Prospect
8. Martin-Kenty Prospect
9. Bag Lake Prospect
10. Sylvanite (Jessie Lake)
11. Milree Syndicate
12. Martin, F.M. Prospect
13. Frobisher Prospect.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

There appears to be considerable scope for custom milling in the Dogpaw and Kakagi Lakes area provided an acceptable centralized site should be selected. New road construction will be required but access will be improved in any case as various properties undergo development.

Table 5 provides a listing of 16 other prospects and occurrences in the Dogpaw and Kakagi Lakes area for which there is insufficient information on record to develop any tonnage and grade estimates. Their inclusion in this list is not intended to minimize their importance in any way: undoubtedly, several of these properties will be found to possess considerable merit for exploration and development.

Dogpaw and Ronald Lake Area

Kenora Mining Division

Data Insufficient for Grade & Tonnage Estimates:

MDC #/Prospects & Occurrences	Remarks
#28/Boulder Prospect	Qtz vein, 2500'x 11'; two shafts w/4 levels to 300'; 1 DDH; no assays.
#35/Bully Boy Occurrence	Qtz vein assoc. w/porph. dike; v.g. + Cu reported; 200' shaft; no record of assays.
#91/Gaudry Occurrence	Drill intersections of 0.15 oz/3 ft and 0.47 oz/3 ft reported. No other information.
#107/Gold Sun Occurrence	Qtz veins/stringers up to 6-7' wide in carbonatized zone. No assays. Adjoins Sylvanite.
#139/Kakagi Lake (East Gp) Occurrence	Qtz veining w/dissem. Py. Sheared, silicified. No other information.
#143/Kenty, J. Occurrence	Au w/Py, Cp, Po, Sph in 1350' shear zone. Five DDH. No assays.
#171/Mongus Lake Occurrence	Narrow qtz veins w/v.g., Py, Cp. No other information.
#194/McIntyre Occurrence	No information in files.
#199/McLennan Occurrence	Qtz vein 1" x 650' in length. Considerable work (Sylvanite, 1944) but no assays.
#218/Oliver Severn Occurrence	Qtz veins, 8" - 26", in sheare near porph. dike; values 0.01-0.36 oz (11 grabs).
#228/Peninsula Bay Occurrence	Py mineralization near porph/metavolc.contact. Six DDH. No assays recorded.
#236/Poirier Occurrence	Scattered low values in mineralized zone, 2000' x 10-18' wide.
#249/Robertson, E.M. Occurrence	Au w/Py in metavolcs. Six DDH. Low values only (0.04 oz) over 5.5'.
#300/Trojan Occurrence	Seven veins, 18" to 12' wide. Three shallow shafts. Low values reported.
#326/Wright, M.P. Occurrence	Four veins & lenses w/v.g.; 275' x 30". No assays recorded.
#330/Zachs Occurrence	Sixty-foot wide shear zone in metavolc.& qtz dior., over 1600' length. Values low.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

6.3. Rowan and Atikwa Lakes

Tables 6 and 7; and Appendix C

The "boundary" between this area and the Dogpaw-Kakagi Lake area is the Cameron Lake Fault. This is a somewhat arbitrary boundary since the gold occurrences on either side of the fault zone are essentially similar and are not spatially separated.

The former Maybrun Mine obviously holds top ranking overall in this area on the basis of probable, possible, and speculative ore reserves. The property originally went into production (at 300 tpd) in 1970 as a source of low grade copper ore (aver. ±1.0% Cu) with gold as a minor byproduct. It operated for only about 18 months. Present prices dictate a reversal in this reasoning and the Maybrun is considered to demonstrate good potential as a gold producer with minor copper recovery in flotation concentrates. Grades of underground gold ore in several zones range from 0.14 oz. to 0.20 oz/ton, less possible dilution. These bodies should be mineable at low cost via declines and with trackless LHD equipment. One million tons, or more, of low grade gold ore (0.03 oz/ton) carrying some copper is available for open pit mining: the gold should be extractable by heap leaching. Depending upon its present physical condition, the former cyanide mill might be renovated as an on-site facility for cyanidation of the Maybrun ore as well as a custom flotation/cyanidation mill for other properties in the area.

The Virginia and Errington prospects; the Noranda-Beggs Lake property; and the Monte Cristo prospect all have fair potential as future mines, most of which may be amenable to low cost decline methods of development.

There are, in addition to those listed in Table 6, some 14 prospects and occurrences shown in Table 7 which may be deserving of exploration. Although data are generally lacking, several of these properties are known to have low to medium grade gold indications.

Rowan and Atikwa Lakes Area

Kenora Mining Division

TABLE 6

SUMMARY	Estimated Tonnage & Grade in Reserves					
MDC #/Prospect	Proven	Probable	Possible	Speculative	Location & Mineability	Suggested Milling Method
#77/Errington Prospect	-	-	224,000/0.24	-	Decline to -240' w/scooptrams	Portable flot/cyan.(200-300 tpd)
#81/Flint Lake Prosp.	-	-	-	15,750/0.08	Decline to -150' w/scooptrams	Heap leaching pad
#116/Grand Chibougamau	-	-	1,150/0.45	-	Open cut to -40' w/Air-Trac	Custom or port. flot/cyan(10tpd)
#177/Maybrun Mine	-	1,000,000/0.03	312,500/0.03	312,500/0.03	Open pit to -150': B Zone	Heap leaching pad
do.	-	-	179,000/0.20	146,000/0.20	Ross Zone: shaft to -275/500'	On-site flot/cyan. (500 tpd)
do.	-	-	73,500/0.18	73,500/0.18	Bay Zone: decline to -150/300'	do.
do.	-	-	28,500/0.14	28,500/0.14	Pot Hole: do.	do.
#189/Monte Cristo	-	-	-	100,000/0.15	Decline to -200' w/scooptram	Custom or port. flot/cyan.
#208/Noranda-Beggs L.	-	-	168,000/0.15	-	Decline w/scooptrams to -350'	Portable(?) flot/cyan.(200 tpd)
do.	-	-	-	72,000/0.15	do. to -500'	do.
#255/Roy (Shingwak L.)	-	-	-	18,000/0.12	Decline to -125'	Custom flot. conc. + cyan.
#310/Violet (Empire)	-	-	-	3,750/0.25	Decline or open cut to -75'	Custom flot/cyan. (10-20 tpd)
#311/Virginia Prospect	-	-	-	830,000/0.08	Open pit to -200'	Crusher + heap leaching
#315/Wampum Lake	-	-	15,000/0.08	-	Surface dump: Payloader	Crusher + heap leaching
Total Est. Reserves:	-	1,000,000/0.03	1,001,650/0.14	1,600,000/0.10		

Ranking Overall:

1. Maybrun Mine
2. Virginia Prospect
3. Errington Prospect
4. Noranda - Beggs Lake Prospect
5. Monte Cristo Prospect
6. Roy (Shingwak Lake) Prospect
7. Flint Lake Prospect
8. Wampum Lake Prospect
9. Violet (Empire) Mine
10. Grand Chibougamau Occurrence

NOTE:

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION
RESIDENT GEOLOGIST'S
FILES, KENORA

Rowan and Atikwa Lakes Area

Kenora Mining Division

Data Insufficient for Grade & Tonnage Estimates:

TABLE 7

MDC #/Prospects & Occurrences	Remarks
#42/Cameron, M.Y. Occurrence	Erratic Au distribution at 5 localities. No other information.
#45/Caviar Lake Occurrence	Qtz. veins in sheared granodiorite. Grab samples reported up to 0.40 oz. Data sparse.
#92/Gauthier Prospect	Discontin. qtz. veins in carb. shear zone. Tonnage est. 2550; grade 0.18 oz (aver.).
#102/Gold Panner Occurrence	Qtz. veins in transverse shears. Estimated 2300 tons/0.15 oz. Needs exploration.
#146/Kuryliw - Sullivan Bay	Three qtz. occurrences. One old shaft (ca. 1930). Assays: tr - 0.03 oz.
#154/Lobstick Bay - Thrasher	Sparse data. Samples gave low values: 0.01 - 0.08 oz/ton.
#158/Logie Occurrence	Qtz. veins in sericitized shears. Assays, 0.20 - 0.23 oz. Data sparse.
#181/Meston Occurrence	Qtz. stringers & lenses in zone, 600' x 80'-100'. Trenched, 4 DDH. Low values.
#205/Nina Occurrence	Shaft to 123' (in 1900). Zone of stringers & veins in shears. Low values.
#252/Roseman - Thompson Occurrence	Qtz. zone w/Gn, Cp. Little information. Assays, tr - 0.09 oz/ton.
#256/Roy (Caviar Lake) Occurrence	Three qtz/carb. veins. Good dimensions. Eleven chip samples: tr - 0.12 oz/ton.
#280/Sullivan Prospect	Mineralized shear w/qtz. veins. Shaft (110'), level & sub-level. No assays reported.
#286/Sylvanite (North Dogpaw) Occurrence	Drilled by Sylvanite (1945) w/inconclusive results. Very little data.
#294/Tillie Lake Portage Occurrence	Qtz. veins trenched w/reported highgrade sections. No other information.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

6.4. Upper and Lower Manitou Lakes

Tables 8 and 9; and Appendix D

The Manitou Lakes comprised an active prospecting and mining area from about 1890 to 1910, and at brief intervals since that time. With one or two exceptions (such as the Manitou Island occurrence), the gold deposits were in quartz veins and stringer zones in strong shears some of which extended through several adjacent properties. None were developed below a depth of about 500 feet although the type of mineralization should continue considerably deeper. The major producers in former days included the Big Master, Elora (or Jubilee), Laurentian, and Detola mines. These all have significant reserves in the probable, possible, and speculative categories with weighted average grades in the 0.10-0.25 oz/ton range. The Big Master has somewhat higher grade. Comprehensive exploration, both on surface and underground, may well prove up larger tonnages then we have indicated in Table 8.

The Manitou Island prospect, as the exception referred to above, exhibits a different type of mineralization; gold is associated with pyritiferous sulphides that are associated with narrow quartz porphyry sills (and dikes?) in volcanics. The property was quite thoroughly explored during the late 1930s and early 1940s but never attained production. It appears to be the most promising prospect in this area, although rather remote as regards accessibility, and it should be amenable to development by decline. We estimate that the ore zones to a depth of 450 feet may contain about 600,000 tons of probable and possible ore at a grade of 0.21 oz/ton, or better.

Properties developed on, or near, Upper Manitou Lake would be well served by a central flotation/cyanidation custom mill in the 300-500 tpd range located on either the Big Master or Elora properties. The Manitou Island prospect, located on an island in Lower Manitou Lake, would require an on-site, portable or semi-portable mill with a capacity of 300 tpd.

Upper and Lower Manitou Lakes

Kenora Mining Division

SUMMARY	Estimated Tonnage & Grade in Reserves					
MDC #/Prospect	Proven	Probable	Possible	Speculative	Location & Mineability	Suggested Milling Method
#15/Bee Hive Prospect	-	126,000/0.16	7,500/0.35	-	Decline to -100' w/scooptrams	Custom (Manitou Is) flot/cyan.
#18/Big Master Mine	-	25,000/0.48	-	-	Shaft to -150' (#3 vein)	On-site flot/cyanidation
do.	-	4,500/0.58	-	-	do.	do.
do.	-	8,500/0.21	-	-	Shaft to -200' (#4 vein)	do.
do.	-	-	1,000/0.25	-	Surface dump w/Payloader	do.
#65/Detola Prospect	-	-	-	10,000/0.09	Shaft to -235'	Heap leaching pad
do.	-	-	-	5,000/0.09	Surface dump w/Payloader	do.
#67/Dryden-Red Lake	-	-	-	30,000/0.20	U/G: decline or shaft	Custom flot/cyan. (50 tpd)
#76/Elora (Jubilee)	-	7,500/0.18	35,000/0.13	-	Shaft or decline to -165'	Custom flot/cyan. (200 tpd)
do.	-	6,000/0.18	180,000/0.13	-	do.	do.
do.	-	-	-	5,000/0.10	Surface dump w/Payloader	Heap leaching pad or flot/cyan.
#88/Frenchman Island	-	-	-	2,500/0.13	Open cut to -40' w/Air-Trac	Portable flot/cyan. (10-25 tpd)
#149/Laurentian Mine	-	2,650/0.25	48,000/0.25	-	Shaft or decline to -575'	Custom flot/cyan. (50-100 tpd)
do.	-	-	-	20,000/0.10	Surface dump w/Payloader	Heap leaching pad
#172/Manitou Island	-	190,000/0.21	341,500/0.21	-	Decline to -450' (#1 Zone)	Fixed (?) flot/cyan. (300 tpd)
do.	-	-	90,000/0.25	-	Decline to -150' (#2 Zone)	do.
#229/Petrie Occurrence	-	-	3,750/0.21	-	Open cut w/Air-Trac to -40'	Custom flot/cyan. (25 tpd)
do.	-	-	-	7,750/0.21	Decline w/scooptram to -125'	do.
#254/Royal Sovereign	-	-	-	3,600/0.28	Shaft: U/G below 100' level	Custom flot/cyan. (25 tpd)
#266/Selby Lake Mine	-	-	22,500/0.37	18,000/0.37	Shaft to -400'/shrinkage	Port. gravity/amalgam/cyan.
#285/Swede Boys(Merrill)	-	-	-	1,000/0.15	Open cut w/Air-Trac to -40'	Port. jig + amalgam. (10 tpd)
#316/Washeibemaga Lake	-	-	52,250/0.37	52,250/0.37	Shaft or decline to -500'	Portable flot/cyan. (100 tpd)
Total Est. Reserves:	-	370,000/0.21	781,500/0.21	155,100/0.25		

Ranking Overall:

1. Manitou Island Prospect
2. Washeibemaga Lake Occur.
3. Elora (Jubilee) Mine
4. Bee Hive Prospect
5. Big Master Mine
6. Selby Lake Mine
7. Laurentian Mine
8. Petrie Occurrence
9. Detola Prospect
10. Royal Sovereign Prospect
11. Frenchman Island Occur.
12. Swede Boys (Merrill Cl.)

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Numerous prospects and occurrences, 22 in all, are scattered through the Manitou Lakes area but for which information is incomplete thus making reserve estimation impossible. Some of these, as listed in Table 9, must be regarded as properties with fair development potential, on the basis of meagre (but encouraging) assays and vein dimensions of some size.

Upper and Lower Manitou Lakes

Kenora Mining Division

TABLE 9

Data Insufficient for Grade & Tonnage Estimates:

MDC #/Prospects & Occurrences	Remarks
#11/Barker Prospect	Good assay from mill test (0.34 oz) but little other information.
#17/Big Dick Occurrence	Qtz. vein, 10' wide. Very low values (0.01 - 0.05 oz/ton).
#49/Kabagukski Occurrence	Qtz. in shear zone. Drilled, 1955. No information re results.
#62/Trafalgar Bay Occurrence	Four qtz. veins but no assay information. Adjoins Big Master to the south.
#94/Giant Prospect	Small, mostly unexplored. Reported 0.30 oz/ton. Shaft and one level at 200' (1897).
#95/Glass Reef Prospect	Qtz. stockwork, w/little continuity. Shaft to 200' & 2 levels (1899-1900).
#103/Gold Rock Prospect	Chip samples over 18" gave 0.12 oz. Tonnage small. Worked 1896, 1928-29.
#104/Gold Rock Occurrence	No information.
#144/King Edward Occurrence	Qtz. vein up to 6' wide w/v.g. No other information.
#148/Last Chance Occurrence	Vein 3' wide showing v.g. Grade unknown. No other data available.
#153/Little Master Prospect	Four parallel, lenticular veins (continuation of Big Master?). Grade 0.13 oz. Small.
#201/National Occurrence	Virtually no data.
#222/Orion Occurrence	Qtz. stringers in schist zone. One 50-ft. shaft. No other information.
#224/Oxford Occurrence	Qtz. stringers in schist. Small shaft (1899). No assays or other data.
#227/Paymaster Prospect	Two qtz. veins w/low values. Shaft to 325' w/3 levels. Little information.
#241/Queen Alexandra Occurrence	No vein exposed. Sulphides assayed 0.08 oz. Milling of 18 tons (1904) gave 0.85 oz/ton
#248/Reliance Prospect	Qtz. vein, 800' x 2'. U/G development to 106 ft. Assays: nil - 0.14 oz/ton.
#284/Swede Boys Island Occurrence	Short, narrow qtz. veins carry v.g. Assays from old dump: 0.03 - 0.30 oz. Data sparse.
#302/Twentieth Century Mine	Qtz. lenses in zone up to 20' wide. No assays, but milling (1902-03) returned 0.20 oz/ton
#306/Victory Occurrence	Qtz. veins (6" wide) in shear zone carry v.g. Panned well, but no assays in files.
#312/Volcanic Reef Prospect	Narrow qtz. veins w/v.g. & Py. Erratic values & low tonnage indicated.
#317/321: Watson/Wetlainen Occurrences	Watson vein assayed "nil"; Wetlainen 0.07 - 0.18 oz/ton. Dimensions unknown.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

6.5. Eagle and Wabigoon Lakes

Tables 10 and 11; and Appendix E

Most of the prospects in the Eagle Lake-Wabigoon Lake area appear to be relatively small tonnage occurrences but individual grades are better than average for the region. With three exceptions, all are in the speculative category reflecting the small amount of exploration and development carried out in past years.

The Magdalena Prospect is by far the largest in potential possible tonnage and has an advantage in that the deposit could be open pitted to a depth of around 300 feet using conventional mining methods. Several other deposits, including the Bonanza Mine, the Eldorado Prospect, and Golden Eagle might be mined through existing shafts (if these can be renovated). All others listed in Table 10 could be developed either by declines or narrow open cuts from surface. Additional exploration would be required before serious consideration is given to mining at any of these properties.

Table 11 lists 22 additional prospects and occurrences in this area which lack sufficient information for evaluation and ore estimation. Several appear to warrant prospecting, sampling, and possibly exploratory drilling.

6.6. Dinorwic-Dyment Area

Tables 12 and 13; and Appendix F.

The former Sakoose and Sandybeach Lake mines offer the greatest potential for development in this area which is quite accessible from several small population centres. As shown in Table 12, the old Sakoose Mine has approximately 85,000 tons in the probable, possible, and speculative categories with an indicated average grade of about 0.30 oz/ton. These figures are based on exploratory work (mainly diamond drilling) to a depth of only 500 feet; there are possibilities of deeper ore at this property. The Sandybeach Lake and Alto-Gardner properties also have good potential for development of considerable tonnages at somewhat lower grades. Several other prospects in this list contain lesser amounts of ore but offer the advantages of low cost mining from surface to shallow depths (25-40 feet).

The Sakoose and Sandybeach Lake deposits probably would require on-site milling facilities with capacities of 100-200 tpd. If either or both of these mills should be equipped for custom milling, ore from all other properties in the area could be handled at these centres unless portable units are found to be more feasible.

Eighteen other prospects and occurrences are listed in Table 13 as requiring more information. From the little information that is available, none appear to offer much encouragement in terms of tonnage dimensions or ore grades.

Dinorwic - Dyment Area

Kenora Mining Division

TABLE 12

SUMMARY	Estimated Tonnage & Grade in Reserves					
MDC #/Prospect	Proven	Probable	Possible	Speculative	Location & Mineability	Suggested Milling Method
#3/Alto-Gardner	-	-	24,375/0.20	-	Decline to -100'; scooptrams	Custom flot/cyan. (50 tpd)
do.	-	-	-	48,750/0.15	Decline to -300'; do.	do.
do.	-	-	11,600/0.18	-	Ore shoots in ore zones	do.
#19/Big Ruby Prospect	-	-	1,500/0.50	-	Open cut w/Air-Trac to -30'	Custom flot/cyan. (10-20 tpd)
do.	-	-	-	3,500/0.50	Decline, -30' to -100'	do.
#38/Calder-Bousquet	-	-	-	41,500/0.15	Open pit to -200' w/Payloader	Custom flot/cyan. (50 tpd)
#58/Cox Lake Occur.	-	-	-	30,000/ ?	Unknown dimensions	-
#193/McCracken Occur.	-	-	-	2,500/0.20	Open cut to -40' w/Air-Trac	Custom flot/cyan. (15 tpd)
#198/McLean Syndicate	-	-	-	12,500/0.12	Open cut to -25' (1200' x 5')	Custom flot/cyan. (25 tpd)
#226/Pathfinder Synd.	-	-	-	1,200/0.43	Open cut to -40' (100' x 4')	Custom flot/cyan. (10 tpd)
#230/Pidgeon(Dyment Gp)	-	-	-	83,000/0.06	Decline to -200' w/scooptrams	Heap leach or port. flot/cyan.
#232/Pidgeon Occur.	-	-	-	60,000/0.20	Decline to -100' (1000' x 6')	Custom flot/cyanidation
#259/Sakoose Mine	-	6,000/0.28	50,000/0.30	29,000/0.31	In mine workings via #4 shaft	On-site flot/cyan. (100+ tpd)
#261/Sandybeach Lake	-	-	13,500/0.21	20,250/0.21	Shaft or decline to -1000'	On-site flot/cyan. (100 tpd)
do.	-	-	27,000/0.21	40,500/0.21	do.	do.
#289/Tabor Prospect	-	-	14,000/0.41	-	Shaft: above existing levels	Portable flot/cyan. (25 tpd)
do.	-	-	-	3,000/0.41	do. to -500'	do.
Total Est. Reserves:	-	6,000/0.28	141,975/0.26	345,700/0.17		

Ranking Overall:

1. Sakoose Mine
2. Sandybeach Lake Occur.
3. Alto-Gardner Prospect
4. Pidgeon Occurrence
5. Tabor Prospect
6. Calder-Bousquet Occur.
7. Pidgeon (Dyment Gp)
8. Big Ruby Prospect
9. McLean Syndicate
10. Pathfinder Syndicate
11. McCracken Occurrence
12. Cox Lake Occurrence

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION
RESIDENT GEOLOGIST's
FILES, KENORA

Dinorwic - Dyment Area

Kenora Mining Division

TABLE 1

Data Insufficient for Grade & Tonnage Estimates:

MDC #/Prospects & Occurrences	Remarks
#7/Avery Lake Occurrence	No information (including exact location) on file.
#47/Church Lake Occurrence	No data available.
#48/Cl. HW 311 Occurrence	No data available.
#96/Godson Occurrence	No information on file.
#132/Pidgeon-Wabigoon Lake Occurrence	Qtz. vein, 1'-10' wide, aver. value 0.15 oz/ton. Small tonnage indicated.
#150/Laval Township Occurrence	Qtz. vein containing small amounts of free gold.
#156/Mennin Lake Occurrence	One 80-ft. shaft (1899); this is only information.
#161/Long Lake - McCracken Occurrence	No assays but mineralized zone reported, 190' x 4', w/Gn, Cp, Sph.
#162/Long Lake (Santa Maria) Occurrence	Two old shafts (1902). Six-inch qtz. vein carries v.g.; assayed 0.19 oz. No other data.
#174/Maryjo Lake Occurrence	Virtually no information available.
#187/Minnehaha Occurrence	Trenching, pitting, 100-ft. shaft (1906-09).
#204/Niemi Occurrence	Flat-lying qtz. body, approx. 100 sq. ft.. Some high values reported. Some potential.
#212/Northern Queen Occurrence	Qtz. vein w/Py, Cp. Some tonnage indicated but no assay information.
#276/Stewart Occurrence	Qtz. vein, 12'-14' wide, traceable for 500 ft. One 20-ft. shaft (1890's). No assays.
#282/Superstition Occurrence	Veins assoc. w/qtz. porphyry. No other information.
#295/Tobacco Lake Occurrence	No data other than mineralized zone at contact of granite & mafic metavolcanics.
#301/Turtlepond Lake Occurrence	Qtz. vein, 9"-12" wide, in fractured andesite. Geophysics survey negative.
#304/Van Houten Prospect	Qtz. stringers up to 10" wide w/v.g., Py, Cp, Mo near granite stock. Narrow.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

6.7. Pipestone Lake-Manitou Stretch

Tables 14 and 15; and Appendix G.

As shown in Table 14, the Straw Lake Beach Mine is the prime property of interest in this area. The mine had been developed to a depth of 725 feet and was equipped with a 60 tpd flotation/cyanidation mill, but closed abruptly in 1941 after an 8-year period of successful operation. Although not specifically stated in the records, it may be assumed that the vein was found to be dipping onto the Konigson ground adjacent to the north and that this may have been the reason for closure. It should be noted that assay plans of the bottom level showed no diminution in values at that level.

The Konigson property has a vein at surface which is said to pinch out at a depth of approximately 40 feet in the shaft; a small amount of ore may be recoverable in a shallow open cut.

The Gates Lake and Straw Lake Occurrences are mainly of geologic interest but they may provide sources of near-surface ore.

Table 15 lists 11 other prospects and occurrences which may, or may not, have potential as future prospects. Most were investigated in the early 1900s. They all require more work.

Pipestone Lake - Manitou Stretch

Kenora Mining Division

TABLE 14

SUMMARY	Estimated Tonnage & Grade in Reserves					
MDC #/Prospect	Proven	Probable	Possible	Speculative	Location & Mineability	Suggested Milling Method
#90/Gates Lake Occur.	-	-	-	37,500/0.15	Decline to -150' + scooptram	Roasting + port. flot/cyan.
#145/Konigson Prospect	-	-	5,600/0.40	-	Open cut to -25' w/Air-Trac	Custom flot/cyanidation(25 tpd)
#277/Straw Lake Beach	-	32,000/0.20	-	-	U/G to -920' w/shaft	On-site flot/cyan.(100 tpd)
do.	-	-	32,000/0.20	-	U/G to -1140' w/shaft	do.
do.	-	-	-	48,000/0.20	U/G to -1500' w/shaft	do.
do.	-	-	30,000/0.15	-	Surface dump - Payloader	do.
do.	-	-	? /0.05	-	Tailings/Payloader or dragline	Heap leaching pad
#278/Straw Lake Occur.	-	-	-	-	U/G: estimates not possible	Unknown
Total Est. Reserves:	-	32,000/0.20	67,600/0.19	85,500/0.18		

Ranking Overall:

1. Straw Lake Beach Mine
2. Gates Lake Occurrence
3. Konigson Prospect

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST's
FILES, KENORA

Kenora Mining Division

Data Insufficient for Grade & Tonnage Estimates:

MDC #/Prospects & Occurrences	Remarks
#6/Austin Occurrence	Au and Sb in shear zone in andesite. Sb 2.29% & lower; Au values unknown. Data sparse.
#16/Bethune Occurrence.	Qtz. vein, 3"-16", w/v.g. Erratic values, 0.02 - 0.98 oz/ton. Slight prospect potential
#59/Cracker Jack Occurrence	Qtz. stringers in schist zone. Three short shafts (ca.1900). No other information.
#105/Gold Standard Occurrence (HW 271)	Qtz. vein, 6' wide, in metavolcs. & agglomerate. Picked sample (dump) ran 1.80 oz.Au.
#106/Gold Standard Occurrence (G.340)	Qtz. vein, 8' wide. Shaft to 150' (1900-01).. No other information.
#167/Lun-Echo (Helena Lake) Occurrence	DD core samples, 0.01 - 0.03 oz. Au. No other information.
#196/McKay Occurrence.	No information available.
#258/Sairy Gamp Occurrence..	Small amount of work in 1900. One 75-ft shaft + 24 ft. lateral work.
#279/Sullivan-Phinney Occurrence	Qtz. vein, 6", flat-lying in greenstone w/v.g. No values reported.
#307/Viger Occurrence	Little significance - information sparse. Au values to 0.03 oz; Ag 0.35 - 0.70 oz.
#328/Dr. Young Occurrence	DD core: 0.01 - 0.03 oz Au. No other data.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Eagle and Wabigoon Lakes Area

Kenora Mining Division

TABLE 10

SUMMARY	Estimated Tonnage & Grade in Reserves					
MDC #/Prospect	Proven	Probable	Possible	Speculative	Location & Mineability	Suggested Milling Method
#26/Bonanza Mine	-	-	22,500/0.20	11,250/0.20	Shaft to -450'; shrinkage	Portable flot/cyan. (50 tpd)
#72/Eldorado Prospect	-	-	6,750/0.47	-	Shaft to -120'; shrinkage	Portable flot/cyan. (25 tpd)
do.	-	-	-	40,000/0.25	Shaft to -250'; shrinkage	do.
#83/Fornieri Prospect	-	-	-	5,000/0.19	Decline or open cut to -50'	Custom flotation/cyanidation
#109/Golden Eagle	-	-	-	5,000/0.25	Shaft or decline to - 70+'	Custom flotation/cyanidation
#119/Grimsby Prospect	-	-	-	8,000/0.42	Open cut w/Air-Trac to -40'	Custom flotation/cyanidation
#152/Little Jumbo	-	-	-	46,800/0.50	Decline to -55+' w/scooptram	Custom flot/cyan. (75-100 tpd)
#170/Magdalena Prospect	-	-	375,000/0.15	375,000/0.15	Open pit to -300'; standard	On-site flot/cyan. (500 tpd)
#180/Meridian Bay	-	-	-	10,000/0.30	Decline to -100' w/scooptram	Port. flot/cyan. + concentrate
#234/Pioneer Island	-	-	-	1,250/ ?	Open cut to -40' w/Air-Trac	Custom milling by flot/cyan.
#283/Swanson Prospect	-	-	-	1,320/0.50	Open cut or decline to -40'	Port. amalgam. or flot/cyan.
Total Est. Reserves:	-	-	404,250/0.16	503,620/0.20		

Ranking Overall:

1. Magdalena Prospect
2. Little Jumbo Prospect
3. Eldorado Prospect
4. Bonanza Mine
5. Grimsby Prospect
6. Meridian Bay Prospect
7. Golden Eagle Prospect
8. Fornieri Prospect
9. Swanson Prospect
10. Pioneer Island Prospect

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Eagle and Wabigoon Lakes Area

Kenora Mining Division

Data Insufficient for Grade & Tonnage Estimates:

TABLE 11

MDC #/Prospects & Occurrences	Remarks
#8/Baden-Powell Mines	Explored surface & U/G; produced 288 oz Au (1902-05). Dimensions lacking. Some potential.
#27/Bonanza United Occurrence	No information except presence of two shafts.
#31/Buffalo Occurrence	Shear zone, 10'-25' wide w/qtz. Two shafts & an adit. No assays reported.
#87/Frederick M & D Occurrence	Shear zone occurrence. Best value, 0.04 oz/ton. No other data.
#100/Gold Moose Occurrence	Vein to 18" wide. Mill test (1902) - no results on record. Shaft to 114 ft, inclined.
#111/Golden Park Occurrence	Vein 6' wide w/Py, Cp. No assays. Two shallow shafts. No other data.
#114/Gordon Occurrence	Narrow qtz. vein, 3"-6". No assays, no dimensions.
#115/Grace Prospect	No real tonnage indicated. Au w/Pb, Zn. Grade 0.17 oz/ton from small production (1902-08.
#151/League Occurrence	Vein to 5' wide. Three shallow shafts, 1899 & 1911. No values given.
#159/Lone Jack Occurrence	Pyritic qtz. vein up to 15' wide; length and grade unknown.
#160/Lone Pine Occurrence	Qtz. vein in shear zone. Shallow shaft (1910). No other information.
#163/Longe, R. Occurrence	Qtz. vein, 1', & stringers. Some high values(0.63, 0.74 oz.) not likely representative.
#164/Lost Occurrence	Explored 1903-10 w/2 shafts. Small production (34 tons, 0.26 oz/ton). No other data.
#192/McCracken-Cameron Occurrence	Qtz. veins up to 10" wide. Reported 0.40 oz/ton. No other information.
#213/North Twin Island Occurrence	Qtz. vein, 18" wide, assayed 0.40 oz/ton. No other data.
#231/Pidgeon Prospect	Some potential. Examined by HBOG, Falconbridge, SteepRock (1970-77). Grade low.
#235/Pitt Occurrence	Irregular qtz. vein, up to 7' wide; 12' shaft (pit?). No assays or dimensions.
#246/Redeemer Mine	Inconclusive values from premature production (1902-04, 1918). Water inflows closed mine.
#250/Rognon Prospect	Slight potential. Low grade (0.04-0.09 oz.) but might be amenable to heap leaching.
#271/Smith, W.W. Occurrence	Qtz. porph. dike & qtz. stringers w/v.g., Py, Cp. Numerous trenches. Tonnage small.
#308/Viking Occurrence	Qtz. vein, 4'-6' wide, w/stringers, said to be 700' long. No other information.
#315/Wachman Prospect	Explored by HBOG (AEM, 1977). Drilling may increase unrealistically low indicated tonnage.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

6.8. Mine Centre Area

Tables 16 and 17; Appendix H

This is an old but well known mining area that was characterized by small, high grade gold occurrences. The Foley Mine is the most significant deposit and it is presently under re-development. Its indicated grade of 0.50 oz/ton makes it a particularly attractive prospect. The Golden Star, Stellar, and Lucky Coon properties, as well as several others shown in Table 16, are likewise excellent prospects for a resumption of activities. Several of these properties could be developed advantageously by declines.

The Foley Mine, and several other deposits in its vicinity, is comprised of quartz veins filling transverse fractures in a granitic porphyry stock immediately west of Shoal Lake, and east of Bad Vermilion Lake. This type of occurrence unrelated directly to volcanics is quite different from the general habit in the region.

Thirteen prospects and occurrences listed in Table 17 were explored at one time or another around the turn of the century. Most exhibit very good grades but there is insufficient information for reliable reserve estimates. It is likely that a number of these occurrences eventually maybe developed as small but profitable ventures.

