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REPORT ON THE GEOCHRONOLOGY, STRATIGRAPHY, AND VMS POTENTIAL

KAMKOTIA AREA WEST TIMMINS

FOR INTERNATIONAL EXPLORERS & PROSPECTORS INC.

December 2019

Lionel Bonhomme

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## 1.0 INTRODUCTION

International Explorers & Prospectors Alliance Inc. (IEP) has funded research to help understand the division of Kidd Monro (KM) and Blake River (BR) assemblages in the Kamiskotia intrusive and volcanic Complexes. The boundaries are critical to locate vms and gold vms deposits in the Abitibi Greenstone Belt (AGB).

The research project started after the Louvicourt discovery in 1989 when MRNQ and McGill published exploration success and was made available in 1992 to the author. Various private companies and syndicates were created to determine if the success could be duplicated in Ontario and other areas in the province of Quebec. Contact was made with Dr Wally MacLean who sent various papers and recommended Dr Tim Barrett who was moving to U.B.C. Dr Barrett would be in Ontario and could travel to Timmins to examine drill core and determine if there were any similarities to Quebec discoveries.

Over the ensuing years Ore Systems Consulting overlooked a large land assembly that led Falconbridge (Ray Band) then vp of exploration to form various joint ventures as he was very familiar with the research. By 1998 a private company Explorers Alliance Corporation (EAC) merged with a number of entities became publicly listed that ultimately became IEP a private company. EAC mapped and compiled 7 townships with the services of Dale Pyke, Kim Cunnison and Dr Tim Barrett.

In 1998 the upper KM assemblage was identified in Carscallen, followed by the upper BR assemblage in Jessop Township. By 2005 Hathway Ayer Hocker confirmed the extension of boundaries. When Falconbridge was taken over by Xstrata many projects were returned to IEP and by 2013 the Kamkotia joint venture was returned to IEP 100% with an nsr to Xstrata and a back-in on certain claims. Many advanced projects were returned between 2003-2013.

IEP continued to refine the boundaries in the Kamkotia area with a compilation by Dr Tim Barrett of 5879 litho-geochemical samples to create alteration areas and chemo-stratigraphic maps. The report was filed with MNDM in 2016. Then in 2017 Ayer, Barrett, Stott, Hamilton, and Berger reviewed the boundaries and the BR complex was extended west and south-east with a refining of ages suggesting a contact between upper and lower BRA previous attempt to obtain an age date at the Robb/Loveland boundary was not successful due to lack of Zircons and location of drill-core.

In 2018 Ayer, Barrett, Hamilton, Berger participated in discussions to test the northwest corner of Robb Loveland and also the Steep lake area. The known research was studied and several locations were selected to collect rock samples in 2018 from July to August 2018 when 21 samples were collected. John Ayer and Ben Berger came to Timmins to visit a site area to confirm a trench from 1949 by Nelson Hogg from the OGS west of Steep Lake area. The rock was identified as a granophyre and was in contact with a series of black chlorite veins that contain up to 2% Cu and 0.03 opt Au. A picture of the veining is attached.

In September 2018 Metal Earth sponsored a field trip MERC-ME 2018-043 A and the author visited the Quemont Powell intrusion with similar veining at the contact. A picture from the field trip guide looks remarkably similar to the Steep lake sample. The author discussed this matter

with B.Dube, M Hamilton , J Ayer , J Goutier and asked if the BR boundaries published by the GSC (Langevin-Mercier P Dube 2017) could be extended in the west Timmins area. While Powell Block has been dated 2702 (M Schofield) a spotted alteration was observed near similar quartz veins with sulphides containing cordierite similar to “spotted dog unit “mapped at the Genex in 1946 (Keevil N.B.) and thin section completed by (F Bleaker ) in 2018. The Genex has been date at 2698.6 with a margin of error of 1.6 by Hamilton, Ayer and Barrett who collaborated on the collection of sample. Some samples collected at Forbes Lake within 800 m west of Genex appear to be good candidates for an intrusion.

All of the available date was shared with the GSC and such an undertaking would require some additional geochron and could be completed over a few years. As a result of these discussions IEP sent the samples to M Hamilton at the U of T. The report of the results also identified the presence of KM 2716, at the Loveland west boundary.

IEP also completed an airborne survey in 2017 with the west end of complex with east -west flight lines and east end of complex with North south flight lines .

