THE SHEPPARD SHOWING
A PYRITE-ARSENOPYRITE-GOLD OCCURRENCE

ARNOLD BURTON
GEOL0GY DEPARTMENT
LAURENTIAN UNIVERSITY
SUDbury, ONTARIO

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SUPERVISOR: DR. R. E. WHITEHEAD
ABSTRACT

The Sheppard Showing, located 1½ miles northeast of Skead, occurs within the Mississagi arkosic sandstones of the Hough Lake Group, Huronian Supergroup. The showing consists of three separate mineralized zones containing pyrite, arsenopyrite, minor chalcopyrite and gold enclosed in albitized wall rock. The three zones are approximately sixty feet apart and lie at the intersections of a discontinuous vertical shear zone and steeply dipping tension fractures which appear to have controlled the emplacement of the mineralization.

The gold occurs as microscopic (15-65 μm) anhedral blebs within the pyrite (microfractures), around the edges of anhedral pyrite grains and in contact with pyrite and arsenopyrite grains. Assays range from trace to a maximum of 2.01 ounces per ton gold, with trace values associated with the host rocks that contain little or no sulfides.

The origin of the Sheppard Showing cannot be physically linked to any features on the surface, however, conjecture relates the occurrence to hydrothermal activity produced from the intrusion of the Nipissing Gabbro just north of the showing. Petrographic evidence suggests the gold is syngenetic with the pyrite and arsenopyrite and they are a result of one epigenetic hydrothermal event.
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INTRODUCTION

The Sheppard Showing (figure 1) is located in the north half of lot four/concession five of Maclennan Township in the district of Sudbury. The showing is at 80°44' longitude and 46°41' latitude and can be reached by highway 541 and East Bay Road.

![Figure 1: Location Map.](image)

This occurrence is a gold-sulphide showing which is hosted by the Mississagi Formation adjacent to a Nipissing Gabbroic Intrusion. Gold occurrences are not uncommon in the Wanapitei Lake area as Dressler (1982) notes 14 occurrences.
within 10 kilometers of the east shore of Wanapitei Lake. The vast majority, if not all, are gold occurrences in quartz veins with associated chalcopyrite and galena. Pyrite is also common, however, the gold is usually 'free' in the quartz.

The object of this study was to examine the petrography, mineralogy, geochemistry and field relationships of the Sheppard Showing to determine, if possible, its origin. The initial step involved detailed mapping of a trench that exposed sulphide mineralization in three zones. Fifteen thin sections were made of the regionally altered arkose, hydrothermally altered arkose and Nipissing Gabbro. Eight polished sections were made of the sulphides for mineralogical identification and paragenetic purposes. Samples of regionally and hydrothermally altered arkoses were also analysed for their whole rock geochemistry.

Previous Work

The area around the Sheppard Showing has a lengthy history of activity related to gold. In 1888 the local area was visited by representatives of the Mineral Resources of Ontario and in 1890 a report, "Report of the Royal Commission", was published referring to showings on the southern side of Wanapitei Lake. They were described as follows:

"...several narrow veins of white quartz cutting a highly feldspathic reddish quartzite, resem-bling a fine grained granite, but distinctly clastic or fragmental in origin..."

"...no single vein or group of veins could be traced far..."
"...the visible gold of these veins occurs as specks and small nuggets in the quartz..."

"...one of those little veins shows a good deal of mispickel and some iron pyrites in crystals along the side of it..."

No map accompanied the report so the exact location is unknown. In the winter of 1980, the Sheppard Showing was rediscovered by the F. D. Delabbio group. In September of 1981, E. F. Pattison, senior geologist for INCO Metals Co., visited the Showing and concluded:

"...The showing consists of a 1 foot wide band of massive to semi-massive granular pyrite and associated disseminated pyrite within outcrops of weakly carbonitized and hematitized Mississagi Formation sandstones. The mineralization trends N70°E (magnetic), dips 60° - 70° to the north-northwest, and is apparently conformable to the attitude of the enclosing sandstone. Visible gold is present as small grains within quartz veins and on limonitic weathering rinds on the massive sulfides..."

INCO assay results ranged from 10 ppb Au to 20 ppm (0.57 ounces per ton) Au.

In October of 1981, the F. D. Delabbio group conducted a geophysical survey over the showing to delineate it. The E. M.-16 survey confirmed a major fault zone south of the showing and also another anomaly southwest of the showing but did not locate the sulphide showing.