Mine Centre Area

Kenora Mining Division

TABLE 16

SUMMARY	Estimated Tonnage & Grade in Reserves					
MDC #/Prospect	Proven	Probable	Possible	Speculative	Location & Mineability	Suggested Milling Method
#79/Ferguson Prospect	-	-	40,000/0.06	-	Tailings; Payloader/dragline	Heap leaching
do.	-	-	-	3,400/0.38	Shaft to -150'; shrinkage	Custom flot/cyan. (10 tpd)
#82/Foley Mine	-	-	40,000/0.50	400,000/0.50	Shaft to -700'; shrinkage	On-site amalgam/cyan. (300 tpd)
#113/Golden Star Mine	-	-	-	20,000/0.42	Shaft to -525'; shrinkage	Custom or port. flot/cyan.
#130/Independence Mine	-	-	-	4,000/0.50	Shaft or decline to -100'	Custom or port. flot/cyan.
#165/Lucky Coon(Hillier)	-	-	-	4,000/1.00	Shaft or open pit to -100'	Custom amalgam/cyan. (10 tpd)
#216/Olive Mine	-	-	-	6,000/0.37	Inclined shaft or open pit	Custom or port. flot/cyan.
do.	-	-	7,000/0.05	-	Tailings; Payloader/dragline	Re-treatment by heap leaching
#272/South Vermilion	-	-	-	4,500/0.35	Shaft or decline to -100'	Custom or port. flot/cyan.
#275/Stellar G.M.	-	-	-	5,800/0.30	Decline or shaft to -60+'	Custom or port. flot/cyan.
do.	-	-	-	2,750/1.00	do.	do. (20 tpd)
Total Est. Reserves:	-	-	87,000/0.26	450,450/0.50		

Ranking Overall:

1. Foley Mine
2. Golden Star Mine
3. Stellar Gold Mines
4. Lucky Coon Prospect
5. Ferguson Prospect
6. Olive Mine
7. Independence Mine
8. South Vermilion Occurrence

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Mine Centre Area

Kenora Mining Division

TABLE 17

Data Insufficient for Grade & Tonnage Estimates:

MDC #/Prospects & Occurrences	Remarks
KRG #2/Alice A. Prospect	Qtz. stringers in felsite schist. Mill test (1898-1900) ran 0.63 oz. Needs exploration.
KRG #55/Russell C. Cone Mine	Highgrade zone gave 1.06 oz in bulk sampling. Some production, 1948-65. Good prospect.
KRG #57/Corrigan (Sewell Bay) Occurrence	High assays (0.82, 1.38, 10.88 oz). Possible stockwork. Needs exploration.
KRG #64/Decca Prospect	Narrow qtz. vein w/v.g. No assays available. Last worked, 1900. Fair prospect.
TBRG #83/Gehl Lake Occurrence	No information available.
TBRG #84/Mills Creek Occurrence	No information available.
TBRG #85/Haines Occurrence	No information available.
KRG #108/Golden Crescent Prospect	Five veins. Some production (1897) gave 0.45 oz/ton. Very little information.
KRG #133/Isabella Prospect	Highgrade pockets yielded up to 7.00 oz/ton (1920's, 1930's). Erratic distribution.
KRG #178/Mayflower Prospect	Encouraging assays from DD intersections (1946): requires exploration, surface & U/G.
KRG #197/MacKenzie-Gray Occurrence	DD gave 0.49, 0.44, 0.27 oz/ton over 4-ft. intersections. More drilling required.
KRG #245/Red Cedar Lake Occurrence	Scattered values reported over 200-ft. long zone.
KRG #262/Saundary Prospect	Production (1934) reported as 1.00 oz/ton. Pits gave 0.80 oz. Good prospect.

KRG: Kenora Regional Geologist's files

TBRG: Thunder Bay Regional Geologist's files

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST's
FILES, KENORA

6.9. Minnitaki Lake-Sioux Lookout

Tables 18 and 19; and Appendix I

The properties listed in Tables 18 and 19 are actually located in the Patricia Mining Division but they are included in this report because they are listed in MDC#16 and they appear on Chart A accompanying that Circular.

Most of the deposits are uniquely associated with short, narrow, quartz veins occupying tension fractures in or near the margins of granodiorite sills intrusive into northeast-trending metavolcanics. (Old reports mistakenly refer to these intrusive bodies as "dikes"). The gold content is usually high within the quartz-filled fractures but the grade may be considerably less (0.15-0.25 oz/ton) over mineable widths. The actual widths that can be mined range from 10 ft. to as much as 28 ft. so the tonnage implications are impressively high, as they are in the Windfall and Goldlund ore zones.

The Goldlund and Windfall mines are clearly the two most important properties in this area. Each has experienced much exploration attention and testing of the ore from underground development and, currently, expanded programs are underway at both of these properties. Production decisions are expected in the near future.

Minnitaki Lake - Sioux Lookout Area

Patricia Mining Division

TABLE 18

SUMMARY	Estimated Tonnage & Grade in Reserves					
MDC #/Prospect	Proven	Probable	Possible	Speculative	Location & Mineability	Suggested Milling Method
#54/Conecho Prospect	-	-	-	41,500/0.15	Goldlund decline to -200'.	Custom flot/cyan. (50 tpd)
#68/Eaglelund Occur.	-	-	-	266,000/0.10	Shaft or decline to -400'.	Custom flot/cyan. or heap leach
#166/Lun-Echo Occur.	-	-	-	116,500/0.20	Shaft or decline to -200'.	Custom flot/cyan. (200 tpd)
do.	-	-	-	175,000/0.15	do. to -500'.	do.
#202/New Kelore Occur.	-	-	-	12,500/0.15	Open pit to -50'/Payloader	Custom flot/cyan. (25 tpd)
#203/Goldlund Mines	-	270,000/0.25	-	-	Decline or shaft to -200'.	On-site (?) flot/cyan.(500 tpd)
do.	-	-	405,000/0.15	-	#1 do. to -300'.	do.
do.	-	-	-	225,000/0.10	#1 do. to -500'.	do.
do.	-	-	163,300/0.20	-	#2 & 3 do. to -400'.	do.
do.	-	-	-	40,800/0.15	#2 & 3 do. to -500'.	do.
do.	-	-	480,000/0.20	-	do. to -400'.	do.
do.	-	-	-	120,000/0.15	do. to -500'.	do.
(Sub-Total)	-	(270,000/0.25)	(1,048,300/0.18)	(385,800/0.12)	-	-
#243/Quyta Occurrence	-	-	-	150,000/0.10	Decline or shaft to -200'.	Custom flot/cyan. or heap leach
#263/Schmidt Occur.	-	-	-	12,500/0.15	Decline or open cut to -100'.	Custom flot/cyan. or heap leach
#309/Villbona Prospect	-	-	-	20,800/0.05	Open cut + decline to -100'.	Heap leaching pad
#323/Windfall Mines	-	420,000/0.25	-	-	Shaft or decline to -200'.	On-site flot/cyan. (1000 tpd)
do.	-	-	630,000/0.15	-	do. to -500'.	do.
do.	-	-	-	(not estimated)	do. below -500'.	do.
Total Est. Reserves:	-	690,000/0.25	1,678,300/0.17	1,180,600/0.13		

Ranking Overall:

1. Goldlund Mines Ltd.
2. Windfall Mines & Oils
3. Lun-Echo Prospect
4. Eaglelund Occurrence
5. Quyta Occurrence
6. Conecho Prospect
7. New Kelore Occurrence
7. Schmidt Occurrence
8. Villbona Prospect

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION
RESIDENT GEOLOGIST'S
FILES, KENORA

Minnitaki Lake - Sioux Lookout Area

Patricia Mining Division

TABLE 19

Data Insufficient for Grade & Tonnage Estimates:

MDC #/Prospects & Occurrences	Remarks
#13/Batch River Occurrence	Qtz. veins, 1"-5" wide, in metavolcs. Drilled (1950). Low grade (0.10 oz). Low tonnage.
#20/BJ-12 Occurrence	Qtz. vein, 5'-6' wide, w/Py, Cp, Gn. Shaft to 35' (1898). No other information.
#50/Miles Lake Occurrence (KRL 30579)	Narrow qtz. veins assoc. w/granodiorite sill. Grade ±0.10 oz/ton. No dimensions given.
#53/Conecho Occurrence	Chloritic dike, 10' wide, cut by narrow qtz-filled fractures. No values recorded.
#128/Hunter Gp. Occurrence	Veins & masses of qtz. w/minor Py, Cp, Gn in qtz/felds. porph. Mag svy. (1947).
#182/Midas Occurrence	Two old shafts, but no other information.
#184/Miller Occurrence	Erratic Au in qtz. stringers in diorite dike (sill?). No assays. Slight potential.

The above prospects and occurrences are those appearing on Chart A, Mineral Deposit Circular 16 - Gold Deposits of the Kenora-Fort Frances Area.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Several other area prospects in various stages of exploration and development demonstrate excellent potential for future production. They include the Lunecho Prospect and the Eaglelund and Quyta Occurrences as well as the Conecho, New Kelore, Schmidt, and Villbona properties. All have essentially similar ore characteristics and future production could be treated in a custom milling facility at either the Goldlund or Windfall mines. This would reduce their capital costs considerably.

With the exception of a small amount of open pittable ore at New Kelore (and possibly elsewhere), all of the properties named are amenable to development by declines rather than by shafts. This too has an important implication for capital cost reductions.

Seven prospects and occurrences with generally similar geological characteristics are listed in Table 19 under the heading of "insufficient data". No tonnage or grade estimates are possible for this group but some or all of them may be shown eventually to possess some potential for future development.

6.10. Sapawe-Atikokan Area

Tables 20 and 21; and Appendix J

As recorded in Table 20, the Atiko Gold Mine property, formerly known as

the "Sapawe" mine, operated during the period 1963-66 and produced 4547 ounces of gold despite milling inefficiences. These results did not substantiate the anticipated grade of close to 0.30 oz/ton and, in consequence, the operation was shut down mainly due to the difficulty in maintaining suitable mill feed. The vein occurrences are fraught with geological structural complexities. It is believed that with a solution to the structural problems in sight,

the property could be re-activated and a satisfactory output achieved through close grade control. If so, this is the logical site for a district custom mill unless it is found more expedient (logistically) to ship ore from some outlying Atikokan properties to mill sites at Mine Centre or Shebandowan.

The Hammond Reef property poses considerable uncertainty. On paper, the property appears to have a large speculative tonnage of more than 2 million tons at an acceptable 0.20 oz. grade and to be amenable to an open pit operation. Exploration results on record do not substantiate these figures, possibly because these results are incomplete. The property obviously requires a great deal of exploration, drilling, sampling and testing before its merit can be fully established.

Several other properties in the area (Jack Lake, Upper Seine, Elizabeth, and the Mammoth Vein) have indicated potential in narrow veins to fairly shallow depths but these (and others) require much more work to advance them from the speculative category.

The ten prospects and occurrences shown in Table 21 lack sufficient information for reserve estimation. Likewise, there is a great scarcity of data on 37 other known occurrences in the area and whose exact locations also are uncertain.

Sapawe - Atikokan Area

Thunder Bay Mining Division

TABLE 20

SUMMARY	Estimated Tonnage & Grade in Reserves					
TB #/Prospect	Proven	Probable	Possible	Speculative	Location & Mineability	Suggested Milling Method
#1/Atiko G.M.(Sapawe)	34,181/0.31	-	-	-	Existing shaft to -320'	On-site, flot/cyan. (200+ tpd)
do.	-	204,000/0.30	-	-	do. to -920'	do.
#3/Sunbeam Mine	-	4,410/0.37	-	-	Shaft to -300' w/shrinkage	Portable flot/cyan. (10-20 tpd)
#4/Hammond Reef	-	-	-	1,600,000/0.20	Open pit to -100' w/dragline	Semi-port. flot/cyan. (200 tpd)
do.	-	-	-	650,000/0.20	Open pit to -40' w/Payloader	do.
#5/Upper Seine GML	-	-	-	66,600/0.20	Shaft or decline to - 300'	Portable flot/cyan. (100 tpd)
do.	-	-	-	46,600/0.05	Hammond Reef to -200'	Heap leaching pad
#6/Elizabeth G.M.	-	-	750/0.41	-	Open cuts to -40' w/Air-Trac	Portable flot/cyan. (25 tpd)
do.	-	-	-	7,300/0.15	do.	do.
do.	-	-	-	10,000/0.20	Surface ore dump w/Payloader	do.
do.	-	-	-	10,000/0.10	Tailings/Payloader/dragline	Heap leaching pad
#7/Jack Walsh(Anjamin)	-	(no estimates possible)		-	Shaft or decline to -100'	Portable flot/cyanidation
#8/Jack Lake Prospect	-	-	75,000/0.35	-	Decline to -150'/top slicing	Portable flot/cyan. (200 tpd)
do.	-	-	37,500/0.40	-	do.	do.
do.	-	-	3,000/0.30	-	Surface ore dump/Payloader	do.
#10/Mammoth Vein	-	-	-	31,250/0.20	Open pit to -50'/Payloader	Portable flot/cyan. (75 tpd)
#11/Pettigrew Prospect	-	-	-	10,000/0.36	Open pit to -150'/Payloader	Portable flot/cyan. (25+ tpd)
Total Est. Reserves:	34,181/0.31	208,410/0.30	116,250/0.36	2,431,750/0.20		

Ranking Overall:

1. Atiko (Sapawe) Gold Mines
2. Hammond Reef
3. Jack Lake Prospect
4. Upper Seine GML
5. Mammoth Vein
6. Elizabeth Gold Mine
7. Pettigrew Prospect
8. Sunbeam Mine
9. Jack Walsh (Anjamin)

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, THUNDER BAY

Sapawe - Atikokan Area

Thunder Bay Mining Division

TABLE 21

Data Insufficient for Grade & Tonnage Estimates:

TB #/Prospects & Occurrences	Remarks
#2a/Harold Lake G.M.	Au-bearing veins produced 600 oz. (1894-96), but potential tonnage appears insignificant.
#9/White Lily	Qtz. stringers & veins. Conflicting reports (1907 & 1934) generally adverse.
#12/Minto	Large qtz. vein, stripped & test-pitted (1903-04) & one 60' shaft. No assays.
#13/Hill Vein	Insufficient information.
#14/Roy Vein	Insufficient information.
#15/Big Six Vein	Insufficient information.
#16/Golden Winner	Mill test (1900) gave 0.23 oz/ton from 18" pay streak, but lowgrade (0.02 oz) on samples.
#17/New Golden Twins	Qtz. vein, 10'-30' wide, 1000' long; two small shafts (1897-99). No other data.
#18/Plator Gralouise	Qtz. vein, 1'-1.5' wide, in trondhjemite. Several high assays, but information sparse.
#19/Clearwater	Insufficient information.

There are, in addition, 37 other known gold occurrences in the general Sapawe - Lumby Lake - Atikokan district but a complete lack of information (including their exact locations) makes it impossible to assess their importance.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, THUNDER BAY

6.11. Moss Lake-Shebandowan Area

Tables 22 and 23; and Appendix K

On the basis of available information, there appear to be only three properties of major interest in this area (Table 22). The Band-Ore Mine is by far the most significant with speculative reserves of more than 450,000 tons grading about 0.20 oz/ton to depths of less than 400 ft. Several geological reports on this property written in the late 1940s were in disagreement on ore grades due to failure of several writers to adopt weighted averages. There was fairly close agreement on tonnage figures although there was some uncertainty as to how many known ore occurrences should be included in the total mineable tonnage. The figures we have presented are on the conservative side.

The Band-Ore property was recently acquired by Noranda's Mattagami Lake Exploration subsidiary (N.Miner, September 11 and October 23, 1980).

Fifteen occurrences inthe Moss Lake-Kashabowie-Shebandowan district are listed in Table 23 but no information on any of them could be found in Ministry files.

Moss Lake - Shebandowan Area

Thunder Bay Mining Division

TABLE 22

SUMMARY	Estimated Tonnage & Grade in Reserves					
TB #/Prospect	Proven	Probable	Possible	Speculative	Location & Mineability	Suggested Milling Method
#20/Band-Ore G.M.	-	-	(unweighted)	(687,500/0.26)	Shaft or decline to -350+ ft.	On-site, flot/cyan. (300 tpd)
do.	-	-	(weighted)	471,500/0.20	do.	do.
#65/Moss Mine	-	-	(substantial)	-	Shaft to -1250', or deeper	Custom flotation/cyanidation
#69/Ray Smith Prospect	-	-	-	7,500/0.72	Decline (?) to -100'	Custom flot/cyan.(50 tpd)
do.	-	-	-	8,500/0.21	do.	do.
Total Est. Reserves:	-	-	(uncalculated)	487,500/0.21		
Ranking Overall:	1. Band-Ore G.M. 2. Moss Mine 3. Ray Smith Prospect					

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGISTS FILES, THUNDER BAY

Moss Lake - Shebandowan Area

TABLE 2

Thunder Bay Mining Division

Data Insufficient for Grade & Tonnage Estimates:

TB #/Prospects & Occurrences	Remarks
#21/Frank Minoletti (Snodgrass) Occurrence	No information available
#59/John Anderson Occurrence	do.
#61/Robanor G.M.	do.
#62/J.F.West Occurrence	do.
#63/Ourgold Occurrence	do.
#64/Canadian Nickel Company	do.
#66/Cominco Occurrence	do.
#67/Andowan Occurrence	do.
#68/Harkness Occurrence	do.
#70/Haines Occurrence	do.
#71/Vanguard Exploration	do.
#72/Gold Creek (UMEX)	do.
#73/Matawin Occurrence	do.
#74/Case Island Occurrence	do.
#75/Bolten Bay Occurrence	do.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGISTS'
FILES, THUNDER BA.

PART II - ECONOMICS OF SMALL-SCALE GOLD MINING

7. INTRODUCTION

The inventory of reserves developed in Part I of this study shows that Northwestern Ontario possesses significant potential for the development and production of gold and, to a lesser extent, associated base metals. The figures shown in the various Tables (and summarized in Table I) are idealized in the sense that not all of the calculated reserves are likely to be exploited but a fair proportion in each area and sub-area are definitely capable of development provided that an acceptable economic climate can be established by way of incentives, both public and private.

It is the purpose of Part II of this study to examine the means by which gold mining and milling in the region may be stimulated and supported. Obviously, the entire gold situation is now vastly changed from the conditions prevailing just five years ago and the current price structure makes deposits attractive that were only barely marginal, if that, in 1975.

The current technology of small scale mining and milling will be reviewed in the following pages and suggestions will be put forward for the most suitable methods to exploit the ore deposits.

Capital and operating cost estimates will be advanced for both mining and milling but it must be emphasized that this is not in any way a feasibility study. Our treatment of costs is "non-site-specific". Definitive cost figures could only be derived in a feasibility study of a specific ore deposit whose grade, dimensions, tonnage reserve, metallurgical characteristics, designed flow sheet, and so forth are completely known. Our figures will be very generalized and are intended only as a guide to the costs that might be anticipated in

the development of regional ore occurrences. Moreover, our estimates may vary by as much as 25%, either way.

The current rate of inflation and almost daily variations in dollar exchange rates combined with high interest rates make it almost impossible to come up with meaningful estimates, in any case.

The figures that we do present are based on 1980 (Cdn.) dollars.

We have based our cost projections on a daily mine production of 200-300 tons. A smaller production rate of, say, 50-100 tpd, would cost very little less except possibly in some equipment and development items.

Because of the many unknowns and uncertainities, we can only attempt to paint the capital cost picture with a very broad brush.

8. THE CONCEPT OF SMALL-SCALE MINING AND MILLING

8.1. Potential for Small-Scale Operations

There does not appear to be any legal definition of "small-scale mining" in the literature but we may assume for our purposes that "small-scale" is limited to a ceiling of approximately 300 tons per day, or around 100,000 tons per year on an annual basis. The inventory demonstrates that only one half dozen or so known deposits could support a production rate in excess of this figure. Thus, most of the potential reserves in the region come under the small-scale heading.

Major mining companies, as a rule, tend to set their sights on deposits capable of much larger daily production (500-tpd, and upwards) and this fact may explain their seeming reluctance to proceed with the development of properties in the region which they already control and which are known to contain mineable reserves (albeit less than, say, 300,000 tons) of merchantable ore. The exploitation of the smaller deposits in the range of a few thousand tons to 100,000 tons annually falls within the domain of the small company, or the individual entrepreneur.

Given the right incentives and assistance on the part of the Government, from exploration through mining and milling, small scale mining of a high unit value product such as gold should be entirely feasible in Northwestern Ontario. Even "very small-scale" operations of 10-20 tpd may be practicable in some cases.

Canada, with a few exceptions, is not noted for small-scale mining endeavours but in many parts of the world these operations assume importance as sources of significant production and employment. We have observed this to be a fact in a number of countries including Kenya, Venezuela, Mexico, and Australia. It is reported, for example, that one-half of the gold recovered in Alaska in 1977 was from small-scale alluvial mining operations.

The potential for small-scale mineral production in Northwestern Ontario is quite clear. The calculable reserves shown in Part I demonstrate this despite the paucity of exploration data going back to the late-1800s.

8.2. Mining Regulations

Any person contemplating small scale mining in Ontario should be aware of the regulations pertaining to the acquisition of mineral lands

as cited in the relevant sections of the Mining Act, as amended, and also should be familiar with the permitting procedures necessary to undertake bulk sampling and actual mining operations.

8.3. Environmental and Labour Considerations

The prospective mine operator should be familiar with the constraints that environmental legislation may impose upon him. In most cases, these can be dealt with quite easily but they must be recognized at the outset. Contamination of the environment by mining and milling operations (often inadvertently) is always a possibility that must be guarded against.

Mine labour is likely to be in short supply and any new mining operations may have to depend on recruiting trained labour from outside the region.

8.4. Metallurgical Considerations

In this study, we are not directly concerned with exploration methods and techniques, per se, aimed at the discovery of new gold deposits or even the tracing of possible extensions of known deposits. However, the mode of occurrence frequently provides evidence as to the mineral association of the gold and hence may indicate the most favourable means of mining, milling, and extracting the precious metal content of an ore occurrence.

It was mentioned on page 13 that the gold deposits of this region bear a close relationship to Archean volcanic belts and that they were emplaced (as a rule) in the upper, more felsic, levels of

the volcanic piles and in the sedimentary rocks associated with the late-stage volcanism, as well as in, or marginal to, quartz-feldspar porphyritic intrusive bodies occurring as dikes and sills. A common characteristic of all the gold deposits is that the gold appears to have been introduced during a late stage in the volcanic cycle and during which the gold was remobilized and injected into favourable host structures and emplaced therein by processes of replacement of chemically-favourable rocks and/or minerals.

Favourable structures include carbonated shear and schist zones in the volcanics; faults, fractures, and brecciated zones in propylitized rocks; bedding plane discontinuities, shears, and drag folds in sedimentary rocks; and fractures and stockwork zones in igneous rocks.

Common elemental associations of the gold include Ag, As, Sb, and Te; SiO_2 and CO_2; K and Na; Cu, Pb, Zn, and W; U, Mo, and Pt; and diverse groupings of Bi, W, As, Sb, Sn, and Pt metals.

It is common, therefore, to find frequent reference in the regional literature to occurrences of gold with copper, iron, and nickel sulphides; with galena and sphalerite; with stibnite; and with various W-, Bi-, and Pt-bearing minerals. Occasionally, separation and extraction of the associated metals may be economically important even though the metals are in small amounts.

Another association which is more common in the Shoal Lake-Lake of the Woods area than elsewhere is the occurrence of gold metallization with arsenopyrite; the presence of arsenic is objectionable and usually involves a roasting cycle to remove it. Also, the accumulation of arsenious wastes may create environmental problems, either real or imagined.

9. SMALL-SCALE MINING TECHNOLOGY

In our free-enterprise system and regardless of whether it is a large mine or a small mine, no mine can exist unless the value of the ore produced meets the costs of mining, milling, transportation and overhead expenses; capital amortization and interest; and provides a profit after all expenses are met. Most of the early mine operations in the region did not meet all of these conditions and so it is not surprising that nearly all of them went bankrupt within a few years of opening. More specific reasons for closure can be pinpointed in individual cases.

9.1. Parameters Related to Selection of a Mining System

The selection of any mining system is guided by several constraining factors which may be mentioned briefly, as follows:

9.1.1: Shape, Size, and Position of the Ore Deposit: The thickness of individual ore deposits varies widely in this region but the vein deposits tend to be narrow, ranging from a few inches to perhaps 5 or 6 feet in width. They usually extend on strike for 100 feet, or more, and dip steeply to practically vertically. There are exceptions of course and some shear zone deposits have widths measurable in tens of feet. The ore deposits are discontinuous in some instances and others show pinch-and-swell characteristics. A methodology employing narrow stoping widths underground with gravity-induced movement of broken ore and some opportunity in the system for selective mining is desirable. Since the known deposits are relatively close to the surface, ground presssure requiring close support of mine workings is not generally anticipated.

9.1.2 Distribution of Gold Values: The old records indicate that ore values in vein deposits of the region are highly erratic, even within short distances. This is to be expected in gold occurrences, and it also makes it difficult to establish reliable average grades. Since the aim of any mining method is to permit the highest possible

extraction of the ore consistent with safety and economics, it may be necessary to choose a mining method that provides selectivity and yet keeps dilution to a minimum. The method chosen may be more costly than some others but the high unit value of gold should provide adequate leeway in making the wisest decision.

The erratic distribution of gold in many of the deposits and particularly in lenses and stringers in shear zones makes it almost mandatory to adopt selective methods or else to accept lower overall mining grades.

A notable feature in the region is that ore boundaries appear to be sharp and well-defined. This simplifies grade control in the ore: wall rock area but it also emphasizes the need to eliminate wall rock dilution as much as possible.

9.1.3. Rock Strength: The selection of a mining system, whether on surface or underground, is influenced by the nature of the ore and the wall rock and, specifically, the strength of these materials and their capability of maintaining their shape and configuration over time periods sufficient to permit extraction of the ore with safety. Rock stress does not appear to be a problem in this region judging from the records and from the fact that recently-reopened workings are in good condition. This may be due to the fact that the mine workings are quite shallow and the region as a whole is tectonically stable.*

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* A recent examination of a mine site in Ecuador revealed a surprisingly high residual stress situation causing squeeze in workings within 150 feet of the surface. This necessitated close timber support consisting of square set posts and caps combined with polygonal timber members. The mine is situated at 10,000 feet in the tectonically-active Andean region.

9.1.4. Economic Factors: The aim of any mining operation is to maximize profits and this depends upon both engineering skills and financial acumen. The economic factors include direct mining costs, capital costs and their recovery, the generation of cash flow, and prevailing market conditions. We can influence the first three but not the last.

Preferably, the selection of a mining method should result in optimum costs except possibly in "developing" countries where labour intensive methods may be adopted and which are not necessarily the least costly or the most efficient. The per ton cost of mining depends upon a number of things including mine preparation, development, and (in the case of underground operations) stoping costs. The latter may be the largest single mining cost item. However, the choice of the lowest-cost-per-ton mining method may not necessarily be the wisest choice because it may result in excessive dilution and it may inhibit selectivity in mining.

Although the total costs of financing small-scale mining are obviously less than is the case with a large tonnage operation, the acquisition of capital may be a nearly insurmountable obstacle for the individual entrepreneur. As established mining company can often generate funds within the organization and this may be viewed as a form of internal investment. The seeking of capital by subscription or from a lending institution, on the other hand, can be difficult. The individual, or the small company, may lack sufficient collateral for a bank loan large enough to put the property into production and the normal banking policy of "last in - first out" may siphon off much of the early profit.

The ease or difficulty of acquiring funds will be closely related to the selection of a mining method and the planned rate of production. Whereas a certain optimal size and rate of production

may be defined, the actual scope may have to be adjusted downward in order to avoid unduly large capital outlays. There is always the possibility that production rates can be increased as time goes on and especially if some extra capacity can be included in the original design of the milling units.

9.1.5. Cash Flow: The generation of cash flow to finance increased rates of production and plant expansion is an accepted axiom in the industry. It is doubly important if initial financing is difficult or if the funding level is lower than anticipated. The desirability of securing an adequate and early cash flow may lead to some unfortunate side-effects, however, such as the tendency to "highgrade" the ore deposit or to underdesign the mine and plant to minimize carrying charges on capital. Both of these procedures were common in the region in former times and undoubtedly led to inefficiencies in operation.

9.1.6. Market Conditions: Unlike his counterpart in base metal mining, the small scale gold miner is not as directly affected by changes in the grade of his product, nor is he influenced to any significant degree by daily fluctuations in market conditions. He is less concerned with flexibility than he is with maintaining a steady rate of production at optimum costs and at the highest possible level of efficiency that his chosen methods of mining and milling allow.

9.1.7. Health and Safety: It is perhaps overstating the fact that the safety and welfare of the miners should be of paramount concern to the mine operator regardless of the scale of operation. It is also the concern of Government agencies and the unions although union labour is not likely to be involved in the types of operations we envisage for this region.

Rockfalls are the greatest single cause of accidents in underground metal mines but other major causes relate to the use of explosives, and electrical and haulage equipment. Certain mining methods obviously impose higher risk levels than others: the safer methods should be chosen whenever possible. *

9.1.8 Other Considerations: Stoping, and the means chosen to perform it, is the crux of underground mining but for the maintainance of an orderly stoping sequence, other auxiliary operations must be carried on. Thus, mine development must proceed in pace with the removal of ore and haulage, hoisting, and ventilation installation must be planned and laid out well in advance of the stoping operations. These comments may seem rather obvious but failure to follow them led to the closure of several former operations in this region. Competent supervision at all stages is a concomitant requirement.

The choice of the stoping method within a specific geologic setting usually dictates the kind and amount of artificial support needed. This leads to the planned demand for timber, fill material, rock bolts, or concrete and other types of supporting and/or grouting material.

9.2. Mining Methods

The principal alternatives in selection of a mining method for a given ore deposit lie between surface mining or underground mining by shafts or declines. The actual choice will be governed in most cases by the geologic setting and by comparative costs.

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* While reading the annual reports by the mine inspectors of the 1890-1910 period, we were impressed with their concerns regarding the unsafe practices being followed (and usually at the same properties, year after year), namely: unprotected manways in shafts; ladders hung by ropes; failure to scale loose; and the common practice of thawing dynamite in ovens or on top of wood stoves. The hazardous storage of dynamite and detonator caps together both on surface and underground was another perennial complaint.

9.2.1. Shafts: With the exception of a few open pit operations, all of the mines in the region were served by shafts. A common practice was to sink the shaft on the vein, either vertically or a few degrees off the vertical. This had some advantage in that the shaft muck was usually ore and provided some early mill feed which brought an immediate financial return. However, the benefit was outweighed by the fact that considerable potential ore was tied up in the shaft pillar and in a vein or ore shoot with a length of, say, 100 feet, approximately 25% of the ore might be effectively lost. At the old Regina Mine, the shaft pillar was later recovered and longitudinal mine sections show the timbered shaft traversing open stopes. This obviously created hazardous conditions. In the not-infrequcnt instances when the vein changed dip, the shaft usually did likewise; this must have introduced some unique hoisting problems.

At the current level of shaft-sinking costs ($750-$1000 per foot) it would seem undesirable to open any new mines to depths of less than 500 feet by either vertical or inclined shafts. The high costs of hoists, cable, cages and skips and various ancillary equipment and supplies can scarcely be justified in comparison with other methods. The use of existing shafts - if still in workable condition or capable of renovation - may be defensible in a few cases but each situation would have to be judged on its merit and, in our opinion, the use of old shaft openings would not be possible, or advisable, in nine cases out of ten. They may, however, serve as ventilation openings or as supply routes.

In many of the former relatively deep mines (say, 800-1500 feet) the vertical interval between levels (60 feet, or so) was obviously too short and resulted in increased development cost per ton mined. This also necessitated higher costs for fixed equipment (pipe, track, and the like) on these levels. An optimum level interval can be

selected in relation to the characteristics of the ore and the design of the most appropriate stoping method. Level intervals of 150 feet are more common nowadays.

It is desirable in any underground operation to incorporate as much mechanization as possible since this is usually the most economically feasible procedure. The use of LHD equipment is a case in point - the same equipment can operate in several work areas on different shifts and effect considerable cost savings as well as being generally more efficient. The same equipment also may be used interchangeably in some development and stoping operations. This leads to real reduction in overall production costs.

Any plans to use modern mechanical equipment in old underground workings would have to be carefully examined as to feasibility; for example, most workings of 40 or 50 years ago are almost certainly too small in cross-section and the curvatures in drifts and crosscuts may be too acute for the efficient operation of modern machinery.

9.2.2. Declines: Underground entry by declines or ramps and using trackless mining equipment has become an increasingly common method of mining in Canada. Within 500 feet or so of the surface, it has many advantages over shaft-mining: It is cheaper and it possesses great flexibility in that the decline can be sited to suit terrain conditions or to take advantage of the most competent rock formations. Declines eliminate much of the infrastructure normally associated with shafts; for example, there is no need for costly shaft timbering, installation of hoisting machinery, headframe construction, etc. A limitation is that the inclination should not exceed about 20%, for efficient operation. The real key to decline acceptance was the adaptation of front-end loading equipment to the low clearance "scooptram" concept as we know it today. This makes possible the speedy LHD (load-haul-dump) cycle as practiced in many Canadian mining operations.

We strongly recommend that future operations, particularly those carried to depths of 300-500 feet, should be planned as decline developments, wherever practicable.

9.2.3. Open Pits: Mining from surface by conventional open pit methods would appear to be the least costly method in ore deposits which are wide enough to ensure an acceptable ore:waste ratio. An acceptable ratio depends on a number of factors including the ore grade, safe pit slopes, and the projected pit depth. Many Canadian open pit mines operate with a 1:1 ore to waste ratio but in this region where narrow ore zones are the rule, a 1:4 ratio is more likely. It is possible too that some ore deposits might employ a combination of open pit plus decline development from the pit bottom.

Minimal equipment is required for small scale open pitting: A track-mounted percussion, or rotary, drill rig; payloader; small clean-up dozer; and one or several highway haulage trucks.

9.2.4. Open Cuts: We have referred to "narrow open cuts" at several places in the property inventory of Part I. This is a somewhat unconventional proposed method of mining which developed from conversations with highway and construction contractors in the region and which appears to us to possess some merit for small, narrow, high grade gold occurrences and especially those deposits which may be of more interest to the individual operator than to the major mining company. It should be applicable to vein widths of several feet and a reserve of 1000 ounces, or more, of recoverable gold.

