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# 2. OVERBURDEN STRIPPING AND RELATED MANUAL WORK

## South Break Project

Claims 312375, 343853, 134888, 199600, 275061, 291641,
216065 and 214064

formerly known as
Claims L4217525, L4217526, L4217527

Eby & Otto Townships
Temiskaming District
Larder Lake Mining Division
**NTS - 42 A/1**
**80°08'57"W 48°05'46"N**
0563300E 5327450N

January 15, 2019
E. Marion

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# Kirkland Lake Resident Geologists District

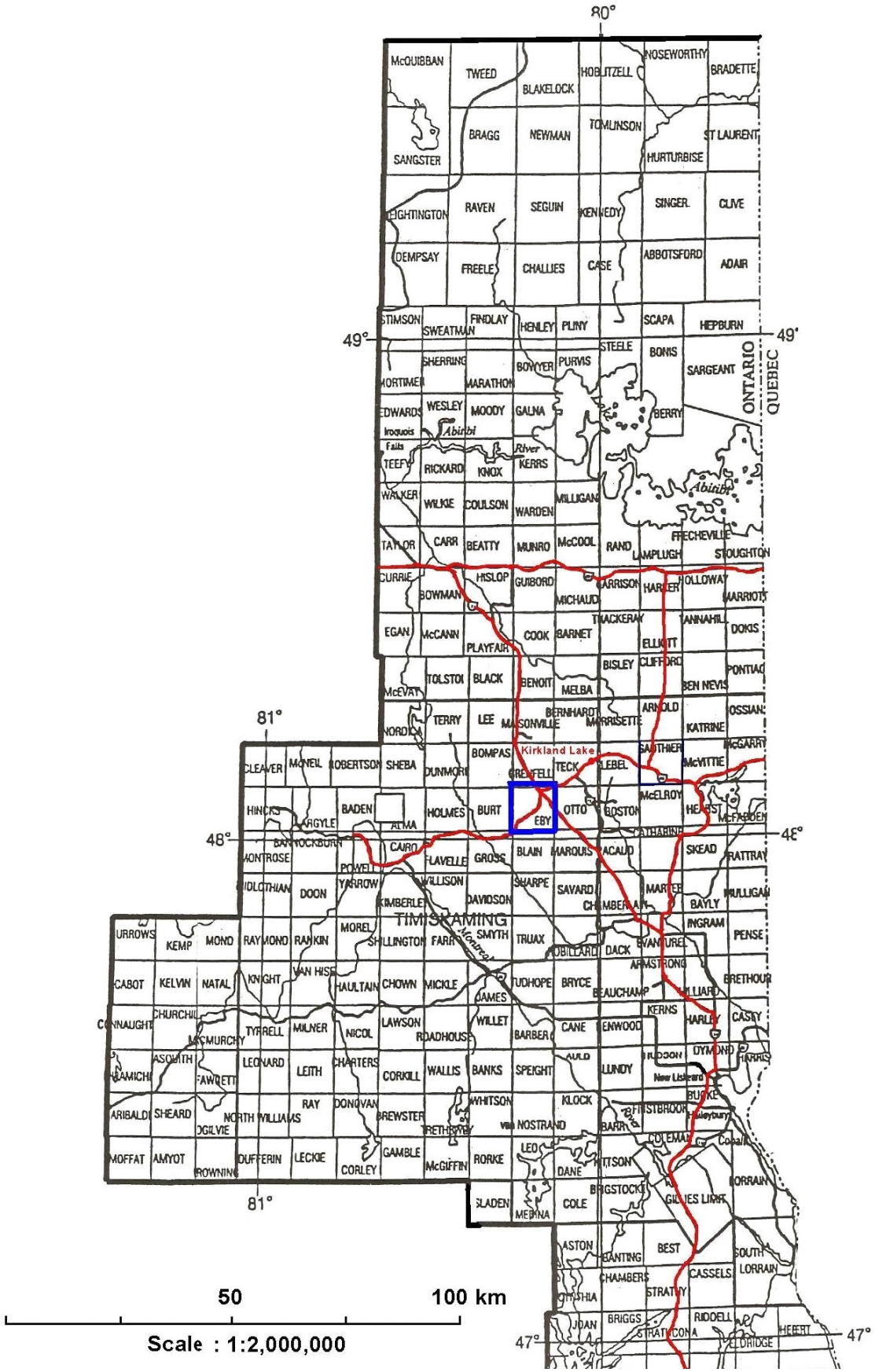



Figure - 1

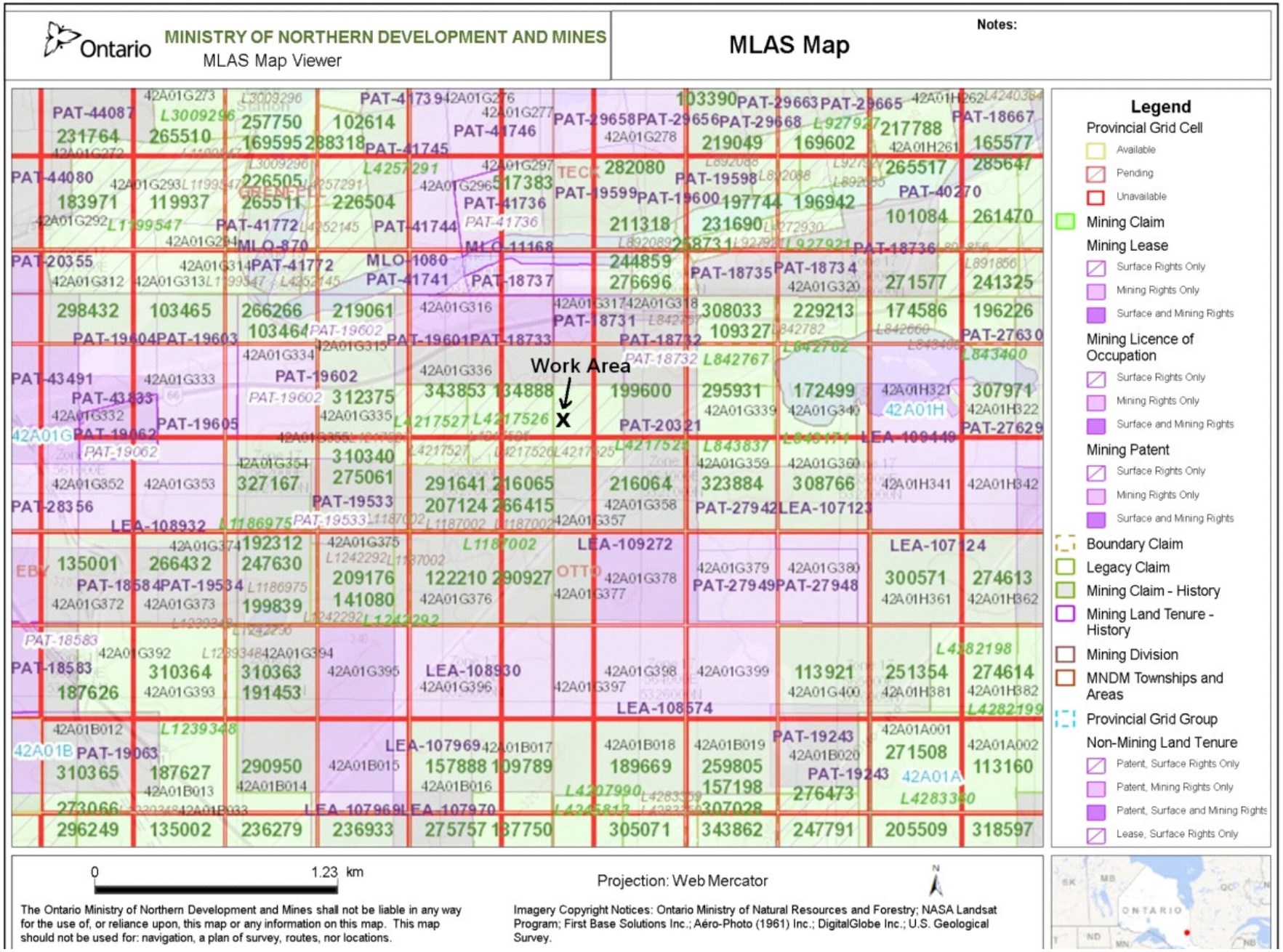

Ontario
MINISTRY OF NORTHERN DEVELOPMENT AND MINES
MLAS Map Viewer
MLAS Map
Notes:
Work Area
Legend
Provincial Grid Cell
Available
Pending
Unavailable
Mining Claim
Mining Lease
Surface Rights Only
Mining Rights Only
Surface and Mining Rights
Mining Licence of Occupation
Surface Rights Only
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ONTARIO

Figure - 2

PROPERTY LOCATION

The claim is located in the Larder Lake mining division approximately 9 kilometers south-west of the town of Kirkland Lake. The group sits straddling the north-south common Eby Twp-Otto Twp boundary, 400 meters south of the common corner of Grenfell, Teck, Eby and Otto townships. Highway 66 passes across the north west corner of the group.claims. This is in the Kirkland Lake Resident Geologists District and can be found on NTS-42 A/1 with the geographic center being at approximately °08'57"W and 48°05'46"N.

ACCESS

Heading west south west on Hwy.#66 from the railway underpass in Swastika for 4.4 kilometers will bring you to the area where Hwy 66 goes across the north west corner of L4217527. 800M east, the Eby-Otto Twp line is cut out and povides walking access to the claims at that area. The newly cut grid gives good walking access to all areas of the two eastern claims.