In the summer of 1982, MacIsaac Mining and Tunnelling trenches the showing and are presently drilling shallow holes to explore the occurrence.
The granodiorite and diorite plutons which form the basement rocks in this part of the Superior Province are Early Precambrian, table 1, in age (2.5 b.y.). The Mississagi Formation of the Hough Lake Group, table 1, was the first formation of the Huronian Supergroup to be deposited in this area. Long (1978) concluded that the greater part of the Mississagi Formation appears to have been deposited from bed load and mixed load streams with a low to intermediate sinuosity. Paleocurrent directions show two large rivers, one flowed from the Sault Ste. Marie area, eastward toward Sudbury and the other river flowed southward off the Cobalt Plain toward Sudbury. The latter river would have been responsible for the deposition of the Mississagi Formation in the Wanapitei Lake area. Sedimentation continued, in various environments, to deposit the Bruce, Espanola and Serpent Formations of the Quirke Lake Group and the Gowganda and Lorrain Formations of the Cobalt Group. As shown in table 1, the Hough Lake, Quirke Lake and Cobalt Groups belong to the Huronian Supergroup which constitutes the Southern Province in this area.

The area south of Wanapitei Lake, figure 2, which contains the Sheppard Showing has undergone regional metamorphism to the chlorite and biotite zones of the low to middle greenschist facies.
TABLE OF IMPORTANT LITHOLOGIC UNITS

Phanerozoic
  Cenozoic
    Quaternary
    Recent
      Swamp, lake, stream
    Pleistocene
      Glacial, glaciofluvial sand and gravel

Unconformity

Precambrian
  Late Precambrian - Mafic Intrusive Rocks
    Olivine diabase

Intrusive Contact

Middle Precambrian - Sudbury Nickel Irruptive
  Sublayer, norite, transition
    zone norite, micropegmatite 1.72 b.y.
    Whitewater Group
      Tuff, quartzite breccia
    Nipissing Intrusive Rocks
      Gabbro 2.16 b.y.

Intrusive Contact

- Huronian Supergroup
  Cobalt Group
    Lorrain Formation
    Arkose
    Gowganda Formation
    Wacke, arkose, conglomerate
  Quirke Lake Group
    Serpent Formation
    Arkose
    Espanola Formation
    Calcareous siltstone, limestone
    Bruce Formation
    Conglomerate
  Hough Lake Group
    Mississagi Formation
    Arkose, conglomerate

Unconformity

Early Precambrian - Basement
  Granodiorite and diorite plutons,
  metasediments, metavolcanics 2.50 b.y.

Table 1: Lithologic Units  Modified after Dressler (1982)
Figure 2: Metamorphisms within the Southern Province.
Most of the above rock types are intruded by large sill and dike like bodies of Nipissing Gabbro. The gabbroic intrusions, 2.16 b.y. in age, appear to have intruded only the Huronian metasediments below the Lorrain Formation as well as the Early Precambrian basement.

The next major geologic event which may have coincided with the Nipissing Gabbro event, is the formation of the Sudbury Basin, which still has a controversial origin. The Basin rocks outcrop southwest of Skead (map 2451) and consists of norite, micropegmatite and Onaping breccia. Fairbairn (1965) obtained a Sr\textsuperscript{87}/Sr\textsuperscript{86} ratio of 0.705 to estimate the age of the Sudbury Basin at 1.72 billion years.

Thin long, Late Precambrian, olivine diabase dikes are the youngest rocks in the area and cut all of the above mentioned rock units.
GEOLOGICAL SETTING

The Mississagi Formation of the Hough Lake Group is the host rock, table 1. The Mississagi is a thickly, 5 - 10 feet, bedded arkosic sandstone with occasional irregular bands of lag conglomerate. The average bedding attitude of the host sandstone is N40°E/45°NW.

South of the showing, Nipissing Gabbro (figure 3) is located in fault contact with the arkose whereas, north of the showing, these same rocks have an intrusive contact that dips 30° southeastward under the showing.

STRUCTURE

The most pervasive structure, (figure 4) is the 070° shear zone which is present discontinuously over the entire length of the trench. It intersects tension fractures at an angle of roughly 60°. The tension fractures trend at 317° and dip at 75° - 85° southwestward and their strike length is not much in excess of 10 feet. Pyrite and arsenopyrite are often concentrated at the intersection of these two structures.