A report by J Ayer M Hamilton is attached with this report.



Figure 1 Godfrey Twp. Veining at granophyre- felsic contact

## 2.0 LOCATION AND ACCESS

The property consists of a group of cells in Godfrey and Loveland Robb Townships. The property can be accessed by paved highway 101 west from the City of to paved municipal road Kamiskotia and at the Ski hill a series of logging roads were blazed to allow access to a beaver dam that is located 400 m south of the Steep Lake area sample. Further along past the Ski hill at the end of asphalt a logging road to Km 9 branches west to Winter Lake logging road with a bridge to a creek leads you to within 200 m of the location of the Noranda dill hole that was saved from their core farm and sampled in 2000 (Calhoun EAC) In 2019 Peter Colbert and Lionel Bonhomme visited the outcrops exposure near Baby moose lake that was mapped under supervision of Dave Comba in 1983 and confirmed the presence of black chloritized rhyolite with Chalcopyrite, Sphalerite anomalous with over 1 g/t Au. The VTEM survey has identified a strong TAU conductor that is untested and suggest a west dip. IEP did drill in 2001 a few hundred meters south and discovered some interesting zinc values in Rhyolite tuff.

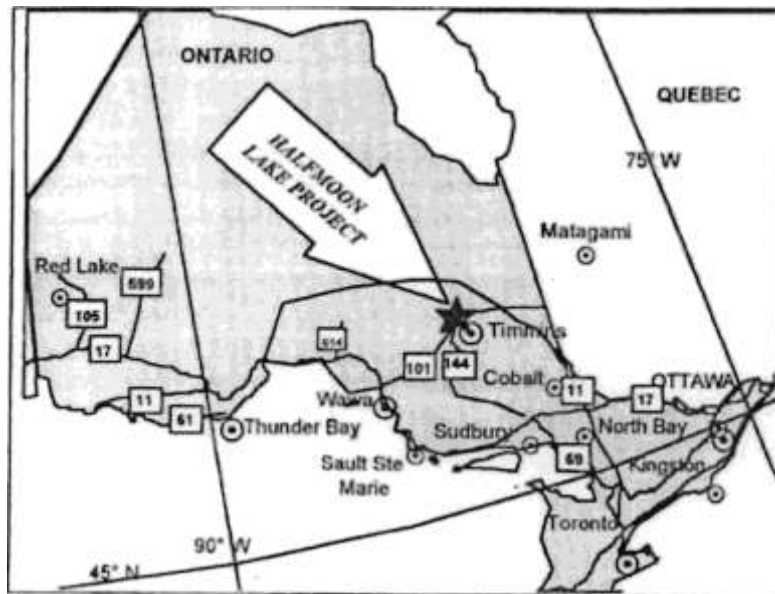


Figure 2 General area of the study area

### 3- REGIONAL GEOLOGY

The area is situated at the west end of the Abitibi Greenstone Belt, which consists of Archean metasediments and felsic to mafic metavolcanics intruded by granitic and mafic bodies. Several assemblages are well endowed in base metals and gold vms in excess of 700 MT of ore (Langevin -Mercier Dube 2017 )The key assemblages are Kidd Munro, Blake River .both Upper and Lower are present The area west of Timmins has a very large presence of these assemblages consisting of 25 km of strike of Kamkotiia Volcanic complex in contact with the Kamkotia Intrusive Complex .This setting is very comparable to the Flavrian granodiorite and Powell granite.