CLAIMS

This project consists of 3 aloquoit parts in the subdivided Townships of Eby and Otto, formerly recorded on Plan M-0345 of Eby Township and Plan M-379 of Otto Township. The ground located mining claims and descriptions of the intended aloquoit parts are as follows:

CL#4217525--Lot 12, Con.6 SW¼ of N½ Otto Twp ~14ha
CL#4217526--Lot 1 Con.6 SE¼ of N½ Eby Twp ~16ha
CL#4217527--Lot 1 Con.6 SW¼ of N½ Eby Twp ~16ha

After the conversion from ground located mining claims to the online digital cell system, the descriptions* are now as follows:

CL#312375-- pt. Lot 1 Con.6 SW¼ of N½ Eby Twp utm cell # 42A01G336
CL#343853-- pt. Lot 1 Con.6 SW¼ of N½ Eby Twp
+ pt. Lot 1 Con.6 SE¼ of N½ Eby Twp utm cell # 42A01G337
CL#134888-- pt. Lot 1 Con.6 SE¼ of N½ Eby Twp
+ pt. Lot 12 Con.6 SW¼ of N½ Otto Twp utm Cell # 42A01G338
CL#199600-- pt. Lot 12 Con.6 SW¼ of N½ Otto Twp utm Cell # 42A01G339

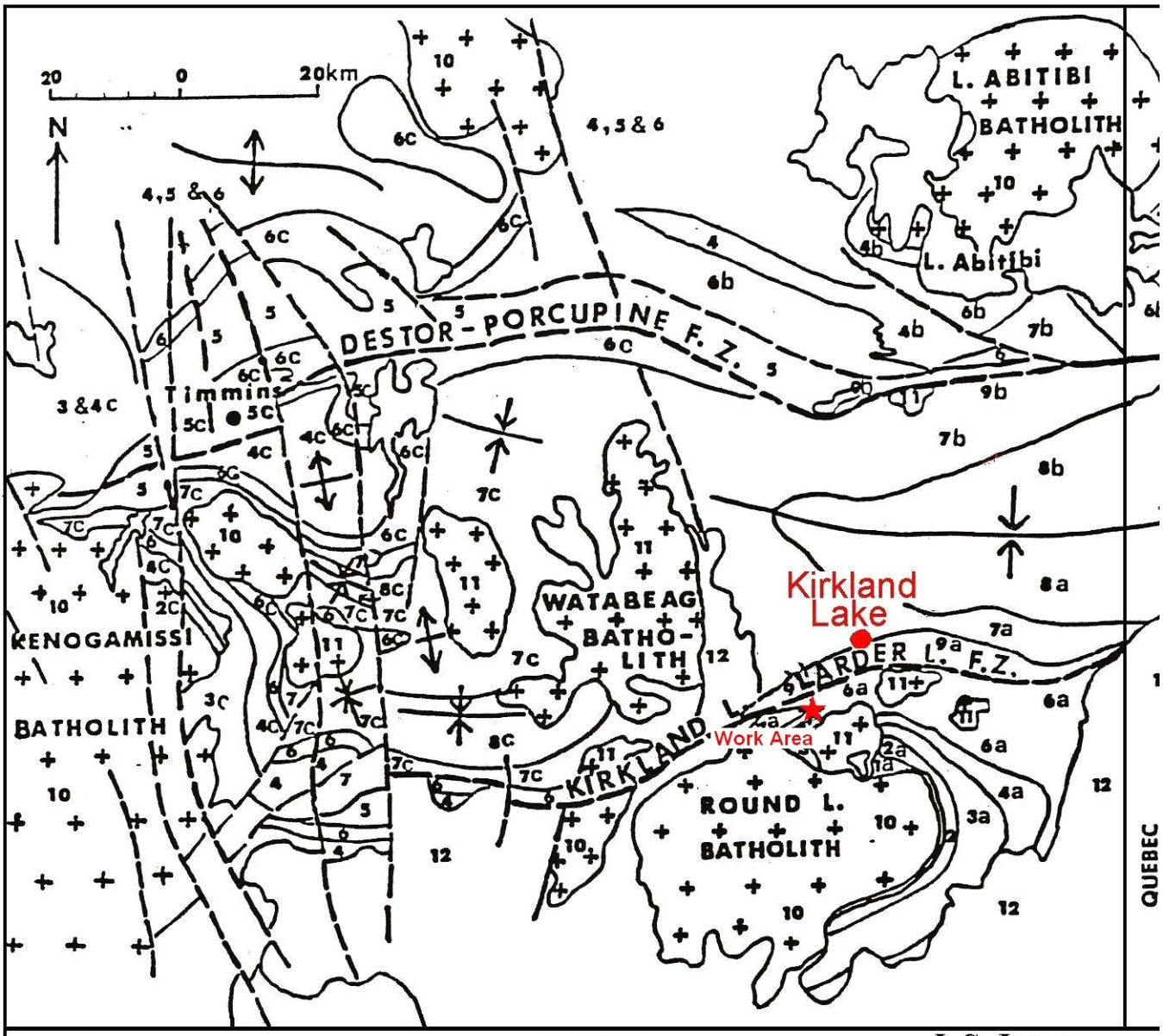
CL#275061-- pt. Lot 1 Con.6 SW¼ of N½ Eby Twp utm cell # 42A01G356
CL#291641-- pt. Lot 1 Con.6 SW¼ of N½ Eby Twp
+ pt. Lot 1 Con.6 SE¼ of N½ Eby Twp utm cell # 42A01G357
CL#216065-- pt. Lot 1 Con.6 SE¼ of N½ Eby Twp
+ pt. Lot 12 Con.6 SW¼ of N½ Otto Twp utm cell # 42A01G358
CL#214064-- pt. Lot 12 Con.6 SW¼ of N½ Otto Twp utm cell # 42A01G359

**It is important to note that patent surface rights completely surround the project area and are defined by the aloquoit units of the subdivided townships and existing land survey. Mining Lands online cell system geospatial data illustrations conflict significantly with the pre-existing land dispositions in the project area. To avoid trespass or work on previously granted lands, great care must be taken to identify the abundant land survey evidence rather than rely solely on the online depictions .*

GENERAL GEOLOGY

This claim lays within the Abitibi Greenstone Belt, a region of predominantly Archean volcanic rocks and related interflow sediments at the south central region of the Superior Province.Several eras of intrusion and deformation have affected most of the lithologies present. The Abitibi belt in the Kirkland Lake area is subdivided into a series of assemblages referred to as Groups in order of decreasing age; Larder Lake, Kinojevis, Blake River, and Timiskaming Groups (Stevenson et al 1995). The historical names of these groups in the Timmins and Kirkland Lake areas was changed by Ayers, et. al. (2005) to unify the lithologies chronologically according to the vast numbers of age dates available.

# General Geology of the Kirkland Lake Area




LEGEND

L.S. Jensen

Proterozoic

Keeweenawan diabase (not shown)

12 Cobalt Group

Archean

Matachewan diabase (not shown)

Granitic rocks

11 Granodiorite, monzonite, quartz monzonite, syenite

10 Massive to gneissic quartz diorite, tonalite, trondhjemite

Upper Supergroup

9 9a* Timiskaming Group, 9b** Destor-Porcupine Complex

8 8a, 8n, Blake River Group, 8c*** Blake River (Upper Fm., Tisdale Group)

7 7a, 7b, Kinojevis Group, 7c Kinojevis Group, (Middle Fm., Tisdale Group)

6 6a Larder Lake Group, 6b Stoughton Roquemaure Group, 6c Lower Fm., Tisdale Group

5 5c Porcupine Group

Lower Supergroups

4 4a Skead Group, 4b Hunter Mine Group, 4c Upper Fm., Deloro Group

3 3a Catherine Group, 3c Middle Fm. Deloro Group

2 2a Wabewawa Group, 2c Lower Fm. Deloro Group

1 1a Pacaud tuffs****

*a refers to Kirkland Lake Area, south limb of synclinorium (Jensen 1978c, 1979).
**b refers to Kirkland Lake Area, north limb of synclinorium (Jensen 1976, 1978b).
***c refers to Timmins Area (Pyke, 1980).
**** (Goodwin, 1965).

Figure - 3

The round Lake batholith, a large Archaen aged granitic intrusive occurs about 6 kilometers to the south-west. The south east of the claim group is the "Otto Stock", an almost circular, somewhat zoned mafic(sanukitoid?) intrusive of some 10 kilometer diameter. Thin bands of clastic sediments and iron formation belonging to the older Skead group trend east-west through the map area and wrap around the Otto Stock. To the south-west of the claim group, a roughly 10 kilometer wide north-south finger of Huronian aged sediments filling a paleo depression of probable structural origin overlie the volcanic rocks. Field work by the Ontario Geological Survey has shown LCDZ strain and faulting affecting these much younger overlying sediments.

The Temiskaming Rift is a regional graben feature strinking at about 330° across this part of Ontario. It has been proposed since at least the early 1960's that this young rift system has a control association with diamond bearing intrusives such as kimberlites found in the Kirkland Lake region. Several NNW-SSE trending fault features passing through the area have been identified as probable Temiskaming Rift associated features.

The Abitibi Belt is host to many large gold and base metal deposits on both sides of the Ontario-Quebec border along structural trends that have an exploration history going back well into the 1800's. These major structural deformation zones, (locally the Larder-Cadillac Deformation Zone or LCDZ), parallel each other west to east across the belt and have acted as a control on gold deposition. In the Larder Lake section, gold mineralization is generally associated with carbonatized ultramafic rocks along the LCDZ. In this section, band of altered mainly fluvial sediments of Temiskaming age, folded and upturned to a near vertical position, coincides with the main structural trend of the LCDZ.

The Kerr Addison deposit, which produced almost 11 million ounces of gold, is situated along the Larder Lake Cadillac Break in the town of Virginiatown approximately 45 km to the east of the South Break claims. The host lithologies for the mineralization include pillowed mafic flows and spinifex textured komatiite flows cut by lamprophyre dikes that have been strongly altered.

Around Kirkland Lake gold mineralization occurs in sheared syenitic intrusions, trachytic flows and sedimentary rocks along the Kirkland Lake Fault. The gold deposits of the Kirkland Lake area's "mile of gold" formed within the Timiskaming
Group of sediments, trachytic volcanics, and alkali intrusives. They are located along the Kirkland Lake Main Break and subsidiary structures that are centred on a syenite porphyry mass but also cut the Timiskaming sediments and tuffs as well as smaller mafic and felisic syenite intrusives.

Other former producing mines clustered around the Dobie area, located approximately half way between the Kirkland Lake mines and the Kerr Addison deposit, include the Upper Canada, Upper Beaver, and McBean deposits. These all occur in different geological assemblages despite the fact that they are all clustered within a 10 km radius of each other. The McBean deposit occurs within a green carbonate altered ultramafic package intruded by felsitic dikes, somewhat similar to the Kerr Addison associated with the Larder Lake- Cadillac Break, whereas the Upper Beaver probably represents a magmatic related gold- copper deposit associated with a composite mafic intrusive and series of syenite porphyry dikes (Masson, 2012). The third of these deposits, the Upper Canada Mine, lies within the Timiskaming Group trachytic volcanic and sedimentary package. It appears to be related to strong albitite alteration associated with a possible splay from the Larder Lake Cadillac Break.

It should be noted that the structures on which almost all of the major mines are situated exhibit a common orientation (strike) of about 065 - 075 degrees, however there are also many gold enriched subsidiary faults that parallel or roll into the major structures.

The Macassa Mine is the last operating producer of the historic Kirkland Lake camp which has produced in excess of 28 million ounces of gold has its #3 shaft located about 1200 meters north - north - east of the South Break claims. There it is on the east side of the Amikougami Fault which is a later, displacing cross fault. Although there have been several postulated correlations of the economic faults to fault or vein features to the west of this north south fault, no economically encouraging "ore blocks" have been defined to the west of the Amikougami Fault. Available geologic reports and publications appear to have differing information and estimation of the amout of and direction of off-set by the Amikougami Fault. The east-north east trending Kirkland Lake Break is mapped as merging with the Larder Cadillac break about 400 meters north - north - west of the the project claims.