Two thrust faults with attitudes of N55°E/34°SE have slickenslided surfaces that show movement was perpendicular to the strike and south side up. Both thrust faults are cut by a well developed joint pattern with only slight displacement evident.
Figure 4: Sketch of Structures
The possible origin for the major structures will play an important role in future local exploration. The oldest structure within the trench is the 317° tension fractures with the 070° shear zone being the next. The two thrust faults appear to have formed later than these two structures. The last structural event developed the joint pattern that slightly displaces the thrust faults. This order for the structural features is discussed by Billings (1972) in an experiment describing the rupture patterns due to a couple force.

Within figure 5, A denotes a square frame that is covered by a sheet of rubber, on which there is a sheet of paraffin.
Figure 5, B, denotes fractures that develop because of a couple force, $t$, represents tension fractures perpendicular to the plane of the paper, $s$, represents shear fractures perpendicular to the plane of the paper, $\theta$, thrust faults inclined to the plane of the paper. These diagrams are modified from Billings' (1972) structural text and about these he states:

"...The first ruptures are vertical tension fractures, $t$, that strike parallel to the short diagonal of the parallelogram..."

"...After further deformation, vertical shear fractures, $s$, developed parallel to the sides of the wooden frame..."

"...Small thrust faults, $\theta$, which develop in the last step of deformation strike parallel to the long diagonal of the parallelogram..."

This appears to be the same forces that were present to form the structural elements of the Sheppard Showing. Billings' experiment showed the first two structures to form should be tension fractures and shear zones. This would correspond to the $317^\circ$ tension fractures and $070^\circ$ shear zone of the Sheppard Showing. This intersection would produce a dilatent zone for the solutions to pass through and the mineralization does appear to be controlled by those intersections. Upon comparing figure 5 with figure 4, more dilatent zones may be present in all directions around the original showing.
ALTERATION

The alteration associated with the sulphide assemblage varies erratically in location and intensity. The best developed is along the 317° veins in the 'A' zone (trench map). Zones 'B' and 'C' also have abundant alteration, however, its relationship to the sulphides is not clearly evident. The alteration, figure 6, is shown in a reconstructed plan view using, as a guide, hand specimen ABT-18. The specimen contains two "317° veins" from the 'A' zone which contain massive to heavily disseminated pyrite in the central portion of the veins with arsenopyrite occurring sporadically along the edges. The alteration persists outward from the veins to a maximum of 3 inches, however, the average width of alteration is less than one inch.

The colour of the altered wallrock varies with intensity and mineralogy. The deep orange-red alteration is most intense and consists mostly of iron rich albite. The lighter colours, almost white, are representative of higher amounts of carbonates and quartz and lesser intensities of alteration.

Figure 6 also shows the location of three thin section photos presented. Photo one is a thin section of completely unaltered (except for regional metamorphism) Mississagi arkose. Plane polarized light was used to accentuate the quartz grains. The feldspars, which are outlined and labelled 's', may be easily mistaken for the matrix, have undergone
Figure 6: Plan view of two parallel 317° veins located in the 'A' zone.
Photo 1: Unaltered Mississagi arkose. P.F.I.

Photo 2: Pyrite and alteration minerals. X-polars

Photo 3: Arsenopyrite alteration minerals. P.F.I.
extensive sericitization by regional metamorphism. Photos two and three show that the relic feldspars, quartz and matrix are completely altered by the hydrothermal alteration. The circulating solutions altered the relic feldspars, quartz and matrix of the arkose to albite and carbonate. Photo two shows a euhedral pyrite grain with abundant albite and carbonate. A large anhedral albite grain is divided into two phases marked as 1 and 2. The inner phase, 1, appears to be a relic feldspar grain that has acted as a nucleus for the precipitation of the clean outer feldspar, 2. Photo 3, plane polarized light, accentuates the carbonate, because of its very low refractive index in comparison to that of albite. An estimation of the modal mineralogy for the altered rocks is as follows:

- albite 55%
- carbonate 28%
- quartz 7%
- orthoclase 5%
- sulphides 5%

The type of carbonate is not determinable from a thin section, therefore, a sample, high in carbonate content, was crushed and ground and analyzed by x-ray diffraction. Patterns comparable to dolomite and ankerite were observed, however, they are indistinguishable by x-ray diffraction unless a single crystal is available. Therefore, the carbonate is either dolomite or ankerite or a combination of both.
### Table 2: Whole rock geochemistry

