GEOLOGY

of

LAVAL-BROWNRIDGE GROUP #1
(KOZOWY OPTION)

District of Kenora, Ontario

Hollinger Mines Limited
Timmins, Ontario

filed for assessment

October 25, 1977

P. J. Bateman

S U M M A R Y

The property is composed of 33 unpatented mining claims in SW Laval Township and SE Brownridge Township, Kenora Mining Division. It is underlain by a layered sequence of predominantly mafic metavolcanic rocks up to 4000 feet (1200 metres) thick. Intercalated with the mafic rocks are three narrow units of felsic volcanics and volcanogenic sediments. The sequence is intruded by five parallel, NNE-trending, irregular-shaped bodies of diorite. Metamorphic grade is thought to be in the quartz-albite-epidote-almandine subfacies of greenschist facies regional metamorphism.

The volcanic and sedimentary assemblage has been folded into a syncline around a NNE axis. Subsequent crumpling on the limbs of this fold was succeeded by NNE fractures which served as sites for dioritic intrusion. Late stage north-trending faults may have offset the western half of the sequence by as much as 4500 feet (1350 metres) in a dextral sense.

The showing is located in the north central part of the claim-group, within intercalated volcanogenic sediments and fine felsic fragmentals. The mineralization, conformable with its host rocks, consists of fine-grained pyrite and galena with some sphalerite, chalcopyrite and a trace of pyrrhotite. A few good Pb, Zn and Ag assays have been obtained, although they tend to be localized and sporadic.

It is recommended to complete the geophysical surveys, evaluate the results, and drill one diamond drill hole. Any encouragement would allow further geochemical surveying, detailed geological mapping, and additional drilling.

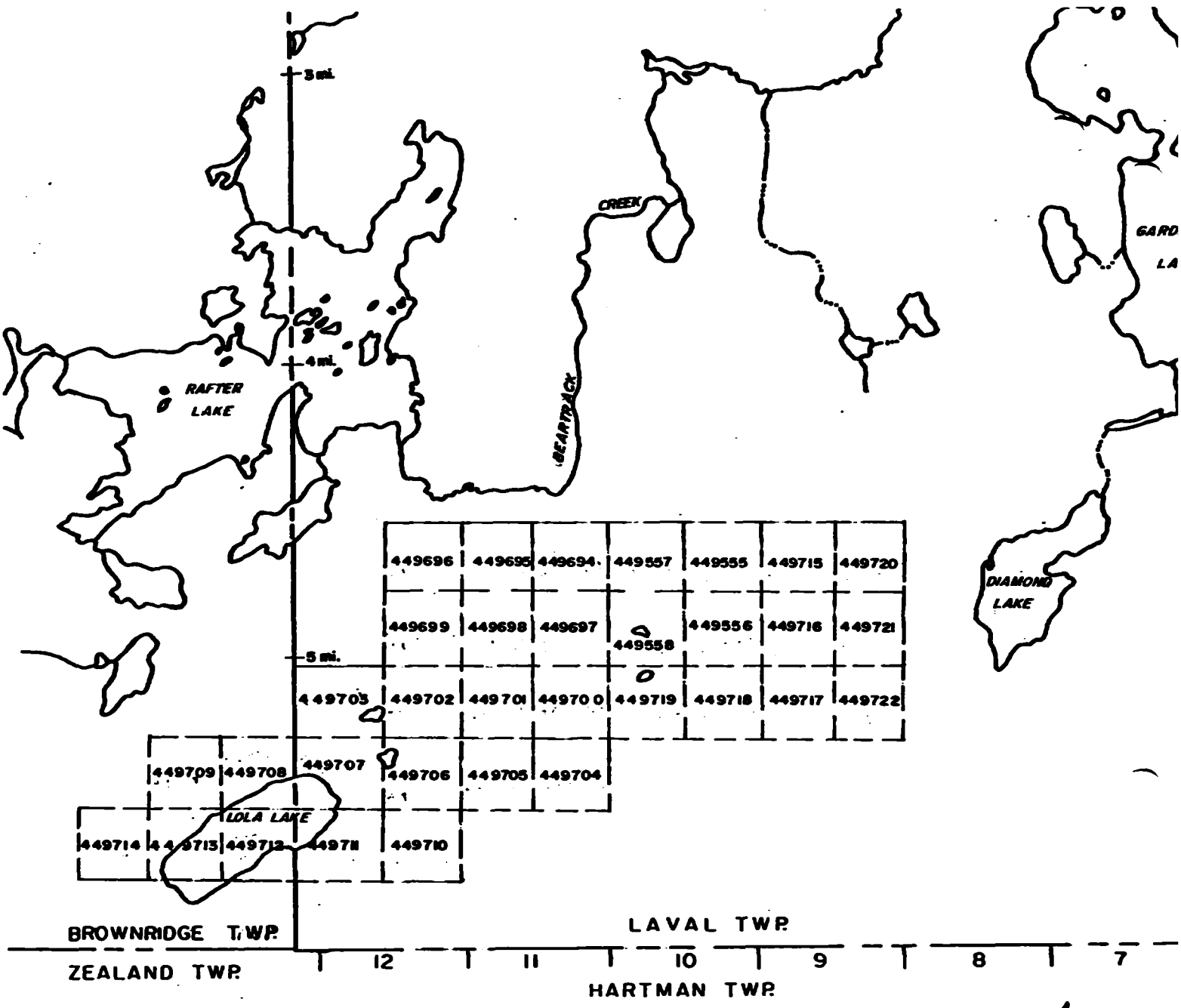


FIGURE 2. **Location of Claim Group, KOZOWY OPTION LAVAL-BROWNRIDGE No.1**

LAVAL and Browridge Twps., District of Kenora

Scale: 1" = 1/2 mile (or 0·8 km.)

N

INTRODUCTION

This report is intended as a presentation of geological survey results from the Laval-Brownridge #1 claim-group, as completed by the writer from July 2 to 15, 1977. Basic geological information from that survey is interpreted in combination with the regional mapping of previous workers, aeromagnetic trends, and available assessment data. Funding for this project is provided under a joint venture agreement between Hollinger Mines Limited, Box 320, Timmins and Amax Exploration Inc., 7 King Street East, Toronto.