CLAIM/LOCAL GEOLOGY

O.D.M. Map M-2239 of Eby Twp. shows the three claim units to be underlain by volcanic rocks of basalt composition. And east-west zone of heavy carbonate alteration following sheared volcanics is mapped across the length of the claims. To the east of the South Break claims, drilling by Battle Mountain Gold in joint venture with Queenston Mining in the 1985 to 1995 time period encountered sporadic gold values in limited diamond drilling done on the aparant strike extension of this feature. This fault lines up with a similar fault described in the report on the "Baldwin" property which is contiguous with the westboundary of the South Break claims. The following report of the Baldwin Mine property is reproduced from the report of GL Holbroke in 1946 and gives a good summation of the local geology and style of mineralization likely to be found .

*REGIONAL GEOLOGY*

*Starting many miles east of the interprovincial boundary, in Quebec. a belt of Temiskamlng age sedimentary rocks with interbedded lavas, from one to four miles wide, extends at least 60 miles westward into Ontario, where it passes through the Larder Lake, Kirkland Lake, Swastika, Matachewan and Midlothian areas. This bclt probably represents one limb of a major geosyncline enfolded with the unconformably underlying complex of older Keewatin basic lavas and intrusives. It is intruded in many places throughout it's length by numerous dykes and irregular masses of medium to acid rocks of Algoman age and is occasionally blanketed by younger, flat lying, Cobalt age sediments.*

*The economic signiligance of this geologic feature is easily appreciated when it is realized that a large percentage of the gold production of Canada comes from structures in, or very near, this belt of Temiskaming rocks.*

*In recent years. detailed geologic mapping of parts of this Important area has indicated what is probably the main structural control of gold deposition. It has been shown that a major fault and shear zone closely follows the south contact of the Timiskaming rocks for over forty miles from the Matachewan area to the Quebec boundary, and the same zone has been traced for a further distance eastward of over 100 miles throughout the Cadillac, Malartic and Bourlamaque aeas of Quebee. In Ontario this zone is known as the "Larder Lake Break" and is thought to be the main structural control of gold deposition throughout the area. It consists of a wide zone of shearing and alteration that follows a sinuous course across the country with a general East-West trend and steep dips. For much of its length it is marked by a wide zone of carbonate alteration accompanied by silicification and sulphide mineralizatlon. At certain places, where local conditions are favourable, important gold deposits, such as those of the Kerr Addison Mine, have bee formed. Numerous shear and fault zones are found throughout the length of the Temiskaming belt and it is thought many of these are subsidiary structures developed from stresses set up by movement along the Larder Lake Break. Where these secondary breaks encounter sufficiently favourable conditions, gold deposits have been forrned. such as the "main break" at Kirkland Lake, the Upper Canada veins, ete. There are thus two main types of ore occurrence throughout the area, one occuring in the Larder Lake Break itself,and the othe in subsidiary structures or "breaks". Those in the Larder Lake Break are usually large but relatively low grade and are very sparingly distributed along the zone. Favourable conditions seem to be caused by local flexures in the shear zone and by drag folded areas in the nearby sediments or greenstones. Those in the subsidiary breaks are usually narrow but high grade and are frequenty found where the breaks cross relatively brittle rocks such as syenite or porphyry. Orebodies of both types are frequently displaced by later strike and cross faults.*

*LOCAL GEOLOGY*

*(A) Rocks*

*The Baldwin property is located astride the south Temiskaming contact. To the south of the contact the rocks consist predominantly of intermediate to basic pillowed*

*Keewatin lava flows with occasional narrow tuffaceous horizons along flow contacts. To the north of the contact they consist of Temiskaming conglomerates, grey wackes and tuffaceous rocks. Both series of rocks have been Intruded by lenticular bodies of syenite and syenite porphyry that are localized in and near the main contact area.*

*(B) Structure*

*The detailed geologic structure underlying the property has not as yet been worked out. The lavas to the south exhibit definite evidence of broad folding and some faulting. The sediments to the north show close drag folding, roughly parallel to the contact, plus minor cross faulting.*

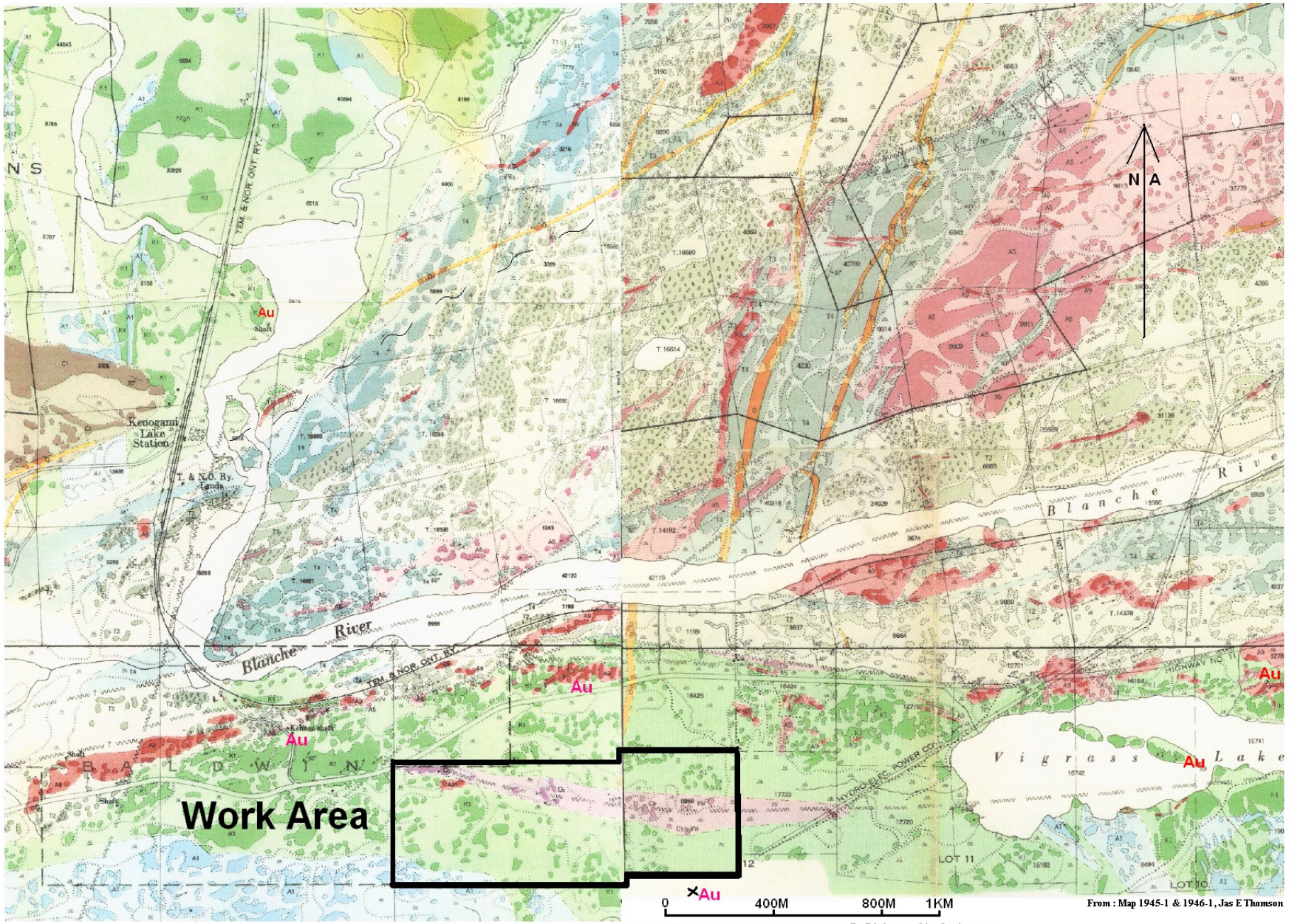
*The main contact itself trends east-west across the NI/2 of Lot 2 Con. VI and NW¼ of Lot I, Con. VI, a distance of 4,000' and on the latter location shows a broad flexure or warping. In this area the main contact is strongly sheared and altered over widths of from 30' to 200' and almost certainly marks the position of the important Larder Lake Break. As elsewhere along its length it is probable that here too the Larder Lake Break represents a fault zone of major displacement. The Blanche River flows west-east across the length of the property parallel to, and about 800' north of, the main contact. The rocks on both sides of the river are Timiskaming sediments but while those to the south strike east-west, those to the north strike north-east. This disconformity must mark a fault of major displacement and, underlying the river bed, a supposition that is substantiated by the 2000' right displacement of two north-south trending diabase dykes as they cross the river near the east property boundary.*

*(C) Alteration, etc.*

*The zone of strong alteration that marks the Larder Lake Break follows the sediment greenstone contact. In the mine area it Ius been developed for an approximate length of 500' on one or other of three levels underground. Here it has an average width of about 50' and consists of an intense carbonization plus a moderate silicification and pyrite mineralization. The silicilication is best developed in and near syenite and porphyry bodies lying in the zone. Following the alteration the zone was fractured and the fractures filled by quartz veinlets and stringers running in all directions. This introduction of secondary quartz is frequently accompanied by coarse visible gold and apparently determines the location and shape of the orebodies. Approximately 1200' South of the Larder Lake Break a parallel zone of shearing and strong carbonate alteration cuts the greenstones across the south part of the property. Some secondary quartz is visible in this zone but no attempt has been made to investigate it and nothing is known concerning the possibilities. The fault zone underlying the Blanche River has been investigated by one short diamond drill hole put in for assessment purposes. It shows a strong zone of shearing, carbonization. silicification and mineralization. Some secondary quartz veinlets were noted and several low gold values were obtained.*

*ECONOMIC GEOLOGY*

*The main feature of possible economic importance on the property is the Larder Lake Break described above. As cited, the break crosses the property for 4,000' with an east-west strike and a steep south dip. It marks the location of a major zone of crustal weakness along which a series of fault movements has taken place over a long period of geologic time. Being a zone of weakness it has formed a locus of acid igneous intrusions and of alteration and mineralization. Where developed on the property it shows as a 50' wide zone of intense carbonization and silicification cut by later quartz filled fractures. Several relatively small syenite and porphyry masses and dykes are found throughout the zone and these show a rake of about 45° to the east down the plane of the zone. As described below, a limited amount of diamond drilling and underground development has outlined several small but rich gold ore-bodies lying in the zone and apparently associated with the more easily fractured syenite rocks. As with the intrusive bodies these ore shoots show a 45° east rake and it is probable that both are following some folded structure in the zone. There is a distinct flexure in the zone about 1,000' east of the shaft and it is likely that this has controlled the fracturing which*




K1 Basalt A1 Gabbro/Diorite T2 Conglomerate T4 Tuff A5 Augite Syenite A9 Porphyritic Syenite C1 Huronian Conglomerate D Diabase Cb Carbonate

Figure - 4

*allowed the introduction of secondary quartz and accompanying gold values. The underground work has also indicated the presence of a strike fault with a steep north dip cutting the zone a short distance above the 400' level. The displacement on this fault is such as to cause a fault gap of some 300' from above the 400' horizon to the 600' horizon. There is thus on this property a set of conditions that has resulted in the formation of important ore-bodies elsewhere in the Larder Lake Break, namely a flexure in the break and the intrusion into it of masses of acid igneous rock. Coupled with this the presence of rich, though small, oreshoots makes the exploration of this area of the break highly desirable and justifies extensive diamond drilling and underground development. In addition to tne Larder Lake Break this zone of shearing and alteration under the Blanche River has shown low gold values and should be further investigated by diamond drilling both from surface and underground. The carbonate zone to the south in the greenstone should also be investigated.*
*August 19, 1946.* *G. L. HOLBROOKE. M.E.*

\- - - -

PREVIOUS WORK

Undoubtably the claim area was looked at by many prospectors in the early part of the 1900's as the Swastika Camp and then the Kirkland Lake Camp were being opened up and gold discoveries were drawing many to the area. There are many smaller deposits and showings in the Swastika and Kirkland Lake areas that have been explored with shafts and may have had minor production in the past. No submitted assessment work on file for the mining lands forming the South Break group of claims exists. No mention of these lands was found in any records or files currently within the Ministry of Mines geological database.