<table>
<thead>
<tr>
<th>Major Oxide</th>
<th>Unaltered Mississagi Arkose ABT-01</th>
<th>Alteration ABT-02</th>
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</thead>
<tbody>
<tr>
<td>SiO₂</td>
<td>80.31</td>
<td>62.16</td>
</tr>
<tr>
<td>Al₂O₃</td>
<td>12.43</td>
<td>18.16</td>
</tr>
<tr>
<td>Fe₂O₃*</td>
<td>1.01</td>
<td>6.23</td>
</tr>
<tr>
<td>MgO</td>
<td>0.46</td>
<td>0.38</td>
</tr>
<tr>
<td>CaO</td>
<td>0.10</td>
<td>0.73</td>
</tr>
<tr>
<td>Na₂O</td>
<td>2.82</td>
<td>11.53</td>
</tr>
<tr>
<td>K₂O</td>
<td>2.62</td>
<td>0.24</td>
</tr>
<tr>
<td>TiO₂</td>
<td>0.18</td>
<td>0.26</td>
</tr>
<tr>
<td>P₂O₅</td>
<td>0.04</td>
<td>0.29</td>
</tr>
<tr>
<td>MnO</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>99.99</td>
<td>100.00</td>
</tr>
<tr>
<td><strong>Loss of Ignition</strong></td>
<td>1.49</td>
<td>3.58</td>
</tr>
</tbody>
</table>

*Total Iron

A further check was initiated to obtain the major oxide geochemistry of a regionally altered and hydrothermally altered sample. An x-ray fluorescence unit was used to obtain the results in table two. The major oxides detected in the alteration sample correlates to the alteration assemblage determined by thin section work.
SULPHIDE ASSEMBLAGE

The mineralization consists of massive to weakly disseminated pyrite and arsenopyrite with minor chalcopyrite. Within the 'A' zone (trench map), the sulphides have a true width of 1 foot and are predominantly within the 31° fractures. They do not invade the 070° shear zone to any great extent. In contrast the sulphides in the 'B' zone (trench map), are more abundant within the 070° shear zone and also have a true width of about 1 foot. Zone 'C' (trench map), is a 8 foot wide vein of sulphides within the 070° shear zone and the 31° fracture is almost barren.

Figure 6, zone 'A', shows the relationship between the two main sulphides as well as their relation to the alteration of the host rock. The pyrite is more abundant than the arsenopyrite and it appears to be concentrated along the center of the 31° veins whereas, arsenopyrite occurs along the edges of the veins. Within the 'B' zone arsenopyrite makes up less than 5 percent of the sulphides with no evident zonation. The sulphides in zone 'C' are 8 feet in width and occur mostly within the 070° shear zone. Zonation is on a large scale within the 'C' zone as it can be seen on the trench map. Arsenopyrite is concentrated in a 8 inch band along the northern edge of the 070° shear zone (trench map). This band is 95% arsenopyrite and 5% pyrite. The amount of arsenopyrite decreases south-
ward out of this band the amount of pyrite increases proportionally. The southern 2 feet of the 070° shear zone is completely mineralized with pyrite.

Paragenesis for each zone as determined from polished sections is as follows:

<table>
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<th>Gangue</th>
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<tr>
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<td>2</td>
</tr>
<tr>
<td>Arsenopyrite</td>
<td>3</td>
</tr>
<tr>
<td>Gold</td>
<td>4</td>
</tr>
<tr>
<td>Chalcopyrite</td>
<td>5</td>
</tr>
</tbody>
</table>

Pyrite

The most abundant sulphide is pyrite which constitutes over 80 percent of the total sulphides. The amount of inclusions varies from over 60 percent of the pyrite (photo 4) to 20 percent of less of the pyrite (photo 5). Euhedral arsenopyrite crystals within the pyrite (photo 4) are not common although anhedral masses of arsenopyrite within pyrite are fairly common. The edges of the pyrite are smooth and rounded as shown in photos 4 and 5. The 'ice cake' pyrite of photos 7 and 8 also have round corroded edges and they represent the weakly disseminated pyrite.

The corrosive texture suggests the early formed pyrite is reacting with the later arsenopyrite. The ice cake texture appears to suggest the pyrite may have started to
Photo 4: Cubic arsenopyrite in pyrite.