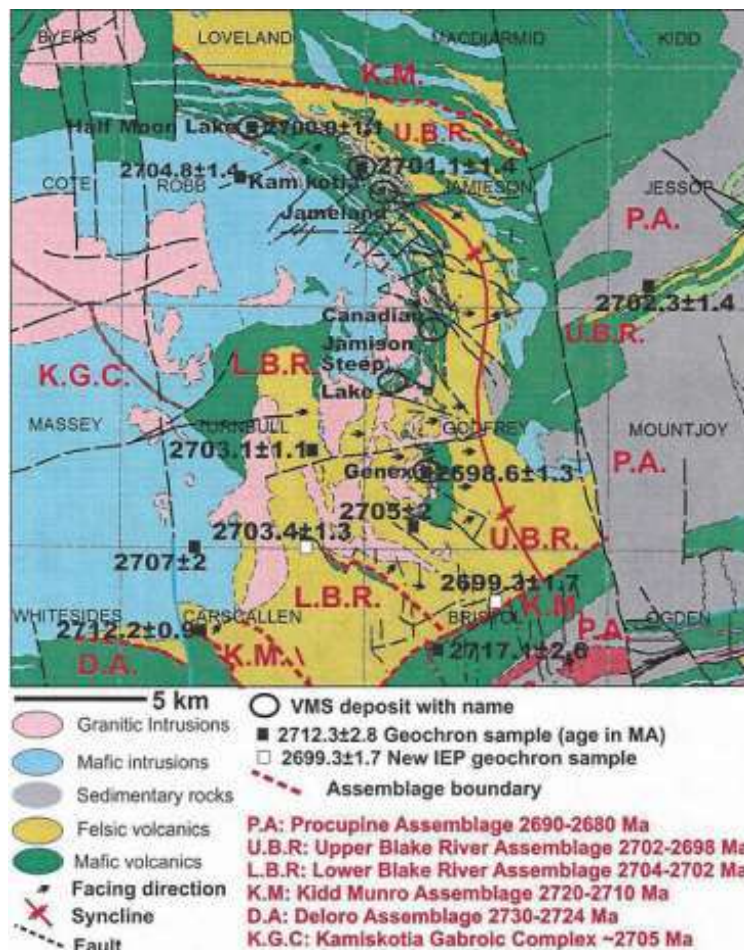


Figure 1. Kamiskotia area general geology with U-Pb zircon ages in MA VMS deposit locations and assemblage boundaries.

Figure 3 Geology of the Kamiskotia area

#### **4.0 PREVIOUS WORK**

There were 4 producers in the area that extracted over 6 M T mainly closing between 1966 to 1972. The companies could not compete with the wages and signing bonuses provided by Texas Gulf Sulphur Company including a new truck. The senior management of the last 3 operators became TGS employees with Ray Clarke becoming president of the company. TGS struggled after a plane crash of the chairman and 6 aides on February 12, 1981. They were on a flight from Montreal to Toronto and the author and his father were meeting with them that morning for a meeting.

The company had a takeover bid by Elf Aquitaine that was blocked by the federal government as it was a foreign takeover that was not permitted and then became managed by the Canada Development Corporation with bureaucratic accountants and lawyers deciding the fate of the company. Many of the senior exploration team left due to the frustrations with the new bureaucratic environment. Ultimately the company was sold to Placer Dome. Noranda and Falconbridge with Placer Dome selling their share to have Noranda Falconbridge ownership with Falconbridge surviving as the sole owner.

The exploration quality for the period 1964 to 1981 was exceptional and the envy of the mining industry. It attracted the best talent and believed in research and development in conjunction with exploration. That quality of work has been buried and lost in their archives to be built again.

IEP is collaborating with Metal Earth, MERC and other agencies to revive and retrieve the data from archives with modern technology. There has not been any new mines placed into production for vms or gold vms in northeast Ontario in the previously unknown KM and BR assemblages while the province of Quebec had been very successful since 2000 with over 200 MT discovered.

#### **5.0 CONCLUSIONS**

The understanding of the key assemblages as identified with new seismic, MT, surveys, geochronology studies and footprint of large deposits should stimulate the richest and largest greenstone belt in Canada. It is now recognised that the large vms also are enriched in gold at depth and previous exploration in the KM totally ignored gold grades under 3 g/t at the sediments and qfp contacts. The presence of large Porphyries of similar age to type 1 in the KM assemblage for gold and cu-au is now being documented in Ontario and Quebec and the Pipestone fault is now recognised as a new corridor that has lacked exploration due to low commodity prices.



## 6. Author's Certificate

I Lionel Bonhomme do declare that:

I reside at 643 Pine St North Timmins, Ontario P4N 6M2

I hold a valid Prospectors license

I hold a client number with MNDM

I am a member of the Porcupine and Sudbury Prospectors Group

I am a life member of Prospectors & Developers Association of Canada

I am a member of the Geological Association of Canada

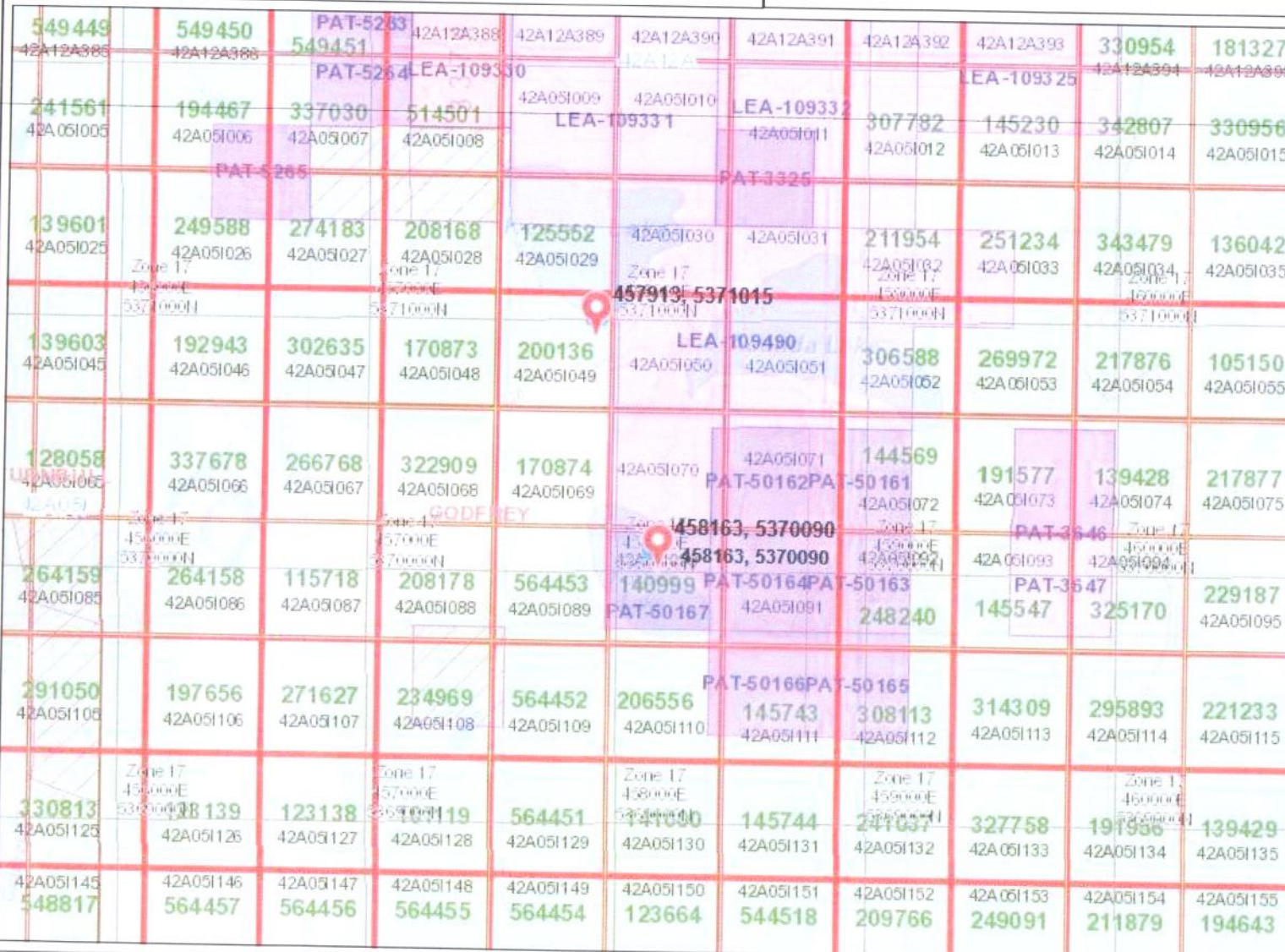
I have been active in mineral exploration and worked in the industry since 1964

I am the president of International Explorers & Prospectors Inc.

I have managed the exploration program in this report.

A handwritten signature in black ink, appearing to read 'L. Bonhomme', with a horizontal line underneath.