Several occurances of gold are located in the immediate area around the claim. Most notably of the gold occurances in the area is the workings of the Gateford Mine about 5 kilometers east north east of this claim, on the west shore of Otto Lake. These holdings include the workings of the Swastika Mine which is the site of the first discovery west of Larder Lake in 1906, three years before the major discoveries 4½ north east in what was to become the historic Kirkland Lake gold camp. The property is underlain by volcanic rock cut by syenite dikes. These deposits consisted of quartz vein zones in mafic volcanics south of the Larder Lake Cadillac Break. Gold occurs in very rich thin flat laying quartz veins associated with galena and molybedenite. Initial production at the Swastika Mine began in 1911 and was sporadic unill about 1950. About 1 million dollars of gold from about 100,000 tons of ore were produced from the combined Gateford operations.

In 1911 gold was discovered on the "Baldwin" property which is contiguous on the west side of L4217527. (see section above on Claim Geology) The property was developed with a shaft to 400 feet, 920 feet of crosscutting, and 1120 feet of drifting. Fine grained native gold associated with molybedenite and chalcopyrite occurs in several east-west oriented quartz stringers within a carbonate schist. Shoots also occur in red syenite porphyry dykes and light pink fine grain syenite. The shaft and workings are in the Temiskaming aged sediments.

*DEVELOPMENT*

*The property has been developed by a few surface trenches across the main contact zone, by some 12,000' of surface and underground diamond drilling, and by shaft sinking and lateral work. Most of this work is located on the NI/2 of Lot 2, Con.VI Eby Twp and is practically confined to the Larder Lake Break. The shaft is located about the centre of the lot and is of two compartments and reaches a depth of 420'. Four levels have been established at 100' intervals and some 1,000' of drifting and cross-cutting has been done mostly on the 200' and 300' levels. On both of these levels crosscuts have been driven 350' north and 300' south of the shaft to give a 650' wide cross section of the area. The composite lateral work in all levels covers approximately 500' of the zone with the upper levels extended to the west and the lower to the east.*

*Because of the east rake of the ore shoots the actual development of favourable ore structures only covers about a 300' length. Of the 12,000' of diamond drilling reported, over 7,000' is in 5 holes put down to investigate the contact zone at the 850' horizon, well below the fault gap mentioned above. The balance is in holes drilled from surface and underground to trace the extension of the 300' level ore shoots.*

*ORE SHOOTS*

*No assay plans or underground maps are available and the following information has been supplied by the former mine manager. Mr. S. L. Macdonald. both verbally and in a report of January 9, 1939. The statements made in Mr. Macdonald's report have been checked and supplemented by Mr. E. K. Fockler, consultin~ engineer, in a report of February 25, 1939. Mr. Fockler agreed with Mr. Macdonald's statements. It is on the 300' level that definite are lenses are established and it is here that most of the effective development has been carried out. Two are shoots have been outlined:*

***i)*** *311 Ore Shoot*

*This ore body lies in highly altered and fractured tuffs near the south side of the contact zone. In this are shoot the distribution of values is very erratic with much visible gold in evidence. For a length of 65' drift assays show values of from $0.70 to $1,000.00 over widths of from 2' to 14'. A representative bulk sample of II tons of drift muck sent to the Temiskaming Testing Laboratories returned $62.70. Three holes drilled from surface to investigate this erratic occurrence. some 40' above the level. returned respectively, $199.00 across 9.5', low values across 13', and low values across 6' true widths. One hole drilled up from the 300' level returned two intersections, $43.05 across 20 inches and $ I5.05 across 24 inches. A raise was put up on this ore shoot for 45' where it was turned to connect with a heading on the 200' level. On completion of the raise the shoot was stoped, by shrinkage methods, for a height of 45'. The broken ore is still in the stope. Because of the erratic distribution of values, and the abundant presence of visible gold. bulk sampling was used in addition to 20 lb. channel samples in the stope. Following is a list of the results otained from the bulk samples:*

| | | |
|---|---|---|
| *70 Lb. representative overall* | *..... $ 62.00* | |
| *80 " stope sections-average* | *..... $119.00* | |
| *80 " " " "* | *..... $105.00* | |
| *80 " " " "* | *..... $ 3.15* | |
| *500 " composite* | *..... $ 26.25* | |
| *72 tons to Noranda Mines* | *..... $ 11.90* | |
| *Overall average* | *..... $ 53.35* | *( all @ $34.71/oz )* |

***i)*** *310 0reShoot*

*This ore body lies about 25' north and consists of a silicious replacement in fractured syenite. From channel sampling during drifting it shows an average of $24.50 across 3.5' for a length of 35'. A branch vein has been traced a short distance northward and shows much visible gold and gives an average of $22.00 across 1.0'. Additional drifting for 50' to the east showed no definite ore, although some visible gold was found and the present face is very strongly silicified and mineralized. On the 200' level two small shoots are indicated*

***ii)*** *210 Ore Shoot*

*This ore shoot is only cut in the crosscut and has not been developed. Sampling here shows $51.00 across 18" of quartz replacement in porphyry. It is probably that this is the upward extension of the 310 orebody.*

***iii)*** *209 Ore Shoot*

*This lies about 30' south of 210 and is possibly the upward extension of the 311 occurrence. Channel sampling shows an are shoot 15' long, 4' wide averaging $21.25. A 5 ton bulk sample of this material returned $21.05. On the 100' level the faulting, that starts to show on the 200' level, has become so intense that no definite ore shoots can be outlined although several individual high assays have been returned. As noted*

*above, the 400' level lies in a fault gap that extends from below the 300' level to about the 600' horizon. No values were obtained on this level. In order to investigate the zone below the fault gap the five deep drill holes mentioned above were drilled on 260' centres to a vertical depth of from 725' to 925'. These holes showed this zone at these horizons and indicated its presence here for over 1,000' of length. No values were obtained but this is not surprising when the erratic nature of the ore, and the east rake of the shoots is considered. Following is an estimate of indicated and broken ore now all the properly. In arriving at this estimate, Mr. Macdonald has cut all high assays, and, where possible, has relied on bulk samples. He has, moreover, cut his final grade figures 40% and also his tonnage figures 40% to allow for sorting. This, I believe, is too drastic and his tonnage figure is too low and probably his grade figure as well.*

*In the tonnage figures he has assumed the extension of ore shoots 50' above and below levels.*

*Surface dump .....600 tons at $11.20*
*311 stope -broken 720 " " $27.00*
*-indicated .....2700 " " $27.00 (all @ $34.71/oz)*
*310 lense -indicated .....720 " " $13.20*
*209 lense -indicated .....240 " " $13.20*

*This gives 5,040 tons with a gross value of $112,404.00 or an average value of $22.30 per ton.*

*August 19, 1946. G. L. HOLBROOKE. M.E.*. (ref KL179)

\- - - -

In 1919 Eby Township was included in mapping by H. C. Cooke of the Geological Survey of Canada while mapping the Kenogami, Round, and Larder Lakes areas.

In 1935, W. S. Dyer of the Ontario Department of Mines mapped Eby Township as part of the Geology and ore deposits of the Matachewan-Kenogami area.

In 1967 Eby Township was mapped by H. L. Lovell of the Ontario Department of Mines. The report and colored geology map was released in 1972 as Geological Report 99.

In 2001, B. R. Berger, Geologist in the Precambrian Geological Section O.G.S., D. Guindon, District Geologist Kirkland Lake Region O. G. S. and G. Grabowski, District Geologis tKirkland Lake Region O. G. S. reported in Ontario Geoligical Survey Open File Report 6070 (Summary of Field Work and Other Activities 2001, Project Unit 10), that a Geological Reconnaissance along Highway 66, from Matachewan to Swastika had begun.The purpose of this multi-year project is to re-map andimprove the geological database.