PROPERTY, DESCRIPTION and LOCATION

The group consists of 33 unpatented mining claims, K-449555 to K-449558 and K-449694 to K-449722 inclusive (Figure 2), located in the SW corner of Laval Township and the SE corner of Brownridge Township, Kenora Mining Division. All the claims have been optioned from Mr. Alex Kozowy, 59 Davis Street, Dryden, Ontario.

The town of Dryden is approximately 15 miles (24 km) west-southwest. Sioux Lookout is about 33 miles (52.8 km) to the northeast.

ACCESSIBILITY, CLIMATE and TOPOGRAPHY

Access can be gained via gravelled timber access road for 5.6 miles (9 km) west from Hwy #72 to the southeast corner of the claim group. The turn-off to this gravel road is 11.5 miles (18.4 km) north of the junction of Hwy 72 and 17 at Dinorwic.

The property is rimmed by sand and outcrop ridges overlooking a broad flat western expanse of wet muskeg swamp. Elevations range from 1350 feet (405 m.) to 1500 feet (450 m.) above sea level. The mean July temperature is between 60°F (15.5°C) and 65°F (18°C), and the mean January temperature is about -5°F (-20.5°C). The annual precipitation averages 25 in. (63.5 cm) - although 1977 has proven much wetter than usual.

HISTORY

A continuous Archean 'greenstone' belt, stretching from Manitoba to the Sturgeon and Savant Lake areas, has been the subject of extensive mineral exploration since the early part of the century. Originally focussing on gold, the search has increasingly concentrated on base metals, nickel and iron over the past 20 years. The discovery of South Bay Mines at Uchi Lake and the various deposits around Mattabi Mines at Sturgeon Lake in the late 1960's and early 1970's, underlined the base metal potential of the area.

In the vicinity of Laval township, the exploration emphasis has traditionally been for gold. However, the main volcanic/sedimentary contact that crosses the property has, to the northeast, several pyritic deposits along or near it (eg. Goldenrod occurrence - Hurst, 1932), and basic metal interest has recently been sparked by drilling on the Goldlund Mines gold property in Echo Twp. In late 1976, the Goldlund drill-hole 76-8, about 3000 feet (900 metres) east of the old shaft, passed through the target granodiorite dyke into andesitic tuff mineralized with sphalerite and pyrrhotite. A 74.2 foot (22.3 metre) section averaged 0.72% Zn including 17.7 feet (5.3 metres) that ran 2.28% Zn. Subsequent drilling failed to uphold such significant widths, but did intersect 5 to 6 foot (1.5 to 1.8 metre) sections that ran from 0.11% to 0.29% Cu and 0.13% to 0.19% Zn with sporadic Au and Ag.

The property (Kozowy option) was previously investigated in 1965 by means of airborne magnetic and electromagnetic surveys for Peñarroya Canada Ltd. The surveys revealed several linear anomalies straddling the main volcanic-sedimentary contact. Ground follow-up was carried out on two grids, one of 1.59 line miles (2.5 km) near Lola Lake and the other of 7.65 line miles (12.2 km) over the eastern part of the present claim-group. There is no data revealing the type(s) of survey or results, but an available sketch shows contours suggesting resistivity or I.P. The results apparently justified drilling, as a drill hole (described later in this report) was discovered just east of the main showing during the course of Hollinger work.

Hollinger conducted ground magnetic, H.E.M., and geological surveys over the main showing during an examination in the fall of 1976. A 24.3 mile (38.9 km) grid of cut lines spaced 400 feet (120 metres) apart was then cut off E-W baselines. That portion of the grid covering the original four claims (northeast central part of existing group) was read using an EM-16 VLF unit. A report on this electromagnetic survey was filed for assessment on July 15, 1977 by D.R. Alexander.

REGIONAL GEOLOGY

General

The northwestern Superior province has been tentatively subdivided into major fault blocks, bounded by E-W fault boundaries thought to mark the latest phase of orogenic activity. Laval Township lies within the Kenora Fault Block, which is between the Quetico block to the south and the English River block to the north. The Kenora block includes the Wabigoon 'greenstone' belt (or Wabigoon Subprovince - Breaks et al, 1976) consisting mainly of calc-alkaline and tholeiitic metavolcanics with interlayered metasediments.

The combined total thickness of this Keewatin layered sequence is estimated to be 22,000 to 25,000 feet (6600 to 7500 metres). The volcanic/sedimentary rocks envelop oval-shaped granitic plutons in interlacing or chain-like patterns as a result of diapiric intrusion (Pettijohn, 1970). The granitic plutons, consequently, may represent pre-Keewatin 'basement'. They cluster in anticlinal areas, and have generally conformable boundaries between intrusive and host, local thermal metamorphic effects, as well as marginal cataclastic deformation.

Laval Township is underlain by a 4000 to 5000 foot (1200 to 1500 metre) thick sequence of south-facing, NE-trending metavolcanics between two metasedimentary sections to the northwest and south. Satterly (1941) gave the names, Brownridge volcanics and Thunder Lake sediments to the meta-volcanic sequence and southern metasedimentary belt respectively. The metasediments correlate along strike to the northeast with the Minnitaki sediments of Hurst (1932), or southern belt of Abram metasediments (Johnston, 1972; Breaks F.W. et al, 1976). At Minnitaki Lake, these metasediments unconformably overlie or are in fault contact with older units, either metavolcanics or Patara metasediments — whereas to the west, metasedimentary contacts with Brownridge volcanics are conformable.