Lionel Bonhomme



### Legend

- Provincial Grid Cell**
  - Available
  - Pending
  - Unavailable
- Mining Claim**
  - Mining Claim
  - Boundary Claim
- Alienation**
  - Withdrawal
  - Notice
- ENDM Administrative Boundaries**
  - ENDM Townships and Areas
  - Geographic Lot Fabric
  - UTM Grid 1K
  - UTM Grid 10K
  - Mining Division
  - Mineral Exploration and Development Region
  - CLUPA Protected Area - Far North
  - Resident Geologist District
  - Federal Land Other
  - Native Reserves
- AMIS Sites**
  - AMIS Sites
  - AMIS Features
  - Drill Hole
  - Mineral Occurrences
- MLAS Mining History**
  - Withdrawal - History
  - Notice - History
  - Mining Claim - History
  - Mining Land Tenure - History
  - Legacy Claim
- Provincial Grid**
  - Provincial Grid 250K
  - Provincial Grid 50K
  - Provincial Grid Group
- Land Tenure**
  - Surface Rights
  - Mining Rights
  - Mining and Surface Rights
  - Order-in-Council

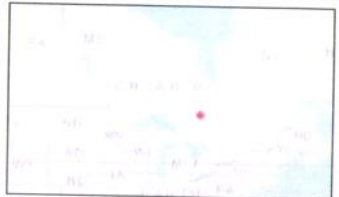


Projection: Web Mercator



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List of samples from July 22<sup>nd</sup>, 2018.

Keeley Lake prospecting:

KL-01 458263, 5370441, fine grained, pyrite cubes, granite vein (or q.v.)

KL-02 458266, 5370481; chalco. Py., malachite staining, spectacular sample for colour.

KL-03 457846, 5370995; s/w shore of Keeley, on top of outcrop

KL-04 457882, 5370968; outcrop in bush.

Gr-A Granite sample from 457913, 5371015





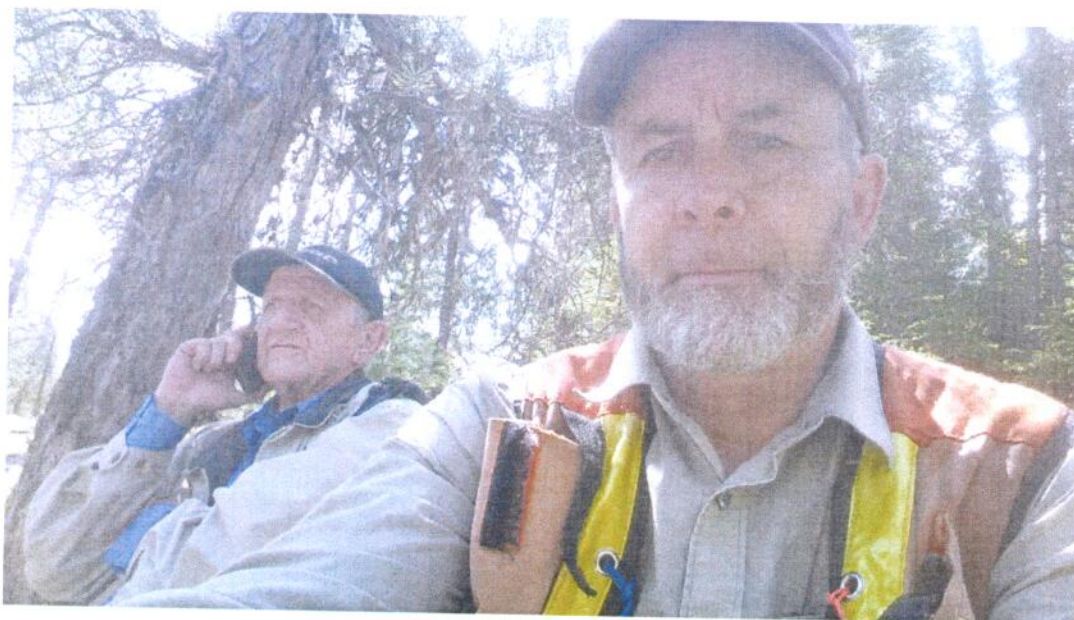


High above the rest of the ground at 458222, 5370500. See next picture. No sample taken only the picture.



Scot

Map of samples from July 20<sup>th</sup> 2018.







Work Report for Monday July 30th, and Wednesday August 1<sup>st</sup>, 2018.