In 1939 gold was discovered 2400 west south west of this claim group on the Rogick-Elliott-Clark claims located in the NW1/4 of the south 1/2 Lot 5 Con 6 and NE 1/4 of the south 1/2 Lot 5 Con 6 and NW 1/4 of the south 1/2 Lot 4 Con 6. D.K.Burke representing Sylvanite Gold Mines Limited reported extensive trenching showed gold values up to about ½ ounce per ton in gold bearing zones up to 20 feet wide, associated with sheared contacts of red syenitic dykes and carbonate rock. Several drill holes were put down on the zone and showed several economic intersections. In the late 60's early 70's much of the surface exposures have been removed by open cutting. (ref : KL 2409a, KL2605, KL1759)

In 1945 - G. L. Holbrooke for Sylvanite Gold Mines, Limited reported on the Rosa Brown Claim # L17990 located in the NW 1\4 of N 1/2 of Lot 1 Con 6 in Eby Township, which is contiguous directly north of L4217527. Interest in the claim was due to the adjacent west property, the Baldwin. The Baldwin is one of the few spots where definite gold values had been obtained from the Larder Lake break / zone.He reported that the greenstone contact of the area crosses the northern part of this claim. Several pyritic quartz veins and numerous pyritic quartz stringer zones were also found in the carbonate areas.The geology of the claim was mapped and a series of 8 shallow drill holes were put down for a total of 1897 feet. Sampling showed "Negligible gold values" ? The main sediment-greenstone contact occurs on the north part of the claim crossing at slightly north of east with a steep

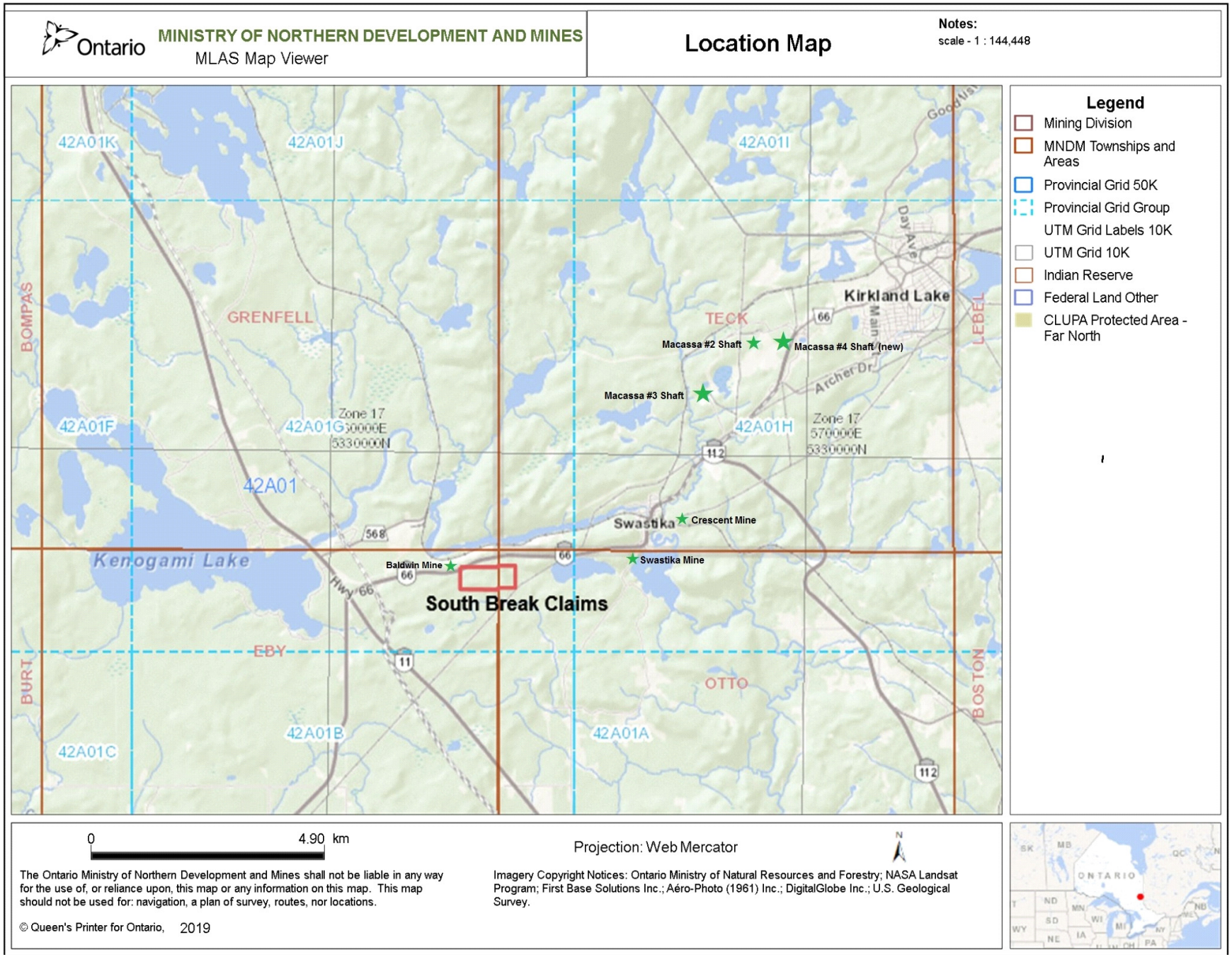

Ontario
MINISTRY OF NORTHERN DEVELOPMENT AND MINES
MLAS Map Viewer
Location Map
Notes:
scale - 1 : 144,448
Legend
Mining Division
MNDM Townships and Areas
Provincial Grid 50K
Provincial Grid Group
UTM Grid Labels 10K
UTM Grid 10K
Indian Reserve
Federal Land Other
CLUPA Protected Area - Far North
42A01K
42A01J
42A01I
42A01F
42A01G
42A01H
42A01
42A01B
42A01A
42A01C
BOMPAS
GRENFELL
TECK
Kirkland Lake
LEBEL
BURT
EBY
OTTO
BOSTON
Macassa #2 Shaft
Macassa #4 Shaft (new)
Macassa #3 Shaft
Archer Dr
Main
Zone 17
570000E
5330000N
Swastika
Crescent Mine
Swastika Mine
Baldwin Mine
Kenogami Lake
Hwy 66
South Break Claims
568
66
112
11
0
4.90 km
Projection: Web Mercator
N
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Figure - 5

south dip.The carbonatized greenstones on the south are intruded by syenite porphyry and mafic syenite. Frequently the carb areas are cut by quartz stockworks with variable amounts of pyrite, pyrrhotite and occasional galena. This claim now forms part of the "Baldwin" claim group (ref KL 2608).

In 1944, the "Lumsden" shaft was sunk about 2650 meters west south west of L4217527,on a red porophyry dike. A pinkish quartz vein at the botton of the shaft assayed about .17 ounces per to across five feet. No reported follow up drilling or work. This lines up well on strike as the west continuation of the Todora geology described above. This may indicate a possible 3.6 kilometers strike length of this zone.

In around 1948, drilling about 1000 meters south of these claim, on the "Todora" claims encountered molybedenite and chalcopyrite with gold in quartz stringers and quartz porphyry in sheared volcanic rocks and iron formation. About 800 meters farther east of this, the 112 foot "Cheltonia" shaft was sunk south of the zone but crosscutting did not go far enough to encounter the shearing. Grab samples from pits in the shaft area reported up to 13% copper.

In 1963 W. S. Savage reported re: Kelly Kirkland Mines Limited Property located In Eby Township, concession VI, Lot 1, NE¼, of the N½,(claim L-16423) and Otto Township, concession VI, lot 12, NW¼ and NE¼ of the N½, and , as well as adjacent parts of Grenfell and Teck Townships, work was done in 1929 by Matabanick Kirkland Gold Mines Limited. An eastwest trending ridge of syenite porphyry is located south of the Larder Lake Break. Gold was found on this ridge of syenite porphyry likely where old trenches blasted across the ridge by former owners. The work consisted of 8,000 feet of surface trenching and the sinking of a 50-foot shaft. Matabanick Kirkland Gold Mines Limited was reorganized as Kelly-Kirkland Mines Limited. The former Kelly-Kirkland claims now belong to Diane C. Strome. In 1939, geological and geophysical investigations disclosed a well-mineralized quartz and porphyry vein and three mineralized dikes (The Northern Miner 1939, p.839).
Some shallow holes, followed by deeper holes, were drilled to test the mineralization. At that time, the property was held by Kelly-Kirkland Mines Limited, an amalgamation of Blanche River Kirkland Gold Mines Limited and Matabanick Kirkland Gold Mines Limited. In 1966, a short hole was drilled under Highway 66 by Kerr Addison Mines Limited. This claim is contiguous directly north of L4217526. (ref : KL 1355)

In 1992 W. Benham and K. Barron of Battle Mountain (Canada) Inc. reported re: Vigrass Lake Property located in Teck, Otto, Eby and Grenfell Townships. Geological mapping, stripping, channel sampling and drilling were completed. The property is underlain by Timiskaming Group trachytic volcanics and sediments and Larder Lake Group mafic to ultramafic volcanics with interbedded graphitic sediments. The larder Lake and Blanche River Fault Zones cross the property. Sub-parallel and splay faults, altered pyritic syenites, volcanics and sediments associated with these structures are present on the property. Reported gold values were generally low but several intersections were in the several gram range.

In 1992 - J. Roth of Stratagex Ltd. reported on behalf of Battle Mountain (Canada) Inc. re: magnetic and HLEM Surveys on the Vigrass Lake Property (see above) that the structural regime is dominated by a network of faults and / or shear zones trending east-west to eastnortheast, comparable to those recognized as important in controlling known gold mineralization. These programs were conducted under the joint partnership with Queenston Mining (formerly HSK Minerals) This work was done on the ground contiguous to the east and north of L4217525 (ref : KL 3907, KL 3582, KL1192, KL3130)

In 1996, directly to the south of, and forming the south boundary of the L4217525-27 J. E. Tilsley, Geologist / Engineer completed a Mag /Electromagnetic Survey on eleven claims in Eby Township in Lot 1,2 and 3 South 1/2 Con VI, (the Reed-Robinson Property). This work was sponsored by Nastek Exploration Ltd. Carbonate alteration with disseminated sulphides and quartz veining were located. Some gold bearing boulders yielded 0.099, 0.495 and 1.337 grams of gold per tonne.

A geotechnical survey with magnetic profiles and magnetic contours, on eleven claims (Lot 1,2 and 3 S 1/2 Con VI) was done again in 1998. Several additional anomalies were detected. Sixteen areas of carbonate alteration, disseminated sulphides, and quartz veining have been defined by stripping, detailed mapping and sampling. Sampling done by Douglas Robinson approximately 75 meters south of L4217525 showed gold values up to 19 grams per ton gold on a 290 to 300 degree trending structure which should trend and continue onto L4217525.