Photo 5: Pyrite enclosing arsenopyrite.

Photo 6: Chalcopyrite within gangue and surrounded by arsenopyrite.
Photo 7: "ice Cake" pyrite.

Photo 3: Corroded pyrite
form earlier and movement of subsequent solutions dissolved the edges.

**Arsenopyrite**

Arsenopyrite is the second most abundant sulphide and its physical properties are totally different than that of the pyrite. The arsenopyrite (photos 4, 5 and 6) has very few inclusions in comparison to the pyrite. It has a 'pseudo-exploded bomb' texture as the arsenopyrite seems to have been fragmented and the gangue is filling between the fracture edges. The fragments (photo 6) can be fitted back together and the edges are exceptionally straight. This suggests deposition of the late gangue by hydrothermal fluids into open fractures with little or no replacement of the arsenopyrite.

**Chalcopyrite**

Chalcopyrite amounts to less than one percent of the total sulphides. It is mostly found in the gangue, (photo 6) although small amounts were found within the arsenopyrite.

**Gold**

The trench was sampled in September of 1982. Assay results (figure 7) show the gold is directly related to the sulphide mineralization. No macroscopic gold was found, however, microscopic gold was present in several polished sections and it can be grouped into two types, 1) gold
Figure 7: Approximate location of sulphide mineralization with corresponding assay results.
within pyrite and 2) gold in contact with pyrite and arsenopyrite. The gold within the pyrite, type 1, was much more abundant, however, microscopic gold was only found in polished sections containing both pyrite and arsenopyrite. The gold appears to be a product of an 'auto-anealing', Coleman (1957), process during cooling of the sulphides. Photo 10 contains a 50 micron bleb of gold at the boundary between two pyrite grains. Photo 11 illustrates the same grain of gold except at a higher magnification. A large bleb of native gold (photo 9), is at the boundary between two pyrite grains and an arsenopyrite grain. This gold also appears to be a product of the 'auto-anealing' process. At the top left corner of the gold (photo 8), a diamond shaped hole denotes a Vicker's Hardness test. A known weight is applied to a diamond stylus to pierce the surface of the mineral specimen. With the weight known, the diameter of the hole is indicative of a certain hardness. Since a 100 gram weight was used and the corresponding diamond was 51.2 microns in diameter, the hardness of the mineral is 70.7 which is within the range of 42.0 to 105.0 for native gold.
Photo 9: Cold at the boundary between two pyrite grains and one arsenopyrite grain.

Photo 10: Cold at the boundary between two pyrite grains.

Photo 11: Higher magnification of photo 9.
DISCUSSION

The structures, 070 shear zone and 317 fractures, controlled the emplacement of the mineralization, however, the origin of the mineralizing fluids is not evident. The author presents the following hypotheses:

The mineralization may be related to hydrothermal activity coinciding with the intrusion of the Nipissing Gabbro to the north of the showing. The intrusion created couple forces to produce the shear zone and tension fractures. The circulating solutions produced, contained albite, pyrite and arsenopyrite. The assemblage pyrite and arsenopyrite, figure 8, is stable only below 450°C, (Clarke 1955, Barnes 1967), and the alteration mineral albite, has a temperature stability field, figure 9, of roughly 300°C to 500°C. Therefore, the occurrence is considered hypothermal or high temperature.

The occurrence is neither strataform or stratabound and the stream (fluvial) environment is not compatible with the occurrence being syngenic with the enclosing Mississagi sandstone.
Figure 8: Isothermal condensed phase relations in the system Fe-As-S at four representative temperatures. All assemblages coexist with vapor. Asp= arsenopyrite, lo=loellingite, po=pyrrhotite, py=pyrite. From Barnes (1967).

Figure 9: Some equilibrium relations in the systems KCl-Al2O3-SiO2-H2O (left) and KCl-Al2O3-SiO2-H2C (right) in a chloride electrolyte environment. The diagram on the left best portrays the stability field for albite. From Barnes (1967).
ACKNOWLEDGEMENTS

The writer wishes to thank Dr. R. E. Whitehead for suggesting the thesis topic and for his guidance and support throughout. He also provided many helpful discussions and his help is gratefully acknowledged and appreciated.

Appreciation is also expressed to Dr. R. Cameron and Dr. J. F. Davies for their generosity in providing much needed information.