Compositionally, the metavolcanics are mainly andesites or basalts with a few intercalated continuous units of dacite and rhyolite from 50 to 150 feet (15 to 45 metres) wide. Rhyodacite and rhyolite tuff beds are usually less than 1 foot (0.3 metres) thick. Acid members may show some subaerial as well as subaqueous features and, according to Satterly (1941), "but for the volcanic structures....., the rocks have lithological characters similar to siliceous sediments." Units of intermediate to basic lava are from 10 to 100 feet (3 to 30 metres) thick and commonly show pillow structure. Individual pillows measure up to 6 by 25 feet (1.8 by 7.5 metres) at Wabigoon Lake (Satterly, 1941) and 10 by 15 feet (3 by 4.5 metres) at Minnitaki Lake (Johnston, 1972). A distinctive

unit, known locally as 'leopard rock' and thought to be a basaltic porphyry, occurs in bands from 2 to 100 feet (0.6 to 30 metres) wide and has been mapped for strike lengths of over 1 mile (1.6 km). Subrounded yellowish-white calcic feldspar phenocrysts (0.25 to 1.5 inches or about 6 mmm to 40 mm in diameter) with frayed edges, are closely-spaced in a chlorite-carbonate-epidote matrix. Flow top and agglomeratic breccias are widespread, with one 'agglomerate', 0.5 mile (0.8 km) south of the outlet of Beartrack Lake, containing basalt porphyry fragments up to 6 feet (1.8 m) across.

The exposed metasediments in the Sioux Lookout area have been subdivided into three assemblages (Pettijohn, 1938; Johnston, 1972) listed here from youngest to oldest:

greywacke-slate
varve slate
conglomerate-arkose (possibly correlates with iron fm)

To the southwest, the arkoses give way to more mafic greywacke with minor argillite, reflecting a change to deeper water environment. The conglomerate is polymictic with numerous stretched pebbles imparting a 'pebble gneiss' appearance. Interbedded with the sediments are tuffs, fine-grained pyroclastics, and intraformational cherty 'conglomerates'. It might also be noted here that units previously mapped as sediments in the Gullwing-Bluett Lakes area (north of Laval Twp.) are now re-interpreted as felsic pyroclastics (Breaks et al, 1976).

The principal intrusive rocks between Dryden and Sioux Lookout are pink granodiorite stocks with restricted dioritic margins. Narrow feldspar porphyry dykes are widespread and may be related to the granitic intrusives. A few irregular-shaped bodies of gabbro and/or diorite have been mapped in the area, as have rare dykes of quartz diabase trending northwest and lamprophyre trending northeast.

Metamorphism is mainly of the regional type and of greenschist facies grade. However, granitic intrusion appears to have been accompanied by local thermal metamorphism, and in Laval Township, biotite aggregates up to 0.25 inches (6.4 mm) diameter are developed in the volcanics as far as 1 mile (1.6 km) from the Gardner Lake Stock. Almandine garnets are also present at some localities. Within the Kenora Block, metamorphic grade generally increases toward the east, and along the north edge in a narrow zone adjacent to the English River gneiss block.

The bedrock has been glaciated, and overlain by deposits which include tills, eskers, drumlins, moraines, kames, and varved clays. A thin sandy till or clay are ubiquitous. The entire area was also covered by glacial Lake Agassiz.

A table of formations is presented below:

Table #1. Table of Formations

PHANEROZOIC

Cenozoic

Recent

- sand; alluvium; stream, fan and basin deposits; peat

Pleistocene

- glacial deposits

--- Great Unconformity ---

PRECAMBRIAN

Proterozoic

Late Mafic Intrusive Rocks (Keweenawan?)

- quartz diabase

--- Intrusive Contact ---

Late Alkalic Intrusive Rocks

- lamprophyre

--- Intrusive Contact ---

Archean

Felsic Intrusive Rocks (Algoman?)*

- quartz-feldspar porphyry**
- granite, granodiorite
- diorite, quartz diorite***

--- Intrusive Contact ---

Early Mafic Intrusive Rocks (Haileyburian?)

- gabbro, altered ultramafic rocks

--- Intrusive Contact ---

Metasediments (Keewatin - Thunder Lake sediments, Minnitaki sediments, southern belt of Abram metasediments)

- greywacke, slate
- varve slate
- conglomerate, arkose, iron formation
- metamorphic equivalents

Metavolcanics (Keewatin - Brownridge volcanics)

- rhyolite, rhyodacite, flow breccia, felsic tuffs and agglomerates, interflow sediments (usually volcanogenic), iron formation
- dacite, dacite porphyry, flow breccia, pyroclastics, pillow lava
- andesite, basalt, massive lava, pillow lava, flow breccia, pyroclastics, aquagene tuff-breccia, variolitic lava, amygdaloidal lava, basalt porphyry, chlorite and talc-chlorite schist, amphibolitic schistose and gneissic metavolcanics

Metasediments (Keewatin - Brownridge sediments)

- greywacke, biotite-quartz schist

* may include two or more different ages

** may, in part, be subvolcanic intrusives

*** may include two or more different ages; some may represent volcanic feeders

Structure

Intrusion of granitic diapirs has pushed the volcanic sequence into large open folds. The attitudes of lavas around the Gardner and Troutfly-Crossecho stocks suggest an anticline (Laval anticline) plunging 25^{o} to 65^{o} SW. A small granitic stock in northwest Hartman Township may be on the southwestern extension of this structure. A complimentary and parallel syncline is inferred to lie to the west of the Laval anticline. Evidence of tight and more complex folding is common in thinly-bedded sequences. Overall, three periods of deformation can be recognized - the first manifested by flexural folds in layering, the second by penetrative and tectonically active foliation (differential movements have led to the superimposing of passive folds on earlier sets), and the third by crenulations and kink bands attributable to late plutonic emplacement or fault movement.

Late stage faulting completed the structural framework. The extent of northeast faults might be masked by the pervasive regional foliation; however, associated northeast faults in the Abram and Minnitaki Lakes area represent, collectively, the southern extension of the Miniss River Fault zone. The youngest faults trend northerly and are mapped or suggested in the Vermilion-Abram-Minnitaki Lakes area (Johnston, 1972), the Troutfly-Laval Lakes area (Satterly, 1941), and just east of Rafter Lake (Satterly, 1941). A fault scarp at the east end of Rafter Lake retains a skim of hematitically-cemented breccia.