Briefly, we propose the cutting of a narrow slot up to 5- or 6-feet in width from surface using a standard track-mounted percussion drill rig to drill long blastholes. The metnod would be limited to vertical, or near-vertical, veins. Mucking might be done with a

backhoe excavator or a crane-mounted clam. Slot depth is limited by the capacity of the drill rig, and probably is about 40 feet, although longer drill holes are technically feasible.

A possible problem relates to ensuring proper blasting fragmentation in such a narrow opening: this may be solved by a demonstration, or testing, program at a suitable locality.

A prime advantage of the suggested method, in our opinion, is that very little waste need be broken. If sloughing of the walls of the cut should be a problem, it may be advantageous to pre-shear the walls: this would entail some additional drilling time and expense but dilution should be all but eliminated. Pre-shearing, incidentally, is a standard procedure in highway rock cuts and the technique is well established.

Mining by track-mounted equipment, as outlined, may be a cheap and practical method of exploiting small tonnage, high grade deposits. It should provide a supply of ore for custom milling, or for treatment in portable units, and guarantee an almost immediate cash return. Leasing of the equipment, rather than outright purchase, should add to the profit potential.

Although this proposed method is limited by the capability of the drilling and excavating equipment, it may well serve as the prelude to deeper mining by decline and it should provide an early cash flow to sustain deeper operations if these are found to be justified.

9.2.5. Stoping Methods: Early mining in the region employed two principal stoping methods: (1) simple overhand (or sometimes underhand) open stopes and (2) strinkage stoping. The steep attitude of

the veins and their relatively narrow widths made them quite suitable for shrinkage methods. As practiced prior to the 1930s or 1940s, this implied the taking down of drift backs and the construction and placement of timber and closely-spaced chutes for the loading of cars on fixed track. The level of the broken muck in the stope above was of course regulated by withdrawal at the chutes in the haulage drift. This is an orderly method of mining and it was quite suitable for its time.

Cut-and-fill and top-slicing methods were used at some properties, or under certain ground conditions, but they were not as common.

Shrinkage stoping, or one of its variations, probably still has applicability in some deposits but the high cost of labour, timber, and other necessary supplies makes it rather outmoded. Today, the trend is towards methods which require less labour, less reliance on matters such as chute control, and which lend themselves to mechanization.*

We believe that production rates of 100-tpd, or more will be more easily met by a modification of top-slicing or benching by longhole drilling with a drill jumbo and blasting to box holes from raises driven in ore (and using mechanized equipment such as the Alimak raise-climber). The broken ore is drawn off through the boxholes and loaded at drawpoints in the drift by LHD equipment. A small crew of half a dozen men should be able to sustain this scale of production.

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* There may still be a requirement in some ore zones for such specialized (and expensive) techniques as "resuing" - that is, the separate extraction of waste rock and narrow mineralized veins and stringers - with much of the waste being retained in the stope as fill.

10. TECHNOLOGY OF SMALL SCALE MILLING

Ore treatment plants range in size from very small and simple units to large, complex, separation and concentration facilities capable of treating many thousands of tons of material daily, Most of the old amalgamation mills of the region were of the "simple" type and the largest flotation/cyanidation mills in Northwestern Ontario were rated at only about 300-tpd. On the whole, the gold deposits of the region are amenable to treatment in small scale facilities by quite straight-forward methods and techniques. Therefore, we are concerned only with small to medium size mills designed primarily for the extraction of gold from relatively simple mineral associations.

10.1. Milling Methods and Procedures

Milling methods, whether simple or more sophisticated, must be concerned with the most efficient means of liberating, separating, and concentrating gold or gold-bearing material from which the gold may later be extracted by appropriate procedures. There are several stages involved but not all of them need necessarily be followed at any one treatment site. It may be sufficient to only produce a gravity concentrate or a flotation concentrate which can then be sold as such, or shipped elsewhere for further processing, or it may be treated on-site to extract the valuable constituents.

There is no need to deal with milling methods in depth in a study of this type other than to mention the several steps that may be followed.

10.1.1. Crushing and Grinding: Run-of-mine ore must be reduced in size by primary and secondary crushers and by fine grinding in order to liberate the valuable mineral particles from the gangue material. The primary crusher will be designed to take any size of material that passes the grizzly and, in practice, this usually leads to

over-design. The discharge from the seccndary crusher normally averages about 1- to 1/2-inch in size. Screens remove the undersize between the crushing stages.

Grinding in ball- or rod-mills reduces the material to whatever mesh-size is required for further separation and concentration. Since grinding mills do not grind to a maximum product size, they must be operated in closed circuit with a classifying apparatus which recirculates the oversize through the mill. This may be done mechanically or by spirals or cyclones.

At most installations, the crushing and grinding equipment is likely to be the most costly equipment component.

10.1.2. Gravity Separation: Discrete particles of gold may be separated from unwanted gangue by various gravity devices or by spirals or cyclones either with, or without, screens. Gold, being a heavy mineral, is particularly suited to gravity methods and heavy media procedures. Although not particularly efficient, screening or tabling is often used when coarse material is processed but classifiers and cyclones are preferred when fine particulate material is involved.

Many of the old operations in the region used corrugated cloth blankets (much like corduroy) to achieve separation: the natural oil in the woolen material probably aided in trapping the gold.

Heavy media separation, or the "sink-float" method, operates well on larger particle sizes (+10-mesh) because it responds only to density differences - not to size segregations - except where sizes are so small that they are affected by surface tension on the particles. Heavy media work is often used as a final cleanup operation in effecting separation.

10.1.3. Concentration: Several of the separation processes mentioned (e.g., sluicing, jigging, tabling, and heavy media) are concentrating methods in themselves and in some free-milling gold ores this may be all that is required to produce a concentrate from which the gold may be recovered by amalgamation or by straight smelting. Costly flotation and/or cyanidation procedures may not be necessary. The converse also is true. If the gold is not free-milling, gravity separation processes may be bypassed and the product from fine-grinding may pass directly to flotation.

Flotation is the most common method of concentration for gold ores, at least for gold-in-sulphide types of ore. The method relies on the ability of metallic minerals (gold, pyrite, chalcopyrite, galena, etc.) to attach themselves to air bubbles in water. The chemistry involved is complicated and specialized but by the use of suitable reagents, closely controlled, selective flotation can be achieved and several concentrates produced.

Flotation concentration usually is performed in two or more stages to clean the rougher concentrate produced in the first stage. Bench testing will normally define the proper size limits for adequate liberation and the most effective flotation procedures for a particular ore. Thus, we can avoid the loss of overly coarse material in the nonfloat fraction and minimize fines (slimes) due to over-grinding and which may not float.

Depending upon the composition and physical characteristics of the concentrate, it may be shipped directly for smelting or enter a cyanidation circuit for extraction of the gold.

10.1.4. Extraction Processes: Gold may be extracted from ores and mineral concentrates by several processes including mercury amalgamation (widely used in the past), agitation leaching, counter-current cyanidation, and heap leaching. The latter will be discussed in some detail in a later section.

The extraction of gold by adhesion to mercury in contact with it and subsequent recovery of the gold from the gold-mercury alloy, or amalgam, by retorting is a process which still has merit for free-gold occurrences. Unfortunately, there are indications that Government regulations may limit this method of extraction in Ontario because of possible mercury loss to the environment. The possibility seems rather unlikely under controlled conditions.

Agitation leaching was used in some of the former gold operations. It has application now and in the future, in some instances. It involves agitation of finely ground material with a cyanide solution in vats at atmospheric pressure followed by precipitation of the gold from the solute. A recent technique is to mix and agitate the materials in a commercial cement mixer or similar type of equipment.

Counter-current cyanidation is the most common process for recovering gold from ore concentrates. As used in conjunction with flotation concentration, the process consists of dewatering the pulp from flotation and exposing it by agitation to a cyanide solution to dissolve the gold. The pregnant solution is thickened, washed, and filtered and zinc dust is added to precipitate the gold by ion exchange. The precipitate is then melted to recover the gold bullion.

Cyanidation is a complex process but high recoveries (in excess of 95%) can be made by the addition of suitable chemicals to complex and selectively precipitate impurities, to promote ion exchange and solvent extraction, and at the same time to recover and conserve the cyanide solvent so it may be regenerated and recycled.

As noted earlier, cyanidation may not necessarily be required in all cases. Laboratory- and bench-testing of specific ores will indicate the type of process best suited to the most efficient extraction of gold from individual gold occurrences.

11. CAPITAL AND OPERATING COST ESTIMATES

11.1. Mining

It is almost an axiom that the capital funds available determine how a mining system should be laid out, and even more importantly, how the system should be modified. Some systems, particularly those in the large tonnage category, require large capital outlays for development and stope preparation before any ore extraction can commence. Clearly then, every effort should be made to "keep it simple" by choosing a method which will require the smallest preliminary expenditures, relatively speaking.

It may be worth noting too that an optimal design for the ore deposit, mining method, and haulage system should be carried out at a very early stage in any project. It must be decided at the outset of planning how large a part of the mineable deposit should be included in the first development and how much should be left for future work. Good planning at this stage will result in lower capital costs per ton produced and the deferment of secondary development will help to counter high interest rates and energy costs.

Capital costs and rates of production are closely related. In the discussion that follows, our estimates of capital costs and production rates follow an almost straight-line relationship but costs (on a per ton basis) will increase markedly with the size and complexity of the projected mine workings and the scale of the mining equipment.

11.1.1. Shaft Mining: Current costs for sinking a three-compartment shaft are high and are probably close to $1000 per foot down to depths of about 500 feet; below that, the footage cost may be reduced to perhaps $750 per foot. The difference is explained by the need to include the contractor's mobilization and demobilization expenses (assuming that the shaft work is contracted, as is the current practice).

Obviously, these expenses will be higher (per foot) in the shallower shaft. Thus, a rectangular timbered shaft with a minimum of three compartments may be expected to cost approximately $100,000-$125,000 for every 100 feet of depth.

To this must be added the capital costs of a production hoist and ancillary equipment as well as a production headframe. These may be in the range $150,000-$350,000 and $350,000-$750,000, respectively. Savings may be effected if these items can be purchased from former operations or from dealers in used equipment, but we have not considered these possibilities. (The same observations apply to the acquisition of compressors, essential mining equipment, etc.).

Capital costs of compressors, pumps, electrical equipment, and so on may be in the range of $150,000 to $250,000. General mining equipment may be in the $750,000-$1,500,000 range but actual figures will depend on the mining system selected, the mining depth, extent of the workings, etc., etc.

Underground development (also dependent on the mining method and other related factors) may vary from $350,000 at 100-tpd to $500,000 or more at the 300-tpd rate. These costs will be influenced directly by the stoping method chosen.

Maintenance and repair facilities including underground facilities, may run from $100,000 to $250,000 again depending upon the extent and complexity of the projected mine workings and the mining equipment requirements.

Capital costs for utilities and services (but excluding engineering services) will be high in shaft mining and are estimated in the range $250,000-$500,000. These amounts are for the mining operation only; an almost equal amount must be allocated to the surface plant and mill (assuming that there is a mill on the property.

We estimate that the cost of developing and equipping an underground shaft mine for a 300-tpd operation may be as much as $4,250,000. These figures are for the first 100 feet of depth; each successive 100-ft. vertical interval will cost at least an additional $100,000, if not more.

11.1.2. Decline Mining: Capital cost estimates for the driving of an exploration and production decline are of the order of $250,000 for each 100 feet of depth. This assumes a minimum cross-section of 8 ft. by 12 ft. at an inclination of 15%, or a 600-ft. slope length per 100 ft, of vertical depth. The footage cost is estimated at approximately $350 per foot but may be more at lower levels. Many mines use a 9 ft. by 15 ft. cross-section but 8 ft. by 12 ft. may be sufficient for the type of operation contemplated in this study. The dimensions of the decline are governed by the need to accomodate LHD equipment with a minimum 2 cu. yd. bucket plus the normal mine services (air, water, etc.) and ventilation ducting.

The capital costs of hoists, headframe, etc. obviously are eliminated in this type of development.

Capital costs of compressors, underground mining equipment, and maintenance facilities are assumed to be somewhat less than for shaft mining. The provision of underground maintenance facilities for LHD equipment and the like may not be necessary due to the mobility of the equipment; it quite likely can be brought to surface shops for routine servicing.

Underground development is assumed to be generally in the same cost range as for shaft mining but, in actuality, the flexibility of the decline system, especially in layout, may result in substantially lower development costs.

Capital costs of utilities and services will be approximately 80% of similar items in shaft development.

We estimate that a complete decline development to a 100-ft. mine depth may represent a capital outlay ranging from a minimum of about $1,500,000 to nearly $2,750,000 at production rates of 100- to 300-tpd, respectively. Development to a vertical depth of 500 feet (for the same daily mining rates) would increase these amounts to approximately $2,500,000 and $3,750,000. Again, actual costs may vary as much as 25% from these figures (likely, mainly upward).

Declines are definitely less costly than shafts and the system possesses greater flexibility. They are probably at least 25% less costly and under the most favourable circumstances they may be as much as 40% cheaper. It may be shown also that declines are less costly to depths of 300 ft. (at a 100-tpd rate) and still cheaper to 500-ft at higher production rates. However, the deeper the decline, the longer is the haulage route and the more haulage units are required. A "break-point" in the cost comparison should be reached somewhere below the 500-ft. depth.

11.1.3. Open Pits: Open pit developments in the region are predicated on a 1:4 ore-waste ratio. Site preparation and stripping to bedrock even under moderate topographic conditions depends upon a number of variables such as depth of overburden, configuration of the bedrock surface, drainage conditions, and so on. We estimate costs of $250,000-$350,000 for this work, on average. At some localities, it may be much more.

The cost of mining equipment is difficult to postulate in the absence of any clear information concerning the attitude and dimensions of a hypothetical ore body but, at the very minimum, the capital cost of essential production equipment, to handle approximately

1500 tons of material per day (drill rig, loader, clean-up dozer, and haulage units, etc.) can be estimated in the range $500,000-$750,000.

Maintenance facilities and the supply of spares are estimated at from $100,000 to $200,000.

Utilities and related services are probably slightly more than two-thirds the cost of similar items in underground mines for a range of about $100,000 to $125,000.

The total capital cost to develop and equip a moderate-size open pit mine is estimated to be approximately $1,000,000-$1,500,000. This does not include engineering, contract services, project management and so forth that would apply in an integrated mine/mill project.

11.1.4. Open Cuts: Site preparation and stripping costs for narrow open cut developments are estimated to be $100,000-$200,000 but may be much less depending upon local site conditions. Equipment capital costs (if purchased) may be in the $200,000-$300,000 range. Both equipment and maintenance costs would be less if leasing arrangements are entered into and, of course, an entirely different cost situation would ensue if the mining is contracted. However, on the supposition that the work is carried on by the owner, the total capital costs are estimated at about $500,000 to approximately $750,000. Tonnages in excess of 300-tpd could only be achieved by the simultaneous mining of several parallel veins or a single long zone with an aggregate mining length of many hundreds of feet.

11.2. Milling

Capital cost estimates for milling can only be made with any degree of accuracy for deposits that have been thoroughly explored, sampled, and tested on both a laboratory and pilot plant scale and for which a design flow sheet exists. None of the known ore deposits of the region meet these criteria at this stage and so firm cost estimates could only be attempted as part of a site-specific detailed feasibility study. Therefore any estimates presented herein should be seen as order-of-magnitude approximations based on rather scanty data.

In keeping with the scope of mining outlined in the preceding pages, we have considered milling throughput levels at 100-, and 300-tons of ore per day. We have also assumed a more or less identical type of ore requiring full treatment from crushing and grinding through concentration to cyanidation. As explained earlier, it may not be necessary to follow all of these steps at all properties; in fact, it obviously is not necessary for some free-milling ores. Metallurgical consultation and detailed advice should be sought in every case.

We have also made the assumption (for purposes of cost comparisons) that each mining operation would include on-site milling. Clearly, this would not be the case and most of the potential ore probably would be milled either in portable or semi-portable units, or in district custom mills under either public or private control.

11.2.1. Capitalization of Equipment: It is not possible to present firm purchase cost figures for equipment since these would not be known until a mill design is prepared and a flowsheet drawn up so that the actual equipment needs (numbers, sizes, capacities, etc.) are established. Equipment prices are extremely fluid at the present

time because of inflation, increasing labour costs, and so on; all we can do is generalize on cost figures.

The equipment items undoubtedly will prove to be the largest segment of expenditure in the mill, apart perhaps from the cost of the structure(s) to house them. Installation of the equipment also will be a major item of expense. In addition, there will be a large number of auxiliary pieces of equipment as well as piping, conveyors, pumps, etc. to move and circulate solids and liquids through the milling process.

There are several methods of approaching an estimate of milling capital costs. The most desirable method is to calculate costs from complete specifications and engineering drawings; this has a probable accuracy of ± 5%. Estimates based on almost complete data but lacking specifications or complete drawings have a probable accuracy of ± 10%. Estimates based on sufficient data to permit budget authorization may be accurate to ± 20%. In the absence of definite data, factored or order-of-magnitude estimates may be made based on a survey of known major equipment costs and/or on previous cost data. The factored method has a probable accuracy of ± 30%.

Assuming that each process unit can be identified in a flow-sheet, the equipment items required for each stage (crushing, grinding, flotation, etc.) can be listed and prices attached according to a current "cost index" (e.g., the M & S Index for Mining/Milling).* The total of these items gives the "purchased equipment cost" for various rates of throughput.

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* Mular, A.L., "Mineral Processing Equipment Costs and Preliminary Capital Cost Estimations", CIMM Spec. Vol. 18, 1978.

The installed equipment cost usually is approximately 40% higher than the purchase cost, or a factor of about 1.40. Several other items must be added to the installed cost; buildings and site development; process piping; instrumentation; items related to water supply and power distribution; launders; etc, etc. These can be calculated separately or grouped as a fixed percentage (up to 100%, or more) of the installed cost. The total of all of the foregoing is the total physicel plant cost. To this must be added engineering and construction costs, administration, and contingencies as well as a factor pertaining to the size of the mill. These also can be figured separately, or grouped as a percentage. The total of all of these items gives the "fixed capital cost".

Capital cost approximations for fixed on-site milling plant rated at 100- and 300-tpd are estimated at $2,500,000 and $3,500,000, respectively, according to the assumptions stated above. Although some may disagree with these figures as being either too high or too low, we believe they are fair approximations. Specific examples of mill costs may be expected to vary somewhat with size, flowsheet complexity, location, heating requirements, and so on.

There are a number of cost-saving avenues open as, for example, the current trend to place all surface plant under one roof which affords material savings on site preparation, foundation construction, erection costs and heating as well as improving overall efficiencies. The recently-constructed Gays River surface plant in Nova Scotia is a case in point. As mentioned earlier, the purchase of used equipment also brings appreciable savings since equipment costs are the largest single cost item.*

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* In 1977, as an example, a 200-tpd flotation mill was built by Minerales de Oaxaca in Mexico at a total cost of only about $450,000 largely due to success in scouring the country for used crushers, ball mills, flotation cells, etc., etc. The only "structure" required was a roof to protect the equipment during the rainy season.

11.3. Engineering, Project Overhead, and Related Costs

Detailed estimates of these costs are almost impossible to formulate because every project will be different. Based on past experience, it is probably safe to assume that the total costs of engineering, design, construction supervision, administration, etc. etc. will comprise a major percentage of the combined capital costs of an integrated mine-mill project. (The high cost of "engineering" is a particularly significant item at the present time). In the absence of specific data, we estimate that the various components that make up this group of expensable items accounts for 30% to 50% of the total capital costs.

These items enumerated above apply to all of the exploitation methods outlined in the preceding sections but they obviously do not apply to the same degree in all mining (or milling) systems. Hence it is difficult to attach meaningful figures to some of the items, and we have not attempted to do so except in a very generalized fashion.

Although some operations may have access to public hydro, we assume that most developments would rely on on-site diesel generators for their power supply. The power requirements will depend quite directly on the mining method selected as, for example, shaft-hoisting vs. decline haulage by self-powered vehicles. The costs of installing hydro power are almost prohibitive for a small operation on a per-mile cost basis (around $75,000 per mile of line) unless the property enjoys a particularly favourable location; but the costs of a diesel plant are also high and might be as much as $500,000 in some instances.

Water supply costs probably are common to all methods of operation as are general plant services.

Capital costs for tailings storage may vary widely from $50,000 to $250,000, or more, depending on several variables such as the pipeline distance to the tailings basin, the length of dams, amount of site preparation required, etc. Tailings costs obviously do not apply if ore is shipped for custom treatment.

Graded sand and gravel access roads may cost approximately $150,000 per mile for new construction in moderate terrain. Ministry of Transportation and Communications estimates are actually less than this ($75,000-$80,000 per mile, without rock work) but our suggested figure is probably more realistic. Cost-sharing arrangements would reduce the amount appreciably.

Major townsite developments are not envisaged in this region. The current trend is to accommodate personnel in mobile trailers with suitable water and electrical hook-ups. On-site office space and cookery arrangements also are usually of the trailer-type. We anticipate that accommodation requirements will be minimal and that the majority of the work force would commute from towns in the area.

As suggested above, engineering and project overhead is likely to be by far the largest single administrative expense. It is a segment that seems to increase steadily and actual costs are difficult to define. The project items include feasibility studies, engineering and technical planning, engineering design, construction supervision, contract management, consulting fees, warehousing, travel, property taxes, insurance, legal and auditing fees, etc., etc. Small scale operations should benefit from lower overhead and several small operations, if under one management, undoubtedly would consolidate not only project overhead but various other administrative expenses as well.

It is customary to add a working capital allowance of at least 10% of the total mine and mill capital costs to provide funds to commence the mining and milling operations.

11.4. Operating Cost Estimates

11.4.1. Underground Mining: Direct mining costs (development and stoping) for underground mining by shaft or decline are estimated at approximately $23.00 per ton with indirect costs at $8.50 per ton, at a production rate of 100-tpd. The indicated total operating cost of $31.50 per ton is quite high but it is felt that these costs are bound to be high in small ore bodies of the type common to the region and especially when mined at hypothetical rates as low as 50-150 tpd. The operating costs at a 300-tpd rate are estimated at about $19.65 per ton.

11.4.2. Surface Mining: Operating costs for surface mining also are high because of the small size of the deposits and particularly on account of their narrow widths and generally unfavourable ore: waste ratio. We estimate operating costs at about $13.20 per ton at 100-tpd and $7.45 per ton at 300-tpd.

We have no reliable figures for mining by open cut: the method is only in the suggestion stage at the present time but the seemingly low capital cost of the method renders it attractive as a possible means of exploitation of narrow veins near surface. The higher ore:waste ratio also is a favourable feature. Its feasibility needs to be investigated by actual testing in the field.

All mining costs are based on an 8-hour shift, five days per week.

11.4.3. Milling: The mill operating costs for the sizes of units discussed range from an estimated $12.95 per ton milled at 100-tpd to $9.15 per ton at 300-tpd. These costs are high but probably

fairly typical for the scope of milling likely to be required. The costs will vary inversely with the tonnage processed and they will depend rather directly on the hardness of the ore and local costs of utilities, reagents, water, and labour.

The cost figures for milling are predicated on a five-day, 12-hour shift basis.

It is assumed that the capital and operating costs for milling in fixed plants will be approximately the same at shaft, decline, and open pit mining sites. No milling costs are presented for open cut mining operations since it is difficult to imagine a fixed milling facility at such a site.

We have no firm basis for these operating cost estimates in the absence of any recent operations in the region and our estimates are extrapolated from costs at comparable installations elsewhere in Canada under roughly similar circumstances.

11.5. Capital Cost Summary

Table 24 provides a general summary of estimated costs for the mining and milling methods reviewed in this study. The capital costs for underground mining are for the first 100 feet only; they will increase with successive depth intervals by at least the incremental costs of shaft-sinking or decline development. We anticipate that mine capital costs could be reduced by 10% or more if the property contains old workings that can be renovated and adapted to the planned mining methods.

The approximations advanced in Table 24 are made on a non-site-specific basis.

The milling estimates are for three alternative methods: conventional fixed milling facilities; semi-portable mills; and

Table 24 - Estimated Capital Cost Summary: Mining & Milling

Estimated Capital Costs	Conventional, Fixed Mill		Semi-Portable, Custom Mill		Heap Leaching (1)	
	100 tpd	300 tpd	100 tpd	300 tpd	100 tpd	300 tpd
Underground Mining:						
Shaft mining (2)	$ 2,250,000	$ 4,250,000	$ 2,250,000	$ 4,250,000	$ 2,250,000	$ 4,250,000
Ore treatment plant	2,500,000	3,500,000	1,750,000	3,250,000	350,000	750,000
Engineering & project overhead (3)	2,850,000	4,650,000	2,400,000	4,500,000	1,560,000	3,000,000
Totals	$ 7,600,000	$12,400,000	$ 6,400,000	$12,000,000	$ 4,160,000	$ 8,000,000
Decline mining (2)	$ 1,500,000	$ 2,750,000	$ 1,500,000	$ 2,750,000	$ 1,500,000	$ 2,750,000
Ore treatment plant	2,500,000	3,500,000	1,750,000	3,250,000	350,000	750,000
Engineering & project overhead (3)	2,000,000	3,125,000	1,625,000	3,000,000	1,425,000	1,750,000
Totals	$ 6,000,000	$9,375,000	$ 4,875,000	$ 9,000,000	$ 3,275,000	$ 5,250,000
Surface Mining:						
Open pit mining (1:4, ore/waste)	$ 1,000,000	$ 1,500,000	$ 1,000,000	$ 1,500,000	$ 1,000,000	$ 1,500,000
Ore treatment plant	2,500,000	3,500,000	1,750,000	3,250,000	350,000	750,000
Engineering & project overhead (3)	1,400,000	2,000,000	1,100,000	1,900,000	540,000	900,000
Totals	$ 4,900,000	$ 7,000,000	$ 3,850,000	$ 6,650,000	$ 1,890,000	$ 3,150,000
Open cut mining (1:1 ore/waste) (4)	$ 500,000	$ 750,000	$ 500,000 (5)	$ 750,000 (5)	$ 500,000	$ 750,000
Ore treatment plant	-	-	585,000	1,050,000	350,000	750,000
Engineering & project overhead (3)	150,000	225,000	325,500	540,000	255,000	450,000
Totals	$ 650,000	$ 975,000	$ 1,410,500	$ 2,340,000	$ 1,105,000	$ 1,950,000

(1) Applicable only to low grade ore (0.10 oz/ton, or less)

(2) Calculated to 100 ft. vertical depth only.

(3) Includes all project engineering, design, construction supervision, administration, power supply, access roads, tailings storage, water supply, housing, etc.

(4) No conventional mills at open cut mine sites.

(5) Assumes that ore from minimum of three open cuts is treated at one semi-portable (custom) mill.

NOTE: Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

heap leaching. It is highly unlikely that conventional mills would be employed at more than one half dozen of the largest properties in the region. The probability is rather for custom milling and/or the use of semi-portable milling units - both, or either of which, should be considerably less expensive than the conventional type. Operating costs would be reduced considerably in the case of semi-portable units.

Custom milling and the use of portable milling equipment will be discussed in some detail in later sections.

The data shown in Table 24 are for mine production rates of 100- and 300-tpd; estimated costs for lower or higher rates may be extrapolated for rough approximations.

Reductions of as much as 35% of the total capital costs may accrue if the mine output can be trucked to a centralized custom mill.

11.6. Production Costs

The indicated operating costs of mining and milling are estimated to range from approximately $28.80 to $44.45 per ton for underground mining and on-site conventional milling, and from about $16.60 to $26.15 for surface mining and milling at 300- and 100-tpd rates, respectively. This is equivalent to a range of $144.00-$222.25 per ounce of gold at an average grade of 0.20 oz/ton, underground; and $83.00-$130.75 per ounce for the same grade in open pit mining operations.

Since the higher costs are at the lowest daily tonnage rates we may assume that production costs for small scale operations of, say, 50-200 tpd may range from a low of $183.15 per ounce to a high of $241.80 per ounce for underground mining at 200-tpd and 50-tpd, respectively, at the 0.20 oz/ton grade. Costs for surface mining and treatment at the same daily rates and for the same grade of ore should be in the range $106.90-$142.70 per ounce.

Estimated production costs per ounce for grades from 0.10 to 0.50 oz/ton at daily mining and treatment rates of 50-200 tpd vary from highs in excess of $400 per ounce to about $75 per ounce for underground operations and from more than $250 to approximately $50 per ounce for surface mines. These figures are based on treatment in fixed, on-site mills and, as explained elsewhere, milling is more likely to be done either in custom or semi-portable facilities at considerably lower cost. Nevertheless, the data indicate that there are quite definite economic limits to the exploitation of various ore grades depending upon what gold price may be acceptable at a given time. A limit price of $500 (Cdn.) is sometimes quoted and if this should be the concensus of opinion, low grade deposits (0.10 oz/ton) at low tonnage rates (say, 50-100 tpd) are not likely to be economic at the indicated higher costs per ounce - at least for underground ore.

The costs quoted above are only for mining and milling: they do not include various incidental administrative expenses, transportation costs, taxes, royalties, etc., etc.

There is clearly a need for sound mining, geological, and metallurgical advice regarding the development and exploitation of individual ore occurrences in this region.

12. THE CUSTOM MILLING CONCEPT

Smelting on a custom basis has been an established concept in the industry for many years. Custom milling leading to the preparation of smelter concentrates is perhaps not as common but nevertheless it is an established procedure. The services provided range from rather primitive crushing and sorting facilities to technologically sophisticated treatment of ore to provide concentrates suitable for smelting and further refining.

Custom milling is particularly well suited to the treatment of the gold ores of Northwestern Ontario for several reasons: (1) the ores are generally quite similar metallurgically or fall within well-defined metallurgical groups; (2) there are several milling facilities in the region that might be rehabilitated at reasonable cost; and (3) some form of custom treatment is the most obvious method of reducing capital expenditures on the part of small scale entrepreneurs*.

Custom treatment implies the provision of technological expertise which the small scale miner may not possess and this in itself may be a compelling argument for custom milling. Owners and/or operators of custom mills also may be in a position to offer loans to small scale miners as an inducement to supply guaranteed quantities of ore over specified periods of time. This is perhaps more likely to occur in the case of public facilities rather than privately-operated mills.

12.1. Private vs. Public Ownership

The logic of custom milling hardly requires further discussion: the only real questions that need to be addressed are "where", "how", and "by whom" should custom milling services be offered. These questions may be dealt with in reverse order.

In some countries, custom milling services are provided through Government-owned and Government-operated facilities. In Western Australia, for example, the State government provides stamp mills and separation facilities at a number of localities, such as in the Southern Cross and Laverton gold districts. These serve the needs of local miners who truck their cobbed ore to the State-owned "battery" on a regular (often weekly) basis.

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* There is ample precedent for custom treatment in the region: the old Rat Portage Reduction Works which operated during the late 1890s and early 1900s (until its untimely destruction by fire) produced concentrates from mines as far away as Dryden and Dinorwic. These ore shipments travelled to Keewatin via the CPR main line.

In southeastern Venezuela, complete treatment is offered through flotation and cyanidation to precipitation and the smelting and marketing of the bullion. These services are provided at the Government-owned, 300-tpd, El Peru mill situated in the El Callao district where it supports the activities of a large number of 3- and 4-man mining crews who work privately-held claims and government leases throughout the Estado Bolivar region.*

A similar pattern of government ownership and operation of custom milling facilities may be seen in many parts of the world, but with local variations.

12.1.1. Private Milling Services: The more generally accepted practice in Canada, as well as in the United States and Mexico, has been to provide these custom services through private companies. In Canada, for example (and without specific reference to gold), custom milling is done on a regular basis by Cominco, Hudson Bay M&S, and Noranda (amongst others) in the western, central, and eastern regions, respectively. Similar services in the U.S. are offered by Asarco, Homestake, and other major companies.

The normal practice in the case of privately-owned facilities is to provide a schedule of charges which usually serves as the basis for negotiation of a contract to process the ore from an individual mining operation. Since privately-owned custom mills must be compensated for costs and metallurgical losses and must earn an operating profit, the amounts payable to the ore supplier are often disappointingly low (at least in the eyes of the supplier). In this connection, milling contracts always should contain provisions

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* It may be of interest to note that this was originally a Canadian facility. The El Peru mill was designed at 600-tpd and was built in the mid-1930s with Canadian funds (Frobisher) and was subsequently nationalized (with some compensation) in the late 1940s. It is now operated at 300-tpd by MINERVEN - the Government mining company.

for periodic adjustments, or even re-negotiation of contract prices, depending upon changing market prices and situations.

In addition to an agreed-upon price schedule for the metal content(s) of an ore, there are other charges to be considered such as transportation, freight and other shipping charges (if applicable), agents' or brokers' fees and handling charges of various kinds. Insofar as the milling operation is concerned, payment may be made on a fixed percentage of the gross value of the ore as determined by assay or head analysis, or it may consist of a fixed fee plus stipulated payments for specified percentages of contained metals, and with deductions or penalties for specified amounts of undesirable or hard-to-treat constituents.

In practice, custom milling facilities for gold usually operate with varying modes of settlement. Normally, there will be a fixed treatment fee plus either a deduction of so many dollars per ounce from the quoted price of gold or it may be a straight payment for something less than 100% of the contained gold in the ore. Most custom mills incorporate as many profit-conserving possibilities in their contracts as they can in order to minimize risks and to ensure profitability.

An established mining company that invests in a mill to treat its own ore and which also offers custom services to other mining groups derives profits from its clientele which ease its own operating costs. This may be a considerable amount if custom milling is carried on for a number of accounts over a period of several years.

The availability of custom milling also generates regional exploration and development and in some instances may lead to the discovery of major ore deposits. If the owner of the mill reserves the right to participate in the development of new discoveries by his clients (as part of a contractual option agreement), the mill-owner may derive a significant future benefit.