Forbes Lake

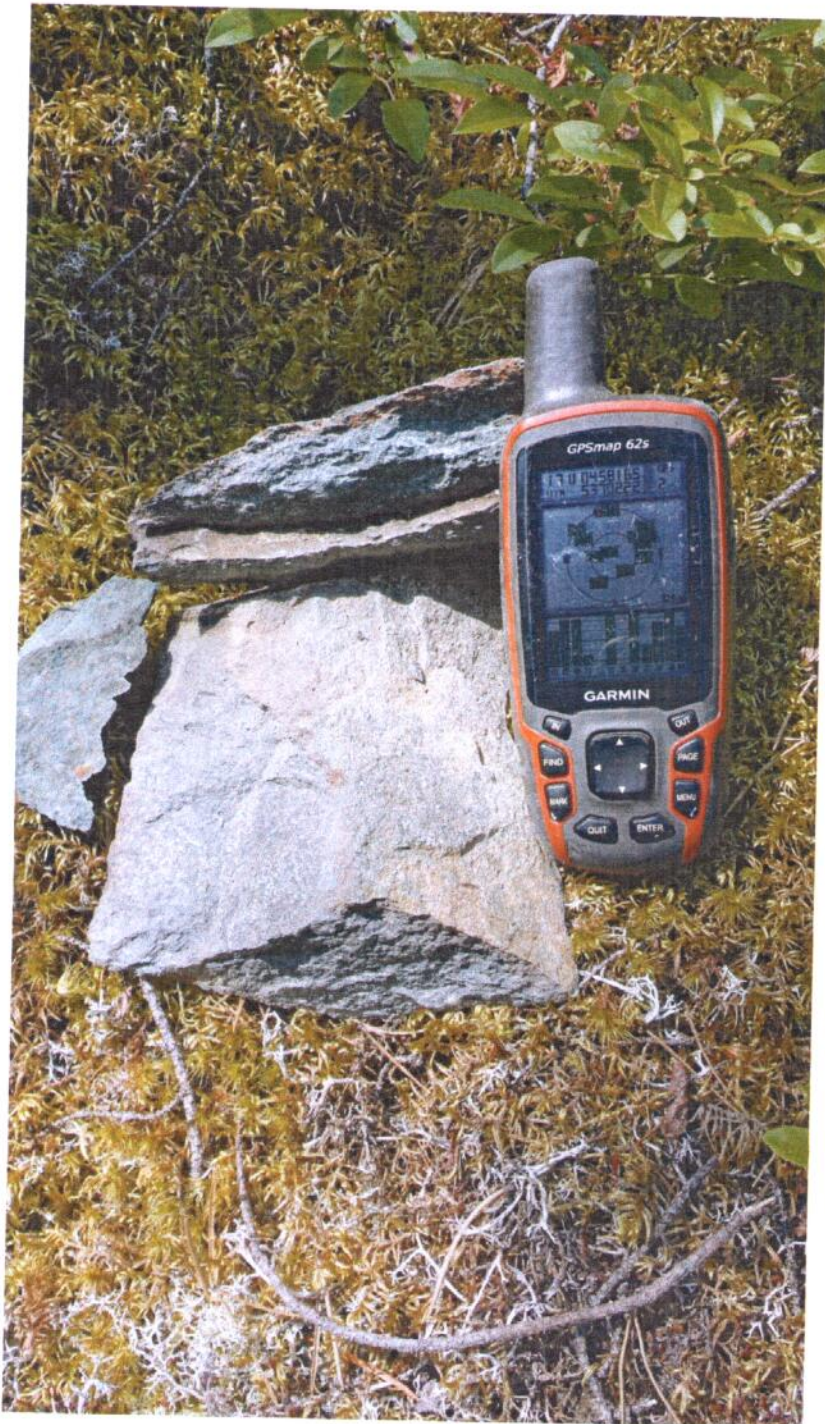


Forbes lake from atop an outcrop from the northeast corner looking west.

Sample FL-01 458561, 5370205 Minor sulphides in rock. Purple sheen on the rock.

Sample FL-02 458491, 5370150 Fine grained volcanic, sulphides.

Sample FL-03 458278, 5370234 Fine grained volcanic, white sheen to the rock.