Economic Geology

There are no producing base metal mines in the belt between Dryden and Sioux Lookout. However, three known pyritiferous deposits, apart from the Goldlund prospect mentioned in a previous chapter, are described below:

1) The North Pines Mines Ltd. deposit is in Dryden Township at the northeast end of Vermilion Lake. Fine-grained banded pyrite with some pyrrhotite, and minor chalcopyrite, sphalerite, and magnetite, form a 30 to 70 foot (9 to 21 metre) wide zone at least 1000 feet (300 metres) long. The mineralization is within a sedimentary schist section that is locally graphitic, strikes N50^{o}E, and dips 55^{o} NW. The hanging wall is lenticular basaltic lapilli tuff whereas the footwall is composed of massive medium-grained dioritic lava. Top determinations from pillows indicate the entire sequence is overturned.

2) The Whalen occurrence is on the south side of East Bay, Minnitaki Lake. A brecciated and mixed massive pyrite zone ((up to 30 feet (9 metres) wide and over 0.5 miles (0.8 km) in strike length)) occurs within schistose graphitic metasediments just north of the metavolcanic contact. Foliation or shearing dips steeply north.

3) The Goldenrod occurrence is in SW Pickerel Township just south of the same metasediment-metavolcanic contact that crosses the Kozowy option property. A 75 foot (22.5 metre) deep shaft explores a unit of iron formation composed of sugary quartz and dark magnetite bands impregnated with pyrite and pyrrhotite.

GEOLOGY OF THE PROPERTY

Rock-types and Distribution

The geology of the property is presented on the accompanying maps (1" = 400' or 1 cm = 48 metres)(see back pocket). Two maps are enclosed - one with basic outcrop information only, the second with interpreted lithological and structural contacts as well. The interpretation copy is recognized as tentative due to local structural complexity and the present lack of ground magnetic survey data.

The oldest rocks exposed are a layered sequence of mafic volcanic lavas with compositions ranging from basalt to andesite (all labelled andesite on map). Flow units are continuous and vary from 80 to 500 feet (24 to 150 metres) in thickness. The lavas are fine-grained, medium grey to black, massive to weakly foliated, locally tough, moderately to strongly magnetic, and variably carbonatized. Weathered surfaces are rough and medium-brown to grey-green. Metamorphic equivalents such as amphibolites, hornblende schists and biotite-chlorite schists are blacker and more intensely foliated. Pillowed units are generally composed of fine-grained, dark grey, amygdaloidal pillows up to 30 by 16 inches (76 by 40 cm) separated by dark green selvages up to 0.5 inches (about 12.5 cm) wide.

A distinctive marker 'horizon', useful because of its continuity, is basalt porphyry (name used here to conform to regional terminology). Three units, from 3 to 25 feet (0.9 to 7.5 metres) wide, have been identified on the property. Cream to greenish-white ragged feldspar phenocrysts up to 30 mm (1.2 inches) diameter are scattered, usually abundantly, through a fine- to medium-grained dark grey to black amphibole-rich matrix. The feldspars weather high and, in places, impart a variolitic appearance to the units. These rocks are moderately magnetic and moderately to non carbonatized.

Mafic fragmental units vary from fine-grained tuffs to coarse pyroclastics and breccias. Tuffs consist of fragments less than or equal to 2 mm diameter with rare suggestions of colour banding (bands up to 4 mm wide). They are medium to dark grey, moderately to strongly magnetic and variably carbonatized. Rare lapilli are found up to 10 mm diameter. Weathered surfaces are grey to buff-grey. Coarser fragmentals are composed of moderately- to closely-packed, elongate or lenticular, angular fragments (from 1 by 3 cm to 5 by 20 cm) of cream-buff dacite or dark green andesite in a fine- to medium-grained light grey to dark greenish-black andesitic matrix. These units weather greyish-brown to green-grey and are variably magnetic. Fragment sizes at selected exposures are shown on the accompanying maps (see back pocket).

A very distinctive fragmental 'band' of aquagene tuff-breccia is found north of the main showing in the north central part of the map-area. The unit appears to be continuous and about 3 to 5 feet (0.9 to 1.5 metres) wide. Subangular to angular, delicately-preserved, ribbon-like, greyish-white to greenish-grey, fine-grained fragments up to 5 cm long are set in a very fine-grained, black cement. The rock is non-magnetic and weakly carbonatized. Weathered surfaces are medium to dark brown, locally rusty, and pitted where some fragments have weathered out.

Units of dacitic composition are mainly tuffaceous lenses up to 900 feet (270 metres) long and 10 to 100 feet (3 to 30 metres) thick. They are fine-grained and either banded white-grey and dark grey or mottled dark green and light grey-green. Fine white siliceous laminae are more resistant to weathering. A few units feature sparsely scattered subangular cream fragments from 6 to 60 mm across. Outcrop surfaces are rough and weather light grey-green or buff.

Felsic volcanic units are principally fragmental, although a section of massive, very fine-grained, dark grey to black, cherty rhyolite comprises part of the felsic unit in the area of the main showing. This unit is 200 feet (60 metres) thick and trends north-east. The felsic tuff and fragmental beds are 20 to 50 feet (6 to 15 metres) thick and can be traced as continuous units across the property. Tuffaceous beds are fine-grained to very fine-grained, light brownish-grey, dark grey or medium green, magnetic, weakly carbonatized and faintly banded with smooth light brown to grey-green weathering. Lapilli tuffs are similar, with the addition of subangular to subrounded dark grey lapilli from 4 to 12 mm diameter. Coarser fragmental units are heterogeneous or homogeneous with subangular to angular, usually elongate, rarely folded, buff-grey, siliceous fragments (two classes - 10 to 50 mm long and 15 to 30 cm long) and/or dark grey angular fragments (from 2 to 8 cm across) in a fine-grained, brown-grey, finely fragmental cement. Fragment sizes at selected exposures are shown on the accompanying maps (see back pocket).