There are some possible disadvantages as well as benefits in private custom mill operations. One obvious problem is the likelihood of disagreements over mill returns; variable grades of ore and differing mineralization amongst ore batches require stringent assay control. This might be best provided on a neutral basis by a Government-operated assay laboratory, or at least be performed under some form of Government control.

The mill owner also may have to furnish transportation services for the ore from mine to mill. This would be an added expense but it may be justified as a guarantee of prompt and regular delivery. Other services may be required too such as assistance in dealing with environmental control problems; geological evaluation of clients' exploration and development work; advance cash payments or provision of credit; and so on.

Some potential custom operators may be reluctant to enter into such arrangements for assistance - whether financial or technical - and may prefer to avoid these inconveniences.

12.1.2. Public Milling Services: Publically-owned mills operate in much the same fashion as private mills and usually, although not necessarily, with a profit motive. They are more common in the developing countries or in regions that lack infrastructure in the form of a road network, railways, and communications in general. There is less opportunity for negotiation of treatment charges, payments, and the like and, in fact, there is frequently no opportunity at all to negotiate these matters, particularly if the facility is the only one in the region.

At first sight, the privately-owned and operated mill would seem to be the more logical choice for the Northwestern Ontario region. However, it is possible that better regional coverage may be afforded by Government-owned and operated units.

The prime justification for Government participation in custom milling is "public service" in its broadest context. The creation of a number of small scale mine operations and the provision of centralized mills to offer custom treatment for these mines generates a range of economic benefits. The local economy will be stimulated as most of the revenue will remain in the community; most purchases of goods and supplies will be made locally; there will be additional tax revenues in the municipalities involved; and, presumably, local labour will be employed if it is available. In the case of a privately-owned operation, most of these revenues and other tangible benefits almost certainly would pass completely out of the region.

In no case should a publically-owned mill be established on purely scciological grounds or to aid a depressed local economy. It can only be justified to provide the greatest potential benefits within the framework of ore availability and optimal production probability.

12.2. Custom Milling Capacities

In line with our comments on the definition of small-scale mining (page 63), custom mills in this region probably would operate at rates up to about 300-tpd. A few, such as the projected Goldlund-Windfall operations, probably will be designed at 1000-tpd, at least. Designed capacity will depend not only on anticipated custom tonnage requirements but also on the anticipated rate of development in the area or district. This, in turn, may be related quite directly to the provision of infrastructure such as road construction, hydro extensions, etc.

We envisage some custom mills in a low tonnage category of perhaps 10-20 tpd. These perhaps would not be "custom" mills in a strict sense but rather "contract" units offering straight contract treatment services on a batch basis.

12.3. Location

Several suggestions were made in the Part I inventory of estimated ore reserves as to logical locations of custom milling units. Depending on the ease or difficulty of transportation within the various areas and sub-sreas, there should be at least one custom mill in each significant area

The main point is to provide custom facilities on as wide a geographic basis as possible although geography per se may not be a decisive consideration. For example, trucking rates in the region are not excessive and ore can be transported economically in this manner for distances up to 50 miles, or more.

Actual locations probably will be determined on geological grounds bearing in mind the modes of occurrence and the characteristics of the individual ore occurrences.

The establishment of a custom mill does not necessarily imply the construction of a permanent unit. Although rehabilitation of existing structures may be the most expedient course at some locations, at others the best course may be (and probably will be) to provide portable or semi-portable facilities.

Followed by p.103

13. THE PORTABLE MILL CONCEPT

Portable and semi-portable mills are a relatively recent development in the ore treatment field. They have been used with considerable success in developing countries and are becoming increasingly popular in North America. They are available in sizes ranging from 10-tpd to 500-tpd with the majority being in the 50-200 tpd range.*

Capital and operating costs are lower than for conventional mills of comparable capacities and this is the chief advantage of portable and semi-portable units.

13.1. Private vs. Public Ownership

The comments made in the preceding section in reference to custom milling also apply to portable mills. In other words, portable equipment may be owned and operated by private interests or by a Government agency. The former is perhaps more common at the present time; at least this has been the case at most foreign locations.

Custom milling using portable or semi-portable equipment is no different than in the case of fixed, in-situ mills. In fact,

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* "Portable" is perhaps a misnomer. They are basically modular units and the only real distinction between them is in the construction of the milling units. So-called "portable" mills are usually either skid-mounted or trailer-mounted and are mobile up to a point whereas "semi-portable" mills are constructed either on prepared concrete foundations and/or on a bolted or welded steel frame. The semi-portable types are only "portable" in the sense that they may be disassembled and moved to another site, and there reassembled.

portability is an undoubted advantage (quite apart from being cheaper) and the units can be transferred from one location to another as requirements arise. Custom treatment, under Government control, would guarantee technological conformity and should ensure the highest possible ore recoveries.

We predict that 90% of all new milling plants in Northwestern Ontario over the next few years will be portable or semi-portable; and three-quarters of them probably will be of the latter type.

13.2. Capital Costs

In capacities up to about 200-tpd, portable mills are less costly than in-situ plants of an equivalent size. Very small mills of about 10-tpd suitable for crushing, grinding, and gravity separation with amalgamation are reported to cost approximately $20,000 (or about $2000 per ton of rated treatment capacity. A truer cost figure probably is closer to $50,000 by the time the units are delivered, installed, and run in under actual operating conditions. This cost estimate does not include the cost of process water, power, tailings disposal, etc., etc. (Tailings disposal is always a problem - even in very small mills - since about nine-tenths of the input material must be physically disposed of as tailings.)

A portable mill capable of treating 200 tpd from crushing and grinding through flotation concentration and cyanidation is estimated to cost a minimum of $1,250,000 and, for the same reasons expressed above, the probable cost delivered, set up, and in operation with all necessary auxiliary services will very likely represent a capital outlay of $2,500,000, and possibly even more. This is still about $500,000 less costly than an in-situ fixed mill of comparable capacity.

Table 26 lists several manufacturers and suppliers of portable and semi-portable milling equipment together with an unsubstantiated estimation of installed costs. These figures probably can be at least

Table 26 - Portable and Semi-Portable Mills

Manufacturer or Agent	Capacity	Estimated Cost
Algoma Development Company Sault Ste. Marie, Ontario Portable: Crushing + Flotation	5- 10 tpd	$20,000-$40,000
Ed. Blanchard Sudbury, Ontario Semi-Portable: Crushing+flotation+cyanidation	50-200 tpd	$200,000-$750,000
J.M.Ore Dressing Eqpt. Co., Ltd. Timmins, Ontario Semi-Portable: Crushing+flotation+cyanidation	10-500 tpd	$50,000-$1,500,000
Pan-o-Matic Corporation Portland, Oregon Semi-Portable: Crushing+concentration	5- 10 tpd	-
Porta-Pack Mill Hilmar, California Portable, skid-mounted: Crushing+flotation	5- 20 tpd	-
Sala Machine Works Ltd. Mississauga, Ontario Portable, trailer-mounted: Crushing+flotation	10-200 tpd	$750,000-$1,500,000
H.A.Simons(International) Ltd. Vancouver, B.C. Semi-Portable: All types	-	-

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

doubled to include such items as engineering and administration, instrumentation, tailings disposal, contingencies, and working capital allowance. The cost of buildings and related structures is included in the tabulated figures (unless otherwise noted) and presupposes Butler-type construction (metal cladding on square or tubular metal framing) with insulation panels.

Operating costs with portable milling equipment are much less than in fixed plant due to more efficient layout and the use of only a two- or three-man work force per shift.

An actual operating cost estimation for a 10-tpd high grade mining and milling gold operation based on laboratory-scale testing and including costs of surface mining, concentration, administration, fuel, power, and general expense was approximately $10.00 per ton. It is not known if this figure was actually met during the recently-completed installation of this portable plant in the Thunder Bay district.

14. THE HEAP LEACHING CONCEPT

Some interest has been generated in recent years in the heap leaching of low grade gold ores through the use of dilute cyanide solutions. The principles are not new and the process has been applied for many years in the extraction of copper and uranium both on surface and also in-situ underground. However, the application of these principles to the recovery of gold from low grade disseminated deposits in Nevada and elsewhere is new and has stimulated interest in many other gold districts. Although the principles are well understood, there is still much to be learned regarding the amenability of different types of gold occurrences to the leaching process.

14.1. Leaching Methods

The heap leaching-carbon adsorption-electrowinning process as developed in laboratory studies, pilot plant tests, and in field practice is an economically attractive method of leaching. It is suitable for the extraction of gold (and silver) values from low grade ores provided that the precious metals are well exposed to the leach solutions by fracturing or coarse crushing and that they are not bound up in sulphide minerals.

14.1.1. Heap Leaching: Leaching is carried out on ore piles in the open. Briefly, the preferred and most common method is to pile the ore into heaps on an impervious base; spray a dilute cyanide-lime solution over the pile to selectively dissolve the gold as the solution percolates through the pile; collect the pregnant solution and treat it in activated carbon columns; strip the gold values from the carbon; and precipitate the gold electrolytically and smelt the resulting precipitate to produce bullion.

Heap leaching has been attempted on run-of-mine ore but this procedure is not recommended. More specifically, the ore should be crushed to 1/2 in.-3/8 in. size and spread in heaps not more than 8-10 feet high and without steep side slopes. The crushed material need not be uniformly sized: it may contain fines but these should not be excessive,nor be segregated. In the latter case, channeling through the fines may occur during percolation and leave the rest of the material untouched by the leach solution. The heap, which may contain as much as 30,000-50,000 tons, should be spread evenly and preferably by a portable conveyor-stacker to avoid packing by wheel-loading. The ore heap is placed on a graded, impervious pad made of asphalt or reinforced plastic membrane. The base must be sloped to convey the percolating solution to one end or corner of the pad.

The leach solution is a dilute 0.05-0.10% sodium cyanide-lime solution with a pH between 10.0 and 10.5; the alkalinity being adjusted by the lime. The solution is distributed by spray over the surface of the pile at a rate varying from 5 to 25 gallons per

square foot per day and percolates down through the ore to the impervious base. The solution is recycled after adjusting the concentration of cyanide and lime. More than 90% of the leach solution is recoverable; the remainder is lost by evaporation.

The leaching process is continued over a period of several weeks up to a maximum of about two months to obtain optimum extraction.

The pregnant solution containing the gold cyanide complexes (plus silver, if any) is passed through carbon columns where the precious metals are adsorbed selectively on the activated carbon (coconut charcoal). The carbon can be loaded to about 400-450 oz. gold per ton. It is then sent for stripping by elutriation using a hot, caustic, cyanide solution, Thence, the gold-bearing solution passes to an electrolytic cell in which ordinary steel wool serves as the cathode. The gold (and silver) is precipitated and is collected and processed further to produce a gold-silver doré mixture, or gold bullion.

14.1.2. Vat Leaching: The vat method, as an alternative, has some advantages over heap leaching in that the cyanide solution is applied by upward and downward percolation and flooding and solution of the metal values only requires a few days exposure to the leach solution. Overall recoveries also are higher in the vat technique and the process can be carried on in colder weather since the vats can be covered. Heap leaching, carried on in the open, obviously is restricted to warmer and drier conditions.

A disadvantage of the vat method is higher capital and operating costs, as well as lower physical capacity.

14.1.3. Recoveries: Under laboratory conditions, the percentage extraction by heap leaching varies from about 70% to approximately 90% and this is a progressive increase over time (10-40 days) and

also is an inverse function of ore size (4 in. - 1/2 in.). Commercial operations on crushed ore (1/2 in.) may be expected to give an extraction of 60%-80% in a 6-8 week leaching period.

Vat leaching is speedier and gives an extraction of about 85% in a 3-6 day leaching cycle.

These figures may be compared with extraction of 95+% within 24 hours for conventional counter-current cyanidation leaching as practiced in standard gold mills.

14.2. **Limitations**

Heap leaching is not recommended for ore grades in excess of 0.20 oz/ton because of its relatively high losses and preferably should be conducted on ore of 0.10 oz/ton, or less. It works well on grades of 0.05 oz/ton down to about 0.025 oz/ton.

The gold should be well exposed to the solution by fracturing or coarse crushing and it should occur in veins or stringer deposits, in stockworks, or in breccias and it should not be intimately associated with complex sulphide minerals. Leaching will not work well in the presence of cyanide-consuming materials such as copper-bearing sulphides.

Climatic conditions present some problems for heap leaching and in Canada the technique is restricted to freeze-free periods. Outdoor operations should be possible for 6-8 months in Northwestern Ontario and ore can be stockpiled during the restricted period.

At first sight, heap leaching might be viewed as posing a threat to the environment but, actually, the process is environmentally attractive because there is a low potential for pollution. The leach solutions are in closed circuit and are all either reclaimed and recycled, or evaporated. The leach residues are coarse-grained and relatively dust free so there is little likelihood of their escape into the atmosphere.

14.3. Capital and Operating Costs

The capital costs for a moderate size (10,000 tons) heap leaching system are estimated at only about 20%-25% of the cost of a conventional cyanidation plant and may be approximately $250,000 in total as compared to about $1,250,000 (minimum) for an equivalent 100-tpd semi-portable flotation/cyanidation plant.

Operating costs for the heap leach system are estimated at one-half to less than one-half of the operating costs of an equivalent semi-portable mill.

The ultimate decision regarding extraction by heap leaching vs. conventional cyanidation would depend on complete laboratory and pilot plant testing combined with detailed feasibility studies to ascertain the optimum process for a given gold deposit in terms of its tonnage, grade, and metallurgical characteristics. It is important to recognize that heap leaching in only applicable to ore with specific characteristics and grade.

15. INFRASTRUCTURE

Infrastructure plays a key role in mining by making exploitation feasible and integrating it into the regional economy. Northwestern Ontario is fortunate in this regard as it has advanced from a frontier region of only 25 years or so ago to one well served by electrical transmission systems, oil and gas pipelines, good transportation facilities, municipal services, and communications - all the services required by the mining industry. The one thing lacking is a supply of trained manpower.

The distribution of these services is somewhat uneven and this could create some problems particularly with regard to power supply. In some cases, it may be advantageous (and more practicable) to locate custom milling facilities close to the towns where power and other services may be more readily available and at lower cost.

The fact that most services of a general nature are available within reasonable distances lessens the capital investment requirements for new mines and new treatment facilities and this tends to decrease the overall project risk.

15.1. Water Supply

Water suitable for domestic and process purposes is in abundant supply in almost all parts of the region. The only place where difficulty might be experienced is in the watershed of the Wabigoon River (Dryden area) where pollution by chemical wastes from the former Reed Paper Company plant at Dryden has been a problem for several years. Steps are underway to correct this particular situation.

Most potential gold properties are located either on water courses or very close to them.

A few areas are environmentally sensitive as, for example, the High Lake-Shoal Lake area on the Manitoba boundary. High Lake is part of the water supply system for the City of Winnipeg.

15.2. Power Sources

It has been mentioned that an adequate power supply may be a problem at some potential mining locations. This comes about not because of a lack of electrical power in the region but rather its distribution pattern. It will be very expensive to bring power from a main station in the transmission net to a new mine site. The necessary transmission line could well be 25 miles or so in length and the power transmitted, say, at 44,000 volts would have to be stepped down at the mine through a transformer sub-station. In the case of Ontario Hydro, it is the Corporation's custom to charge these installations off on a capital contribution basis, and the figures could be high, particularly for a short-lived operation. It is not possible to give any firm figures because each site is unique.

Diesel generation is an obvious alternative power source widely used in the mining industry at remote locations. It is also an expensive source and likely to become more so as energy costs continue to rise. It has been suggested that propane may be a logical fuel supply in the future at lower cost than oil. However, diesel generators probably will be the most feasible suppliers of power to the majority of new mine and mill operations within the foreseeable future.

Some properties in former times installed their own hydraulic power plants when they had access to suitable sites. This may be possible at some localities in the future and the suggestion deserves close scrutiny especially since small, packaged, "mini" hydraulic power plants are available in Canada at the present time.*

Similar transportable hydraulic units are manufactured in Europe, and specifically in West Germany.

Independent, small-scale, hydraulic generating plants on small rivers in the region may provide reliable and energy-conserving sources of electrical power for future mining developments.

15.3. Transportation

In former days the major lakes of the region and the connecting waterways comprised the chief transportation links. Canoes, barges, and steam launches were the principal vehicles by which men, machines, and supplies moved to distant locations. This type of movement helps to explain why so many of the early mining enterprises were established on islands and shorelines of the larger lakes, such as Lake of the Woods and the adjoining Shoal Lake as well as the Manitou Lakes.

The northern and southern portions of the region are well served

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* Barber Hydraulic Turbine Ltd., Port Colborne, Ontario, is reputed to have developed a pre-fabricated, 150 KW prototype unit for installation in the Cochrane area at an initial capital cost of about $800,000. This is higher than an equivalent diesel plant but the hydraulic system is clean, efficient, and has a longer useful life - and does not consume expensive diesel fuel.

by both CN and CP rail lines which give direct access to several of the potential mining districts. Railway transportation is perhaps not of primary concern to gold mining activities except for the movement of construction materials, commodity supplies, and some concentrates; it is more important in the case of base metals and iron ore as witness the rail traffic generated by recent operations at Atikokan and Shebandowan, and currently at Bruce Lake.

The rail lines are paralleled by the main highways of the region, Highways 17 and 11, and Highway 71 provides a north-south link from Kenora to the Kakagi Lake area and to Fort Frances. Secondary and tertiary roads as well as paper company roads exist in places and give access to less frequented localities.

The Manitou Access Highway, completed in 1980, provides a much needed connection between Highways 11 and 17 and shortens the travel distance between the communities of Fort Frances and Dryden. This road was designed as an "access" highway and is not specifically intended for recreational or commercial purposes; however, short connections of less than 5 miles of new construction would provide transportation from the Manitou Highway to several of the potential gold properties in the Upper and Lower Manitou Lakes area.

Trucking costs on the main roads of the region (using 20-ton haulage units) are estimated at approximately $0.10 per ton mile for a one-way haul.

Air Canada and Nordair both offer outside travel connections to the east and west through Thunder Bay and Dryden, respectively, and the Government-subsidized Norontair Airline provides scheduled daily flights to airports at Dryden, Kenora, Fort Frances, and Thunder Bay with connections into and outside the region. Floatplane bases throughout the region (Dryden, Kenora, Nestor Falls, etc.) provide charter services to all areas of interest.

15.4. Municipal Facilities

Social and municipal services are available at Thunder Bay, Atikokan, Ignace, Dryden, Fort Frances, and Kenora for commercial, legal, medical, and law enforcement purposes.

15.5. Communications

Telephone, telegraph, radio and television communications are widely distributed and are adequate for all purposes.

PART III - CONCLUSIONS

This report presents the findings of a study commissioned to investigate the feasibility of small-scale gold mining in Northwestern Ontario.

In order to carry out the study, it was necessary to search the Regional Geologists' files at Kenora, Sioux Lookout, and Thunder Bay. We are indebted to these men and their staffs for their willing cooperation and helpful assistance in locating old assessment files, maps, and production records, many going back to the 1880s and 1890s. The old records are necessarily incomplete and so it was not possible to glean all of the facts we would have wished for many of the known gold occurrences. This was particularly true for the Shoal Lake-Lake of the Woods, Mine Centre and Shebandowan areas where numerous former exploration efforts were reported but for which little, if any, information was ever recorded.

16. SUMMARY AND CONCLUSIONS

16.1. Gold Occurrences

(1) The gold occurrences of the region tend to be localized in Early Precambrian sedimentary-volcanic belts which are well-defined in published geological maps. The mineralization appears to have been related to a late stage of volcanism when gold-bearing solutions were introduced into fracture zones and shears in the felsic lavas and associated sediments and into tension fractures in intrusive dikes and sills.

(2) Several gold associations have been recognized in the region. The simplest is visible gold in quartz-carbonate veins; this accounts for many of the small, high grade, free-milling occurrences formerly

worked with steam stamps and amalgamation equipment. Another association consists of multiple, or en échelon, quartz lenses and stringers in mineralized zones. The grade of the individual lenses may be quite high but overall it is in the 0.20-0.50 oz/ton range. Other occurrences are in schist zones with, or without, pyrite; these tend to be lower grade, around 0.10-0.20 oz/ton. Another type of association is with base metal sulphides (Cu, Pb, or Zn) and the gold runs about 0.15 oz/ton. Still another, exemplified by the Windfall-Goldlund ores, is marked by gold in narrow quartz fillings of tension fractures in the margins of granodiorite and quartz porphyry sills intrusive into volcanics. This type may grade 0.25 oz/ton, or better, in the veins but averages 0.10-0.20 oz/ton over wider mineable widths.

(3) The free-milling, visible gold occurrences usually are amenable to crushing, gravity separation, and amalgamation which may, or may not, be followed by cyanidation depending on the fineness of the gold and its degree of liberation.

(4) Gold with pyrite associations requires some form of concentration, usually flotation, and this may be followed, in turn, by cyanidation.

(5) More complex associations with pyrite and various other sulphides containing Cu, Pb, Zn, etc. require flotation concentration. This holds true also for associations with molybdenum, bismuth, and tungsten. It may be more feasible to market these concentrates to companies producing copper, lead, zinc, etc. than to process them further in-situ to extract the gold.

16.2. Classification of Reserves

(6) The known gold ore reserves were classified as proven, probable, possible, and speculative. The first three groups follow the customary categories as used in the mineral industry but the fourth - speculative - was adopted in this study to signify highly inferred ore which might reasonably be expected if intensive exploration was carried out to substantiate fragmentary information already available.

(7) Estimations of ore reserves by category were made for each of eleven areas and sub-areas and combined for the region as a whole. The overall tonnage figures are conservative, including those in the speculative category. Ore grades are weighted averages based on the best available information. The total estimated reserves - proven, probable, and possible - amount to approximately 7,873,000 tons with an indicated weighted average grade of 0.19 oz/ton. The total estimated reserve in the speculative category is 8,285,000 tons, also with a weighted average grade of 0.19 oz/ton. The estimated potential in Troy ounces is approximately 1,495,000 ounces in the proven, probable, and possible categories and slightly in excess of 1,500,000 ounces in the speculative category.

(8) If only one-third of these reserves should be mined eventually, the reserves represent a potential dollar value (in the ground) of approximately C$500,000,000 at an assumed value of C$500 per ounce.

16.3. Exploitation of Potential Ore Deposits

(9) Several mining methods to exploit these potential reserves were considered. Mining by shaft, either vertical or inclined, is not seen as advisable to depths of only about 500 feet because of the high capital costs involved and the constraints that this method may place on mechanization procedures underground.

(10) Mining by decline is advocated wherever possible when underground methods are indicated on account of lower capital costs and greater flexibility. Capital costs are definitely lower to depths of 300 feet, or so.

(11) Open pit mining by conventional methods is likely to be the least costly method for ore deposits that are amenable to it. Maintenance of an acceptable ore: waste ratio may be an inhibiting factor, however.

(12) An unconventional method of open cut slot-mining has been suggested for the exploitation of narrow ore zones outcropping at surface. This would employ standard construction equipment such as Air-Trac long-hole percussion drills and clams or backhoes for the excavation of broken rock. The method needs to be tested under actual operating conditions but it appears attractive because of its low capital and operating costs.

(13) The least costly method of stoping in the vein and shear zone deposits appears to be a modification of top-slicing by long-hole drilling and blasting to box holes from raises driven in ore by mechanized raise-climbing equipment. The method is quite widely used in contract mining operations and it has been proven successful in many cases.

16.4. Capital and Operating Costs - Mining

(14) Predicated on the basis of 100- and 300-tpd mining rates, the capital costs for shaft mining are estimated in the range $2,250,000-$4,250,000 to a depth of 100 feet. Each additional 100 feet in depth will increase these costs by from $100,000 to at least $150,000, depending upon the daily mining rate.

(15) Decline mining at the same daily rates will incur capital costs in the range of about $1,500,000 to nearly $2,750,000 for the first 100 feet of depth. Increments of approximately $250,000 will need to be added for successive 100-foot vertical depths.

(16) Capital costs for mining by open pit are estimated at approximately $1,000,000 to nearly $1,500,000 for 100- and 300-tpd of ore mined. The ore:waste ratio is assumed to be 1:4.

(17) Open cut slot-mining has no firm basis for costs but we estimate figures in the $500,000-$750,000 range for similar production rates. The method is more amenable to low tonnage rates, say 100-tpd, or less. The feasibility of the method remains to be tested by experimentation in the field.

(18) Operating costs are likely to be high for any mining operations in the types of ore occurrences known in this region, and especially for tonnages of 50- to 150-tpd, or more. We estimate operating costs for underground mining at about $19.65-$31.50 per ton; and for surface mining, $7.45-$13.00 per ton of ore.

16.5. Treatment Method

(19) Depending upon the mineralogical associations and the metallurgical characteristics of the ore occurrences, any one of several milling methods may be suitable for the recovery of the gold. The simplest method is crushing + gravity separation + amalgamation; this is suitable in most cases for the free-milling gold-quartz association. It was used quite successfully in the past and it is still appropriate today although new environmental regulations may prohibit amalgamation treatment in the future.

(20) Gold associated with pyrite and/or other sulphides usually necessitates concentration by flotation in one or more circuits. The concentrate so produced may be amenable to direct smelting and refining; or it may be marketed as concentrate for treatment elsewhere; or it may be treated on-site by a cyanidation leach. The latter is the most common and conventional method of treatment for the majority of Canadian gold ores.

(21) Various combinations of treatment are possible. For example, a high grade ore with free gold might be first amalgamated to extract the easily-recoverable gold (but with relatively high gold loss to the tailing) and then the residue and tailing may be fine ground and treated by flotation and cyanidation to yield an overall recovery of 95%, or better.

(22) Gold associated with arsenopyrite generally must be roasted to drive off the arsenic (and sulphur) before being subjected to future treatment.

16.6. Capital and Operating Costs - Milling

(23) Cost estimates for milling are based on the assumption of full treatment by flotation and cyanidation and are for fixed, on-site facilities. Capital costs range from approximately $2,500,000 for a 100-tpd mill to approximately $3,500,000 for a 300-tpd unit. Operating costs are estimated at about $12.95 to $9.15 per ton milled for throughputs of 100- to 300-tpd.

16.7. Custom Milling

(24) In actual practice, milling in this region is more likely to be done in centralized, portable or semi-portable facilities at considerably reduced capital and operating costs. Since much of this work probably would be performed on a custom basis, most of the capital and operating cost elements would be eliminated for the small operator.

(25) As mentioned, most of the milling probably will be carried on in custom mills either privately owned and operated, or in Government-supported facilities. Each course has its advantages and disadvantages. A Government-supported (or at least controlled) operation should ensure that the greatest benefits accrue to the municipalities within the

region, both tangibly and intangibly. Government operations quite likely would confer greater benefits on the individual mine operator as well as through the provisions of technical aid and expertise.

16.8. Portable or Semi-Portable Mills

(26) The current trend in Canada is towards the installation of portable or semi-portable mills. The design and construction technology of these mills exists in several regions and the costs are much less than for fixed plant of comparable capacity. We estimate that a small, portable, 10-tpd amalgamation unit can be purchased and installed in most localities and with all necessary auxiliary equipment (except tailings disposal) for approximately $40,000-$50,000. The capital cost of a 200-tpd semi-portable mill (likewise, less tailings disposal facilities) is estimated at about $2,500,000. Operating costs for these mills are estimated at not more than two-thirds of similar costs for fixed mills, and probably appreciably less than that.

16.9. Heap Leaching

(27) There is interest at the present time in the concept of heap leaching and the method has been suggested for the treatment of gold ores in Northwestern Ontario. The method should be applicable to some types and grades of ore, specifically those with gold well exposed to leach solutions and grading 0.10 oz/ton, or less. Climatic constraints are not viewed as insurmountable for operations carried on in the open as it need only be done for about six months of the year. Ore can be stockpiled during the colder months.

(28) We believe that the heap leaching concept has considerable merit and should be investigated fully as a possible means of treating low grade ore at a low cost per ton. In fact, it may

prove to be the only feasible method of treating certain types of ore in an otherwise high-cost-per-ton environment.

(29) On a comparable basis, we estimate the capital and operating costs of a heap leaching system at only one-fifth to one-quarter the costs of a semi-portable mill. This is an attractive feature.

16.10. Mining and Milling Alternatives

(30) We have reviewed several methods of mining small ore reserves and treating the mined product in conventional fixed mills, portable mills, and by heap leaching. To put these alternatives into useful perspective, we may consider a hypothetical but typical proven ore deposit of, say, 100,000 tons or more grading 0.20 oz. gold per ton, recoverable by underground methods:

(31) This deposit may be assumed to contain about 20,000 ounces of gold worth approximately $10,000,000. Mining at the rate of 200-tpd would give a mine life of approximately 18 months, or 3 years at a 100-tpd rate. Shaft methods would be expensive for a deposit of this size and could scarcely be justified. A decline development would appear to be more practicable. The cost of developing this deposit by decline to a depth of, say, 300 feet is about $2,000,000. The purchase and installation of a 100-tpd semi-portable flotation/cyanidation mill would be about $1,750,000 and the total cost of an integrated mine/mill operation will be slightly in excess of $5,000,000. This example would benefit by custom milling of the ore with a capital saving of about $1,500.000.

(32) The cost of producing this gold by on-site conventional milling is estimated to be $200-225 per ounce over the 3-year period for a total cost of about $4,500,000. Ore treatment by custom milling may reduce the operating costs to approximately $100-$150 per ounce for a saving of about $1,500,000, thus providing a substantially greater margin of profit.

(33) In nine cases out of ten, decline mining combined with custom milling is the logical route to follow for small-scale underground reserves. From a cost point of view, custom milling is also to be preferred for the majority of surface operations wherever possible.

16.11. Contract Mining

(34) No mention has been made up until now of "contract mining". This is a well established practice in Canada and we believe it may be the most logical approach to mining (and milling) many of the region's ore deposits. It would overcome most of the problems likely to be encountered by the small operator in that the contractor supplies the mining expertise and, quite likely, the equipment as well.

(35) Some contractors may undertake to do the pre-production development only; others may contract the development plus stoping; and still others may be prepared to mill the ore too, either on-site or in a centralized mill.

(36) We estimate that after pre-production development has been completed, mining (including stoping and on-going development) can be contracted for $50-$75 per ton and milling (through flotation concentration) for approximately $50 per ton. The overall cost of mining and milling for capacities of 100-200 tpd should be in the range $100-$150 per ton mined. It is doubtful that the private operator could do this work for anything less (when capital costs are considered).

(37) Actual costs, of course, would depend on many factors such as whether the equipment is supplied and already paid for, or whether it must be purchased and amortized, etc., etc.

16.12. Positive Aspects of Small-Scale Mining

(38) It has been said that small scale mining operations lead to larger operations in the future. This is not entirely true. Some may, but many small ore deposits do not have sufficient reserves to warrant larger scale recovery even under the most favourable economic circumstances. They can only be exploited on a small tonnage basis although economy of size may require some form of cooperative operation by several individual owners.

(39) Small deposits are not likely to be of prime interest to major mining companies that can only operate efficiently at large capacities although a major company might mine a number of small ore deposits and transport the ore within acceptable distances to a central processing facility - as is done in Finland by Outokumpu Oy (a government-owned mining company). This method of exploitation might be initiated by any one of several Canadian companies known to have interests in Northwestern Ontario.

(40) Small scale mines usually have considerable flexibibity in expanding or limiting their production, or even in shutting down operations if economic conditions so dictate. These changes are not likely to have severe impacts on the areas or municipalities concerned.

(41) Small scale operations in Northwestern Ontario do not require a great amount of infrastructure beyond the provision of access roads and power supply. Portable power plants probably would be installed by the private operator, in any case.

(42) Small operations create minimal environmental damage and such impacts as do occur are easily contained or controlled.

(43) "Highgrading" (to the exclusion of mining lower grade material) is a possible negative aspect but this is largely unavoidable in a high value commodity such as gold and, in fact, it may be the only practical procedure to ensure a profitable operation when the contained values have an erratic distribution.

Followed by page 130

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Ministry of Natural Resources
Ontario

Hon. James A.C. Auld
Minister

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Deputy Minister

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Feasibility of Small Scale Gold Mining in Northwestern Ontario (parts of the Districts of Kenora, Rainy River and Thunder Bay)

by

James N. Neilson and R.C.E. Bray

1981

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E.G. Pye, Director
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The reserve tonnages and ore grades reported in this study were calculated from public information and data on file in the regional offices of the Ministry of Natural Resources. They have not been checked by the Ministry.

The opinions expressed in the report are those of James Neilson & Associates, Inc., and are based on the best available data. They are not to be construed as in any way reflecting opinions or policies of the Ministry of Natural Resources or the Ministry of Northern Affairs.

For exact locations of prospects and occurrences, the reader may refer to Mineral Deposits Circular 16 and its accompanying Chart A - "Gold Deposits: Kenora-Fort Frances Area" (Ministry of Natural Resources, 1976).

APPENDICES

		Pages:
A -	Shoal Lake - Lake of the Woods	A1-A12
B -	Dogpaw and Kakagi Lakes	B1-B16
C -	Kowan and Atikwa Lakes	C1-C12
D -	Upper and Lower Manitou Lakes	D1-D13
E -	Eagle and Wabigoon Lakes	E1-E10
F -	Dinorwic - Dyment Area	F1-F12
G -	Pipestone Lake - Manitou Stretch	G1- G4
H -	Mine Centre Area	H1- H8
I -	Minnitaki Lake - Sioux Lookout	I1- I9
J -	Sapawe - Atikokan Area	J1- J9
K -	Moss Lake - Shebandowan Area	K1- K3

Volume 2

FEASIBILITY OF SMALL SCALE GOLD MINING

in

Northwestern Ontario

(parts of the Districts of Kenora,

Rainy River and Thunder Bay)

-Appendices-

by

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APPENDIX A

SUMMATION: Area/Sub-Area: Shoal Lake - Lake of the Woods

MDC#/Property: #4/ Ambrose Prospect (Lake Hill G.M.)