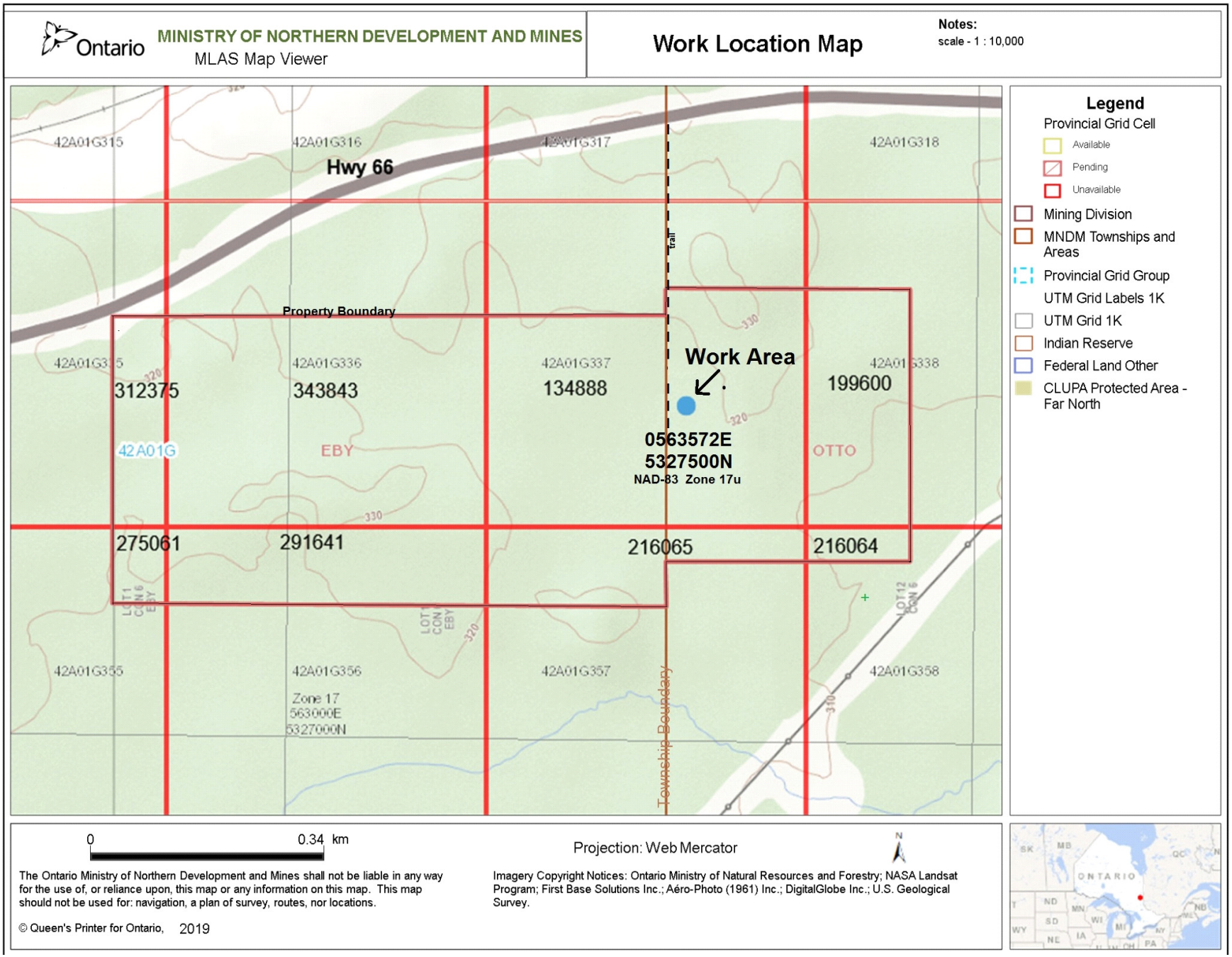

Ontario
MINISTRY OF NORTHERN DEVELOPMENT AND MINES
MLAS Map Viewer
Work Location Map
Notes:
scale - 1 : 10,000
Legend
Provincial Grid Cell
Available
Pending
Unavailable
Mining Division
MNDM Townships and Areas
Provincial Grid Group
UTM Grid Labels 1K
UTM Grid 1K
Indian Reserve
Federal Land Other
CLUPA Protected Area - Far North
42A01G315
42A01G316
42A01G317
42A01G318
Hwy 66
trail
Property Boundary
42A01G335
42A01G336
42A01G337
42A01G338
Work Area
312375
343843
134888
199600
0563572E
5327500N
NAD-83 Zone 17u
42A01G
EBY
OTTO
275061
291641
216065
216064
LOT 1 CON 6 EBY
LOT 1 CON 7 EBY
LOT 12 CON 6
42A01G355
42A01G356
42A01G357
42A01G358
Zone 17
563000E
5327000N
Township Boundary
330
320
310
0
0.34 km
Projection: Web Mercator
N
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Figure - 6

## PRESENT WORK

During October of 2017 hand stripping and washing of outcrop, sampling and mapping was done at approximate grid coordinates 0+25E 1+65S on mining lands now designated as being part of boundary cell 134888. For reference purposes the work location has been designated work site "5". The site had been briefly visited earlier in the season while outcrop checking when pyrites and fuchsite were noted in altered volcanic rock. The progran exposed sheared, foliated carbonate altered rock showing some patchy pyrite up to 10% in disseminations and fine cubes with much fuchsite developed. Gps readings (NAD83 Zone 17u) averaged out to 0563572E 5327500N at the reference location indicated on figure 8 herein.

Oct 1, 2017

Access work area. Trim trail off of grid line into 1+65S 0+25E and then start to clear trees of 8m x 5m area on and around the stripping area. All brush and small trees and organic materials are placed in a low pile adjacent to the north of the stripping, off the work area. Begin to clean off root mat and talus. All work done by hand with axes, grub hoe, sandvik, long handled shovel and 4 foot pry bar.

Oct 18, 20, 21, 2017

Access work area. Continue to strip and clear off outcropping. Once stripped down to rock, brushes are used to expose the rock. Water is then hauled by hand and used in a final brushing. All work is done with axes, grub hoe, long handled shovel, a 4 foot pry bar, stiff bristle brushes and a couple of 20 liter water pails.

Oct 24, 2017

Sample prep and round trip to Swastika Ontario to drop off samples at Swastika Assay Labratory.

Oct 26, 2017

Access work area. Map and measure work area. Clean up site and carry out hand tools.

## RESULTS

Much of the knoll of scattered outcrops is covered with 12 centimeters to 16 centimeters of organics with a densely interwoven mesh of roots and up to 3 centimeters of sandy greyish ash?-loam underneath. Underlying this layer where not directly on the rock, there is varying thickness of a sandy unsorted till with the odd boulder up to 40 centimeters. Most of the angular clasts are readily attributable to known lithologies up ice and no out of the ordinary rocks were noted. All clasts over about 8 centimeters were placed in a pile to the north east adjacent to the stripping Clast content overall was about 25% of the material removed. The sand was a medium grain light reddish to yellowish brown color. About 1/2 way on the stripped area, an east - west gap filled with sandy till likely marks the trace of an approximately 100° striking, steeply north dipping fault. This gap was dug down almost 1 meter without finding bedrock before stopping. The material probably represents basal till from the last ice advance. Some effort was made to keep the material from the gap in a separate pile to the west side of the stripped area for panning or indicator mineral purposes. A north - south cross fault likely passes under cover between the south east and south west stripped areas. Offsets in a band of noted shearing/foliation on the exposed surfaces would support this.

The north part of the stripped area on the north side of the till filled gap is a medium grained, greenish, carbonate altered, mafic volcanic rock. The surface is relatively un weathered or thinly weathered with a brownish to dark brown staining overall due to old oxidizing of the surface pyrites however some of the oxidation is slightly redder in hue. Rarely does the rust or weathering appear to penetrate beyond 2 millimeters to 3 millimeters. Flecks of fuchsite are abundant. Sprays of fine to medium grained pyrite up to 10% occur throughout. Random tight lineaments or foliations at about 100°ast with sub-vertical dips (which appears to be the dominant strike throughout the work site) with several anasmotising wisps and 1 centimeter to 2 centimeter quartz or dolomite stringers running parallel. Weak HCL does not effervesce and the rock is non magnetic. Although quite promissing looking with copious pyrite, sample 20186 taken here showed only 20ppb Au.

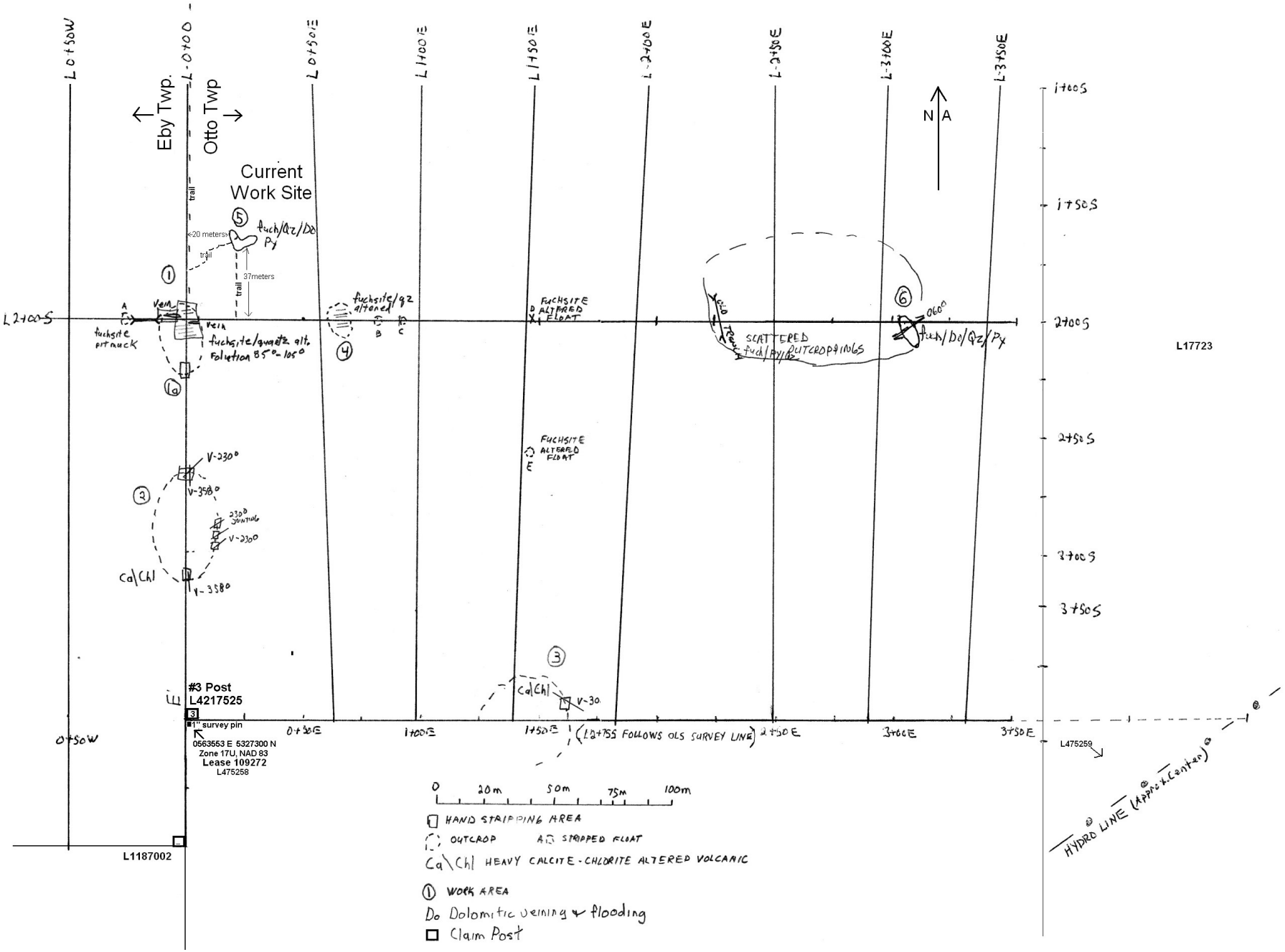

L 0+50W
L-0+00
L 0+50E
L 1+00E
L 1+50E
L-2+00E
L-2+50E
L-3+00E
L-3+50E
Eby Twp.
Otto Twp
Current Work Site
trail
<20 meters
37meters
fuch/Qz/Do Py
fuchsite/qz altered
FUCHSITE ALTERED FLOAT
SCATTERED fuch/Py/Qz OUTCROPPINGS
fuch/Do/Qz/Py
060°
Vein
fuchsite pit/nuck
fuchsite/quartz alt. Foliation 85°-105°
V-230°
V-350°
230° JOINTING
V-230°
Ca\Chl
V-358°
V-30
#3 Post
L4217525
3" survey pin
0563553 E 5327300 N
Zone 17U, NAD 83
Lease 109272
L475258
L1187002
L17723
L475259
HYDRO LINE (Approx. Center)
(L2+75S FOLLOWS OLS SURVEY LINE)
1+00S
1+50S
2+00S
2+50S
3+00S
3+50S
N
A
0
20m
50m
75m
100m
HAND STRIPPING AREA
OUTCROP
STRIPPED FLOAT
Ca\Chl HEAVY CALCITE-CHLORITE ALTERED VOLCANIC
① WORK AREA
Do Dolomitic veining & flooding
Claim Post