At the main showing is a narrow sequence of intercalated felsic flow units and volcanogenic sediments or tuffs. The sediments consist of alternate black and buff-white bands up to 6.4 cm (2.5 inches) wide, striking 085° az. (average), dipping vertical to steeply south, with local crenulations and possible small scale cross-bedding. The pattern suggesting cross-bedding is indistinct, and may be due solely to small arcuate fractures. Within the banded sequence, in the south half of the main trench, is a 12 inch (30 cm) bed of fine-grained, dark grey rhyolite that weathers smooth and buff. There is a hint of graphite or black carbonaceous material in some of the dark bands, particularly near a quartz vein at the north end of the pit. Many of the rocks within this sequence are magnetic, a feature due to disseminated crystals of magnetite.

Seventy-five feet (22.5 metres) northeast of the main trench, an outcrop of rhyolite tuff features two central bands of agglomerate about 10 feet (3 metres) apart. The fragments are subrounded, elliptically-shaped, dark grey rhyolite 'bands' up to 5 cm by 2 cm. A sample sent to the Ministry of Natural Resources, Mineral Research Branch, for thin section (Rept. No. c 18435) was confirmed as a felsic volcanic fragmental. Further petrographic work by the writer determined that the bombs or 'pods' consist of very fine-grained quartz grains from 0.005 to 0.02 mm diameter. The cement is composed of rounded alkali feldspar and/or quartz fragments up to 0.8 mm diameter, scattered phlogopite flakes up to 0.12 by 0.07 mm, with interstitial sericite and quartz. The modal composition based on a 500 point count is outlined in the following table:

Table #2. Modal Composition of Felsic Agglomerate (in per cent)

	Quartz	Feldspar	Phlogopite	Sericite	Chlorite	Hematite	Opaques & Sphene	Carbonate	Saussurite
Total	56.1	3.2	15.9	15.3	0.7	5.9	1.3	Tr.	Tr.
Bombs or Pods	79.8	1.7	8.1	2.9	Tr.	4.0	2.3	-	-
Cement	35.7	4.5	22.1	26.1	1.5	7.5	0.5	1.0	1.0

North of the main showing, by about 125 feet (37.5 metres), the felsic sequence contains a spherulitic flow up to 22 inches (56 cm) wide. The spherules are medium to dark grey, closely-packed, subrounded, and form a unit that strikes 045° az. and dips steeply southeast.

An outcrop of fine-grained, yellowish to dark grey arkose-greywacke at the south end of XL 00 is apparently part of the metasedimentary sequence ('Thunder Lake sediments') overlying the metavolcanics. The rock is moderately foliated, weakly magnetic, variably carbonatized and locally micaceous. On the basis of foliation trends, adjacent volcanic units (known to be conformable to the west), and aeromagnetic patterns, a metasedimentary unit up to 800 feet (240 metres) thick is interpreted to cross the southern part of the map-area.

Five roughly linear and parallel bodies of metadiorite cut the layered volcanic assemblage. They trend NNE and have irregular shapes, varying from 60 to 1200 feet (18 to 360 metres) in width. They are medium-grained and mottled dark green/black and white-grey/cream. The mafic constituents are black hornblende, some fibrous dark green amphibole, some biotite, and scattered cubic crystals of pyrite. The rock is generally non-magnetic and weakly to moderately carbonatized. Rough weathered surfaces are speckled cream and black. It is difficult to distinguish finer-grained more mafic parts of these units from similar meta-andesites.

Metamorphism

Many of the mafic volcanic rocks have been metamorphosed to hornblende and biotite-chlorite schists, or black, amphibole-rich, strongly-foliated rocks with cream feldspar schlieren or lenticles. Most of the narrow intravolcanic sedimentary units have been changed to biotite-sericite-quartz-feldspar schists. These assemblages, coupled with the association of almandine,

hornblende, albite and quartz farther north in the belt, suggest that the rocks are in the high temperature quartz-albite-epidote-almandine subfacies of the greenschist facies of regional dynamothermal metamorphism (Winkler, 1967). Insufficient work has been done to determine the nature and extent of zoning; however, the amount and degree of metamorphic change appears greatest in the southeast corner of the map-area.

Structure

As mentioned above, two maps accompany this report - for the structural interpretation on one remains tentative. The interpreted picture, which fits available data and conforms to regional knowledge about structural history and orientation, shows the layered metavolcanic assemblage synclinally folded around younger metasediments at the south end of the grid. The synclinal axis crosses the eastern part of the claim-group at a strike of 025° az. to 030° az., with a SW plunge. Small dragfolds at the southern end of the eastern limb imply that the sequence is folded back to the east in an anticline just beyond the claim-group. Crinkle folding and minor dragfolding (axes trend 060° to 080°, plunging westerly on the east limb; axes trend 350° az.(?) and plunge south on the NW limb) appear to ripple the flanks of the main synclinal fold. This is suggested by the pattern of basalt porphyry and felsic volcanic exposures - both of which make excellent markers. Such a crumpling or ripple effect could be produced by a re-orientation of the principal stress direction. Foliations shown on the map are, where possible, parallel to lithological contacts. Some strong foliations, however, are parallel to the main synclinal fold axis, even at the nose, and are attributable to later stage deformation.

Late stage faulting is represented by NNE fractures parallel to the main synclinal axis, and along which the dioritic bodies intruded. Still later, the rocks were cut by a series of

in most cases not shown, as sense and

north-trending faults with probable movement (magnitude uncertain) both horizontally and vertically. These faults are suggested in the map-area by the extension of previously-recognized regional faults, by aeromagnetic patterns, and by topographic lineaments. Aeromagnetic data and the apparent repetition of units west of XL 24 W suggest a dextral horizontal movement along one or a combination of north-south faults in the order of 3000 to 4500 feet (900 to 1350 metres).

ECONOMIC GEOLOGY

The showing, located in the north central part of the property, consists of up to 10% fine-grained sulphides (pyrite, galena, some sphalerite and chalcopyrite, and traces of pyrrhotite) within volcanogenic tuffs or sediments, and near the contacts with fine felsic fragmentals. A 15 ft. by 5 ft. (4.5 by 1.5 metre) blasted pit exposed the mineralization and has been subjected to grab, channel, and plugger dust sampling. Some good assay values in Pb, Zn and Ag were obtained, although so far, they are localized. The best assay results are unchanged from the previous company report (Bateman, 1976).