I also wish to express my sincere thanks to Mrs. L. Dupuis and Miss W. Bedard for their contribution of processing my samples through the x-ray fluorescence unit.

Mr. W. Desjardins made the thin sections and polished sections and Mrs. B. Burton typed the thesis. Their assistance is gratefully acknowledged.
APPENDIX

Hand Specimen Descriptions

ABT-01 - Mississagi arkose
- unaltered
- tan coloured
- medium grained arkosic sandstone
- north of zone 'B'

ABT-02 - pink and red alteration
- north edge of alteration, within 070° shear zone
- 10% pyrite
- euhedral pyritohedrons
- sugary texture
- zone 'B'

ABT-03 - center of 070° vein (shear zone)
- varying colours of alteration, white-carbonate rich
  red-iron rich albitization
- sugary texture
- 30 - 40% pyrite, fine grained
- zone 'B'

ABT-04 - south edge of alteration in 070° vein (shear zone)
- sugary texture
- pink alteration
- 60% pyrite
- 5% arsenopyrite
- small amounts of azurite
- zone 'B'

ABT-05 - same as ABT-04 for location
- 5% pyrite
- sulphides very fine grained
- zone 'B'

ABT-06 - from muck pile
- coarse grained altered metasediment
- contains a pocket of albitized alteration with large
  1/2 cm arsenopyrite crystals (euhedral)
- 10% arsenopyrite

ABT-07 - from muck pile
- 30% pyrite
- 5% arsenopyrite
- disseminated striated pyrite cubes common
ABT-08 - Nipissing Gabbro
- north of showing
- medium grained
- moderately altered

ABT-09 - Mississagi arkose with occasional lag pebbles
- strongly iron-carbonated
- 10 feet south of zone 'A'

ABT-10 - Mississagi arkose
- unaltered
- 3 feet north of zone 'C'

ABT-11 - north edge of zone 'C'
- 070° shear zone
- asp rich band
- 90% asp
- 10% py

ABT-12 - north half of 070° shear zone (zone 'C')
- strongly carbonitized
- 25% diss py
- 10% diss asp
- white colored alteration

ABT-13 - same as ABT-12 for location
- 65 - 70% py
- pinkish alteration

ABT-14 - center of 070° shear zone (zone 'C')
- massive disseminated pyrite
- 90% pyrite
- no asp
- white alteration

ABT-15 - Mississagi arkose
- unaltered
- south of zone 'C' (2 feet)

ABT-16 - center of zone 'A'
- massive fine grained pyrite
- cut by barren quartz vein

ABT-17 - from muck pile
- red alteration
- sulphides poddy
- 5% py
- 12% asp
ABT-18 - alteration between two 317° veins
  - zone 'A'
  - 30% py
  - 10% asp
  - 60% alteration minerals and original arkose
  - used in figure 6, text

ABT-19 - zoned sulphides within 317° veins
  - zone 'A'
  - py in central portion of veins
  - asp along edges of veins
  - 20% py
  - 10% asp

ABT-20 - one quarter mile west of showing
  - 30 feet south of arkose-gabbro contact
  - arkose appears unaltered

ABT-21 - same as ABT-20 for location except 20 feet
  - south of arkose-gabbro contact
  - small veinlets of qtz-carb

ABT-22 - same as ABT-21 except 10 feet south of contact

ABT-23 - same as ABT-20 for location except directly
  - from rusty contact, not thin sectionable

ABT-24 - same as ABT-20 for location except 10 feet
  - north of arkose-gabbro contact
  - within Nipissing Gabbro
Bibliography


Mining Lands Section
Control Sheet

File No 28478

TYPE OF SURVEY

GEOPHYSICAL
GEological
GEOCHEMICAL

□ EXPENDITURE

MINING LANDS COMMENTS:

________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________

Signature of Assessor

________________________________________________________

Date
The Mining Act

Instructions: - Please type or print.
- If number of mining claims traversed exceeds space on this form, attach a list.
- Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns.
- Do not use shaded areas below.

**Ministry of Natural Resources**

**Ontario**

**Report of Work**

(Geophysical, Geological, Geochemical and Expenditures)

The Mining Act

**Name and Address of Author (of Geo-Technical report)**

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**Name and Address of Author (of Geo-Technica**
Ontario Ministry of Geotechnical Geology, Natural Resources Report Approval

Mining Lands Comments

Clarence:
Is this acceptable?