Location: Gull Island, Lake of the Woods

Type of Occurrence:	
Ore Setting	Four qtz. veins striking N 80°E
Host Rock	Qtz/felds. porphyry intruding schistose basalt/tuff
Mineralization	v.g. w/Py, Gn, Sph
Exploration/Development:	
Surface	Tr: #2 vein for 270 ft, #3 vein for 255 ft.
Underground	One shaft to 40 ft. Adit, 40 ft, W from lakeshore
Geophys/Geochem.	None
Diamond Drilling	16 DDH (1937), 3509 ft.
Sampling & Testing:	
Sampling	# 3 vein trench sampling:
Assays	0.71 oz over 172-ft length, width 3.6 ft.
Other Metals	Possibly Pb, Zn
Production History:	
Period/Tons Milled	None recorded
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	#3 vein only: 160 ft x 5 ft to -40 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	2,600/Oz

Treatment Amenability: Portable or custom, flotation/cyanidation (10 tpd)

Remarks: Definitely mineable. Could be Air-Trac open cut to 40 ft depth. Portable or custom milling of a flotation concentrate. Potential tonnage: possibly 10,000 speculative.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX A

SUMMATION: Area/Sub-Area: Shoal Lake - Lake of the Woods

MDC#/Property: #25/ Blindfold Mining Group (Golden Gate Mine)

Location: Lake of the Woods, 13 mi. S.E. of Kenora

Type of Occurrence:	
Ore Setting	Qtz. veins (250'+) strike NW
Host Rock	Altered volcs.
Mineralization	v.g.
Exploration/Development:	
Surface	10 trenches over length of 250'
Underground	Shaft on vein (1891-95), to 85' depth
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Sampling of trenches over 150' length
Assays	0.89 oz.
Other Metals	-
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Minimum dimension: 50 ft x 4 ft x -100 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	1600/0.89

Treatment Amenability: Flotation/cyanidation, portable plant (10 tpd)

Remarks:

Estimated to 100' depth

Suitable for portable plant

Needs DD exploration

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX A

SUMMATION: Area/Sub-Area: Shoal Lake - Lake of the Woods

MDC#/Property: #40/ Duport MiningCo. (Cameron Island Mine)
Location: Shoal Lake

Type of Occurrence:	
Ore Setting	Three qtz. veins, dimensions unreported
Host Rock	Altered greenstone, felsic and mafic tuffs
Mineralization	Au in qtz. and in Aspy - Py, Po, Cp
Exploration/Development:	
Surface	Stripping and trenching, 1898
Underground	Inclined shaft, 132'; inclined winze, 245'; levels at 65,125,250,375' 3365' lateral
Geophys/Geochem.	AEM and mag (1974)
Diamond Drilling	1928-29, 4000'; 1933-36; 1950,15929'; 1951,1923'; 1964-67,1200'.
Sampling & Testing:	
Sampling	Watts, Griffis, & McOuat, 1973:
Assays	0.36 oz.
Other Metals	
Production History:	
Period/Tons Milled	1898, 1906, 1934-36/1287 tons/4672 oz. Au, 1143 oz. Ag
Method of Treatment	Presumably amalgamation
Recovery	Low (?) Rec. grade: 3.6 oz. Au/ton 0.89 oz.Ag/ton
Potential Ore Bodies:	Well-defined ore zones to -375 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	27,000/0.36	210,000/0.36	482,000/0.36	-

Treatment Amenability: Roasting (As) + on-site flot/cyanidation (500 tpd)

Remarks: Ore zone explored over 1100' length.
Geophysics (1974) indicated sulphide zones on property.
Excellent prospect - now under development.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

SUMMATION: Area/Sub-Area: Shoal Lake - Lake of the Woods

MDC#/Property: #56/ Cornucopia Mine (Cedar Island Mine)

Location: Bag Bay, Shoal Lake (Kenora P & D)

Type of Occurrence:	
Ore Setting	Two qtz. veins: #1 strikes NW, 3'-4' width; #2, NE, 3' wide
Host Rock	In greenstone cut by qtz porph.
Mineralization	
Exploration/Development:	
Surface	Several test pits
Underground	#1, inclined, 165' w/385' drifting & 163' XC #2, vert. to 646' w/5450 'drifting + XC
Geophys/Geochem.	
Diamond Drilling	1899 - 869'; 1929-36, 1800' mostly u/g
Sampling & Testing:	
Sampling	-
Assays	0.29 oz. (from production)
Other Metals	
Production History:	
Period/Tons Milled	1896, 1932, 1935-36/17,050 tons
Method of Treatment	-
Recovery	4941 oz.Au(0.29 oz./ton) + 3884 oz. Ag(0.23 oz./ton)
Potential Ore Bodies:	Narrow qtz. veins, 3-4 ft. wide, in mine workings to -650 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	28,000/0.50 (from 1936 longitudinal section)	-	- 15,000/ ? (tailings

Treatment Amenability: Flotation/cyanidation, portable plant (50 tpd)

Remarks: Geological and assay plans are lacking, firm estimates not possible. Good prospect for development & production. Sulphides contain Asp so may require roasting. Ore transfer from Cedar Island to mainland could be bypassed by raising from 625' level to surface.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX A

SUMMATION: Area/Sub-Area: Shoal Lake - Lake of the Woods

MDC#/Property: #101/ Gold Mountain Prospect

Location: Western Peninsula, Lake of the Woods

Type of Occurrence:	
Ore Setting	Irregular qtz. stringer stockwork
Host Rock	in sheared qtz. porph. close to contact w/rhyolite, tuff, felsite
Mineralization	Low grade Au, reported 0.04 oz. (dump grab samples)
Exploration/Development:	
Surface	Numerous trenches, 1895-99
Underground	One shaft, 30'
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	No infmn except dump samples
Assays	0.04 oz. in zone 350' x 30'
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Open pit area: 350 ft. x 30 ft. to -125 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	100,000/0.04

Treatment Amenability: Heap leaching

Remarks: Potential for open pit + heap leaching

SOURCE OF INFORMATION
RESIDENT GEOLOGIST'S
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX A

SUMMATION:	Area/Sub-Area: Shoal Lake - Lake of the Woods
MDC#/Property:	#127/ Hopkins-Heintzman Prospect
Location:	SW of Bag Bay in Shoal Lake
Type of Occurrence:	
Ore Setting	Two qtz. veins striking N5E & N14°E
Host Rock	in gran. porphy. cutting metavolcs.
Mineralization	Qtz. w/Py. Cp, Asp, Po, Gn, Sph
Exploration/Development:	
Surface	Several test-pits
Underground	None
Geophys/Geochem.	None
Diamond Drilling	3 DDH - 473'
Sampling & Testing:	
Sampling	Silicified Zone
Assays	Reported: 0.72 oz.Au; 7.46% Zn; 0.10% Ni (0.23 oz.Au) surface trenches
Other Metals	Zn, Ni, Cu(?)
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Underground, 2 veins to -50 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	11,000/0.23

Treatment Amenability: Flotation/cyanidation + roasting (?)

Remarks: Arsenical ore - may require roasting if auriferous Aspy.
Some potential.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX A

SUMMATION: Area/Sub-Area: Shoal Lake - Lake of the Woods

MDC#/Property: #142/ Kenricia Mine

Location: Clearwater Bay, Lake of the Woods

Type of Occurrence:	
Ore Setting	Two qtz. veins up to 7.5' strike E-W
Host Rock	Agglom. & basalt flows intruded by qtz. porph. dikes
Mineralization	Au w/Ph, Cp, Gn
Exploration/Development:	
Surface	Tranches (1935) on #1 & 3 veins
Underground	Vert. shaft, 530'; 3 levels w/6940' lateral
Geophys/Geochem.	None reported
Diamond Drilling	DD, surface + u/g, 11.293'
Sampling & Testing:	
Sampling	#1 vein, 0.68 oz.
Assays	#3 vein, 0.15 oz.
Other Metals	
Production History:	
Period/Tons Milled	1939-40/22, 344 tons at 100 tpd
Method of Treatment	Cyanidation
Recovery	97.2% 2533 oz. Au (0.11 oz/ton), 521 oz.Ag (0.02)
Potential Ore Bodies:	#1 vein } in mine workings, rake extension unmined #2 vein } Depth is -530 + ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	10,900/0.68 - #1 vein	
	-	-	28,125/0.15 - #3 vein	

Treatment Amenability: Flotation/cyanidation, portable, 50 tpd.

Remarks: Estimates based on assumption that ore grades persist in depth. Vein dips steeply but rakes westerly at 20° - 25° - complicates mining and necessitates lengthy drifting.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX A

SUMMATION: Area/Sub-Area: Shoal Lake - Lake of the Woods

MDC#/Property: #183/ Mikado Mine

Location: Bag Bay, Shoal Lake

Type of Occurrence:	
Ore Setting	Four qtz. veins, strike N80°E
Host Rock	Qtz./felds. porph intruding basalt & tuff schist
Mineralization	v.g.w/Py, Cp, Mo, Bi, tetradymite
Exploration/Development:	
Surface	Trenching 270' (#2 vein) 255' (#3 vein), 4000' (#1 ve
Underground	Four shafts: #1 inclined length 1125' (560'vert.) #2,240' vert; #3,80'vert; #4,65'vert. Drifting 750
Geophys/Geochem.	
Diamond Drilling	3DDH(1912, from ice); 1933-34, 2760' u/g
Sampling & Testing:	
Sampling	Channels, u/g on 370' and 504' levels
Assays	0.56 oz./N lens; 0.69 oz./S lens between 370' & 504'
Other Metals	Mo, Cu, Bi
Production History:	
Period/Tons Milled	1898-1902, 1910-11, 1931/57,813 tons/28,335 oz.Au 41 oz.Ag
Method of Treatment	Amalgamation + cyanidation
Recovery	87% - 91% (1902)
Potential Ore Bodies:	N. lens:) S. lens:) to -560 ft. (Allow 15% dilution)
	Tailings (offshore), 6400 tons/0.09 oz.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	5,200/0.56 - N.lens	
	-	-	6,100/0.69 - S.lens	
	-	-	tailings - 6,400/0.09 (offshore)	

Treatment Amenability: Flotation/cyanidation of u/g ore
Heap leaching of tailings w/dragline

Remarks: The North and South lenses underlie a mined-out zone and have the same flat westerly rake. The offshore tailings are amenable to heap leaching.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX A

SUMMATION: Area/Sub-Area: Shoal Lake-Lake of the Woods

MDC#/Property: #233/ Pine Portage Prospect

Location: Pine Portage Bay, Lake of the Woods

Type of Occurrence:	
Ore Setting	Qtz. vein, strikes N-S
Host Rock	Hornblende schist in mafic volcs.
Mineralization	v.g. w/Py, Cp. Aspy, native Ag, Cu
Exploration/Development:	
Surface	none
Underground	shaft on vein, at 75°SE, to 120' Level at 35', 112' lateral
Geophys/Geochem.	none
Diamond Drilling	1000', 1968-70
Sampling & Testing:	
Sampling	Channels on 35' level, over ± 7' width
Assays	2.05 oz. Au
Other Metals	-
Production History:	
Period/Tons Milled	Prior to 1900/ No record of milling, but there was a mill
Method of Treatment	Stamps + amalgamation (?)
Recovery	-
Potential Ore Bodies:	Estimated only to -35 ft:. 110 ft. x 7 ft. Shaft believed to extend to -100 ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	2100/2.05	-

Treatment Amenability: Portable flotation/cyanidation, 10 tpd

Remarks: May be free-milling, and thus require only jig + amalgamation
Currently under exploration

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX A

SUMMATION: Area/Sub-Area: Shoal Lake - Lake of the Woods

MDC#/Property: #239 Purdex Prospect

Location: SE of Electrum Lake

Type of Occurrence:	
Ore Setting	Qtz. veins in drag folds
Host Rock	in qtz. porph. & greenstone
Mineralization	Au w/Py, Po, Cp
Exploration/Development:	
Surface	Trenching & stripping
Underground	None
Geophys/Geochem.	None
Diamond Drilling	37 DDH, 9000' + (1958)
Sampling & Testing:	
Sampling	Not recorded
Assays	0.32 oz.
Other Metals	
Production History:	
Period/Tons Milled	None on record
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Estimated 76,500 tons of u/g (MDC#16)

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	76,500/0.32	-

Treatment Amenability: Flotation/cyanidation

Remarks: Amenable to portable milling
Suitable for decline development

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX A

SUMMATION: Area/Sub-Area: Shoal Lake - Lake of the Woods

MDC#/Property: #281/ Sultana Mine

Location: Sultana Island, Lake of the Woods

Type of Occurrence:	
Ore Setting	Qtz. veins in granite & gran. porphyry
Host Rock	close of greenstone
Mineralization	Au w/minor Py, Cp, Mo
Exploration/Development:	
Surface	Several trenches, 1898-1900, 1959-60
Underground	5 shafts: #1,164'; #2,30'; #3 main,600', #4,143',#5,75'
Geophys/Geochem.	Approx. 5300' lateral on 8 levels
Diamond Drilling	771' DD, 1899-1903; 3512', 1934-35; 7821', 1959-60
Sampling & Testing:	
Sampling	Little infmn.
Assays	0.21 oz. from mill data
Other Metals	
Production History:	
Period/Tons Milled	1894-1906, 1949/77,481 tons - produced 15,977 oz.Au
Method of Treatment	Stamps + amalgamation/20-30 tpd
Recovery	Not known
Potential Ore Bodies:	Unknown

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	- Insufficient data for estimates -			

Treatment Amenability: Flotation/cyanidation

Remarks: Fair potential for deep DD exploration of unmined veins and mined veins below bottom level.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX A

SUMMATION: Area/Sub-Area: Shoal Lake - Lake of the Woods

MDC#/Property: #292/ Thrasher (Cl.P-218)

Location: Jaffray Twp, E. of Kenora

Type of Occurrence:	
Ore Setting	Qtz. veins striking N30°E in sheared metavolcs.
Host Rock	
Mineralization	Qtz. stringers & dissem. sulphides
Exploration/Development:	
Surface	Some trenching (1898)
Underground	Shaft, to 50 ft. on vein (1898)
Geophys/Geochem.	None
Diamond Drilling	6 DDH, 1109 ft. across shear zone
Sampling & Testing:	
Sampling	DD core: zone 25 ft. wide at surface, 0 ft. at 72 ft. depth
Assays	Low values, but 0.16 oz. for 160 ft. length
Other Metals	-
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Surface to -40 ft: 160 ft. x 10 ft.(aver.)

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	4500/0.16

Treatment Amenability: Flotation/cyanidation w/custom or portable mill (10tpd)

Remarks: Requires further sampling & exploratory drilling.
May have potential for open cut & heap leach if overall grade is low (< 0.10 oz.)

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (West of Cameron Lake Fault)

MDC#/Property: #1/ Abraham Occurrence (Neda GML)

Location: N. of Snake Bay, near Sioux Narrows

Type of Occurrence:	
Ore Setting	1 ft. qtz. vein in 8-ft wide shear zone
Host Rock	strike 110'. dip 70°NE
Mineralization	v.g. w/Py, Cp
Exploration/Development:	
Surface	Trenched for 250 ft. in shear zone + 25 ft. test pit (1934-36)
Underground	One shaft to -40 ft.
Geophys/Geochem.	None
Diamond Drilling	4 DDH
Sampling & Testing:	
Sampling	High assays reported from trenches & test pits
Assays	No values reported.
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Zone: 250' x 5' x 40'

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	4150/?

Treatment Amenability: Custom or portable flotation/cyanidation (20 tpd)

Remarks: Some prospect potential for shallow open cut

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (West of Cameron Lake Fault)

MDC#/Property: #9/ Bag Lake Prospect

Location: SW of Dogpaw Lake

Type of Occurrence:	Au-bearing sulphides in shear zone, 4-8 ft. wide
Ore Setting	Pyritized fractures in intensely altered metabasalt w/qtz. porph. dikes
Host Rock	
Mineralization	
Exploration/Development:	
Surface	Stripping & washing - en echelon, overlapping lenses
Underground	None
Geophys/Geochem.	None
Diamond Drilling	7 DDH - 1647 ft.- 50 ft. apart
Sampling & Testing:	
Sampling	24 surface samples:
Assays	erratic: up to 0.50 oz (some to 2.0 oz.)
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	300 ft. x 6 ft. x 150 ft. depth Assumed aver. grade, 0.25 oz.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	22,500/0.25

Treatment Amenability: Custom flotation/cyanidation (25-50 tpd)

Remarks: Fair prospect potential w/erratic but good values.
May be mineable by decline.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (West of Cameron Lake Fault)

MDC#/Property: #37/ Burnt Prospect

Location: Peninsula Bay, Kakagi Lake

Type of Occurrence:	
Ore Setting	Narrow qtz. veins w/v.g., Py, Cp
Host Rock	in diorite (?)
Mineralization	
Exploration/Development:	
Surface	Unknown
Underground	Unknown
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Grab samples:
Assays	0.22 oz., 0.98 oz.
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Dimensions unreported; assays are of interest

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	-

Treatment Amenability:

Remarks: Sparse data but some potential as prospect

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (W of Cameron Lake Fault)

MDC#/Property: #44/ Caswell-Williams Prospect

Location: Flint Lake near Dogpaw Lake

Type of Occurrence:	Mineralized lenses, 1100 ft. x 8 ft. width, N75°E, 85°S
Ore Setting	Sericite schist
Host Rock	v.g. w/Py
Mineralization	
Exploration/Development:	
Surface	Trenching (1936)
Underground	Vert. shaft to 140 ft; level at 125 ft.
Geophys/Geochem.	Mag. & EM (Gunnex, 1969) - two conductors indicated
Diamond Drilling	4 DDH(1936) from ice; 40 DDH (Noranda, 1945),3000 + ft; 6108 ft. E core, 494 ft. x-Ray, some U/G drilling
Sampling & Testing:	
Sampling	Zone 100 W-100E, 0.21 oz; Zone 1050 W-1500 W, 0.28 oz
Assays	Noranda drilling, 0.04 oz.
Other Metals	(DD results may be misleadingly low)
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Zone 100W-100E: 200 ft. x 8 ft. x 125 ft. Zone 1050W-1500W: 450 ft. x 8 ft. x 225 ft. and to -450 ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	13,750/0.21	-	-
	-	25,300/0.28	20,250/0.28	45,400/0.28

Treatment Amenability: In situ flotation/cyanidation (75-100 tpd)

Remarks: DD program (1945) gave good coverage. There appears to be mineable tonnage. Good potential.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (W. of Cameron Lake Fault)

MDC#/Property: #52/ Combined Prospect

Location: N.W. of Nestor Falls, Lake of the Woods

Type of Occurrence:	
Ore Setting	Four main veins (Nos. 1, 7, Patterson & "flat" vein)
Host Rock	Pillow lava w/qtz. porph. dikes
Mineralization	-
Exploration/Development:	
Surface	Trenched, 1897-1902; 1903-04; 1905-06
Underground	Shaft to 101 ft. w/166 ft. drifting; shaft to 45 ft. w/159 ft. drifting
Geophys/Geochem.	Adit
Diamond Drilling	-
Sampling & Testing:	
Sampling	
Assays	No assays except 1904 mill test
Other Metals	
Production History:	
Period/Tons Milled	1904/ 37-ton mill test
Method of Treatment	
Recovery	0.33 oz/ton
Potential Ore Bodies:	No.1 vein, 600 ft. x 5 ft; No.7 vein, 2500 ft. x 2-4 ft; Patterson vein, 2500 ft. x 4-5 ft; flat vein, 4-5 ft. by 1200 ft. x 600 ft.(21,000 sq.ft. at ± 40-ft. depth)

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	240,000/0.30

Treatment Amenability: Portable flotation/cyanidation (150 ~ 200 tpd)

Remarks: Data are meagre but appears to be good prospect with open pit potential to mine 240,000 tons at shallow (40-ft.) depth.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (W. of Cameron Lake Fault)

MDC#/Property: #66/ Dogpaw Lake Prospect (Consol. Golden Arrow)

Location: Dogpaw Lake

Type of Occurrence:	
Ore Setting	Three qtz. veins in shear zones, trend E-W, aver. 5.8 f wide
Host Rock	In metavolcs. & qtz. porph. dikes
Mineralization	Au assoc. w/Py, assoc. w/qtz. porph
Exploration/Development:	
Surface	Considerable trenching, 1960-61
Underground	None
Geophys/Geochem.	None recorded
Diamond Drilling	82 DDH(Noranda, 1959); 116 DDH, 18373 ft. (Gold.Arrow, 1960-61)
Sampling & Testing:	
Sampling	
Assays	0.43 oz. (Golden Arrow aver. 1960-61)
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	
Recovery	
Potential Ore Bodies:	Noranda, 1959: 44,000/0.66 Zone 7 ft. wide, 350 ft.dee Noranda, 1959: 12,000/0.29 Zone, 180x4.9 ft. wide, 150 ft. deep Cons. Gold. Arrow,1960-61: 96,650/0.43 2 veins, 10.6 ft

Summary: Estimated Tonnage & Grade wide, 600 ft.dee

	Proven	Probable	Possible	Speculative
Reserves (This compilation)	-	30,000/0.30 (#1 to 150 ft) (#2 to 175 ft.)	70,000/0.30 (to 600 ft.)	80,000/0.30 (to 1000 ft.)

Treatment Amenability: On-site, or portable, flotation/cyanidation (100-200tp

Remarks: Well-tested prospect w/good grade & high potential
Mineable by shaft, or possibly decline; narrow shrinkage stoping.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (W. of Cameron Lake Fault

MDC#/Property: #89/ Frobisher (Burriss) Prospect

Location: SW of Dogpaw Lake

Type of Occurrence:	
Ore Setting	Qtz. veins & lenses assoc. w/qtz. porph. dikes
Host Rock	Zone strike N8°E, dip steeply W
Mineralization	Au w/Mo, Py, Cp. (Au exclusively in qtz, free-milling)
Exploration/Development:	
Surface	Trenching on veins #1, #2, #3, Mo vein
Underground	None
Geophys/Geochem.	None
Diamond Drilling	48 DDH to 20 ft. depth only (1944, by Frobisher)
Sampling & Testing:	
Sampling	Surface samples low & erratic (aver.0.01 - 0.04 oz)
Assays	Drill core, 0.10 - 0.51 in 5 zones
Other Metals	Mo (non-commercial)
Production History:	
Period/Tons Milled	None, but staked 1942
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Five zones on Vein #1, to 30 ft. depth

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	3500/0.27	-	-

Treatment Amenability: Portable, amalgamation or flotation/cyanidation (10-20 tpd)

Remarks: Erratic but high values (0.40-0.50) in drilling.
Showings have potential for shallow open cuts w/Air-Trac + backhoe

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (W. of Cameron Lake Fault)

MDC#/Property: #173/ Martin, F.M. Prospect

Location: Island N. of Cliff Point in Kakagi Lake

Type of Occurrence:	
Ore Setting	Mineralized shear zone, strikes 85°
Host Rock	Sericite schist
Mineralization	Au w/Py, also malachite
Exploration/Development:	
Surface	Unknown
Underground	None
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Grab samples: 0.34 & 0.04 oz.
Assays	
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Zone (at surface): 150 ft. x 15 ft. (to 75-ft. depth)

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	14,000/0.15

Treatment Amenability: Custom flotation/cyanidation (25-50 tpd)

Remarks: Some potential as open pit w/Air-Trac drilling & clam

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (W. of Cameron Lake Fault)

MDC#/Property: #175/ Mascott Prospect

Location: W. of Young's Bay, Kakagi Lake

Type of Occurrence:	
Ore Setting	Four qtz. veins, strike NE, dip ± 80°E
Host Rock	in greenstone assoc. w/qtz. diorite
Mineralization	v.g. w/Py
Exploration/Development:	
Surface	Test-pits, 1896-99
Underground	Two shafts to -35 ft. on #1 vein; one on #3 vein to -43 ft.
Geophys/Geochem.	Adit, 75 ft w/XC 31 ft; winze, 50 ft. in adit
Diamond Drilling	
Sampling & Testing:	
Sampling	No assays recorded, but said to be much v.g.
Assays	Values probably erratic in pinch & swell
Other Metals	
Production History:	
Period/Tons Milled	1899/ ± 1300 tons
Method of Treatment	Prob. stamp + amalgam.
Recovery	Est. grade 0.40 oz.
Potential Ore Bodies:	#1 vein: 300 ft. x 3 in. to 5 ft. #2 vein: 200 ft. x 3 in. #3 vein: 50 - 60 ft. length #4 vein (assoc. w/dike): 20 ft. wide

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	-

Treatment Amenability: Custom flotation/cyanidation

Remarks: No tonnage & grade estimate possible due to lack of data but has some potential as prospect (produced Au in past)

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (W. of Cameron Lake Fault)

MDC#/Property: #185/ Milree Syndicate

Location: Kakagi Lake

Type of Occurrence:	
Ore Setting	Six veins, mineralization in transverse fractures
Host Rock	mostly in diorite. Qtz. porph. dike, 500 ft. wide,
Mineralization	strikes N70°W. v.g. + Py
Exploration/Development:	
Surface	Trenching & pitting on Veins #2 & 5
Underground	None
Geophys/Geochem.	None
Diamond Drilling	3 DDH on Vein #2
Sampling & Testing:	
Sampling	Grab samples, vein #4; tr. to 2.43 oz.
Assays	Grab samples, vein #5, 0.05 to 0.26 oz.
Other Metals	-
Production History:	
Period/Tons Milled	No production: staked 1944; Sylvanite option, 1945
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Vein #5 - good prospect, never drilled, 325 ft. x 7.5ft

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	32,500/0.12 to -150f

Treatment Amenability: Custom flotation/cyanidation (50-100 tpd), or heap leach depending on grade.

Remarks: Some potential for DD exploration & possible development by decline.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (W. of Cameron Lake Fault)

MDC#/Property: #209/ Noranda-Cameron-Carmichael Prospect

Location: NE of Jessie Lake, Kakagi Lake Area (Cdn. Arrow Mines)

Type of Occurrence:	
Ore Setting	Three qtz. veins in shear zone, aver. width 5.5 ft.
Host Rock	Metavolcs. w/qtz. porph. E-W strike
Mineralization	
Exploration/Development:	
Surface	Considerable trenching (1959-61)
Underground	None
Geophys/Geochem.	None
Diamond Drilling	88 DDH, shallow (1959); 18,000 ft. to -600 ft.(1960-61
Sampling & Testing:	
Sampling	Drill core: 0.43 oz. (aver.)
Assays	-
Other Metals	-
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Drill-indicated; surface to -600 ft., aver. 5.5 ft.wid

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	99,650/0.43	-	-

Treatment Amenability: Custom, or on-site, flotation/cyanidation (100 tpd)

Remarks: Good prospect, drill-indicated, presumably open at depth

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes

MDC#/Property: #210/ Martin-Kenty Prospect

Location: S. of Dogpaw Lake

Type of Occurrence:	
Ore Setting	Six qtz. veinlets, N60°E, dip steep
Host Rock	Replaced diorite (silica, albite, carbonate alteration
Mineralization	Au w/Py, minor Cp
Exploration/Development:	
Surface	Minor amount of trenching, 1900-01
Underground	None
Geophys/Geochem.	None
Diamond Drilling	9300 ft. DD (1944)
Sampling & Testing:	
Sampling	very little information
Assays	-
Other Metals	-
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	#1 shoot: 200 ft. x 8 ft. to -350 ft. (drilling basis)
	#2 shoot: 180 ft. x 4 ft. to -350 ft. (")

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	-	46,500/0.15
	-	-	-	21,000/0.15

Treatment Amenability: Custom flotation/cyanidation (50-100 tpd)

Remarks: Slight potential as prospect. Requires re-sampling program in trenches & drill core. Dilution could be 15% - 20%.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (W. of Cameron Lake Fault)

MDC#/Property: #247/ Regina Mine (Horseshoe & Regina Reef Mines)

Location: Regina Bay, Lake of the Woods.

Type of Occurrence:	
Ore Setting	Total of 8 qtz. veins transverse to
Host Rock	granite/greenstone contact. Range, few inches - 12/15 ft.
Mineralization	v.g., Py, Mo, Sph in chimney-like ore shoots
Exploration/Development:	
Surface	Considerable trenching on all veins, 1894-99 up to 190
Underground	Five shafts: Main shaft, 723 ft w/9 levels, 4327 ft. lateral
Geophys/Geochem.	None
Diamond Drilling	None recorded
Sampling & Testing:	
Sampling	Past production records, 0.15 oz. - 0.57 oz.
Assays	0.50 oz. (1895-97)
Other Metals	-
Production History:	
Period/Tons Milled	1895-1905/ 36,828 tons/0.21 oz. Au, 0.04 oz. Ag
Method of Treatment	1940-41/3110 tons/100 tpd. 1942/5000 tons tailings
Recovery	Orig. stamps + amalgam; then (1896) cyanidation of conc. (73% recovery)
Potential Ore Bodies:	In situ, above 9th level On 9th level, 120'x6'x60'; below 9th, 200'x43"x80' From 6th-9th levels, N of shaft: 150'x6'x150'

Summary:

Estimated Tonnage & Grade

Proven	Probable	Possible	Speculative
Reserves -	above 9th	6000/0.41	3600/0.57 on 9th
-	-	-	4800/0.43 in winze
-	-	-	11,250/0.40 6th-9th
-	-	8000/0.15	- tailings

Treatment Amenability: Portable flotation/cyanidation (25-50 tpd)
Heap leaching of tailings

Remarks: Long & checkered career as producer. Mismanaged in early days. Possibilities exist for ore in mine down to 9th level (-516 ft) and below 10th level. Requires approx. 900 ft. drifting on 3 levels plus 400 ft. raising to reach raking ore shoots w/zones of enrichment. Assays were up to 0.50 oz. or better, but probably aver. closer to 0.02 oz.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (W. of Cameron Lake Fault)

MDC#/Property: #268/ Sewell Prospect

Location: Dogpaw - Flint Lakes Area

Type of Occurrence:	
Ore Setting	Mineralization in shear zones, E-W strike, dips 75°-80°N
Host Rock	N side of qtz/porph. dike
Mineralization	Fine-gr. v.g. w/Py in tuff (?)
Exploration/Development:	
Surface	Ten trenches, #2 zone by Sylvanite (1944)
Underground	None
Geophys/Geochem.	None
Diamond Drilling	9 DDH, 1282 ft. (Gateway Uranium, 1961)
Sampling & Testing:	
Sampling	Trenches 1, 2, 3, 8: 0.28-0.66 oz.
Assays	DM grabs: 0.84 oz. & 0.07 oz. over 45 ft. width
Other Metals	-
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Surface to -100 ft: 600' x 8' #2 zone: Possible open pit, 100'x40'x40'

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	40,000/0.25	-
	-	-	12,000/0.07	-

Treatment Amenability: Custom, or portable, flotation/cyanidation (100 tpd)
Heap leaching of low grade (0.07 oz.)