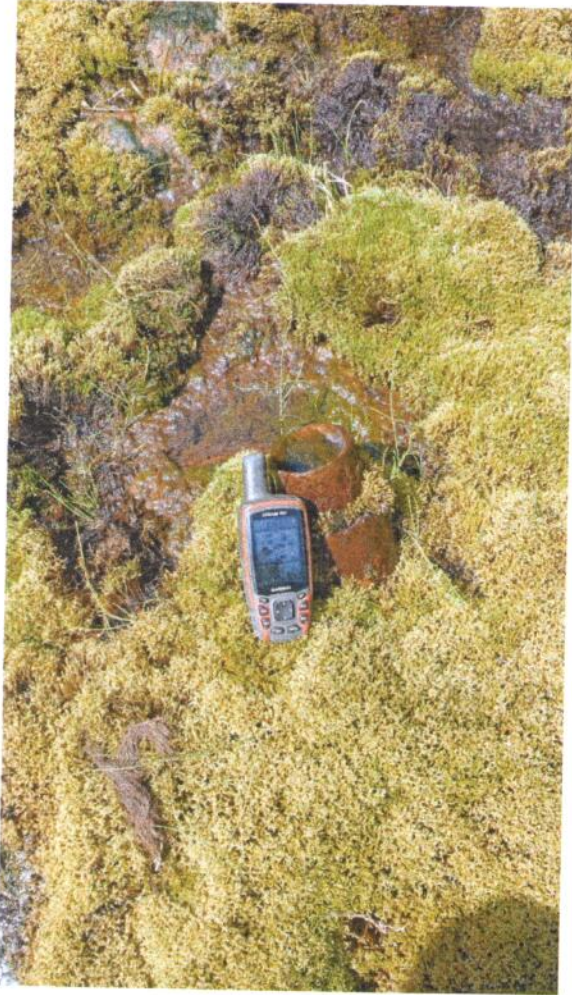


Sample FL-04 45816, 537022 Pyrite cubes, chalco. (see pic above)



Outcrop above with 2 contacts. Hammer points north. About 60 m south of sample 4.

Sample FL-05 458163, 5370090 Dysemminated pyrite, rusty rock. From north side of an outcrop.



DDH: 458395, 5369930 Az 100\* Dip -45\*

Sample FL-06 458502, 5369763 Pyrite cubes, q.v., chalco.

Sample FL-07 458355, 5369648 5 % pyrite, cubes, chalco., the best pieces taken, but here there is a 10 m length of outcrop with pyrite throughout its length.

Sample FL-08 458320, 5369539 From pit blasted decades ago. Taken from south wall and piece from rock pile. Pyrite, rusty rock.

Picture below from outcrop on south side of Forbes Lake. 458300, 5369539.



Sincerely, Scott Woolhead.

# **Report on the 2019 Kamiskotia area Geochronology, Stratigraphy and VMS Potential**

By John Ayer, Ph.D., P.Geo, Ayer and Associates Consulting Geologists, Sudbury and Mike Hamilton, Ph.D., Jack Satterly Geochronology Laboratory, University of Toronto

## **Introduction**

Two geochronology samples were collected in the Kamiskotia area of Timmins, Ontario during the summer of 2019 for International Explorers and Prospectors Inc. (IEP). Identification of the best areas for sample collection was provided by 2 days of consultations by John Ayer and Ben Berger. Analysis and results on the geochronology samples was provided by Mike Hamilton of the Jack Satterly Geochronological Laboratory (JGSL) in 2019.

The Abitibi greenstone belt (AGB) is a difficult area to explore for Volcanogenic Massive Sulfide (VMS) deposits because of the structural complications related to multiple episodes of folding and faulting, metamorphism locally up to amphibolite facies and extensive overburden thickness of glacial till and lacustrine clay. Geophysics, as well as lithogeochemistry, alteration studies and an understanding of the stratigraphic location of favourable horizons for VMS deposition are thus valuable tools in the search for new deposits. In order to better understand the distribution of key base metal bearing stratigraphic assemblages to aid in future exploration for VMS deposits on IEP's claim holdings the geochronological samples were collected in strategic areas based on previous geochronological and lithogeochemical results including the IEP report from 2017. Two new samples of felsic volcanic rock were collected from outcrop and diamond drill core in Godfrey and Loveland townships respectively.

## **Analytical Methods**

U-Pb work was carried out at the Jack Satterly Geochronology Laboratory at the University of Toronto. New rock samples were crushed using a jaw crusher, and ground with a disk mill. Initial separation of heavy minerals was carried out via multiple passes on a Wilfley table to concentrate zircon. Subsequent work included density separation using methylene iodide, followed by magnetic separations with a Frantz isodynamic separator. Final sample selection was achieved by hand picking under a microscope, choosing the highest optical quality euhedral zircon grains (as inclusion-, crack-, alteration-free as possible). Grains with obvious cores were avoided.