Figure - 7

The south part of the stripped area south of the till filled gap shows an east - west band of foliation about 2 meters wide trending predominantly at about 100° with dips of about 85° to the north. More alteration and deformation is evident. The rock is rather solid (silicified/dolomitized?) and the banding shows thin wisps and stringers of quartz and or dolomite. Silvery to brassy pyrite occurs throughout as fine disseminations and grains up to 1/2 millimeter. The color varies from medium green to the emereld green of the fuchsite which occurs as flecks and streaks or shear coatings. Pale yellow to pale beige sericite occurs throughout as flecks, replacements and small streaks or coatings, or as ghostly remnants of altered wallrock clasts within the veining. Adjacent to the till filled gap, at the north east edge of the south west stripped outcropping, a 5 centimeter band of cherty looking quartz-dolomite shows a light buff colour and 3% to 5% very fine pyrites. Exposed platey shearing here shows waxy slickenside? coatings. Sample 20185 taken from here assayed out at 640ppbAu. To the south across the band of shearing, the rock grades back to less intense strain and more massive appearing as iut is to the north side of the till filled gap but much fuchsite and fair pyrite continues until under cover.

The south east stripped area exposes the same band of foliated rock as the south west stripped outcrop. The southern extent of the intense foliation on the south east exposure was not encountered however visual and mapped allignment of the south edge of the intense foliation of the south west stripping does not appear that it will align with the east side leading us to presume some lateral displacement along a roughly 355° ast trending cross fault buried between the twoi exposures. It is hoped to follow up on the elevated sample and strip further to the east. along the till filled gap.

SAMPLES

20185 0563572.5E 5327498N Cherty looking, quartz-dolomite?, light buff colour to the silicious appearing material, with up to 5% very fine pyrites. Wispy chlorite/mariposite noted on tight fracture surfaces. Odd relict wall rock clasts pea size up to 1.5 centimeter evident by buff-beige replacements. No reaction to dilute HCL. Hardness is greater than a pocket knife to slightly less hard than an axe file. Non magnetic. 620ppb Au

20186 0563571E 5327500N Medium grained, greenish, carbonate altered, mafic volcanic rock. Flecks of fuchsite and sprays of fine to medium grained pyrite up to 10% occur seemingly at random occur throughout. Odd brassy to yellowish pyrite specks or possibly chalcopyrite grains. Hardness greater than a pocket knife but less than an axe file. No reaction to dilute HCL. Non magnetic. 20ppb Au




Gashy qz-dolomite veins in fuchsite/pyrite altered mafic volcanic rock. Site 5

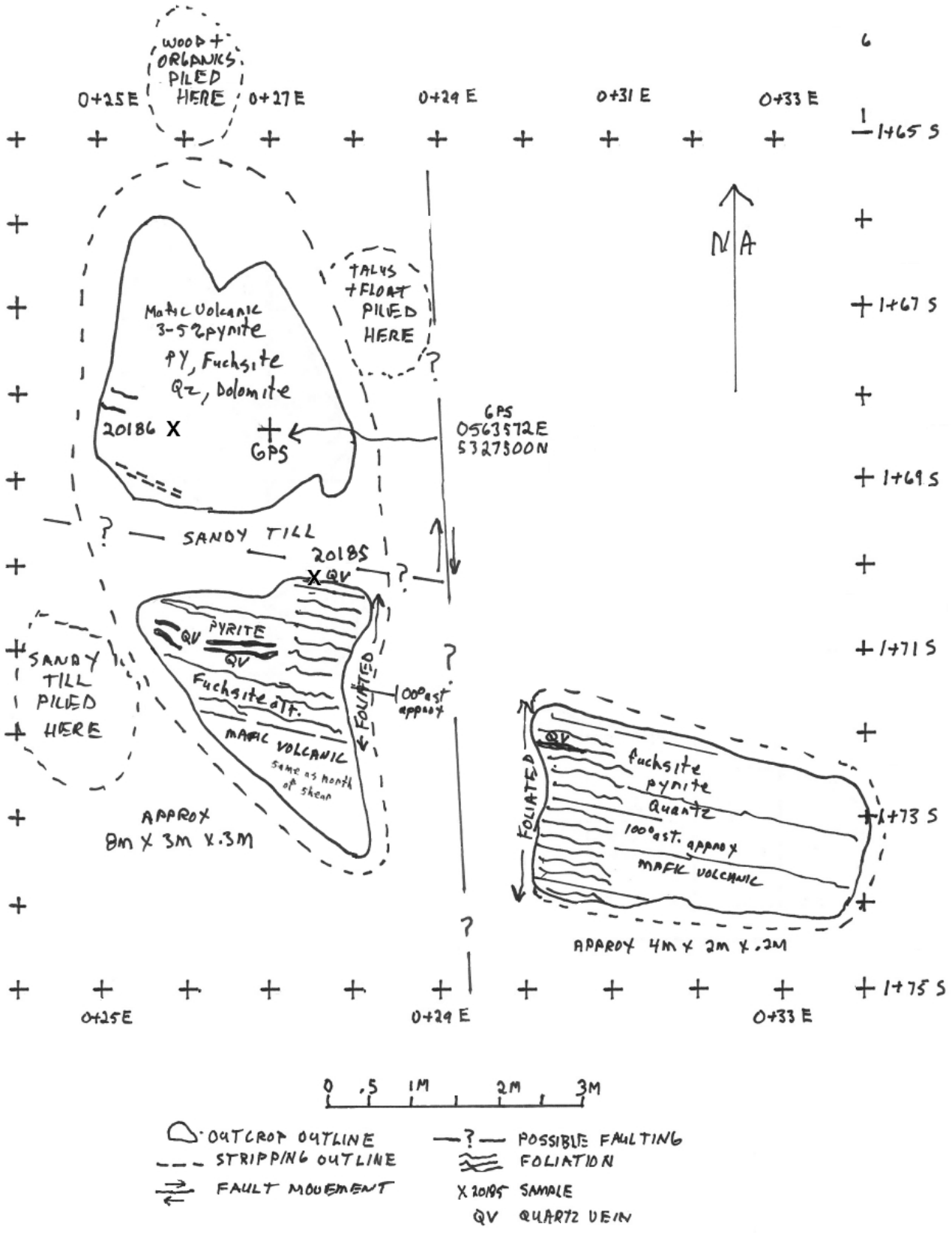

WOOD + ORGANICS PILED HERE
0+25E
0+27E
0+29E
0+31E
0+33E
1+65S
1+67S
1+69S
1+71S
1+73S
1+75S
N
A
TALUS + FLOAT PILED HERE
Matic Volcanic 3-5% pyrite
py, Fuchsite
Qz, Dolomite
20186
GPS
GPS 0563572E 5327300N
SANDY TILL
20185
QV
PYRITE
FOLIATED
100° ast approx
Fuchsite alt.
MAFIC VOLCANIC
same as north of shear
SANDY TILL PILED HERE
APPROX 8m X 3m X 3M
Fuchsite
pyrite
Quartz
100° ast. approx
MAFIC VOLCANIC
APPROX 4m X 2m X .2M
0 .5 1M 2M 3M
OUTCROP OUTLINE
STRIPPING OUTLINE
FAULT MOVEMENT
POSSIBLE FAULTING
FOLIATION
20185 SAMPLE
QV QUARTZ VEIN

Figure - 8

# Swastika Laboratories Ltd

Established 1928

Assaying - Consulting - Representation



***Assay Certificate***

**Certificate Number: 17-2831**

Company: **Eric Marion**

Project:

Report Date: 27-Oct-17

Attn: Eric Marion

*We hereby certify* the following Assay of 3 rock/grab samples submitted 24-Oct-17 by Eric Marion

| Sample Number | Au FA-MP ppb |
|---|---|
| 20185 | 640 |
| 20186 | 20 |
| XXXXX | XXX |
| Blank Value | 10 |
| OxH122 | 1250 |

*Certified by*

Valid Abu Ammar

1 Cameron Ave., P.O. Box 10, Swastika, Ontario P0K 1T0
Telephone (705) 642-3244 Fax (705) 642-3300

Statement of Qualifications

I, Eric Marion, with the mailing address of Box 792 in the Town of Kirkland Lake, P2N 3K4
do certify that:

1. I have worked in the exploration industry in various capacities continuously since 1977, mostly within Canada, and particularly in Ontario.
2. As a private prospector/explorationist I have been practicing since 1995.
3. I have participated in several MNDM run prospecting techniques and geophysical prospecting techniques courses. (1990's)
4. I have gained knowledge and skills by committed research, hands on training, and application.
5. I have made use of the records and publications of the Ontario Geological Survey and the Kirkland Lake Resident Geologists Files for technical data and nomenclature, as well as field observations and personal knowledge of the area in the preparation of this report.
6. I am the recorded holder of the mining lands on which the reported work activities occured.
7. I am a Director of the Northern Prospectors Association.
8. I have completed the Mining Act Awareness Program and have been assigned the verification number of EA32-082F-D9F7-0433

2019/01/15

signed : E Marion

# Bibliography

Ayer, J.A., et. al.,
2005: Overview of results from the Greenstone Architecture Project: Discover Abitibi Initiative; Ontario Geological Survey, Open File Report 6154, 146p

Barnes, S.J., Gorton, M.P. and Naldrett, A.J.
1981:Platinum Group Elements in Abitibi Komatiites Associated with Nickle Sulfide Deposits; in Geoscience Research Grant Program, Summary of Research, 1980 to 1981, Ontario Geological Survey,Miscellaneous Paper 98, Grant 17, p. 1-12

Berger, B. R. Grabowski, G., Guindon, D.
2001, Ontario Geological Survey Open File Report 6070 Summary of Field Work and Other Activities 2001, Project Unit 10, Geological Reconnaissance along Highway 66

Burrows, A. G., and Hopkins, P. E.
1914: The Kirkland Lake and Swastika gold areas and Maisonville, Grenfell and Eby Townships; Ontario Bur. Mines, Vol. 23, pt. 2, 39p. Accompanied by Maps 23a, 23b, scale 1 inch to 34 mile.