Remarks: Some potential for decline development (erratic values) plus open pit potential on #2 zone.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes (W. of Cameron Lake Fault)

MDC#/Property: #287/ Sylvanite (Jessie Lake)

Location: S. of Jessie Lake, Kakagi Lake Area. (also Williams-Caswell Option). (This property includes MDC#107-Gold Sun)

Type of Occurrence:

Ore Setting	Qtz. veins, 6-7 ft. wide, in 60 ft-wide shear zone
Host Rock	Carbonatized metavolcs. strike N65°E
Mineralization	
Exploration/Development:	
Surface	None recorded
Underground	Two adits; 45 ft. & 70 ft; 600 ft. apart (on Gold Sun)
Geophys/Geochem.	None
Diamond Drilling	Sylvanite: 3 DDH, 651 ft.(from ice, 1943) " 8 DDH, 1306 ft. (1944)
Sampling & Testing:	
Sampling	DDH #1: up to 0.42 oz. over 5 ft.
Assays	Two zones: 0.07 oz/15 ft. or 0.10 oz/8.9 ft. 0.13 oz/19 ft. or 0.25 oz/9 ft.
Other Metals	
Production History:	
Period/Tons Milled	None Prospected: 1944-46
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Open pit (both zones): 200'x30'x100' depth

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	50,000/0.10	-	-

Treatment Amenability: Heap leaching

Remarks: Fair prospect as indicated by DD & trenches A,B,C, & D.
May be open pittable to -100 ft. w/Air-Trac & payloader

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX B

SUMMATION: Area/Sub-Area: Dogpaw & Kakagi Lakes

MDC#/Property: #319/ Wensley, E. Prospect

Location: Wicks Lake, N. of Kakagi Lake

Type of Occurrence:	
Ore Setting	Qtz. veins in diorite & gabbro intrusive into
Host Rock	bedded tuffs; later qtz/porph. dikes; E-W, dip 70°N
Mineralization	v.g. w/Py, Cp (values in alteration zones on walls)
Exploration/Development:	
Surface	900 ft. trenching on #3 vein; 700 ft. trenching, #5 vein
Underground	4 trenches on #4 vein
Geophys/Geochem.	None
Diamond Drilling	49 DDH, 6000 ft (by Noranda, 1944)
Sampling & Testing:	
Sampling	#3 vein grab: 2.02 oz.
Assays	-
Other Metals	-
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	#3 vein: 1600'x6'x400' depth #4 vein: 360'x6'x 90' depth #5 vein: 700'x6'x175' depth

Summary:

Estimated Tonnage & Grade

Proven	Probable	Possible	Speculative
-	-	-	320,000/0.20 - #3
-	-	-	16,200/0.15 - #4
-	-	-	61,250/0.20 - #5

Reserves

Treatment Amenability: Custom flotation/cyanidation (200 tpd)

Remarks: Good prospect for further exploration & development by decline or shaft

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX C

SUMMATION: Area/Sub-Area: Rowan-Caviar-Atikwa Lakes

MDC#/Property: #77/ Errington Prospect

Location: E. part of Rowan Lake

Type of Occurrence:	
Ore Setting	Four qtz. veins in chlorite schist & felsite
Host Rock	Strike SE, dip ± 90°
Mineralization	v.g. w/Py, Cp, Po, Sph.
Exploration/Development:	
Surface	Trenched, 1936-37
Underground	None reported, but there is one U/G DDH(?)
Geophys/Geochem.	None
Diamond Drilling	27 DDH, 6409 ft (1937); 12 DDH, 5000 ft (1947)
Sampling & Testing:	
Sampling	1937 drilling: 0.29 oz/12 ft. Erratic, high values.
Assays	MNR (1979) grabs: 0.08-0.09 oz; chip 0.86 oz/3 ft.
Other Metals	-
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Vein #1: 450' x<1' - low values Vein #2: stringers up to 3' - low values Vein #4: 450' x 2"-15" up to 6' - values aver. 0.24 oz. - to 240 ft. depth

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	224,000/0.24	-

Treatment Amenability: Portable, flotation/cyanidation (200-300 tpd)

Remarks: Good prospect. Needs U/G exploration & drilling. Gold is erratic but may provide large tonnage at 0.20 - 0.25 oz. O.K. for decline developmen

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX C

SUMMATION: Area/Sub-Area: Rowan-Caviar-Atikwa Lakes

MDC#/Property: #81/ Flint Lake Prospect (also Thomas Edison)

Location: Flint Lake, near Caviar Lake

Type of Occurrence:	
Ore Setting	Qtz. carb. veins in 10 ft. wide fault schist
Host Rock	Fault zone at contact of metavolcs. & pyroclastics (rhyolites)
Mineralization	Vein is 2 ft wide, N 65°W, 70°N
Exploration/Development:	
Surface	Trenched 300 ft. along vein
Underground	Two shafts, 27 ft & 15 ft.
Geophys/Geochem.	Mag. svy, 1973
Diamond Drilling	None reported
Sampling & Testing:	
Sampling	Chip over 2 ft: 0.32 oz.
Assays	Chip over 4 ft (schist): 0.02 oz.
Other Metals	Chip (trench): 0.08 oz/4.2 ft.
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Low grade: zone 300' x 4.2' x 150' depth

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	15,750/0.08

Treatment Amenability: Heap leaching

Remarks: Fair prospect for low tonnage. Data sparse.
Decline

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX C

SUMMATION: Area/Sub-Area: Rowan-Caviar-Atikwa Lakes

MDC#/Property: #92/ Gauthier Prospect

Location: Dogpaw Lake, E. Side

Type of Occurrence:	
Ore Setting	Discontinuous qtz. veins, 150 ft. x 2.5-4.0 ft.
Host Rock	Carbonate shear zone, 30-40 ft. wide, S76°E, 70°-80°N
Mineralization	v.g. w/Py, Cp
Exploration/Development:	
Surface	Considerable trenching (1944)
Underground	None
Geophys/Geochem.	None
Diamond Drilling	3 DDH, 60 ft. apart
Sampling & Testing:	
Sampling	Grab samples, 0.26 oz.
Assays	Channels & grabs, up to 0.80 oz (erratic)
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Qtz. zone, 170' x 1.8' to 100' depth

Summary:

Estimated Tonnage & Grade			
Proven	Probable	Possible	Speculative
Reserves	-	-	2,500/0.18	-

Treatment Amenability: Custom flotation/cyanidation (20 tpd)

Remarks: Some potential for small-scale production by decline

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX C

SUMMATION: Area/Sub-Area: Rowan-Caviar-Atikwa Lakes

MDC#/Property: #102/ Gold Panner Occurrence

Location: Island at S. end of Caviar Lake

Type of Occurrence:	
Ore Setting	Qtz. veins in transverse shears
Host Rock	in qtz. porphyry
Mineralization	v.g. + Py, Cp
Exploration/Development:	
Surface	Some trenching
Underground	Two shafts, 19 ft. & 100 ft. (vert.) w/level at 70 ft.
Geophys/Geochem.	111 ft. of drifting. Closed in 1903 due to water problems
Diamond Drilling	Unknown
Sampling & Testing:	
Sampling	8-ft. wide ore zone:
Assays	0.18 oz. (sparse records)
Other Metals	-
Production History:	
Period/Tons Milled	None (1899-1903)
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Very speculative-insufficient data to substantiate grade. Could be large tonnage of low grade in wide shear zone.

Summary:

Estimated Tonnage & Grade			
Proven	Probable	Possible	Speculative
Reserves	-	-	-	2,300/0.15

Treatment Amenability: Probably custom flotation/cyanidation (20 tpd)

Remarks: Decline development. Needs U/G exploration & surface drilling.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX C

SUMMATION: Area/Sub-Area: Rowan-Caviar-Atikwa Lakes

MDC#/Property: #116/ Grand Chibougamau Prospect

Location: Caviar Lake

Type of Occurrence:	
Ore Setting	Qtz./carb. veins, stringers, lenses; N30°E
Host Rock	Andesitic lavas, silicified & carbonatized
Mineralization	Au w/Py, Cp. Erratic
Exploration/Development:	
Surface	Stripped & trenched (1948-49)
Underground	None
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Trench #4: 0.60 oz.
Assays	Other trenches: 0.46, 0.30, 0.03 oz.
Other Metals	-
Production History:	
Period/Tons Milled	
Method of Treatment	
Recovery	
Potential Ore Bodies:	Trench #3: 100 ft x 42 in. x 40 ft deep

Summary:

Estimated Tonnage & Grade			
Proven	Probable	Possible	Speculative
Reserves	-	-	1150/0.45	-

Treatment Amenability: Custom flotation/cyanidation (10 tpd)

Remarks: Slight potential as open cut operation

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX C

SUMMATION: Area/Sub-Area: Rowan-Caviar-Atikwa Lakes

MDC#/Property: #177/ Maybrun Mine

Location: Atikwa Lake

Type of Occurrence:	
Ore Setting	Eight ore zones, qtz/carb veins
Host Rock	Mostly in pillow lavas
Mineralization	Cu-Au mineralization (Au w/Cp, Py, Po). Some Sb.
Exploration/Development:	
Surface	Trenching, 500+ ft (1951-55, Noranda)
Underground	Shaft to -298 ft. w/2 levels at 150 & 275 ft.
Geophys/Geochem.	w/3965 ft. drifting, x-cutting, & raising.
Diamond Drilling	96 DDH, 35,016 ft (1951-53); 113 DDH, 66,059 ft (1955-5 123 DDH, U/G; 27,675 ft.
Sampling & Testing:	
Sampling	Comprehensive from DD
Assays	Au assays in Au Zones aver. ± 0.18 oz.
Other Metals	Cu, Sb
Production History:	
Period/Tons Milled	1973-/varied production, ceased Dec. 1974
Method of Treatment	Flotation concentration
Recovery	-
Potential Ore Bodies:	B zone: open pit, 500'x160'x150' deep; then -200' & -25 Ross zones: U/G, 625'x12.5'x275' deep; then to -500' Bay zone: U/G, 600'x9.8'x150' deep; then to -300' Pot Hole Zone: U/G, 300'x7.6'x150' deep; then to -300'

Summary:

Estimated Tonnage & Grade

		Proven	Probable	Possible	Speculative
Reserves	Ross	-	-	179,000/0.20	146,000/0.20 (1.00%C
	Bay	-	-	73,500/0.18	73,500/0.18 (0.50% C
	Pot Hole	-	-	28,500/0.14	28,500/0.14 (1.41%C
	B Zone	-	1,000,000/0.03	312,500/0.03	312,500/0.03 (1.12% C

Treatment Amenability: On site, sulphide flotation concentration (500 tpd)
On site, heap leaching of B Zone ore + flot. conc.

Remarks: Good prospect for resumption of development & production.
B Zone: mineable by open pit to -150 ft; thence probably gloryhole U/G to -200 & -250 ft.

Ross Zones: shaft mining to -275 ft (present bottom level; thence to -500 ft.

Bay & Pot Hole Zones: declines to -150 ft; thence to -300 ft. subject to 10% - 15% dilution

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX C

SUMMATION: Area/Sub-Area: Rowan-Caviar-Atikwa Lakes

MDC#/Property: #189/ Monte Cristo Prospect

Location: S. shore of Rowan Lake

Type of Occurrence:	
Ore Setting	Discontinuous qtz. lenses; N65°E, vert; 600 ft. long
Host Rock	Chlorite schist in sheared qtz. porph.
Mineralization	Au
Exploration/Development:	
Surface	Nine trenches, approx. 350 ft. linear (1900)
Underground	Two shallow (?) shafts
Geophys/Geochem.	None recorded
Diamond Drilling	9 DDH, 5000 ft (1937)
Sampling & Testing:	
Sampling	Channels (1900): 0.21 oz.
Assays	Channels (1936): lower values
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Zone: 400'x15'x200' deep

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	100,000/0.15

Treatment Amenability: Custom, or portable, flotation/cyanidation (100-200 tpd

Remarks: Some prospect potential. Needs considerable work.
Could be developed by decline.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX C

SUMMATION: Area/Sub-Area: Rowan-Caviar-Atikwa Lakes

MDC#/Property: #208/ Noranda-Beggs Lake (Zahavy Mines Ltd.)

Location: Beggs Lake - Cameron Lake Area

Type of Occurrence:	
Ore Setting	No information
Host Rock	-
Mineralization	Au
Exploration/Development:	
Surface	Unknown
Underground	None
Geophys/Geochem.	None
Diamond Drilling	49 DDH,9576 ft(1960-72); 9 DDH,2101 ft (Noranda,1974)
Sampling & Testing:	
Sampling	1960 DD core: tr-0.26 oz; 1972 core,0.02-1.48 oz;
Assays	1974 core, 0.15-0.19 oz (one high assay, 0.34 oz/3.8')
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Arrowsmith (1972): surface to -350 ft & from -350 to -500 ft. Noranda's 1974 drilling difficult to correlate, values mostly low; appears holes not drilled deep enough to intersect ore zone.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	168,000/0.15	-
	-	-	-	72,000/0.15

(Assumes ore zone 1110' x 5.2' x 350' on dip)

Treatment Amenability: Portable flotation/cyanidation (200 tpd)

Remarks: Prospect has potential for considerable tonnage. Amenable to decline operation & shrinkage stoping.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX C

SUMMATION: Area/Sub-Area: Rowan-Caviar-Atikwa Lakes

MDC#/Property:	#255/Roy (Shingwak Lake) Prospect
Location:	SE end of Shingwak Lake, Rowan Lake Area
Type of Occurrence:	
Ore Setting	Lenticular qtz veins
Host Rock	in sheared porphyry in metavolcs. & metaseds.
Mineralization	v.g. w/Py, Cp
Exploration/Development:	
Surface	Trenched, 1899-1903
Underground	None
Geophys/Geochem.	None
Diamond Drilling	Unknown
Sampling & Testing:	
Sampling	Grab samples:
Assays	0.07 - 0.18 oz Au; 6.2%-0.23% Cu
Other Metals	Cu
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Ore zone: 250'x6.8' to -125 ft depth Cu content may be significant

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	18,000/0.12

Treatment Amenability: Custom flotation concentration + cyanidation (50 tpd)

Remarks: Qtz. occurs for 500-600 ft. on strike w/Sullivan and Monte Cristo showings. Has some prospect potential.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX C

SUMMATION: Area/Sub-Area: Rowan-Caviar-Atikwa Lakes

MDC#/Property: #310/ Violet (Empire) Mine

Location: Empire Lake, N. of Rowan Lake

Type of Occurrence:	
Ore Setting	Two qtz. veins striking N40°E & S75°E in shears
Host Rock	in metavolcs. near granite stock
Mineralization	Au, w/Py, Po
Exploration/Development:	
Surface	Open cut on vein (in 1902)
Underground	Two shafts, 12 & 15 ft.
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Selected grab from dump at N. shaft, 0.27 oz.
Assays	Selected grab from dump at S. shaft, 0.49 oz
Other Metals	
Production History:	
Period/Tons Milled	1902-08/ 300 tons milled averaged 0.50 pz.
Method of Treatment	Presumably stamps & amalgamation
Recovery	-
Potential Ore Bodies:	Mineable zone: 150 ft. x 4 ft to 75 ft. depth

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	3,750/0.25

Treatment Amenability: Custom flotation/cyanidation (10-20 tpd)

Remarks: Amenable to U/G decline or narrow open cut.

Information is sparse; requires exploratory work but property has some small tonnage potential.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX C

SUMMATION: Area/Sub-Area: Rowan-Caviar-Atikwa Lakes

MDC#/Property: #311/ Virginia Prospect

Location: Eliza Lake, NE of Caviar Lake

Type of Occurrence:	
Ore Setting	Qtz. vein (main), 750 ft x 3-4 ft plus two others
Host Rock	In felsic schist w/qtz. porph. dikes
Mineralization	Au w/Py, Cp
Exploration/Development:	
Surface	Three test pits (1898-1900)
Underground	Shaft at -60°E to 200 ft. Adit, 72 ft.
Geophys/Geochem.	Level at 100 ft; 144 ft XC through shear zone.
Diamond Drilling	None recorded
Sampling & Testing:	
Sampling	Said to be 100 ft width of mineralized schist
Assays	Shaft samples to 30 ft: 0.85-85.0 oz.
Other Metals	Shaft at 200 ft: 0.42 oz
	Test pit, 320 ft SW, 0.03-0.08 oz; 770 ft SW, 0.58 oz.
Production History:	
Period/Tons Milled	None. Mine closed, 1903
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	HW(?) zone: 750 ft x 3.5 ft. to -200 ft Shear zone: 500 ft x 100 ft to -200 ft (open pit) (in 0.05-0.10 oz. range) Narrow high grade zone: range 0.08-0.42 less 20% dilution, say, aver. 0.20 oz.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	-	(43,750/0.20)
	-	-	-	830,000/0.08

Treatment Amenability: Heap leaching

Remarks: Attractive but erratic values from meagre information. Assuming sheared porphyry is adequately mineralized, property has large tonnage potential for leaching operation w/open pit development. Needs exploratory drilling.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX C

SUMMATION: Area/Sub-Area: Rowan-Caviar-Atikwa Lakes

MDC#/Property: #312/ Wampum Lake Prospect

Location: N. of Newman Lake, S. of Rowan Lake

Type of Occurrence:	
Ore Setting	Nine qtz. veins reported in 2 parallel zones,
Host Rock	1000 ft. apart. Main zone, 500 ft. wide in schist,
Mineralization	strikes 106°, dip vert.
Exploration/Development:	
Surface	More than 300 ft. trenching (1940-41) E of shaft
Underground	Shaft to 190 ft, levels at 100 & 188 ft w/180 ft lateral
Geophys/Geochem.	Mag & EM (1968)
Diamond Drilling	35 DDH (prob. 1958)
Sampling & Testing:	
Sampling	Grab samples from trenches & 15,000 ton surface dump:
Assays	0.08 oz.
Other Metals	-
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	
Potential Ore Bodies:	No potential ore body indicated Surface dump could be treated by crushing & leaching

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	15,000/0/08	-

Treatment Amenability: Heap leaching

Remarks: Little exploration potential: grades appear low.
Approx. 1000 oz. Au might be recovered from leaching of dump.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX D

SUMMATION: Area/Sub-Area: Upper & Lower Manitou Lakes

MDC#/Property: #15/ Bee Hive Prospect

Location: Manitou Island, Lower Manitou Lake

Type of Occurrence:	
Ore Setting	two qtz. veins in shear zone (chlorite/sericite schist)
Host Rock	in qtz. monzonite. E-W ore zone, 800'x12'
Mineralization	v.g. w/Py N-W ore zone, 200'x 4.4'
Exploration/Development:	
Surface	Trenched (1897-98) for 900 ft (E-W zone), 200 ft (N-S zone)
Underground	None recorded, but old plans show a shaft on N-S zone
Geophys/Geochem.	None
Diamond Drilling	14 DDH (12 across ore zones)
Sampling & Testing:	
Sampling	Samples from trenches
Assays	E-W zone, 0.16 oz; N-S zone, 0.35 oz.
Other Metals	
Production History:	
Period/Tons Milled	None recorded
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	E-W zone: 800 ft.x12 ft. N-S zone: 200 ft.x4.4 ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	126,000/0.16	-	-
	-	-	7500/-.35	-

Treatment Amenability: Flotation/cyanidation (portable mill)

Remarks: Good prospect for moderate tonnage at good grades.
Adjoins and/or is part of #172/ Manitou Island property.
Patented ground.
Mineable underground by decline.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX D

SUMMATION: Area/Sub-Area: Upper & Lower Manitou Lakes

MDC#/Property: #18/ Big Master Mine (former producer)

Location: Upper Manitou Lake

Type of Occurrence:	
Ore Setting	Four qtz. veins, all in shears, strike N35°E
Host Rock	Qtz/sericite schist assoc. w/qtz. porph.
Mineralization	Au in sulphides (Py)
Exploration/Development:	
Surface	Trenching: W ore zone (vein #3),220'x2'; E ore zone (vein#4),270'x5'
Underground	Three vert. shafts to 638',99',52';
Geophys/Geochem.	6 levels w/3956' drifting, 1109'XC
Diamond Drilling	35,851' surface, 980' U/g
Sampling & Testing:	
Sampling	Milling of 14,470 tons (1902-05):
Assays	0.18 oz. Au, 0.13 oz. Ag
Other Metals	None reported
Production History:	
Period/Tons Milled	1902-05/14,470 tons
Method of Treatment	Unreported, but probably stamps + cyanidation
Recovery	<70%
Potential Ore Bodies:	#3 vein to -150 ft; 200'x12'x150' interval #3 vein to -150 ft; 40'x12'x150' interval #4 vein to -200 ft; 270'x 6'x 75' interval surface dump: 1000 tons (est.)

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves		25,000/0.48	1000/0.25	- surface dump
		4,500/0.58	-	-
		8,500/0.21	-	-

Treatment Amenability: Flotation/cyanidation

Remarks: Estimates are after 20% dilution allowance. Exploration was adequate to 600 ft. depth (discontinuous lenses in 30'-40' wide shear zone). Mine closed in 1948 when surface plant destroyed by fire. Patented since 1975.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX D

SUMMATION: Area/Sub-Area: Upper & Lower Manitou Lakes

MDC#/Property: #65/ Detola Prospect (Tecumseh GM)

Location: Kabagukski Lake

Type of Occurrence:	
Ore Setting	Seven qtz/calcite veins
Host Rock	Andesitic volcs. w/porph. diabase, chlor.schist & graphite
Mineralization	Au in Py (?)
Exploration/Development:	
Surface	Considerable stripping & trenching (1906-11, 1936-37, 1970)
Underground	Shaft to 255' w/3 levels: 1372' drifting
Geophys/Geochem.	None reported
Diamond Drilling	None reported
Sampling & Testing:	
Sampling	Grab samples (1933):
Assays	0.09 oz.
Other Metals	None
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Zone: 85 ft. x 6 ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	-	10,000/0.09
	-	-	-	5,000/0.09, dump

Treatment Amenability: Possibly heap leaching (on property), or flot/cyan. treatment in custom mill if Au is not leachable.

Remarks: Some potential as prospect for exploration & development.
Data are sparse.
Needs metallurgical study.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX D

SUMMATION: Area/Sub-Area: Upper & Lower Manitou Lakes

MDC#/Property: #67/ Dryden-Red Lake Prospect

Location: Lower Manitou Lake

Type of Occurrence:	
Ore Setting	Qtz. veins up to 1 ft. wide in 10'-20' shear zone
Host Rock	Andesite & chloritic schist
Mineralization	
Exploration/Development:	
Surface	Stripped, test-pitted, & trenched for 300 ft.
Underground	None
Geophys/Geochem.	None
Diamond Drilling	None Ore zone: 300 ft. x 6 ft.
Sampling & Testing:	
Sampling	Chip samples over 4' in pit #1, over 8' in pit #2
Assays	0.04 - 0.55 oz.
Other Metals	None reported
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Ore zone: 300 ft. x 6 ft, to (say) -200 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	30,000/0.20

Treatment Amenability: Flotation/cyanidation (custom mill)

Remarks: Data are sparse but indications of fair grades.
Fair potential for exploratory drilling below 200 ft. depth.
Can be developed by decline.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX D

SUMMATION: Area/Sub-Area: Upper & Lower Manitou Lakes

MDC#/Property: #76/ Elora (Jubilee) Mine (past producer)

Location: Upper Manitou Lake

Type of Occurrence:	
Ore Setting	Qtz. veins, lenses, stringers in schisted shear zone
Host Rock	Contact of acidic/basic metavolcs.
Mineralization	v.g. w/nonauriferous Py
Exploration/Development:	
Surface	Numerous trenches (1897-98)
Underground	Shaft (1898) to 75' w/88' lateral on 48' level
Geophys/Geochem.	Shaft (1935-38) to 175' w/1414' lateral on 165' level
Diamond Drilling	4275 ft.(1935-38)
Sampling & Testing:	
Sampling	U/G mineralization: 649'x10.6' w/0.134 oz.
Assays	Ore shoot, 150'x6.0' w/0.185 oz.
Other Metals	Bulk sample (1936) of 1909 lb. assayed 0.25 oz. Au, 0.15 oz. Ag
Production History:	
Period/Tons Milled	1936-39/13.766 tons milled (0.10 oz Au,0.02 oz. Ag)
Method of Treatment	Stamps + amalgamation plus flotation/cyanidation
Recovery	Reported as 96%
Potential Ore Bodies:	Above 165-ft level: ore shoot 150'x6' Mineralized zone, 350'x10' Below 165 ft, to -500 ft: same assumption

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves (Above 165-ft level)		7500/0.18	35,000/0.13	-
(Below 165-ft level to -500 ft)	-	6000/0.18	180,000/0.13	-
	-	-	-	5000/0.10 surface dump

Treatment Amenability: Flotation/cyanidation of U/G ore (custom milling)
Heap leaching of surface dump material

Remarks: Good potential for exploration below bottom level (175-500 ft)
Most of old records missing. Former production believed to be from surface open cut.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX D

SUMMATION: Area/Sub-Area: Upper & Lower Manitou Lakes

MDC#/Property: #88/ Frenchman Island Occurrence

Location: Upper Manitou Lake

Type of Occurrence:	
Ore Setting	Three qtz. veins; one is 525'x1'-8' wide (aver. 3 ft)
Host Rock	Granodiorite
Mineralization	Au w/sulphides (Py)
Exploration/Development:	
Surface	Unknown
Underground	-
Geophys/Geochem.	-
Diamond Drilling	-
Sampling & Testing:	
Sampling	Chip samples over 3 ft. widths
Assays	0.13 oz: zone 250' x 3'
Other Metals	none reported
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Zone: assumed 250 ft.x 3 ft.(mineralized)

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	2500/0.13

Treatment Amenability: Flotation concentrate w/10-25 tpd portable mill. Custom cyanidation of concentrates

Remarks: Mine open cut w/Air-Trac & backhoe to 40 ft. depth
Sparse data. Fair potential for DD exploration.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX D

SUMMATION: Area/Sub-Area: Upper & Lower Manitou Lakes

MDC#/Property: #149 Laurentian Mine (former producer, 1906-09)

Location: Upper Manitou Lake

Type of Occurrence:	
Ore Setting	Four qtz. veins (only one mined): qtz. bands (4") in 20 ft. shear
Host Rock	
Mineralization	v.g. w/Py (continuation of Jubilee (Elora) vein)
Exploration/Development:	
Surface	Unrecorded (no old records)
Underground	Shaft at -80° to 415 ft. Winze from -80' to -480'
Geophys/Geochem.	Four levels (80',200',300',400'). 1740' drifting, 591' XC, 544' raising
Diamond Drilling	Unknown
Sampling & Testing:	
Sampling	Winze level at -473' assayed 0.24 oz. uncut over 10' for 80'
Assays	Milling averaged 0.41 oz.
Other Metals	None reported
Production History:	
Period/Tons Milled	1906-09/19,950 tons
Method of Treatment	Stamps + amalgamation
Recovery	<80%. Recovered 8100 oz.(0.41 oz/ton), above 400-ft level
Potential Ore Bodies:	Winze level (400'-480'): 40 ft.x10ft.x80ft interval Below winze bottom to -575 ft: 600 ft.x10 ft.(possible

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	2650/0.25	48,000/0.25	
	-	-	-	20,000/0.10 surface dump

Treatment Amenability: Flotation/cyanidation (custom mill)
Heap leaching of dump material (at site)

Remarks: Excellent prospect for DD & U/G exploration, Considerable tonnage potenti w/grades of 0.20-0.25 oz. Developed vein is unexplored below 400 ft. level. Ore shoot on 4th level is 350'x 6' (aver.)
Patented 1975.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX D

SUMMATION: Area/Sub-Area: Upper & Lower Manitou Lakes

MDC#/Property: #172/ Manitou Island (Gaffney Mine)

Location: Manitou Island in Lower Manitou Lake

Type of Occurrence:	
Ore Setting	Mineralized granite dike & qtz. veins
Host Rock	Dikes in greenstone & chlorite schist
Mineralization	Au w/sulphide replacement of porph. dike
Exploration/Development:	
Surface	Stripping, trenching, test-pitting. Trenching over 900'x15'-55'
Underground	None
Geophys/Geochem.	None recorded
Diamond Drilling	1506' (1934),1752'(zone 1400'x15'x200' depth),2146' (1944)
Sampling & Testing:	
Sampling	Mineralized #1 zone: 300' x 24'
Assays	Pit#1,12' chip,1.48 oz; Pit#2,6' chip,0.54 oz; grabs (Py), 0.05, 0.11 oz; 14' DD core, 0.40 oz; Hole 5, 5' core, 0.30 oz: Hole 6,6' core, 0.40 oz; Hole 12, 11' core, 0.50 oz. All others <0.28 oz.
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	From surface drilling indications: #1 zone: 190,000 tons to -310 ft.(probable) 341,500 tons to -450 ft.(possible) #2 zone: 90,000 tons to -150 ft.(possible)

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	190,000/0.21	-	-
	-	-	341,500/0.21	-
	-	-	90,000/0.25	-

Treatment Amenability: Conventional flotation/cyanidation with fixed 300 tpd mil

Remarks: Excellent prospect w/complete data. Drilling values (1936 & 1943-45) were erratic but appear to aver. ±0.21 oz. (in lenses) in strong shear. Should persist in depth as en echelon lenses up to 300 ft. long x 10 ft. wide. Requires u/g drilling. Ideal for decline development.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX D

SUMMATION: Area/Sub-Area: Upper & Lower Manitou Lakes

MDC#/Property: #229/ Petrie Occurrence

Location: Lower Manitou Lake

Type of Occurrence:	
Ore Setting	Qtz. vein, 250 ft. long x 4-5 ft. wide
Host Rock	Gneiss (?) & chlorite schist
Mineralization	
Exploration/Development:	
Surface	Vein traced 250 ft. Trenched 24'x 8' deep
Underground	Shaft to 60 ft. (1899-1900)
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	13 samples near shaft:
Assays	0.096-0.33 oz. (aver. 0.21 oz)
Other Metals	none reported
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Zone (open cut): 250 ft. x 4.5 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	3,750/0.21	surface to -40'
	-	-	-	7750/0.21 to -125'

Treatment Amenability: Flotation/cyanidation by custom milling

Remarks: Possibility of mining open cut to -40 ft. w/air-trac & backhoe.
Underground below 40 ft. to -125 ft, by decline.
Some exploration potential

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX D

SUMMATION: Area/Sub-Area: Upper & Lower Manitou Lakes

MDC#/Property: #254/ Royal Sovereign (Neepawa Mines, 1896-1903)

Location: NW shore of L. Manitou Lake.

Type of Occurrence:	
Ore Setting	Zone of qtz. veins & stringers (up to 50' wide) in
Host Rock	chlorite/sericite schist. (Qtz. veins up to 1' wide)
Mineralization	v.g. w/Py, Cp in shear. Zone may be 1500' length.
Exploration/Development:	
Surface	Stripping
Underground	Shaft,-75° to 80 ft. Adit intersects vein near shaft.
Geophys/Geochem.	Shaft,-75° to 105 ft. w/2 levels (65', 100') & 121' drifting
Diamond Drilling	
Sampling & Testing:	
Sampling	Payzone in shaft, 16' wide: 0.28-7.78 oz.
Assays	Chip over 6' in adit: 0.005 oz.
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	-	3600/0.28 (below 100' level)

Treatment Amenability: Either flot/cyanidation (custom mill) or heap leach depending on grade

Remarks: Some potential as prospect. Very little exploration done. There could be considerable tonnage at low grade (0.05 oz. -0.15 oz.)

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION
RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX D

SUMMATION: Area/Sub-Area: Upper & Lower Manitou Lakes

MDC#/Property: #266/ Selby Lake Mine

Location: Upper Manitou Lake

Type of Occurrence:	
Ore Setting	Qtz. lenses in 8' wide shear zone, trends NE
Host Rock	Contact of basic metavolcs. & felsite dike
Mineralization	v.g.
Exploration/Development:	
Surface	40 trenches on vein; 1200' trending over 450' length
Underground	Two shafts (1904). One shaft (1936?) to 265'
Geophys/Geochem.	w/2 levels at 125' & 250', 1115' lateral
Diamond Drilling	3000' surface, 3000' u/g
Sampling & Testing:	
Sampling	Ore shoot reported 318' x 9'
Assays	0.37 oz.
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	U/G, possible; 300 ft x 8 ft to -250 ft; speculative, to -400 ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	22,500/0.37	-
	-	-	-	18,000/0.37

Treatment Amenability: Gravity separation + amalgamation + cyanidation
Portable plant. (Mostly free milling)

Remarks: Potential prospect. Needs more lateral work and at depth to substantiate reserves and grade.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX D

SUMMATION: Area/Sub-Area: Upper & Lower Manitou Lakes

MDC#/Property: #285/ Swede Boys (Merrill Claim)

Location: Upper Manitou Lake

Type of Occurrence:	
Ore Setting	Qtz. vein, 1065' x 18", plus stringers in shear zone:
Host Rock	strikes N30°E, 65°SE
Mineralization	v.g. w/Py, Cp
Exploration/Development:	
Surface	Trenching SW of discovery zone: 90' x 10' wide
Underground	None
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Chip samples over 3 ft, in vein: 0.16 oz.
Assays	Grab samples over 6"-18": 4.64 oz.
Other Metals	None
Production History:	
Period/Tons Milled	None Worked in 1895 & 1932
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Surface to -40 ft (narrow open cut)

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	1000/0.15

Treatment Amenability: Portable 19 tpd, gravity + amalgamation mill plus cyanidation depending on ore characteristics.

Remarks: Some porential for small open cut development w/Air-Trac + backhoe.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX D

SUMMATION: Area/Sub-Area: Upper & Lower Manitou Lakes

MDC#/Property: #316/ Washeibemaga Lake Prospect

Location: E. of Upper Manitou Lake

Type of Occurrence:	
Ore Setting	Three zones of qtz. veins and lenses in shears. Ore
Host Rock	shoots are related to qtz. porph. intrusives. Strike NW-SE
Mineralization	v.g. w/Py,Gn #1 zone, 250'+ #3 zone, 190'x 5.2' #12 zone, 50'x 8'
Exploration/Development:	
Surface	Considerable stripping & trenching
Underground	None
Geophys/Geochem.	Geophys. svys. 1973-74, by W.G.Wahl Ltd.
Diamond Drilling	At least 7 DDH
Sampling & Testing:	Pelham, 1938-39; New Calumet, 1963-73; W.G.Wahl,1973-74
Sampling	#12 zone: varies up to 5.62 oz. (aver. 0.29 oz.)
Assays	# 3 zone: 0.28 oz.
Other Metals	Composite length, 560'x 4': 0.37 oz. W.G. Wahl (37 chip + selected grabs) substantiate previous assays, 0.28 oz.-5.08 oz.
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Eight ore shoots defined, varying in width from 4 ft. to 8 ft. and inlength from 50 ft. to 250+ ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	52,250/0.37 (composite of 8 ore shoots)	52,250/0.37

Treatment Amenability: Flotation/cyanidation w/semi-portable plant, 50-100 tpd

Remarks: Good prospect for additional drilling to 500 ft. or deeper.
Mineable U/G by shaft or decline
Property is not easily accessible from Manitou Lakes but could be reached by new construction from new Manitou Access road.
Patented 1975.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX E

SUMMATION: Area/Sub-Area: Eagle & Wabigoon Lakes

MDC#/Property: #26/ Bonanza Mine (Contact Bay Mine)

Location: Van Horne Twp. Dryden Area

Type of Occurrence:

Ore Setting: Discontinuous qtz. lenses, 2" - 20" wide, strike NE,

Host Rock: dip 75°N in basic volcs. & rhyolite tuff intruded by porph dikes

Mineralization:

Exploration/Development:

Surface: Minor trenching & test-pitting (1913-18)

Underground: Shaft, -80° to 268 ft. then vert. to 333 ft; 3 levels

Geophys/Geochem.: at 80, 170, 268 ft. w/1091 ft. lateral development.

Diamond Drilling: None reported

Sampling & Testing:

Sampling: Over ± 600 ft: 0.20 oz.

Assays: Mill test, 1206 tons (1920-23): 0.20 oz. Au, 0.07 oz Ag

Other Metals: None

Production History:

Period/Tons Milled: 1920-23/ 1206 tons (mill test)

Method of Treatment: Unknown

Recovery: Grade 0.20 oz. Au, 0.07 oz. Ag (Rec ± 240 oz.)