☐ To: Geophysics
Comments

☐ Approved ☐ Wish to see again with corrections Date Signature

☐ To: Geology - Expenditures
Comments

☑ Approved ☐ Wish to see again with corrections Date Signature

☐ To: Geochemistry
Comments

☐ Approved ☐ Wish to see again with corrections Date Signature

☐ To: Mining Lands Section, Room 6462, Whitney Block. (Tel: 5-1380)
S.E. Yundt  
Director  
Land Management Branch  
Room W.6643  
TORONTO, Ontario  

ATTENTION: SUSAN HURST  

SUBJECT: Data for Assaying submitted on Mining Claims S.607400, et al, in MacLennan Township-Work Report No. 85-93  

Further to your letter to Thomas Sheppard on 1986 01 21, here is the additional information requested:  

A) Proof of payment of the $1350.00 expenditure credits claimed.

V. C. Miller  
Mining Recorder  
Sudbury Mining Division  
Telephone (705) 675-4125  

VCM/  
Encls. 2  

c.c. Thomas Sheppard  
294 Penman Avenue  
Garson, Ontario  
P0M 1V0  

c.c. Fred Delabbio  
1114 Delwood Court  
Sudbury, Ontario  
P3E 4M4  

RECEIVED  
LCB 6-9-1388  
MINING LANDS SECTION  

[Handwritten notes: 1 yes, 2 no, handwritten comments: OK!]
January 28, 1986

Ministry of Natural Resources
Whitney Block, room 6643
Queen's Park
Toronto, Ontario
M7A 1W3

Attention: Mr. S.E. Yundt

Dear Sir:

Reference: File 2.8478

With reference to your letter, we are enclosing two copies of the receipt for the proof of payment for the expenditure credits claimed.

Yours truly,

T.H. Sheppard

THS/cp
cc: Mining Recorder – Sudbury
    F. Delabbio – Sudbury

SUDbury MINING DIV.
RECEIVED
JAN 30 1986
A.M. 7 8 9 10 11 12 1 2 3 4 5 6 P.M. 7 8 9 10 11 12 1 2 3 4 5 6
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<th>DATE</th>
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<th>VENDEUR SALESPERSON</th>
<th>VOTRE COMMANDE NO. YOUR ORDER NO.</th>
<th>NOTRE COMMANDE NO. OUR ORDER NO.</th>
<th>EXPÉDIÉ A SHIPPED TO</th>
<th>EXPÉDIÉ PAR SHIPPED VIA</th>
<th>TERMINES TERMS</th>
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<td>Oct. 2/85</td>
<td>T.H. Sheppard</td>
<td>verbal</td>
<td>8503</td>
<td></td>
<td>Same</td>
<td>Same</td>
<td>**</td>
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To cover cost of specimen work performed at Laurentian University $1350.00

** As per agreement between T. Sheppard and Precambrian re equity to be obtained by grubstake

SUDBURY MINING DIV. RECEIVED
JAN 30 1986

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<tr>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
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<td></td>
<td></td>
<td></td>
<td>$1350.00</td>
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</table>
Dear Sir:

RE: Data for Assaying submitted on Mining Claims S 607400, et al, in Maclennan Township

Enclosed is a copy of our letter dated October 28, 1985 requesting additional information for the above-mentioned submission.

Unless you can provide the required data by January 31, 1986 I will have no other alternative but to instruct the Mining Recorder to cancel the work credits recorded on September 24, 1985.

For further information, please contact Mr. Ray Pichette at (416)965-4888.

Yours sincerely,

S.E. Yundt
Director
Land Management Branch

Whitney Block, Room 6643
Queen's Park
Toronto, Ontario
M7A 1W3
Phone:(416)965-4888

SH/mc

cc: Mining Recorder
Sudbury, Ontario
File: #93

Encl.
October 28, 1985

Thomas Sheppard
294 Penman Avenue
Garson, Ontario
POM 1VO

Dear Sir:

RE: Data for Assaying submitted on
Mining Claims S 607400, et al,
in Macleanan Township

With reference to the above-mentioned report, sub-
missions of this type are not normally accepted as
assessment work. However, the Ontario Geological
Survey has reviewed your report and has decided to
make an exception in this case provided the following
information is submitted in duplicate.