Burrows, A. G., and Hopkins, P. E.
1923: Kirkland Lake gold area (revised edition); Ontario Dept. Mines, Vol. 32, pt. 4, p.1-52, (published 1925). Accompanied by Map 32e, scale 1 inch to 1/2 mile.

Burt, A.K. and Hamilton, S.M.
2004. A comparison of selective leach signatures over kimberlites and other targets; Ontario Geological Survey, Open File Report 6142, 179p.

Cooke, H. C.
1919: Exploration of the townships west of Kirkland Lake, Ontario; Geol. Survey of Canada, Summary Report, 1919, pt. E, p.l8E-19E, (published 1920).

Cooke, H. C.
1922: Kenogami, Round, and Larder Lake areas, Timiskaming District, Ontario; Geol. Survey of Canada, Mem. 131, 64p. Accompanied by 3 maps

Crocket, J.H. and Bowins, R.J.
1985:Rare Earth Element Properties of Archean Iron Formations and their Host Rocks-Some Results from the Temagami and Boston Iron Formations; in Geoscience Research Grant Program, Summary of Research 1984 to 1985, Ontario Geological Survey, Miscellaneous Paper 127, Grant 132, p. 10-14

Crocket,J.H., Blum,N., Hurley, R.,Bowins,R., McRoberts,G., Fyon,A., McNutt,R.H., Schwarcz,H.P. and Rees, C.E.
1984:Geological and Geochemical Studies of the Boston and Temagami Iron Formationsand their Contiguous Volcanosedimentary Piles; in Geoscience Research Grant Program,Summary of Research, 1983 to 1984,Ontario Geological Survey,Miscellaneous Paper 121,Grant 132, p. 72-83

Crocket,J.H., Blum,N., Hurley, R.,Bowins,R., McRoberts,G., Fyon,A., McNutt,R.H., Schwarcz,H.P. and Rees, C.E.
1983:Isotopic and Geochemical Characterization of Archean Iron Formations and Associated Volcanic Rocks-Some Preliminary Results from the Temagami and Boston Iron Formations; in Geoscience Research Grant Program, Summary of Research, 1982 to 1983, Ontario Geological Survey,Miscellaneous Paper 113,, Grant 132,p.29-40

Dyer, W. S.
1935 : Geology and Ore Deposits of the Matachewan-Kenogami area; Ontario Dept. of Mines, Volume 44, part 2, pg 1 - 55, Accompanied by Map 44a, 1 inch to 1000 feet, and Map 44b, scale 1 inch to 1 mile

Fyon,J.A., Crocket, J.H., Schwarcz, H.P., Kabir, A., and Knyf, M.
1981: Trace Element and Stable Isotope Geochesistry of Auriferous Iron Formations in the Timmins Area; in Geoscience Research Grant Program, Summary of Research, 1980 to 1981, Ontario Geological Survey Miscellaneous Paper 98, Grant 49, p. 90-107

Fortescue, J.A.C. and Gleeson, C.F.
1984: An introduction to the Kirkland Lake (KLIP) Basil Till Geochemical and Mineralogical Study (1979-1982), Timiskaming District, Ontario Geological Survey, Map 80 714, Geochemical Series, Compiled 1984

Grabowski,G.P.B. and Wilson, A.C.
2005. Sampling lamprophyre dikes for diamonds: DiscoverAbitibi Initiative; Ontario Geological Survey, Open File Report 6170, 262p.

Guindon, D.L. and Reid, J.L.
2005. Regional modern alluvium sampling of the Kirkland Lake–Matachewan area, northeastern Ontario; Ontario Geological Survey, Open File Report 6124, 121p.

Hicks,K.D.,and Hattori, K.
1988:Magmatic-Hydrothermal and Wall Rock Alteration Petrology at the Lake Shore Gold Deposit,Kirkland Lake, Ontario; in Geoscience Research Grant Program, Summary of Research 1987 to 1988, Ontario Geological Survey, Miscellaneous Paper 140,Grant 313, p.192-204

Hattori, Keiko, and Levesque, G.
1989: Hydrothermal Activity in the Kirkland Lake Intrusive Complex, Temiskaming District, Ontario, in Geoscience Research Grant Program,Summary of Research 1988 to1989, Ontario Geological Survey, Miscellaneous Paper 143, Grant 313, p. 59-67

Jensen, L.S. and Langford, F.F
1983:Geology and Petrogenesis of the Archean Abitibi Belt in the Kirkland Lake Area, O.G.S. Open File Report 5455

Lawton, K. D.
1954: The Round Lake batholith and its satellitic intrusions in the Kirkland Lake area; unpublished Ph.D. thesis, University of Toronto, Toronto, Canada.

Lawton, K. D.
1957: Geology of Boston Township and part of Pacaud Township; Ontario Dept. Mines, Vol. 66, pt. 5, 55p.,

Lovell, H. L.
1969a: Geology of the Bourkes area, District of Timiskaming; Ontario Dept. Mines, Open File Report 5036 (typescript).
1969b: Otto Township and northern part of Marquis Township, District of Timiskaming; Ontario Dept. Mines, Prelim. Geol. Map P.501, scale 1 inch to 1/2 mile. Geology1968.

Lovell, H.L.
1972: Geology of the Eby and Otto Area, District of Temiskaming, Ontario Department of Mines and Northern Affairs, Geological Report 99, Accompanied by Map 2239, scale 1 inch to 1/2 mile

Lovell, H.L. and Caine, T.W.
1970:Lake Temiskaming Rift Valley; Ontario Department of Mines Miscellaneous Paper 39

Moore, J.C.G.
1966: Geology of Burt Holmes Area,District of Temiskaming,Ontario Department of Mines Geological Report 44, Accompanied by Map2078, scale 1 inch to 1/2 mile

O.G.S.
1979:Airbourne Electromagnetic and Total Intensity Magnetic Survey, Kirkland Lake Area,Morrisette Township, District of Temiskaming : by Questor Surveys Limited for the Ontario Geological Survey, Prelim.Map P.2258 Geophys. Ser., Scale 1:20,000, Survey and compilation February and March 1979

O.G.S.
1979:Airbourne Electromagnetic and Total Intensity Magnetic Survey, Kirkland Lake Area, Teck Township, District of Temiskaming : by Questor Surveys Limited for the Ontario Geological Survey, Prelim.Map P.2263A North Half, and 2263B South Half , Geophys. Series, Scale 1:20,000, Survey and compilation February and March 1979

O.G.S.
1972: Geological Compilation Series, Map 2205, Timmins - Kirkland Lake area, compiled byD.R. Pyke, L. D. Ayres, and D.G. Innes

O.G.S.
1986: Volcanology and Mineral Deposits, Miscellaneous Paper 129

O.G.S.
2000: Airbourne magnetic and electromagnetic surveys, shaded image of the second vertical derivative of the magnetic field and Keating coefficients, Kirkland Lake area: Ontario Geological Survey, Map 82 056, scale 1:50,000

Morris, T.F., Bajc, A.F., Bernier, M.A., Kaszycki, C.A., Kelly, R.I., Murray, C and Stone, D.,
1995: Kimberlite Heavy Mineral Indicator Data Release, Ontario Geological Survey, Open File Report 5934, 91p.

Powell, W.G., Hodgson, C.J., and Hanes, J.A.
1989:The Expression of the Larder Lake Break in the Matachewan Area,Temiskaming District,Ontario; in Geoscience Research Grant Program, Summary of Research 1988 to 1989,Ontario Geological Survey, Miscellaneous Paper 143, Grant 329, p. 125-132

Rainsford, D.R.B.
2013: Summary of geophysical projects and activities; in Summary of Field Work and Other Activities 2013, Ontario Geological Survey, Open File Report 6290, Project Unit 13-026: Gases and Biota Related to Serpentinization of Kimberlites in the Kirkland Lake Area, B. Esen, T.H. Brisco, B. Sherwood Lollar, M.O. Schrenk, S.M. Hamilton and G. Lacampe-Couloume, Section 41, page 41-1 to 41-6

Savage, W.S.
1964:Mineral Resources and Mining Properties in the Kirkland Lake - Larder Lake Area, District of Temiskaming, Ontario Department of Mines Mineral Resource Circular No. 3 Accompanied by Chart A Kirkland-Larder Lake Area, scale 1 inch to 2 miles

Sage, R.P.
1996. Kimberlites of the Lake Timiskaming Structural Zone; Ontario Geological Survey, Open File Report 5937, 435p.

Sage, R.P.
2000. Kimberlites of the Lake Timiskaming structural zone: supplement; Ontario Geological Survey, Open File Report 6018, 123p.

Stevenson, D.B., Broughton, D.W., Cruji, D.R., Masson, M.W. and Parry, S.E.
1995: Geology and Exploration History of the Amalgamated Kirkland Deposit, Kirkland Lake, Ontario; Exploration Mining Geol. Vol. 4. Pp 187-196; CIMM

Thomson, Jas. E.
1948: Geology of Teck Township and the Kenogami Lake area, Kirkland Lake gold belt; Ontario Dept. Mines, Vol. 57, pt. 5, p. 1-53, (published 1950). Accompanied by Maps 1945-1, 1946-1, scale 1 inch to 1,000 feet.

Thompson, P.H.
2005. A new metamorphic framework for gold exploration in the Timmins–Kirkland Lake area, western Abitibi greenstone belt: Discover Abitibi Initiative; Ontario Geological Survey, Open File Report 6162, 104p.

Toogood, D.J. and Hodgson, C.J.
1986: Relationship Between Gold Deposits and the Tectonic Framework of the Abitibi Greenstone Belt in the Kirkland Lake-Larder Lake Area; in Geoscience Research Grant Program, Summary of Research 1985 to 1986,Ontario Geological Survey, Miscellaneous Paper 130,Grant 227, p.79-86

Ministry of Northern Developement and Mines
:Resident Geologist Files, literally hundreds of files of submitted assesment work files covering many claim areas in Bernhardt Township, Eby Township, Grenfell Township, Gauthier Township, Lebel Township, Morrisette Township, Otto Township, Teck Township,