Potential Ore Bodies: Assumed: 600'x 1.5' x 300' depth (possible to 450' depth (speculative)

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	22,500/0.20	
	-	-	-	11,250/0.20

Treatment Amenability: Portable flotation cyanidation (50 tpd)

Remarks: Sparse data, but fairly reliable. Fair prospect for small to moderate tonnage at acceptable grade. May be liable to wallrock dilution (10% - 15%)

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX E

SUMMATION: Area/Sub-Area: Eagle & Wabigoon Lakes

MDC#/Property: #72 Eldorado Prospect

Location: Eagle Lake

Type of Occurrence:	
Ore Setting	Siliceous shear zone, blue qtz. blebs w/Au in Py
Host Rock	Granite
Mineralization	Mineralization in fissure, 500 ft x 3-5 ft (aver.4.5 ft) Strikes N70°E
Exploration/Development:	
Surface	Open cut in granite, 70 ft. long x 20 ft. deep
Underground	Shaft at -73° to 140 ft; 2 levels (70,120 ft), 178 ft. lateral
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Mill test on 30 tons (1904)
Assays	0.47 oz.
Other Metals	
Production History:	
Period/Tons Milled	1900-04/ mill test on 30 tons
Method of Treatment	Unknown
Recovery	Unknown, but indicated grade 0.47 oz./ton
Potential Ore Bodies:	Zone: 500' x 4.5' x 120' depth (possible to 250' depth (speculative)

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	6750/0.47	
	-			40,000/0.25

Treatment Amenability: Portable or custom, flotation/cyanidation (25 tpd)

Remarks: Some potential as prospect

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX E

SUMMATION: Area/Sub-Area: Eagle & Wabigoon Lakes

MDC#/Property: #83/ Fornieri Prospect

Location: Fornieri Bay, Eagle Lake

Type of Occurrence:	
Ore Setting	Irregular qtz. stringers & masses w/Py, Po, Cp, Bi & v.g.
Host Rock	Qtz. porph. dike
Mineralization	
Exploration/Development:	
Surface	No record
Underground	No record
Geophys/Geochem.	-
Diamond Drilling	-
Sampling & Testing:	
Sampling	Sampled (?) across 12 ft. width in qtz. porph. dike:
Assays	0.19 oz.
Other Metals	Possibly Cu, Bi, Ni
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Possible open cut: 300 ft x 4 ft, to -50 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	5000/0.19

Treatment Amenability: Custom milling, flotation/cyanidation

Remarks: Some potential. Requires exploratory drilling.
May be amenable to open cut excavation to 50 ft. depth

SOURCE OF INFORMATION: RESIDENT GEOLOGISTS' FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX E

SUMMATION: Area/Sub-Area: Eagle & Wabigoon Lakes

MDC#/Property: #109/ Golden Eagle Prospect

Location: Eagle Lake

Type of Occurrence:	
Ore Setting	No record of geological setting
Host Rock	-
Mineralization	-
Exploration/Development:	
Surface	No records
Underground	Shaft to 70 ft (1903-06) w/160 ft. drifting
Geophys/Geochem.	-
Diamond Drilling	-
Sampling & Testing:	
Sampling	Mill test on 29 tons (1903)
Assays	0.59 oz.
Other Metals	-
Production History:	
Period/Tons Milled	1903-06/ mill test on 29 tons
Method of Treatment	
Recovery	0.59 oz./ton
Potential Ore Bodies:	speculative: 160' x 5.5' x 70' depth

Summary:

Estimated Tonnage & Grade			
Proven	Probable	Possible	Speculative
Reserves	-	-	-	5000/0.25 (Grade assumed, cut from 0.59)

Treatment Amenability: Probably portable or custom flotation/cyanidation

Remarks: Few records available, hence much uncertainty, but property appears to have some small tonnage potential at a good grade.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX E

SUMMATION: Area/Sub-Area: Eagle & Wabigoon Lakes

MDC#/Property: #119/ Grimsby Prospect

Location: Van Horne Twp. Dryden Area

Type of Occurrence:	
Ore Setting	Qtz. vein, 2.5 ft. strikes N12°E, dip N, traced 0.5 mi.
Host Rock	altered diabase
Mineralization	Au assoc. w/Py
Exploration/Development:	
Surface	Unknown
Underground	Two shafts, 20 ft. & 85 ft.
Geophys/Geochem.	Unknown
Diamond Drilling	DD, 500 ft (1940)
Sampling & Testing:	
Sampling	Mill test, 80 tons:
Assays	0.42 oz.
Other Metals	
Production History:	
Period/Tons Milled	Approx. 1940/ 80 ton mill test
Method of Treatment	-
Recovery	0.42 oz/ton
Potential Ore Bodies:	Assumed: 600 ft x 4 ft, to -40 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	8,000/0/42 to -40 ft

Treatment Amenability: Custom or portable flotation/cyanidation (25 tpd)

Remarks: Only slight potential. Might be operated by open cut methods w/Air-Trac drilling.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX E

SUMMATION: Area/Sub-Area: Eagle & Wabigoon Lakes

MDC#/Property: #152/ Little Jumbo Prospect

Location: Van Horne Twp. Dryden Area

Type of Occurrence:	
Ore Setting	Qtz. stringers assoc. w/18 ft. wide dike of
Host Rock	schist in agglomerate.
Mineralization	Au (high grade)
Exploration/Development:	
Surface	Unknown
Underground	Shaft to 55 ft.; 20 ft. x-cutting
Geophys/Geochem.	Unknown
Diamond Drilling	Unknown
Sampling & Testing:	
Sampling	Old reports: 0.78 oz.
Assays	Grab sample: 1.00 oz. (may not be representative)
Other Metals	(for estimation purposes, grade is cut to 0.50 oz.)
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Speculative: 625 ft. x 18 ft to -50 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	46,800/0.50

Treatment Amenability: Custom, or portable jig/amalgamation or flotation/ cyanidation (75-100 tpd)

Remarks: Good prospect potential for drilling & U/G development. Could be mined by shaft or decline.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX E

SUMMATION:

Area/Sub-Area: Eagle & Wabigoon Lakes

MDC#/Property: #170/ Magdalena Prospect

Location: Eagle Lake

Type of Occurrence:	
Ore Setting	Mineralized shear zone strikes E-W, 2000 ft x 100 ft
Host Rock	In pillow lavas at contact w/qtz. porph. dikes
Mineralization	v.g. w/Py., Po, Cp
Exploration/Development:	
Surface	No specific record
Underground	None
Geophys/Geochem.	Some geophysics (1948-51)
Diamond Drilling	4495' (1948-51)
Sampling & Testing:	
Sampling	Old trench, 15 ft. wide, 0.30 oz. Channels over 60 ft 0.145 oz.
Assays	Channels over 40 ft, 0.146 oz. channels over 25 ft, 0.146 oz.
Other Metals	Possibly Cu, Ni
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Potential open pit area: 500 ft x 60 ft, to -150 ft. (poss.)
	Zone #1, to -300 ft (spec.)

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	375,000/0.15	
	-	-	- (All in Zone #1)	375,000/0.15

Treatment Amenability: Fixed or semi-portable flotation/cyanidation (up to 500 tpd) or heap leaching if grade proves lower than indicated.

Remarks:

Good potential for large scale, low grade, open pit operation w/consistent grades. Needs additional exploration along strike.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX E

SUMMATION: Area/Sub-Area: Eagle & Wabigoon Lakes

MDC#/Property: #180/ Meridian Bay Prospect

Location: Eagle Lake

Type of Occurrence:	
Ore Setting	Vein in shear 30 ft. wide, strikes N65°E, steep dip
Host Rock	In diabase/gabbro
Mineralization	Au w/Py, Cp, Po (0.5-1.0% Ni, Cu, & Ag)
Exploration/Development:	
Surface	Three trenches (1910); vein stripped for 200 ft;
Underground	None Test pit, 25 ft x 10 ft.deep
Geophys/Geochem.	None reported
Diamond Drilling	None
Sampling & Testing:	
Sampling	Grab samples (1907)
Assays	0.20-0.45 oz. Au, 3.0 oz. Ag, 0.9% - 4.22% Cu
Other Metals	Au, Ag, Cu, Ni.
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Zone: 200 ft x 6 ft, to -100 ft. depth

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	10,000/0.30 oz.Au, 3.0 oz.Ag,2.5% Cu

Treatment Amenability: Portable, flotation concentration mill (50 tpd) and custom treatment of concentrates.

Remarks: Some prospect potential in a zone 200 ft x 6 ft x 100 ft deep but deposit may be larger than data indicate. Needs more exploration. Could be exploited by shaft or decline. (Assays need to be substantiated).

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX E

SUMMATION: Area/Sub-Area: Eagle & Wabigoon Lakes

MDC#/Property: #234/ Pioneer Island Prospect

Location: Eagle Lake

Type of Occurrence:	
Ore Setting	Qtz. vein in zone 400 ft. long, 1-5 ft wide, gossan on surface panned Au - assoc. w/granite & traprock
Host Rock	
Mineralization	Au w/Py, Cp
Exploration/Development:	
Surface	Unknown
Underground	Shaft to 80 ft; 160 ft drifting on 70 ft level
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Exploitable zone: 160 ft x 2.5 ft x 80'
Assays	No assays reported (1938)
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Zone: 160 ft x 2.5 ft, to -40 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	1250/ ?

Treatment Amenability: Custom flotation/cyanidation

Remarks: Slight potential. No grades given. Might be mined as narrow open cut to 40 ft. depth.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX E

SUMMATION: Area/Sub-Area: Eagle & Wabigoon Lakes

MDC#/Property: #283/ Swanson (Morning Star) Prospect

Location: Eagle Lake

Type of Occurrence:	
Ore Setting	Small veinlets in qtz. zone, 8 in -2 ft wide, strikes E-W
Host Rock	Highly schisted and altered chloritic zone
Mineralization	
Exploration/Development:	
Surface	Several pits over a 200-ft length of zone (1938)
Underground	Shaft to 55 ft.
Geophys/Geochem.	None
Diamond Drilling	Four X-Ray DDH w/v.g. intersections (Pioneer GML)
Sampling & Testing:	
Sampling	veinlets, 1.00 oz.
Assays	ODM sampling, 1.00 oz.
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Possibly 200 ft x 2 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	1320/0.50

Treatment Amenability: Custom milling by flotation/cyanidation or portable amalgamation if highgrade persists.

Remarks: Mineable by shallow open cut but additional drilling exploration may indicate shaft or decline potential. Good grades suggested from sparse data.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX F

SUMMATION:

Area/Sub-Area: Dinorwic-Dyment Area

MDC#/Property: #3/ Alto-Gardner Prospect

Location: MacFie Twp.

Type of Occurrence:	
Ore Setting	Qtz veins, lenses, & stringers in shear zone; N45°E,ver
Host Rock	Assoc. w/qtz. porphy.intrusive at contact w/greenstone schist
Mineralization	v.g. w/Py, Cp, Po
Exploration/Development:	
Surface	Aggregate 1500 ft. of trenching (1937-41)
Underground	None
Geophys/Geochem.	None
Diamond Drilling	382 ft. in 2 DDH
Sampling & Testing:	
Sampling	Grab samples over 650 ft, 0.37 oz. over 13 ft. width
Assays	Grab samples over 200 ft. width 24 ft, 0.13 oz.
Other Metals	Possibly Pt, W.
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Two ore shoots: 240' x 4' x 120' deep 100' x 4.8' x 50' deep

Summary:

Ore zones, 5-20 ft thick; aver. width 4.5 ft. to -100f (possible) & -300 ft(spe

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	24,375/0.20	- surface to -100 ft
	-	-	-	48,750/0.15 to-300 f
	-	-	11,600/0.18	- Two ore shoots

Treatment Amenability: Custom milling w/flotation/cyanidation (50 tpd)

Remarks: Data are sparse, but potential indicated to at least 300 ft. depth. Requires exploratory drilling, sampling, & testing. Could be mined by decline. Values are erratic.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX F

SUMMATION: Area/Sub-Area: Dinorwic-Dyment Area

MDC#/Property: #19/ Big Ruby Prospect

Location: Dinorwic Lake, Southworth Twp.

Type of Occurrence:	
Ore Setting	Qtz. vein, 6 ft. wide, interbedded w/slate (chlorite schist)
Host Rock	
Mineralization	
Exploration/Development:	
Surface	Trenching, 1898
Underground	Shaft to 30 ft.
Geophys/Geochem.	None recorded
Diamond Drilling	None recorded
Sampling & Testing:	
Sampling	Shaft assays: 1.00-82 oz. Also native Cu
Assays	Inferred 0.50 oz. for estimation purposes
Other Metals	
Production History:	
Period/Tons Milled	No production
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Inferred ore zone: 100 ft x 6 ft, to -100 ft

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	1500/0.50	(to -30')
	-	-	-	3500/0.50 (to -100'

Treatment Amenability: Custom or portable, flotation/cyanidation (10-20 tpd)

Remarks: Good prospect for drilling to test length, depth & grade. Might be mined to -30 ft by open cut w-Air/Trac, thence decline.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX F

SUMMATION: Area/Sub-Area: Dinorwic-Dyment Area

MDC#/Property: #38/Calder-Bousquet (Eclund GML)

Location: Troutfly Lake, Laval Twp.

Type of Occurrence:	
Ore Setting	Numerous mineralized qtz/felds. porph. dikes, trend NE,
Host Rock	Up to 50 ft. wide, cutting volcs.
Mineralization	Au w/Py, Gn, Cp in cross fractures
Exploration/Development:	
Surface	Not recorded
Underground	None
Geophys/Geochem.	None
Diamond Drilling	11 DDH, 1101 ft (1950)
Sampling & Testing:	
Sampling	Grab sample, 0.12 oz. Au
Assays	Drill core; best assay 0.27 oz Au } aver. 0.15 oz.
Other Metals	WO_3 reported
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Assumed zone: 100 ft x 50 ft to -100 ft (indicated) -200 ft (speculative)

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	41,500/0.15

Treatment Amenability: Custom or portable mill, flot/cyanidation (50 tpd)

Remarks: Prospect potential for open pit

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KE..O..A

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX F

SUMMATION: Area/Sub-Area: Dinorwic-Dyment Area

MDC#/Property: #58/ Cox Lake Occurrence

Location: Kawashegamuk Lake

Type of Occurrence:	
Ore Setting	Qtz. vein up to 8 ft. wide in shear zone, traced 300 ft
Host Rock	Hornblende/biotite granite gneiss
Mineralization	Au w/Py
Exploration/Development:	
Surface	Unknown
Underground	None
Geophys/Geochem.	None
Diamond Drilling	Unknown
Sampling & Testing:	
Sampling	-
Assays	No assays available
Other Metals	-
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Insufficient information

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	30,000/?

Treatment Amenability: Unknown

Remarks: Very little information, but may have some tonnage potential.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX F

SUMMATION: Area/Sub-Area: Dinorwic-Dyment Area

MDC#/Property: #193/ McCracken Occurrence

Location:

Type of Occurrence:	
Ore Setting	Qtz. vein system, trends E-W, dip vert.
Host Rock	Greenstone
Mineralization	Au w/galena
Exploration/Development:	
Surface	Several pits, trenching
Underground	Two shafts, 20& 28 ft (1902)
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Grab samples in trenches; tr -0.24 oz.
Assays	Other grabs: 0.19 oz (aver.)
Other Metals	Pb
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Assumed ore zone, 190 ft. x 4 ft, to 40 ft. depth

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	25,00/0.20

Treatment Amenability: Custom flotation/cyanidation (15 tpd)

Remarks: Slight potential for narrow open cut w/Air-Trac + backhoe (three-month operation).

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KEMORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX F

SUMMATION: Area/Sub-Area: Dinorwic-Dyment Area

MDC#/Property: #198/ McLean Syndicate

Location: Melgund Twp - Dyment Area

Type of Occurrence:	
Ore Setting	Composite veins, lenses, stringers trend E-W, dip 40°-70°N
Host Rock	in shear zone in metavolcs w/qtz/felds sills or dikes
Mineralization	Au w/Py, Mo
Exploration/Development:	
Surface	Trenched for 1200 ft.
Underground	One old shaft
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Grab samples from trenches (1943): 0.09 - 0.17 oz.
Assays	-
Other Metals	Mo
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Assumed zone: 1200 ft x 5 ft wide, to 25 ft depth

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	12,500/0.12

Treatment Amenability: Custom flotation/cyanidation (25 tpd)

Remarks: Some potential for shallow (25 ft) open cut w/Air-Trac

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX F

SUMMATION: Area/Sub-Area: Dinorwic-Dyment Area

MDC#/Property: #226/Pathfinder Syndicate

Location: Melgund Twp - Dyment Area

Type of Occurrence:	
Ore Setting	No information available
Host Rock	-
Mineralization	-
Exploration/Development:	
Surface	Test-pit, 20 ft. deep
Underground	Shaft to 20 ft. Small surface dump
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Shaft samples (12): 0.43 oz
Assays	Dump sample: 0.43 oz.
Other Metals	Selected sample near shaft: 1.14 oz. over 3.5 ft.
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Assume zone (minimum): 100 ft x 4 ft

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	1200/0.43

Treatment Amenability: Probably custom flotation/cyanidation (10 tpd)

Remarks: Small, highgrade occurrence suitable for Air-Trac open cut to 40 ft. depth

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILE, KENORA

APPENDIX F

SUMMATION:	Area/Sub-Area:
MDC#/Property:	#232/ Pidgeon Occurrence
Location:	Melgund Twp - Dyment Area
Type of Occurrence:	
Ore Setting	Two qtz. lenses, 1 in-1 ft x 1320 ft; N41°E, vert.
Host Rock	in qtz/carb. zone, 5-6 ft wide in sheared, carbonatized
Mineralization	chlorite/sericite schist striking N70 E, dip vert. carries v.g.
Exploration/Development:	
Surface	Nine trenches, total length over 1320 ft.
Underground	Shaft to 20 ft.
Geophys/Geochem.	None
Diamond Drilling	14 DDH (1959)
Sampling & Testing:	
Sampling	Trenches: 0.01-2.95 oz. (erratic)
Assays	Grab from dump: tr
Other Metals	-
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Possibly 1300 ft x 5.5 to, say to -100 ft. depth

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	60,000/0.20

Treatment Amenability: Custom flotation/cyanidation

Remarks: Fair prospect for exploratory drilling and sampling to test for average grade

Might be mineable by decline

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX F

SUMMATION: Area/Sub-Area: Dinorwic-Dyment Area

MDC#/Property: #230/ Pidgeon (Dyment Gp.) Occurrence

Location: Hyndman Twp - Dyment Area

Type of Occurrence:	
Ore Setting	Qtz. vein in shear zone, strikes 327°, dip unknown
Host Rock	At contact of hornblende diorite & metavolcs.
Mineralization	Mineralized zone 400 ft x 10-15 ft wide Au w/Po, Cp (Ni, Cu values)
Exploration/Development:	
Surface	Trenching for 1250 ft (1966)
Underground	None
Geophys/Geochem.	None
Diamond Drilling	8 DDH (Maverick Mines & Oils, 1967
Sampling & Testing:	
Sampling	Best drill core assays: 0.77% Cu, 0.64% Ni, over 10 ft
Assays	0.90% Cu, 0.68% Ni over 12 ft. Au: 0.06-0.08 oz.
Other Metals	Cu, Ni
Production History:	
Period/Tons Milled	No production
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Assumption: potential zone, 400 ft x 12.5 ft, to -200 f

Summary:

Estimated Tonnage & Grade			
Proven	Probable	Possible	Speculative
Reserves	-	-	-	83,000/0.06 to -200 ft.

Treatment Amenability: Heap leaching and/or portable flotation/cyanidation (100 tpd)

Remarks: Potential for large tonnage w/Ni, Cu and low Au values
Possibly mineable by decline & scoop trams
Heap leaching for Au values; or flotation concentrates for base metal and Au recovery.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX F

SUMMATION: Area/Sub-Area: Dinorwic-Dyment Area

MDC#/Property: #259/ Sakoose Mine (formerly Golden Whale, 1897-1900 Van Houten Mines, 1944-47

Location: N. of Lowery Lake
S. of Dyment

Type of Occurrence:	
Ore Setting	Qtz. veins & lenses up to 7 ft. wide in silicified
Host Rock	andesite w/interbd. metaseds, intruded by qtz/felds.
Mineralization	v.g. w/py, Cp, Sph, Gn. Strikes NE, dip 60°SE porph.
Exploration/Development:	
Surface	Extensive stripping, trenching, & open cuts (1698)
Underground	Four shafts: #1, -80°SE to 105 ft; #2, vert to 105 ft.
Geophys/Geochem.	inclined at bottom; #3 to 80 ft; #4 (in 1935), vert to
Diamond Drilling	143 ft. Extensive lateral development. Total DD, 7100 ft on surface, 389' ft u/g
Sampling & Testing:	
Sampling	#1 shaft, sampling to 120 ft: 0.78 oz. over 18 inches
Assays	Open cut (1931): 0.46 oz.
Other Metals	Ag
Production History:	
Period/Tons Milled	1944-47/ milled at 50 tpd rate
Method of Treatment	Originally amalgamation (76% rec.) later by cyanidation
Recovery	Original mill recovered coarse Au only
Potential Ore Bodies:	Defined ore zones in mine workings & drilled area

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	6000/0.28Au /0.24Ag	50,000/0.30Au /0.26Ag	29,000/0.31Au /0.26Ag

Treatment Amenability: On-site flotation/cyanidation (100 tpd)

Remarks: Estimates to 500 ft. depth on basis of drilling results. Excellent prospect w/drill-indicated reserves to 500 ft. depth. #4 shaft needs to be deepened to 500 ft for production purposes. Sakoose mill should serve as custom mill for district.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX F

SUMMATION: Area/Sub-Area: Dinorwic - Dyment Area

MDC#/Property: #261/ Sandy Beach Lake Prospect

Location: Sandy Beach Lake, MacFie Twp

Type of Occurrence:	
Ore Setting	Main zone: irreg. qtz. veins & lenses
Host Rock	#2 zone: shear zone 400 ft SW of main zone
Mineralization	Au w/Cp, Po, WO_3
Exploration/Development:	
Surface	Extensive trenching up to 500 ft long-1500 ft in 1940-4
Underground	None
Geophys/Geochem.	None recorded
Diamond Drilling	2 DDH
Sampling & Testing:	
Sampling	Samples from 33 trenches: 0.21 oz over 4.5 ft (aver)
Assays	Repetition (chip): over 5',0.314 oz; over 5'10",0.216oz over 5'6",0.202 oz. (consistent)
Other Metals	Possibly Cu, Ni, W + Pt
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Ore shoots: #1-90 ft x4.5 ft x400 ft depth (tested) #2-180 ft x4.5 ft x400 ft. depth (tested) Speculative zones from -400 to -1000 ft depths

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	#1 - 13,500/0.21	
	-	-	-	20,250/0.21
			#2 - 27,000/0.21	40,500/0.21

Treatment Amenability: On-site, protable flotation/cyanidation (100 tpd)

Remarks: Good prospect for development & production in portable mill.
Flotation concentrates will contain Au, Pt(?), Cu, Ni,W(?)
Exploitable by shaft or decline.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX F

SUMMATION: Area/Sub-Area: Dinorwic-Dyment Area

MDC#/Property: #289/ Tabor Prospect

Location: SW of Dyment

Type of Occurrence:	
Ore Setting	Qtz. vein, 1-2 ft wide
Host Rock	Basic metavolcs. intruded by 200 ft-thick qtz porph
Mineralization	Au (ore zone: length 200+ft, widths up to 2 ft.) (sill ?
Exploration/Development:	
Surface	Stripping (1898); open cut (1934)
Underground	Shaft, -80° to 70 ft, thence vert. to 280 ft
Geophys/Geochem.	Three levels (68',125',250') w/909 ft lateral developme
Diamond Drilling	9569 ft in 27 DDH + 387 ft in 1978
	EM anomaly in 1976-78 (Selco)
Sampling & Testing:	
Sampling	Mill test (1935): 0.41 oz.Au, 0.05 oz. Ag
Assays	believed to be from surface open cut
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Ore zone: 200 ft x 2 ft, to -400 ft (possible) and to -500 ft (speculative) Grade (0.41 oz.) assumed over a mineable width

Summary:

Estimated Tonnage & Grade

Proven	Probable	Possible	Speculative
Reserves -	-	14,000/0.41	-shaft area above -40 ft.
-	-	-	3,000/0.41 to -500ft

Treatment Amenability: Portable flotation/cyanidation (25 tpd)

Remarks: Fair potential prospect w/good grade. Tonnage might be increased by additional exploration (U/G). Shaft may have been deepened to 500 ft. in 1957-61 or 1978 (records are obscure)
(There appears to be no basis for Cdn. Mines Handbook (1969) estimate of 50,000-ton reserve at 0.50 oz.)

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX G

SUMMATION: Area/Sub-Area: Pipestone Lake-Manitou Stretch

MDC#/Property: #90/ Gates Lake Occurrence

Location: Manitou Stretch

Type of Occurrence:	
Ore Setting	Arsenopyrite w/Au in oxidized shear zones, N70°E,90°
Host Rock	-
Mineralization	Au & Sb w/Py, Aspy
Exploration/Development:	
Surface	Trenched, 1940-42
Underground	None
Geophys/Geochem.	None reported
Diamond Drilling	None
Sampling & Testing:	
Sampling	Panning in shear zone (by Noranda, 1941):0.16-0.36 oz.
Assays	-
Other Metals	Au & Sb
Production History:	
Period/Tons Milled	None recorded
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Zone: 300 ft x 10 ft to -150 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	37,500/0.15 to -150f

Treatment Amenability: Roasting-flotation-cyanidation (75 tpd)
Not suitable for custom treatment.

Remarks: Data are sparse.

There is possibility of large tonnage/low grade (0.10-0.20 oz); required considerable exploratory drilling.

May be mineable by decline

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX G

SUMMATION: Area/Sub-Area: Pipestone Lake-Manitou Stretch

MDC#/Property: #145/ Konigson Prospect

Location: N. shore of Straw Lake

Type of Occurrence:	
Ore Setting	Qtz. stringers on surface coalesce in shaft to 9 ft. width
Host Rock	-
Mineralization	As assoc. w/Py, Cp. No v.g. but high values on assay
Exploration/Development:	
Surface	Trenched, 1933-34
Underground	Shaft to 28 ft.
Geophys/Geochem.	None
Diamond Drilling	6 DDH, 1122 ft. (by Sylvanite, 1945)
Sampling & Testing:	
Sampling	Surface grab samples: 0.46-2.65 oz.
Assays	Shaft samples: 0.02-0.80 oz.
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Zone: 460 ft x 6 ft to -25 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	5,600/0.40 -to -25 ft.	

Treatment Amenability: Custom flotation/cyanidation (25 tpd)

Remarks: Surface showings could be mined by open cut w/Air Trac + backhoe. Pockety, spectacular assays that lack continuity. The Konigson Prospect is not too significant in itself but the adjacent Straw Lake Beach vein may dip into Konigson ground below 700 ft. depth.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX G

SUMMATION: Area/Sub-Area: Pipestone Lake-Manitou Stretch

MDC#/Property: #277/ Straw Lake Beach Mine

Location: Straw Lake, E. of Pipestone Lake.

Type of Occurrence:	
Ore Setting	Qtz. vein, 13"-17", in sericite schist assoc. w/
Host Rock	rhyolite breccia
Mineralization	v.g. w/Py, Cp, Gn, tetradymite (Bi) & tr.Zn
Exploration/Development:	
Surface	Stripping, trenching, test-pitting, 1933-34
Underground	Shaft, vert. to 723' w/6 levels:4631 ft.drifting,XC,raising
Geophys/Geochem.	Winze, 425-465 ft. w/level at -465 ft.
Diamond Drilling	11 DDH, 3579' (1934-41); DD + mapping (1976).
Sampling & Testing:	
Sampling	Mill results (33,662 tons):
Assays	0.34 oz. Au, 0.03 oz. Ag
Other Metals	-
Production History:	
Period/Tons Milled	1934-41/33,662 tons at 60 tpd
Method of Treatment	Flotation/amalgamation-0.34 oz.Au, 0.03 Ag/ton
Recovery	High tailings losses reported.
Potential Ore Bodies:	Probable ore: from -700 ft. to -920 ft. Possible ore: from -920 ft to -1140 ft. Speculative ore: from -1140 ft. to -1500 ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	32,000/0.20	32,000/0.20	48,000/0.20
	-	-	30,000/0.15	- surface dump
	-	-	? /0.05	- tailings

Treatment Amenability: On-site flotation/cyanidation custom mill (100 tpd)
Heap leaching of tailings.

Remarks: Excellent prospect for exploration & development. Data are quite complete although up-to-date mine plans & sections are lacking. As noted, there are indications that vein dips into Konigsom ground at depth:. this may have bee reason for closure in 1941.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX G

SUMMATION: Area/Sub-Area: Pipestone Lake-Manitou Stretch

MDC#/Property: #=78/ Straw Lake Occurrence (Lucy Claims)

Location: Straw Lake, E. of Pipestone Lake

Type of Occurrence:	
Ore Setting	Qtz. veins up to 6" wide (vein network, strike 100°, dip vert.)
Host Rock	Qtz/felds dike, 1-5 m thick
Mineralization	
Exploration/Development:	
Surface	Stripping & test-pitting, 1933-34
Underground	None
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Grab sample in porph:0.03 oz; grab samples in qtz. 0.14 oz.
Assays	Grab samples in qtz: 0.15-0.52 oz.
Other Metals	-
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	None defined

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	-

Treatment Amenability:

Remarks. Not possible to estimate tonnage; no dimensions given and little work done. Grade appears to be ± 0.15 oz./ton. Fair prospect for exploration because of favorable location.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX B

SUMMATION: Area/Sub-Area: Mine Centre

MDC#/Property: #79/ Ferguson Prospect

Location: N. end, Bad Vermilion Lake

Type of Occurrence:	
Ore Setting	Three narrow qtz. veins in shear zone, str.NW, dip SW
Host Rock	Qtz. porph. bounded by gr'nstone & cg.
Mineralization	v.g. w/Py, Gn, Sph.
Exploration/Development:	
Surface	Trenched over lengths 800'-1000'
Underground	Three shafts, 146',107',110'; 509' lateral dev.
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Sampled U/G, 50' above and below level
Assays	0.38 oz. (wt'd aver., all samples)
Other Metals	-
Production History:	
Period/Tons Milled	No records available
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	40,000/0.06	(tailings)
	-	-	-	3400/0.38 (U/G)

Treatment Amenability: Flotation + cyanidation

Remarks: Requires more complete exploration

Optioned by Russell Cone, Jr.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX H

SUMMATION: Area/Sub-Area: Mine Centre

MDC#/Property: #82/ Foley Mine

Location: Shoal Lake, SW of Mine Centre

Type of Occurrence:	
Ore Setting	Eleven qtz veins striking N to NW, dip steeply E, and
Host Rock	occupying parallel tension fractures in granite porph.
Mineralization	v.g. w/sulphides in veins, varying few inches to few ft. in width
Exploration/Development:	
Surface	stripping & test-pitting
Underground	two shafts + winze, total depth 725'. Lateral 5204' on 4 levels
Geophys/Geochem.	none
Diamond Drilling	4380' (1922-29)
Sampling & Testing:	
Sampling	DD core, 814'
Assays	0.60 - 0.75 oz
Other Metals	-
Production History:	
Period/Tons Milled	No record - but some milling done (aver. ±1.6 oz/ton)
Method of Treatment	Amalgamation
Recovery	Unknown
Potential Ore Bodies:	-

Summary:

Estimated Tonnage & Grade			
Proven	Probable	Possible	Speculative
-	-	40,000/0.50	-
-	-	-	400,000/0.50

Treatment Amenability: Flotation + cyanidation

Remarks: Estimates are believed reliable

Requires dewatering and re-sampling of u/g workings

Optioned by Russell Cone, Jr.

surface diamond drilling in progress (1980)

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION
RESIDENT GEOLOGIST
FILES, KENORA

APPENDIX H

SUMMATION: Area/Sub-Area: Mine Centre

MDC#/Property: #113/ Golden Star Mine

Location: N. end, Bad Vermilion Lake

Type of Occurrence:	
Ore Setting	Qtz. veins up to 8' in width
Host Rock	in felsite dikes cutting metavolcs.
Mineralization	v.g. w/Py, Po, Cp, Gn
Exploration/Development:	
Surface	Pits & trenches on 2 veins
Underground	Three shafts: main shaft,537'; 6 levels w/3500' (1910)
Geophys/Geochem.	-
Diamond Drilling	1001' in 8 DDH (1902) - surface & u/g
Sampling & Testing:	
Sampling	Drill core
Assays	0.42 oz. (aver.)
Other Metals	Cu reported
Production History:	
Period/Tons Milled	None recorded
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	200,000/0.42

Treatment Amenability: Flotation + cyanidation

Remarks: No assay plans or stoping records available

Mill tailings reported in lake, quantity & grade unknown.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX H

SUMMATION:

Area/Sub-Area: Mine Centre

MDC#/Property: #130/ Independence Mine

Location: Bennett Twp., E. of Mine Centre

Type of Occurrence:	
Ore Setting	Qtz. veins in felsite schist, N 80°E, 70°N
Host Rock	Schist mineralized for variable distance
Mineralization	-
Exploration/Development:	
Surface	Two test pits + 40' open cut
Underground	Three shafts; main 85' depth; 10'XC, 20' drifting, 45' level
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	XC reported 0.36 oz. (1899) }
Assays	surface dump, 0.94 oz. } est. 0.50 oz. overall
Other Metals	-
Production History:	
Period/Tons Milled	None reported
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Surface dump, est. 4000 tons

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	4000/0.50

Treatment Amenability: Flotation + cyanidation

Remarks: No mine plans on file
Mineralized schist reported to extend onto Olive & Alice A properties
May have continuity in depth. Dilution est. 20%.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX H

SUMMATION: Area/Sub-Area: Mine Centre

MDC#/Property: #165/ Lucky Coon (Hillier)

Location: E. of Bad Vermilion Lake, N. of Shoal Lake

Type of Occurrence:	
Ore Setting	Parallel qtz veins in felsic intrusive, strike NW, dip W (steep)
Host Rock	
Mineralization	v.g.
Exploration/Development:	
Surface	Stripping + trenching for 2000' on veins
Underground	Four shafts. Deepest is 115'. Drifting at 25' & 100'
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	
Assays	1.35 - 1.45 oz. (1895 report)
Other Metals	
Production History:	
Period/Tons Milled	None on record
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	4000/1.00 oz.