The economic potential of the rest of the property might be enhanced by subsequent geophysical data. All other sulphide occurrences (galena, sphalerite, and chalcopyrite) found to date were along internal fractures or contacts of quartz veins. Preliminary 'trends' from size of volcanic fragments are still too sketchy to be of value.

An old AX diamond drill-hole site, probably Peñarroya's, and about 200 feet (60 metres) of core were discovered during the course of Hollinger's surveys. The set-up clearing is 400 feet (120 metres) northeast of the present pit. Footage markers are illegible and some of the core is upset; however, if the order of boxes is accurate, the hole collared in dark green-grey, strongly

magnetic and carbonatized andesite. This was succeeded by andesite to dacite lapilli tuff and breccia, then a unit of dark grey, non magnetic, moderately carbonatized andesite tuff. A unit of very fine-grained, medium grey, non magnetic and non carbonatized rhyodacite followed, and the hole seems to have bottomed in dark green, strongly magnetic and carbonatized, andesite tuff. The only sulphides of note were within a narrow upper andesite zone containing 1 to 5% disseminated pyrite and a narrow quartz vein rimmed by sphalerite. No significant assay results were obtained from selected grab samples.

Positive and negative traits for this prospect are summarized in Table #3.

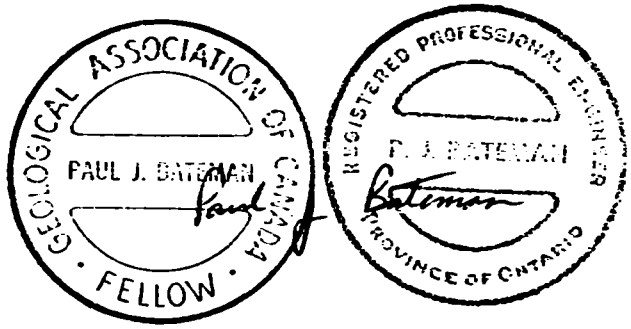
Table #3. Summary of Positive and Negative Traits Re Prospect

Positive	Negative
- the blasted pit has exposed new ground and the 'bedded' mineralization may have been previously unknown.	- the coincident EM conductor axis is very long (similar to graphitic 'horizons')
- the showing and strong conductor are coincident with or near to the main felsic volcanic unit	- the anomaly may have been tested already (old drill hole)
- significant assays have been obtained	- the 'bedded' mineralization has been found so far at only one locality; elsewhere, sulphides are associated with quarts veins.
- the old drill hole may not have reached the target area (unless some core was removed, the hole seems too short to have reached the conductor)	

CONCLUSIONS and RECOMMENDATIONS

The property is underlain by a layered volcanic assemblage that has been synclinally folded around a NNE axis. The principal felsic volcanic unit occurs on the north-west limb, and is host to the main Pb-Zn-Ag prospect. The setting is favourable for a distal volcanogenic sulphide deposit, and some significant assays have been obtained.

The writer recommends completion of the geophysical surveys, evaluation of results, and one diamond drill hole to test the 'showing area' at depth. If the program receives encouragement, further work could be planned in the form of additional drilling, geochemical surveys, and detailed geological mapping.



October 25, 1977

P. J. Bateman

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2. Breaks F.W. et al, 1976, Operation Kenora-Ear Falls: Sandybeach-Route Lakes Sheet, District of Kenora, Ontario Division of Mines, Preliminary Map P.1204, Geol. Ser. and Marginal Notes, 1" = 1 mile or 1:63,360.

3. Hewitt D.F., 1967, Pyrite Deposits of Ontario: Ontario Dept. of Mines, Mineral Resources Circular No. 5, 64 pg.

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5. Johnston F.J., 1972, Geology of the Vermilion-Abram Lakes Area, Dist. of Kenora : Ontario Division of Mines Geological Report 101, 51 pg.

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Ontario

Ministry of Natu

GEOPHYSICAL – GEOLOGI
TECHNICAL DATA

900

TO BE ATTACHED AS AN APPENDIX TO TECHNICAL REPORT
FACTS SHOWN HERE NEED NOT BE REPEATED IN REPORT
TECHNICAL REPORT MUST CONTAIN INTERPRETATION, CONCLUSIONS ETC.

Type of Survey(s) Geological

Township or Area Laval and Brownridge

Claim Holder(s) Hollinger Mines Limited
Box 320, Timmins, Ont.

Survey Company Hollinger Mines Limited

Author of Report Paul J. Bateman

Address of Author 279 Patricia Blvd., Timmins, Ont.

Covering Dates of Survey July 2 to July 15, 1977
(linecutting to office)

Total Miles of Line Cut 27.5

SPECIAL PROVISIONS CREDITS REQUESTED

ENTER 40 days (includes line cutting) for first survey.

ENTER 20 days for each additional survey using same grid.

	DAYS per claim
Geophysical	
–Electromagnetic	
–Magnetometer	
–Radiometric	
–Other	
Geological	40
Geochemical	

AIRBORNE CREDITS (Special provision credits do not apply to airborne surveys)

Magnetometer _____ Electromagnetic _____ Radiometric _____
(enter days per claim)

DATE: Oct 28, 1977 SIGNATURE: Paul J. Bateman
Author of Report or Agent

Res. Geol. _____ Qualifications 2.1134

Previous Surveys

File No.	Type	Date	Claim Holder

OFFICE USE ONLY

MINING CLAIMS TRAVERSED
List numerically

(prefix) (number)

K	449555
K	449556
K	449557
K	449558
K	449694
K	449695
K	449696
K	449697
K	449698
K	449699
K	449700
K	449701
K	449702
K	449703
K	449704
K	449705
K	449706
K	449707
K	449708
K	449709
K	449710
K	449711
K	449712
K	449713
K	449714
K	449715
K	449716
K	449717
K	449718
K	449719
K	449720
K	449721
K	449722

TOTAL CLAIMS 33

If space insufficient, attach list

NOTES

400' surface rights reservation along the shores of all lakes and rivers.