1) a sketch map showing where the samples
   were taken from in relation to local
topography, claim lines and claim numbers.
   (Scale of not more than 500 feet and
   not less than 100 feet to one inch)

2) proof of payment of the $1350.00 expendi-
ture credits claimed

When submitting this information, please quote file
2.8478.

Yours sincerely,

S.E. Yundt
Director
Land Management Branch

Whitney Block, Room 6643
Queen's Park
Toronto, Ontario
M7A 1W3
Phone: (416) 965-4888

SH/mc

cc: Mining Recorder - Sudbury, Ontario
    F. Delabbio - Sudbury, Ontario
Ministry of Natural Resources
Whitney Block, Room 6643
Queen's Park
Toronto, Ontario
M7A 1W3

Attention: Mrs. S.E. Yundt

Dear Sir: MAM:

Reference: File 2.8478

Re: Data for assaying submitted on mining claims S607400 et al, in MacLennan Township.

With reference to your letter we are enclosing two copies of the location map requested.

Unfortunately we are unable to obtain the proof of payment from Laurentian University due to the current strike of their clerical staff but upon settlement we will obtain the required documentation and forward it to you.

Yours sincerely,

Fred Delabbio

PD/cp
cc: Mining Recorder - Sudbury
    T. Sheppard, Garson
Dear Sirs,

Let's make an exception. Although we have not accepted theses as assessment credit, this one provides data on the property which should be of use to the exploration community.

1) We must ask for proof of payment. Did the claim owner pay $1,350 for the work done? If not - no credit.

2) Could you indicate that we are making an exception in this case only.

C. Kuehne

RECEIVED
Oct 16, 1955
MINING LANDS SECTION

Map - appropriate scale showing where sample was taken in relation to topography, etc. Particularly claim lines & number.

To Whom It May Concern

This will certify that Arnold Burton was a student at Laurentian University and examined and reported upon the rocks and mineralization located in the north half of Lot IV, Concession V, MacLennan Township.

During this study, twenty-four rock specimens were collected, fifteen thin sections and eight polished sections were prepared from these specimens and were described and reported upon by A. Burton in a thesis entitled "The Sheppard Showing: A Pyrite-Arsenopyrite-Gold Occurrence" May 1983.

A fair market value for the preparation, examination and report on the work described in this thesis is as follows:

8 polished sections at $75 each .................... $ 600.00
15 thin sections at $50 each ........................ $ 750.00
$1350.00

R.A. Cameron,
Associate Professor,
Department of Geology.
Mining Rights of land and land under the waters of Wanapitei Lake are WITHDRAWN from staking out under Sec 45 of the Mining Act, Order No. 6772, dated Nov 17, 1976. File 7569 x 9.

PATENTED LAND
CROWN LAND SALE
LEASES
LOCATED LAND
LICENSE OF OCCUPATION
SURFACE RIGHTS ONLY
MINING RIGHTS ONLY
ROADS
IMPROVED ROADS
KINGS HIGHWAYS
RAILWAYS
POWER LINES
MARSH OR MUSKEG
MINES
CANCELL ed
PATENTED S.R.O.

NOTES
400* Surface Rights Reservation along the shores of all Lakes and Rivers.
For Status of S.R. Loc. B. Islands in this Twp, please contact Ministry of Natural Resources
Reserve Flooding Rights Along The Shore of Wanapitei Lake And Islands Therein To The
Elevation Of Crest Of Dam At Outlet Of Lake.
File: 58064
Islands In Wanapitei Lake Withdrawn From Staking Sec 38(c) of Mining Act (R.S.O. 1970)
All Mining Claims In Area shown thus: [ ]
Are Withdrawn From Staking In Case Of Cancellation Sub. (d) Sec. 39 Of The
Mining Act File 77440.

AREAS WITHDRAWN FROM STAKING
S.R. - SURFACE RIGHTS M.R. - MINING RIGHTS
Sec. Order No. Date End Date File
$ 480320 4 (70) 10/27/79 M.R. 44114
$ 4796 10/27/79 M.R. 44114
$ 4796 10/27/79 M.R. 44114
$ 4796 10/27/79 M.R. 44114
$ 4796 10/27/79 M.R. 44114
$ 4796 10/27/79 M.R. 44114

PLAN NO.-M.841
ONTARIO
MINISTRY OF NATURAL RESOURCES
SURVEYS AND MAPPING BRANCH