Treatment Amenability: Gravity separation + amalgamation

Remarks: Data are sparse, but nature and size of veins warrant exploration.
Early history was one of management disputes
Has potential for shallow open cut w/custom treatment

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX H

SUMMATION: Area/Sub-Area: Mine Centre

MDC#/Property: #216/ Olive Mine

Location: W end of Little Turtle Lake

Type of Occurrence:	
Ore Setting	2' qtz. vein, 1000' length; strike N 60°E, 70°N.
Host Rock	In schist, in gr'nstone
Mineralization	v.g.
Exploration/Development:	
Surface	Trenched for 1000' on vein
Underground	Three shafts, inclined to 251'; 4 levels; 1335' drifti.
Geophys/Geochem.	+ 90' XC. Two winzes from 60' & 135' levels
Diamond Drilling	Two drills u/g (1899)
Sampling & Testing:	
Sampling	Ore zone;
Assays	0.37 oz.
Other Metals	-
Production History:	
Period/Tons Milled	Intermittent, 1897-1900, 1937-42/7255 tons
Method of Treatment	Hardinge mill + blankets + amalgamation
Recovery	Produced 3572 oz Au, 343 oz. Ag
	Recovery probably about 70-75%
Potential Ore Bodies:	Ore zone (Sylvanite est.) 200 ft over vert depth 120 ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	-	6000/0.37
	-	-	7000/0.05	-

Treatment Amenability: Gravity + amalgamation or flotation/cyanidation

Remarks: Production ceased 1942 due to destruction of plant by fire.
Dilution may be 15% - 20%.
Good prospect for custom treatment depending on extent of stoping.
Tailings may have potential for re-treatment.

SOURCE OF INFORMAT
RESIDENT GEOLOG ST.
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX H

SUMMATION:

Area/Sub-Area: Mine Centre

MDC#/Property: #272/ South Vermilion (Pacitto Property, also Verlac G.M.)

Location: Bad Vermilion Lake

Type of Occurrence:	
Ore Setting	Eleven qtz. veins. Vein system 5000' x 2'-3'
Host Rock	Sheared gr'nstone & Qtz. porpn. Veins strike NW, dip 90°.
Mineralization	
Exploration/Development:	
Surface	525' trenching + numerous pits
Underground	Shaft on #1 vein to 118' depth, station cut at 115'
Geophys/Geochem.	-
Diamond Drilling	Four DDH's to test #1 vein at 100' depth.
Sampling & Testing:	
Sampling	#1 vein, 0.37 oz./1ft. Bulk sample: 298 lb.
Assays	#2 vein, 0.33 oz/1.7 ft. 0.98 oz.Au, 0.34 oz.Ag, 0.17% Cu
Other Metals	Cu reported
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	#1 & 2 veins: 180 x 3 ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	-	4500/0.35

Treatment Amenability: Flotation/cyanidation

Remarks: Sparse data. Erratic, highgrade Au values in surface sampling. Prospect potential for small scale custom milling and/or portable millin

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX H

SUMMATION: Area/Sub-Area: Mine Centre

MDC#/Property: #275 Stellar Gold Mines

Location:

Type of Occurrence:	
Ore Setting	Nine qtz. veins strike N 80°E. Veins to 150' x 2'
Host Rock	Sheared qtz. porph & chlorite schist, metadiorite, gabbro
Mineralization	v.g. w/Py, Cp, Sph, Gn
Exploration/Development:	
Surface	Test pitting on various veins
Underground	Two shafts; #1 vein to 15', #2 vein to 68'
Geophys/Geochem.	-
Diamond Drilling	Two DDH's (1977) to test #1 and #2 veins
Sampling & Testing:	
Sampling	
Assays	#1 vein, 0.30 oz; #2 vein, 1.21 oz.
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	#1 vein 5800/0.30	
	-	-	#2 vein 2750/1.00	

Treatment Amenability: Flotation + cyanidation

Remarks: Estimates not entirely reliable due to scarcity of data
May have potential for custom treatment
Requires mapping, geophysics & detailed diamond drilling

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX I

SUMMATION: Area/Sub-Area: Minnitaki Lake-Sioux Lookout

MDC#/Property: #54/ Conecho Prospect

Location: Echo Twp - Crossecho Lake

Type of Occurrence:	
Ore Setting	Qtz-filled fractures in metavolcs; dip 75° SE
Host Rock	Either side of granodiorite dike (sill?)
Mineralization	v.g. w/Py
Exploration/Development:	
Surface	Unknown
Underground	Shaft w/725'lateral on 200'level-connected to Goldlund workings
Geophys/Geochem.	Unknown
Diamond Drilling	Small amount, 1946. 28 DDH (1952) 2659 ft.
Sampling & Testing:	
Sampling	Drill core (?):
Assays	Up to 1.60 oz.
Other Metals	-
Production History:	
Period/Tons Milled	None Formerly, Conecho Mines Ltd. 1950-57; Consol. Frederick, 1957-62
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Ore zone: 250' x 10'; surface to -200 ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	-	41,500/0.15

Treatment Amenability: Custom flotation/cyanidation (50 tpd)

Remarks: Potential source of custom ore for milling at Windfall/Goldlund, adjacent and connected u/g at 200 ft. level.

Overall grade appears to average 0.10-0.15 oz.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX I

SUMMATION: Area/Sub-Area: Minnitaki Lake-Sioux Lookout

MDC#/Property: #68/ Eaglelund Occurrence

Location: Minnitaki Lake

Type of Occurrence:	
Ore Setting	Mineralized fracture zones in granodiorite sill,
Host Rock	10-40 ft. wide over 3000 ft. length
Mineralization	(Similar to Windfall & Goldlund)
Exploration/Development:	
Surface	Trenching
Underground	None
Geophys/Geochem.	None
Diamond Drilling	7 DDH (1950, Gold Eagle), 2300 ft. (zone,800 ft.long)
Sampling & Testing:	
Sampling	DD zone, 800' in length: v.g. in cross-fractures
Assays	0.31 oz.(0.12-0.31 oz.) Wt'd aver. 0.10-0.15 oz.
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Ore zone: 800' x 10', to -400 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	266,000/0.10-0.15

Treatment Amenability: Custom flotation/cyanidation, or heap leaching if grade < 0.10 oz. (up to 300 tpd)

Remarks: Potential for medium tonnage, low grade operation by custom milling. Shaft or decline development.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX I

SUMMATION: Area/Sub-Area: Minnitaki Lake-Sioux Lookout

MDC#/Property: #166/ Lun-Echo Occurrence (Franciscan Lake)

Location: Minnitaki Lake, Echo & Pickerel Twps.

Type of Occurrence:	
Ore Setting	Mineralized granodiorite sill, traced 1400 ft.
Host Rock	NE-trending metavolcs. intruded by qtz/felds porphyry
Mineralization	Mineralized over 5-ft width
Exploration/Development:	
Surface	Stripping & trenching (Mosher Long Lac, 1946-47)
Underground	None
Geophys/Geochem.	Mag. svy, 1947
Diamond Drilling	DD (Lun-Echo GML, 1951),8337 ft.
Sampling & Testing:	
Sampling	Drill core (?):
Assays	0.30 oz.
Other Metals	
Production History:	
Period/Tons Milled	No past production
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Mineable zone: 1400 ft.x 5 ft, surface to -200 ft. speculative: to -500 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	116,500/0.20
	-	-	-	175,000/0.15

Treatment Amenability: Custom flotation/cyanidation (200 tpd)

Remarks: Potential source of custom ore
Shaft or decline, shrinkage stoping

SOURCE OF INFORMATION
RESIDENT GEOLOGIST'S
FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX I

SUMMATION: Area/Sub-Area: Minnitaki Lake-Sioux Lookout

MDC#/Property: #202/ New Kelore Occurrence

Location: Minnitaki Lake

Type of Occurrence:	
Ore Setting	Qtz. stringers
Host Rock	Schist zone in or near qtz. porph. intrusions & metased
Mineralization	
Exploration/Development:	
Surface	Several pits at various locations, Ruby Island, etc.
Underground	Shaft to 25' (1901): shaft to 110 ft w/2 levels (57,100 & 152 ft. lateral development.
Geophys/Geochem.	None
Diamond Drilling	Unknown
Sampling & Testing:	
Sampling	6' section in shaft, 0.20 oz; samples, 57' level,
Assays	0.17 oz; 100' level, 0.14 oz; stripping, 0.10-0.24 oz.
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Zone: 100 ft x 30 ft, to -50 ft (open pit)

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	12,500/0.15

Treatment Amenability: Custom flotation/cyanidation (25 tpd)

Remarks: Mineable by small open pit to -50 ft.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX I

SUMMATION: Area/Sub-Area: Minnitaki Lake-Sioux Lookout

MDC#/Property: #203/ Goldlund Mine (Newlund Prospect)

Location: Echo Twp. Crossecho Lake

Type of Occurrence:	
Ore Setting	Narrow (0.5-8") qtz veins in tension fractures
Host Rock	Granodiorite sill conformable to metabasalts & qtz/fel
Mineralization	porphyry, striking N 70°E. Several ore zones (#1 zone, 900' x 28'(?) down to 500' level)
Exploration/Development:	
Surface	9000 ft of surface stripping & trenching.
Underground	Vert. shaft to 825': 5 levels w/15,027 ft.lateral dev.
Geophys/Geochem.	(200-ft, 5957'; 350-ft,3042'; 500-ft,3512';
Diamond Drilling	650-ft, station only; 800-ft, 2435')
	Deline being driven.
Sampling & Testing:	20,419 ft.DD
Sampling	No.1 Zone:
Assays	Sampled on 200 & 350-ft levels: 0.25 oz. to -200 ft.
Other Metals	0.15 oz.(cut)to -300 f
	0.10 oz.(cut)to -500 f
Production History:	Nos. 2 & 3 Zones:
Period/Tons Milled	Surface & drill core samples to 500':
Method of Treatment	0.20 oz.(cut)to -400 f
Recovery	0.15 oz.(cut)to -500 f
	Surface & drill core samples run 0.30-0.40 oz. (uncut)
Potential Ore Bodies:	Mineable ore zones: No.1, 900 ft x 18 ft.
	(assumed) No.2, 350 ft x 14 ft.
	No.3, 900 ft x 16 ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves No. 1	Zone: 270,000/0.25		405,000/0.15	225,000/0.10 to-500 f
Nos. 2 & 3	Zones:	-	163,300/0.20	40,800/0.15 to-500 f
	-	-	480,000/0.20	120,000/0.15 to-500 f

Treatment Amenability: Custom milling by conventional flot/cyanidation (500 tpd)

Remarks: Excellent potential for productive mine operation by either shaft or decline. Deep ore zone appears to pitch onto Windfall property around -550 ft on mutual boundary.

The Goldlund reserves are estimated at 1,704,000 tons at 0.18 oz/ton.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX I

SUMMATION: Area/Sub-Area: Minnitaki Lake-Siouz Lookout

MDC#/Property: #243/ Quyta Occurrence

Location: Minnitaki Lake, Pickerel Twp.

Type of Occurrence:	
Ore Setting	Qtz.-filled fractures, 1"-3", in porph, sill traced
Host Rock	3000 ft NE, up to 400 ft wide
Mineralization	v.g. w/sparse Py Fractures 3-4 ft apart Strike N 30°E, 45°NW
Exploration/Development:	
Surface	Trenching - geology similar to Windfall/Goldlund
Underground	None
Geophys/Geochem.	None
Diamond Drilling	6 DDH (1951)
Sampling & Testing:	
Sampling	Grab samples over 900 ft. length: 0.20-6.00 oz.(errati
Assays	Grab samples from trenches: tr.-0.01 oz.
Other Metals	
Production History:	
Period/Tons Milled	None recorded
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Mineable zone: 900 ft x 10 ft, to -200 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	150,000/0.10

Treatment Amenability: Custom flotation/cyanidation (120 tpd) or heap leaching depending on overall grade.

Remarks: Potential source of custom ore; requires more exploration. Mineable by decline.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, KENORA

APPENDIX I

SUMMATION: Area/Sub-Area: Minnitaki Lake-Sioux Lookout

MDC#/Property: #263/ Schmidt Occurrence

Location: Swimit Lake, E. of Sandy Beach Lake

Type of Occurrence:	
Ore Setting	Parallel qtz. stringers in zone 1400 ft x 3-5 ft wide
Host Rock	Strikes N 25°E
Mineralization	Au w/Sph, Gn, Cp, Py
Exploration/Development:	
Surface	Unknown
Underground	Shaft to 29 ft.
Geophys/Geochem.	Unknown
Diamond Drilling	DD, 1000 ft (1950?)
Sampling & Testing:	
Sampling	Channels, erratic to 3.86 oz. Au
Assays	Probably lowgrade overall
Other Metals	Cu, Pb, Zn (in a flotation concentrate)
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Assumed zone: 250' x 3', to -100 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	12,500/0.15

Treatment Amenability: Custom flotation/cyanidation (25 tpd), or heap leaching depending on overall grade and recoverability of Cu, Pb, Zn.

Remarks: Some potential for custom ore - erratic and lowgrade on average.
Needs close drilling (say, 50 ft. centres)
May be mineable by narrow open cut, or decline. Grade will be lowered over mineable width.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST
P.E., KENORA

APPENDIX I

SUMMATION: Area/Sub-Area: Minnitaki Lake-Sioux Lookout

MDC#/Property: #309/Villbona Prospect

Location: Franciscan Lake, Echo Twp.

Type of Occurrence:	
Ore Setting	Au in qtz-filled fractures in granodiorite sill,
Host Rock	2000 ft x 100 ft, in NE-trending metavolcs.
Mineralization	intruded by qtz. porph. in irregular masses.
Exploration/Development:	
Surface	Considerable surface work outlined sill for 6500 ft.
Underground	None
Geophys/Geochem.	None
Diamond Drilling	DD, 18,700 ft. (1950, or later)
Sampling & Testing:	
Sampling	-
Assays	No assays available, but assumed lowgrade (0.05-0.10 oz
Other Metals	-
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Potential ore zone: 250 ft x 10 ft, to -100 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	20,000/0.50-0/10

Treatment Amenability: Probably heap leaching

Remarks: May be mineable by decline

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX I

SUMMATION: Area/Sub-Area: Minnitaki Lake-Sioux Lookout

MDC#/Property: #323/ Windfall Mines & Oils

Location: Echo Twp. Crossecho Lake

Type of Occurrence:	
Ore Setting	Similar geological setting to Goldlund Mines
Host Rock	Narrow qtz veins in tension fractures in
Mineralization	granodiorite sill assoc w/qtz/felds. porph.
Exploration/Development:	
Surface	Not recorded
Underground	Vert. 3-compart. shaft to 225';2979' lateral dev. on 200-ft level
Geophys/Geochem.	Unknown
Diamond Drilling	19 DDH, 7111 ft (1947 & later) 30,000 ft (current) in 1980 17 DDH, u/g, 8183 ft.
Sampling & Testing:	
Sampling	Complete & adequate sampling: aver. 0.25 oz.
Assays	-
Other Metals	-
Production History:	
Period/Tons Milled	None recorded, but probably some previous extraction
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Mineable ore zone (over 900 ft ?) Assumed width, 28 ft. Grade may be cut to 0.15 oz. below 200 ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	420,000/0.25		-
	-	-	630,000/0.15	
	-	-	-	(not estimated)

Treatment Amenability: On-site, conventional flotation/cyanidation (1000 tpd)
Should be custom facility for district.

Remarks: Excellent mine potential by shaft, or decline.

The Windfall reserves are estimated at 1,050,000 tons at 0.19 oz/ton, or possibly 1,250,000 tons at 0.18 oz/ton if 200,000 tons of speculative ore should be determined in the 1980 drilling program.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, KENORA

APPENDIX J

SUMMATION: Area/Sub-Area: Sapawe-Atikokan Area

MDC#/Property: TB #1/ Atiko GM (formerly Sapawe GM)

Location:

Type of Occurrence:	
Ore Setting	Five Au-bearing qtz veins + sulphide zone in shears in
Host Rock	qtz porph intruded by "blue qtz", in contact w/volcs.
Mineralization	Au w/Gn, Sph, Cp
Exploration/Development:	
Surface	Considerable trenching
Underground	Shaft to 1015' w/5 levels: 6075' drifting & XC,2724' raising
Geophys/Geochem.	Not recorded
Diamond Drilling	143 DDH, 8638 ft.
Sampling & Testing:	
Sampling	No assay plans available; figures from Heather (1966).
Assays	Milling results gave 0.14 oz. DD results, ± 0.30 oz.
Other Metals	Cu, Pb, Zn
Production History:	
Period/Tons Milled	1963-66/33,013 tons
Method of Treatment	Presumably flotation/cyanidation
Recovery	Not known - but mill operated inefficiently (Produced 4547 oz at 0.14 oz Au/ton
Potential Ore Bodies:	

Summary:

Estimated Tonnage & Grade			
Proven	Probable	Possible	Speculative
Reserves	34,181/0.31 (above 320-ft level)		
	- 204,000/0.30 (from 320-ft to 920-ft level)		

Treatment Amenability: On-site flotation/cyanidation plant (100 tpd)

Remarks: High potential for re-opening of mine. Required exploration of other veins on property and detailed structural interpretation. Also requires good grade control in mining operations.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, THUNDER BAY

APPENDIX J

SUMMATION: Area/Sub-Area: Sapawe-Atikokan Area

MDC#/Property: TB#3/ Sunbeam Mine

Location:

Type of Occurrence:	
Ore Setting	Qtz/calcite in grey granite schist, vein 1-2 ft. wide
Host Rock	
Mineralization	Minor Py & Gn
Exploration/Development:	
Surface	Trenched in 1899
Underground	Shaft, vert. to 71 ft, then inclined to 410 ft.
Geophys/Geochem.	Three levels: 96, 113, & 212 ft; ± 1567' lateral development
Diamond Drilling	None
Sampling & Testing:	
Sampling	1st level; 150'/2' at 0.11 & 0.19 oz;. 2nd level, 240'/1
Assays	0.27 & 0.43 oz; 3rd level, 120'/1'; 2.88, 0.61, 0.87 oz.
Other Metals	None reported
	Assumed widths from Bruce, ODM Vol. 34
Production History:	
Period/Tons Milled	1904/650 tons
Method of Treatment	
Recovery	270 oz (grade, 0.42 oz/ton)
Potential Ore Bodies:	

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	4410/0.37 - to - 300 ft.		-

Treatment Amenability: Custom or portable flotation/cyanidation (10-20 tpd)

Remarks: Fair prospect for small to moderate tonnage at a good grade. Some errati high values (in ore shoots ?)
Shaft mine. Shrinkage stoping; may be amenable to resuing.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, THUNDER BAY

APPENDIX J

SUMMATION: Area/Sub-Area: Sapawe-Atikokan Area

MDC#/Property: #TB 4/ Hammond Reef

Location:

Type of Occurrence:	
Ore Setting	Qtz lenses in shear zone, N 25°E. widtn 200 ft (aver)
Host Rock	Tronuhjemite
Mineralization	Au w/Py, Gn, Sph
Exploration/Development:	
Surface	13-15 trenches & pits over length of 1000' + 500' + 300
Underground	1.Inclined shaft to 127' on B vein. Area: 2000 x 200 ft.
Geophys/Geochem.	2.Shaft on reef, 80' w/60' level & 37' XC
Diamond Drilling	3.Open cut, 150x50x35 ft; vert. shaft from bottom to 60'
Sampling & Testing:	
Sampling	A vein, 1.82 oz; B vein, 0.66 oz; C vein, 0.40 oz
Assays	All in 1896
Other Metals	
Production History:	
Period/Tons Milled	1898/977 tons - presumably by amalgamation.
Method of Treatment	Mill & plant destroyed by lightning. ± 1900
Recovery	Produced 222 oz (0.23 oz/ton)
Potential Ore Bodies:	A vein zone: 1000 x 200 ft
	C vein zone: 1000 x 200 ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	-	1,600,000/0.20 to -100'
	-	-	-	650,000/0.20 to - 40'

Treatment Amenability: Portable or semi-portable flotation/cyanidation (200 tpd or heap leaching if overall grade is <0.10 oz.

Remarks: May be significant prospect for open pitting w/dragline. Precise data re size & grade lacking. Examined by Slyvanite (1939) with negative opinion & by Noranda and McIntyre (1937) with no follow-up although reaction was favorable.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, THUNDER BAY

APPENDIX J

SUMMATION: Area/Sub-Area: Sapawe-Atikokan

MDC#/Property: #TB 5/ Upper Seine GML (Sawbill Lake Mine)

Location: Sawbill Lake

Type of Occurrence:	
Ore Setting	Qtz w/Py, Cp in granite; N 25°E, 75°SE
Host Rock	Assoc w/carb/chlorite alteration
Mineralization	
Exploration/Development:	
Surface	12 pits & trenches explored vein for 1800' length (1897-99)
Underground	Shaft to 245' (1899) and winze 50' below 243' level
Geophys/Geochem.	Four levels w/830' lateral, N & S
Diamond Drilling	5 DDH on Hammond Reef, prob. 1936-39
Sampling & Testing:	
Sampling	#1 vein: 800'x 12"-67", aver. 40". Assayed 0.26 oz.
Assays	Hammond Reef: 400' x 7', 0.05-0.08 oz.
Other Metals	-
Production History:	
Period/Tons Milled	1897-99
Method of Treatment	
Recovery	Produced 1009 oz (aver. 0.19 oz/ton)
Potential Ore Bodies:	

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	#1 vein: 66,600/0.20 to -300 ft	
	-	-	Hammond Reef: 46,600/0.05 to -200 ft.	

Treatment Amenability: Portable flotation/cyanidation (100 tpd) on higher grade ore. Heap leaching on low grade (0.05 oz)

Remarks: Assumption that mine assay plans represent true ore grades.
Examined by Sylvanite (1939) with favorable reaction.
Good prospect.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, THUNDER BAY

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX J

SUMMATION: Area/Sub-Area: Sapawe - Atikokan Area

MDC#/Property: #TB 6/ Elizabeth Gold Mine

Location: 6 mi W of Atikokan

Type of Occurrence:	
Ore Setting	Seven qtz veins, striking N-S
Host Rock	In granite close to greenstone contact; chloritic alte atic
Mineralization	Au w/Py, Cp, ankerite. Scheelite reported.
Exploration/Development:	
Surface	Trenching, 1903-13
Underground	#1 shaft to 110', 115' lateral; #2 shaft to 270', w/3
Geophys/Geochem.	levels at 65,120, & 235' w/1200' lateral development
Diamond Drilling	
Sampling & Testing:	
Sampling	No.1 vein, vert, 100' x 3' x 30'; 0.41 oz.
Assays	No.2 vein, -85°, 400' x 4' x 40'; 0.68 oz.
Other Metals	Office vein, vert, 200' x 3' x 40'; 0.10 oz
	Hill vein, -75°, 150' x 6' x 30'; 0.10 oz.
	Cliff vein, -75°, 100' x 2.5' x 30', 0.15 oz.
	Power House, -65°, 100' x 3' x 30; 0.20 oz.
	No.6 vein: -70°, 100' x 3' x 30', 0.15 oz.
	Surface dump, 10,000 tons at 0.20 oz.
	Tailings, 10,000 tons at 0.10 oz.
Production History:	
Period/Tons milled	1903 - 13 (?)/20 tons
Treatment method	
Recovery	20 oz. produced (aver. 0.40 oz/ton)

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	750/0.41	7,300/0.15 to -30-40 f
	-	-	-	10,000/0.20 dump
	-	-	-	10,000/0.10 tailings

Treatment Amenability: Portable flotation/cyanidation (25 tpd) + heap leaching of tailings

Remarks: Some potential for small scale narrow open cut operations in various veins to 30-40 ft. depths w/Air-Trac + backhoe. Geology is favourable for irregular, narrow veins w/fair values (0.10-0.40 oz.). Au in surface dump & tailings recoverable in portable plant and by heap leach.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, THUNDER BAY

APPENDIX J

SUMMATION: Area/Sub-Area: Sapawe-Atikokan Area

MDC#/Property: #TB 7/ Jack Walsh (Anjamin Mines)

Location: Sabawi Lake

Type of Occurrence:	
Ore Setting	Qtz lenses w/sulphide impregnations in
Host Rock	chloritic & hornblendic schists
Mineralization	v.g. w/Py, Cp, CuS, Aspy & carbonate
Exploration/Development:	
Surface	Test-pitting (1900-03); stripping & trenching (1928 & 1967-68)
Underground	Shaft to 92' & 50' XC (1930-34)
Geophys/Geochem.	None
Diamond Drilling	DD, 1930-34, unknown amount; 16 DDH, 3361' (1966-67)
Sampling & Testing:	
Sampling	Drill core from shaft vein, 0.21-1.09 oz
Assays	Parallel vein, 1.29 oz.
Other Metals	
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	No information re lengths, widths, etc.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	-

Treatment Amenability:

Remarks: No estimates possible but property appears to have some prospect merit due to favorable geology and attractive assays.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, THUNDER BAY.

APPENDIX J

SUMMATION:

Area/Sub-Area: Sapawe-Atikokan Area

MDC#/Property: #TB6/ Jack Lake Prospect

Location: near L. Seine Lake

Type of Occurrence:	
Ore Setting	Qtz stringers in shear zone up to 20 ft wide
Host Rock	Qtz porphyry Zone strikes N 45°E
Mineralization	Au w/Py, Cp, Gn, Sph
Exploration/Development:	
Surface	Six test pits over 300 ft length of zone
Underground	Three shafts; 140, 200, and 192 ft deep
Geophys/Geochem.	Main shaft (192'): 2 levels at 102 & 187'. Drifting,239
Diamond Drilling	32 DDH (1945-46): 20,000'. 7 DDH (1961), 2300'
	Zone drilled to -650' over 700' strike length
Sampling & Testing:	
Sampling	Drill core assays, 0.45 oz. allowing for 15% dilution
Assays	High grade core: 0.52 oz. w/15% dilution
Other Metals	Ore dump assayed 0.30-0.40 oz.
Production History:	
Period/Tons Milled	None recorded, but operated 1878-1902, 1945-46, 1961- ?
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Ore zone: 300 ft long x 10-20 ft. wide

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	75,000.0.35 - 300' x 20' x 150'	
	-	-	37,500/0.40 - 300' x 10' x 150'	
	-	-	3,000/0.30 - ore dump	

Treatment Amenability: Portable, or custom, flotation/cyanidation (200 tpd)

Remarks: Good prospect for small tonnage and better than average grade. Estimates from DD assays and assume continuity between drill holes. Suitable for decline operation.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, THUNDER BAY.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX J

SUMMATION: Area/Sub-Area: Sapawe - Atikokan Area

MDC#/Property: #TB 10/ Mammoth Vein

Location: Sabawi Lake

Type of Occurrence:	
Ore Setting	Qtz lenses in schistose zone (N 75°E)
Host Rock	in qtz porphyry
Mineralization	Au w/minor sulphides
Exploration/Development:	
Surface	Some test pits (1929). (Not systematically explored)
Underground	None
Geophys/Geochem.	None
Diamond Drilling	None
Sampling & Testing:	
Sampling	Assays over 16 inches, N end of zone (250 ft long)
Assays	0.22 oz.
Other Metals	-
Production History:	
Period/Tons Milled	
Method of Treatment	
Recovery	
Potential Ore Bodies:	

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	31,250/0.20 to -50 ft.

Treatment Amenability: Custom, or portable flotation/cyanidation (75 tpd)

Remarks: Potential for small open pit to 50 ft. depth, possibly deeper. Dilution from pit walls may be a factor to be considered.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, THUNDER BAY

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX J

SUMMATION: Area/Sub-Area: Sapawe-Atikokan Area

MDC#/Property: #TB 11/ Pettigrew Prospect

Location: Companion Lake

Type of Occurrence:	
Ore Setting	Qtz veins in wide (70 ft) shear zone
Host Rock	in altered granite. Trends NE, dip 45°-50°NW
Mineralization	Au w/Py, Cp, Gn
Exploration/Development:	
Surface	Six trenches on shear zone (1899-1900)
Underground	#1 shaft, inclined on FW of shear, to 27 ft.
Geophys/Geochem.	#2 shaft, vertical, to 105 ft on HW of zone, 78' later
Diamond Drilling	None
Sampling & Testing:	
Sampling	Assay plans:
Assays	0.36 oz. (Sylvanite examination, 1940)
Other Metals	Possibly Cu, Pb
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Open pit area: 100 x 70 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves *	-	-	-	10,000/0.36

Treatment Amenability: Custom, or portable, flotation/cyanidation (25-50 tpd)

Remarks: Good prospect for open pit (100 ft x 70 ft) to 150-ft depth. Requires additional diamond drilling & sampling.

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

*Ore reserves at closing estimated to be 30,000 tons, averaging 1.003 gold per ton (Can. Mines Handbook, 1975/76, p.360)

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, THUNDER BAY

APPENDIX K

SUMMATION: Area/Sub-Area: Moss Lake-Sheoandowan Area

MDC#/Property: #TB 20/ Band-Ore GM

Location: Moss Lake

Type of Occurrence:

Ore Setting	Qtz veins in shear zone (sericitized schist),15 ft. wid
Host Rock	Feldspar prophyry
Mineralization	Au w/Py, Cp, Sph

Exploration/Development:

Surface	10 trenches, 1936-40; 11 trenches, 1940-44. Zone testec 3000 ft.
Underground	None
Geophys/Geochem.	None reported
Diamond Drilling	68 DDH (1940-46), 37,000 ft.

Sampling & Testing:

	Hatch	Crosscombe	Bartley
Sampling		Zone A: 0.23 oz.	0.12 oz)
Assays	0.30	Zone B: 0.46 oz.	0.26 Oz) wt'd aver.
Other Metals		Zone C: 0.31 oz.	0.21 oz)

Production History:

Period/Tons Milled	None
Method of Treatment	-
Recovery	-

Potential Ore Bodies: Ore zone: defined by Hatch (1946 ?) and with assays evaluated by Bartley on weighted aver. basis: Mineable to -350 ft, & possibly to -500 ft.

Summary:

Estimated Tonnage & Grade

	Proven	Probable	Possible	Speculative
Reserves	-	-	-	(687,500/0.26)(Crosscol
	-	-	-	(471,500)
	-	-	-	471,500/0.20 wt'd ave:

Treatment Amenability: On-site flotation/cyanidation (300 tpd)
Custom mill for district.

Remarks: Good prospect for development (currently under development by Mattabi)
Lower grade (0.20 oz.) more acceptable average.

SOURCE OF INFORMATION:
RESIDENT GEOLOGIST'S
FILES, THUNDER BAY

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX K

SUMMATION: Area/Sub-Area: Moss-Lake - Shebandowan Area

MDC#/Property: #TB65/ Moss Mine (Kerry GM)

Location: Moss Lake

Type of Occurrence:	
Ore Setting	Qtz veins in shear zone in metavolcs.
Host Rock	
Mineralization	Au w/Py
Exploration/Development:	
Surface	Trenching (in the 1880's)
Underground	Extensive: 3 shafts; #1,170'; #2,1280', #3,60'
Geophys/Geochem.	10 levels (to 1250'); 14,254' drifting, 2644' XC
Diamond Drilling	869' raising. Winze, 175' below 1000' level.
	16 DDH, 1354'(1957): 1 DDH(1972): 10 DDH(U/G, 1937)
Sampling & Testing:	
Sampling	
Assays	Underground sampling, 1.12 oz.(cut value)
Other Metals	-
	-
Production History:	
Period/Tons Milled	1932-36/200 tpd 1880's/143,724
Method of Treatment	Cyanide mill
Recovery	- Prod. 29,628 oz (aver. 0.21 oz)
	Grade decreased to 0.16 oz (1932-36)
Potential Ore Bodies:	

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	-	-

Treatment Amenability: Flotation/cyanidation.

Remarks: Insufficient data for ore estimates, but substantial amounts of ore in various parts of the mine. Need assay data. Only 50% of shear zone reported explored. Good prospect.

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, THUNDER BAY

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.

APPENDIX K

SUMMATION: Area/Sub-Area: Moss Lake-Shebandowan Area

MDC#/Property: #TB 69/ Ray Smith Prospect

Location: Middle Shebandowan Lake

Type of Occurrence:	
Ore Setting	Zone #1: irreg. qtz. vein in felsic/mafic metavolcs.
Host Rock	N 45°W, vert. Zone is 415' x 4"-30".
Mineralization	Zone #2: parallel qtz stringers in shear zone, 50' long
	Au w/Ag, Sph, Py, Cp.
Exploration/Development:	
Surface	Stripping (1953-54)
Underground	None
Geophys/Geochem.	EM (1955), Mag + SP (1959)
Diamond Drilling	16 DDH, 1910'(1954-55); 5 DDH, 1324'(1955); 2 DDH, 550' (1959): 6 DDH (1960) + 12 DDH on Tabor Lake GML
Sampling & Testing:	
Sampling	Hwy 11 showing: tr Au, 0.46 oz. Ag, 0.55% Cu, 0.72% Zn
Assays	Zone #1: 0.72 oz.Au, 0.22% Cu, 1.17% Zn
Other Metals	Zone #2: up to 2.00 oz.Au Tabor Lake, 0.47 oz.Au
Production History:	
Period/Tons Milled	None
Method of Treatment	-
Recovery	-
Potential Ore Bodies:	Zone #1: 105 ft x 8.6 ft.
	Zone #2: 200 ft. x 5.1 ft.

Summary:

	Estimated Tonnage & Grade			
	Proven	Probable	Possible	Speculative
Reserves	-	-	Zone #1: 7500/0.72 to -100 ft.	
	-	-	Zone #2: 6500/0.21 to -100 ft.	

Treatment Amenability: Custom flotation/cyanidation (50 tpd)

Remarks: Some prospect potential for a decline operation

SOURCE OF INFORMATION: RESIDENT GEOLOGIST'S FILES, THUNDER BAY

Ore reserve calculations based on data in assessment work files; validity not guaranteed by O.G.S.