SAND and GRAVEL

(Q1) GRAVEL File 156744
(Q2) GRAVEL File 144049
(Q3) MTC PIT N°1112

AREAS WITHDRAWN FROM STAKING

SR – SURFACE RIGHTS M.R.–MINING RIGHTS

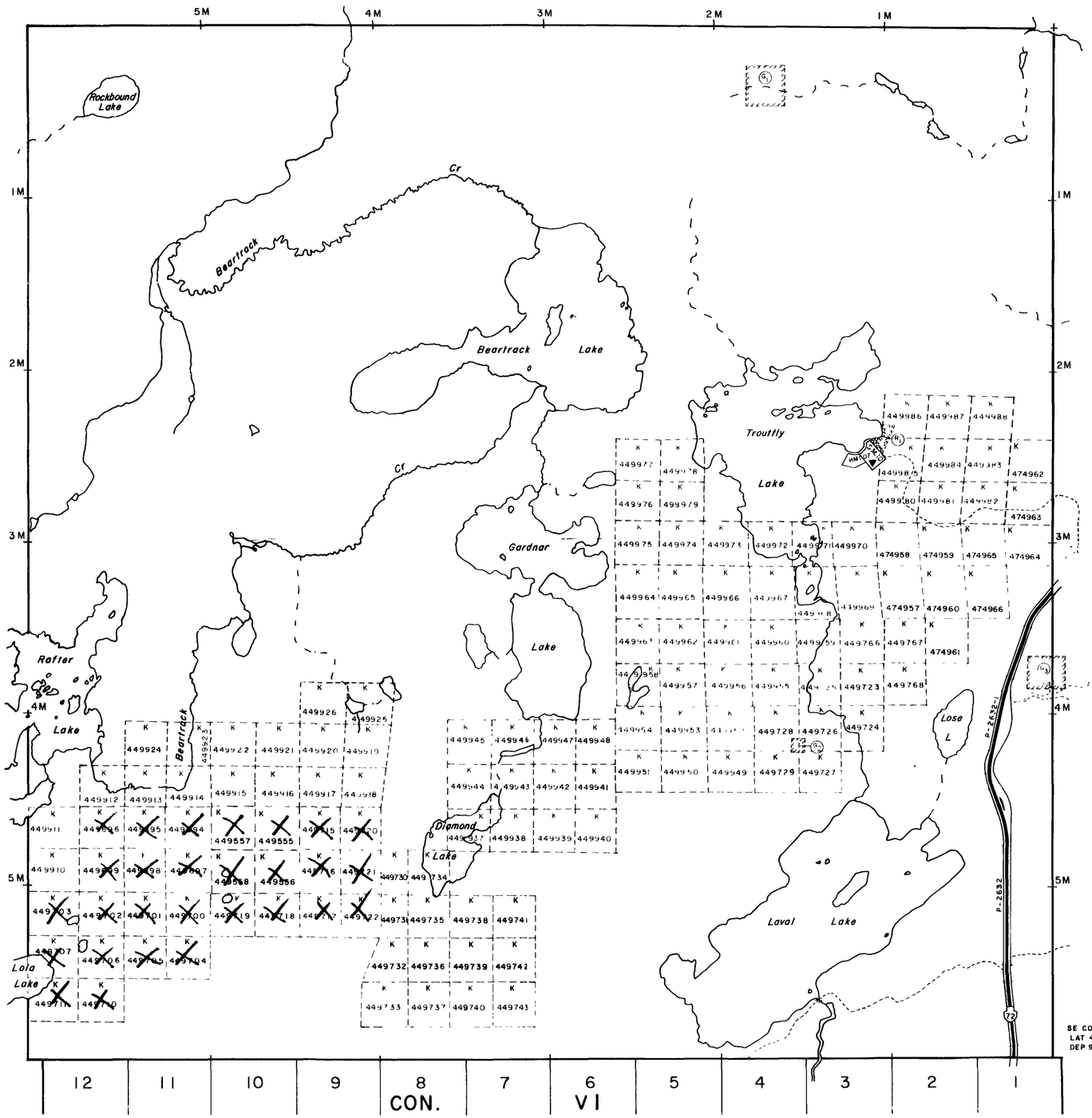
	Section	Date	Disposition	File
(R1)	Res. for Public use			183473

200

WEBB TP. M.1874

BROWNRIDGE TP. M.1954

TP. M.2254 McAREE



HARTMAN TP. M.1986

SE CORNER co-ordinates
LAT 49°48'00"
DEP 92°24'37" Approx

LEGEND

- HIGHWAY AND ROUTE No
- OTHER ROADS
- TRAILS
- SURVEYED LINES
  - TOWNSHIPS, BASE LINES, ETC
  - LOTS, MINING CLAIMS, PARCELS, ETC
- UNSURVEYED LINES
  - LOT LINES
  - PARCEL BOUNDARY
  - MINING CLAIMS ETC
- RAILWAY AND RIGHT OF WAY
- UTILITY LINES
- NON-PERENNIAL STREAM
- FLOODING OR FLOODING RIGHTS
- SUBDIVISION
- ORIGINAL SHORELINE
- MARSH OR MUSKEG
- MINES

DISPOSITION OF CROWN LANDS

TYPE OF DOCUMENT	SYMBOL
PATENT, SURFACE & MINING RIGHTS	●
" SURFACE RIGHTS ONLY	◒
" MINING RIGHTS ONLY	◓
LEASE, SURFACE & MINING RIGHTS	■
" SURFACE RIGHTS ONLY	◨
" MINING RIGHTS ONLY	◧
LICENCE OF OCCUPATION	▼
CROWN LAND SALE	CS
ORDER-IN-COUNCIL	OC
RESERVATION	(R)
CANCELLED	(X)
SAND & GRAVEL	(S)

SCALE : 1 INCH 40 CHAINS

FEET 0 500 1000 2000 4000 6000 8000
METRES 0 200 400 600 800 1 KM 2 KM

ACRES	HECTARES
40	16

TOWNSHIP 2.2523
LAVAL

DISTRICT
KENORA

MINING DIVISION
KENORA

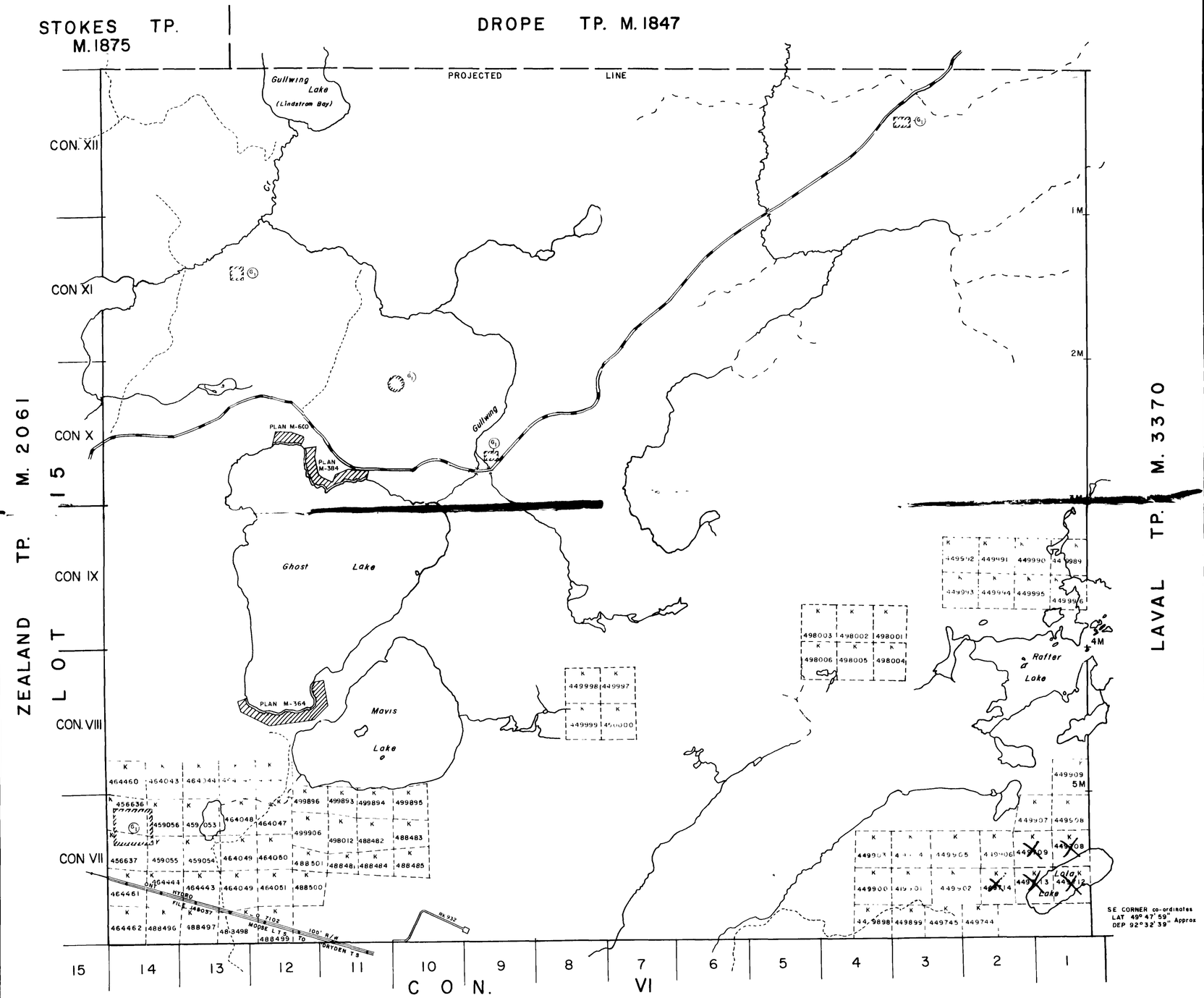
Ministry of Natural Resources
Ontario Surveys and Mapping Branch
Date Nov '74
Whitney Block
Queen's Park, Toronto
Plan No M.3370

NOTES

400' surface rights reservation along the shores of all lakes and rivers

SAND and GRAVEL

(G1) GRAVEL File 159618



LEGEND

- HIGHWAY AND ROUTE No
- OTHER ROADS
- TRAILS
- SURVEYED LINES
  - TOWNSHIPS, BASE LINES, ETC
  - LOTS, MINING CLAIMS, PARCELS, ETC
- UNSURVEYED LINES
  - LOT LINES
  - PARCEL BOUNDARY
  - MINING CLAIMS ETC
- RAILWAY AND RIGHT OF WAY
- UTILITY LINES
- NON-PERENNIAL STREAM
- FLOODING OR FLOODING RIGHTS
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- ORIGINAL SHORELINE
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DISPOSITION OF CROWN LANDS

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" SURFACE RIGHTS ONLY	◒
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" MINING RIGHTS ONLY	◧
LICENCE OF OCCUPATION	▼
CROWN LAND SALE	CS
ORDER-IN-COUNCIL	OC
RESERVATION	(R)
CANCELLED	(X)
SAND & GRAVEL	(S)

SCALE : 1 INCH 40 CHAINS

FEET 0 500 1000 2000 4000 6000 8000

METRES 0 200 400 600 800 1KM 2KM

ACRES	HECTARES
40	16

TOWNSHIP

BROWNRIDGE

DISTRICT

KENORA 2.2523

MINING DIVISION

KENORA

Ministry of Natural Resources

Ontario Surveys and Mapping Branch

Date Nov '74

Whitney Block Queen's Park, Toronto

Plan No M. 1954

DATE OF ISSUE NOV - 3 1977 SURVEYS AND MAPPING BRANCH

52F15SE0005 2.2523 LAVAL

210

RAFTER LAKE

LOLA LAKE

Bedrock Creek

BROWNRIDGE TWP. | LAVAL TWP.

ZEALAND TWP. | HARTMAN TWP.

HOLLINGER MINES LTD

LAVAL & BROWNRIDGE TWPS.

(Dryden Area, Ontario)

KOZOWY OPTION

GEOLOGY

Scale : 1 inch to 400 feet
1 cm. to 48 metres

2.2523