Chemical abrasion (CA, Mattinson, 2005) pre-treatment methods were used to improve concordance of zircon analyzed subsequently by isotope dilution – thermal ionization mass spectrometry (ID-TIMS). Selected single grain zircon fractions were annealed in a quartz crucible at 900°C for a period of 48 hours. Crystals were then leached in hydrofluoric acid (HF) at 200°C in Teflon bombs (Krogh, 1973) for 4 hours.

Weights of zircon grains were estimated from photomicrographs and the density of zircon. Mineral grains were washed prior to loading for dissolution. Zircon was dissolved using concentrated HF in Teflon bombs at 200°C (Krogh, 1973), to which a  $^{205}\text{Pb}$ - $^{235}\text{U}$  spike was added. Samples were dried and subsequently re-dissolved in 3N HCl overnight to convert to a salt and promote equilibration with the spike. U and Pb were separated from the solutions using 50 microliter anion exchange columns (Krogh, 1973). Column washes were preserved for possible future use (e.g. Hf isotopic analysis). Mixed, purified U and Pb solutions were loaded directly onto Re filaments using silica gel and analyzed with a VG354 mass spectrometer in single (Daly) collector, pulse-counting mode. Deadtimes of the measuring system for Pb and U during this period were 15 ns. The mass discrimination correction for the Daly detector was constant at 0.07%/AMU. Daly characteristics were monitored using the SRM982 Pb standard. Thermal mass discrimination corrections were  $0.10 \pm 0.03\%$  /AMU.

The new zircon chemical abrasion methods, combined with spike refinements and increased instrumental sensitivities, result in more accurate and more precise age determinations than initially possible during earlier studies of the volcanic stratigraphy in the AGB.

## **Blake River Assemblage**

The Kamiskotia Volcanic Complex (KVC) consists of an extensive bimodal sequence of tholeiitic basalts and high silica rhyolites located about 20 km northwest of Timmins in the Kamiskotia area of the Abitibi greenstone belt (AGB). The KVC is part of the Blake River assemblage, the youngest volcanic-dominated assemblage within the AGB with ages ranging from 2704 to 2697 Ma (Ayer et al., 2002, 2005). The KVC has a broad northerly strike, extending from a faulted contact with the Kidd Munro assemblage in northern Bristol Township to a faulted contact with the Kidd Munro assemblage in northern Robb and Jamieson townships (Fig. 1). Extending for over a strike length of 25 km, the KVC represents the second largest accumulation of rhyolites in the AGB, following the ~50 km strike length of felsic volcanics hosting the Matagami VMS camp in Quebec. To the west, the KVC is underlain by the Kamiskotia Gabbroic Complex (KGC), an extensive mafic intrusion with ages ranging from  $2707 \pm 2$  to  $2705 \pm 2$  Ma (Fig. 1). To the east, the KVC is truncated by the Mattagami River fault, a north striking Proterozoic-aged fault in which the older Archean rocks of the AGB are displaced with sinistral offset of 5 to 10 km.

## **Previous Geochronology**

U-Pb zircon geochronology by Barrie and Davis (1990) yielded an age of  $2707 \pm 2$  Ma for a pegmatitic quartz gabbro from the Middle Zone of KGC in southern Turnbull Township and  $2705 \pm 2$  Ma for rhyolite in southwestern Godfrey Township (Fig. 1).

Subsequent higher precision U-Pb zircon geochronology (Hathway et al., 2008) yielded an age of  $2704.8 \pm 1.4$  Ma from a granophyric sample in the Upper Zone of the KGC in central Robb Township. The 4 new KVC rhyolite ages ranged from an age of  $2703.1 \pm 1.2$  Ma in the lower part of the KVC in Turnbull Township to 3 rhyolite ages ranging from  $2701.1 \pm 1.4$  to  $2698.6 \pm 1.3$  Ma in the upper stratigraphic part, thus confirming that the KVC is part of the Blake River assemblage (2704–2697 Ma) (Ayer et al., 2005). The upper part of the KVC appears to be



more favourable for VMS mineralization containing 5 known VMS deposits extending over 15 km from the Half Moon deposit in Robb Township to the Genex mine in Godfrey Township (Fig. 1).

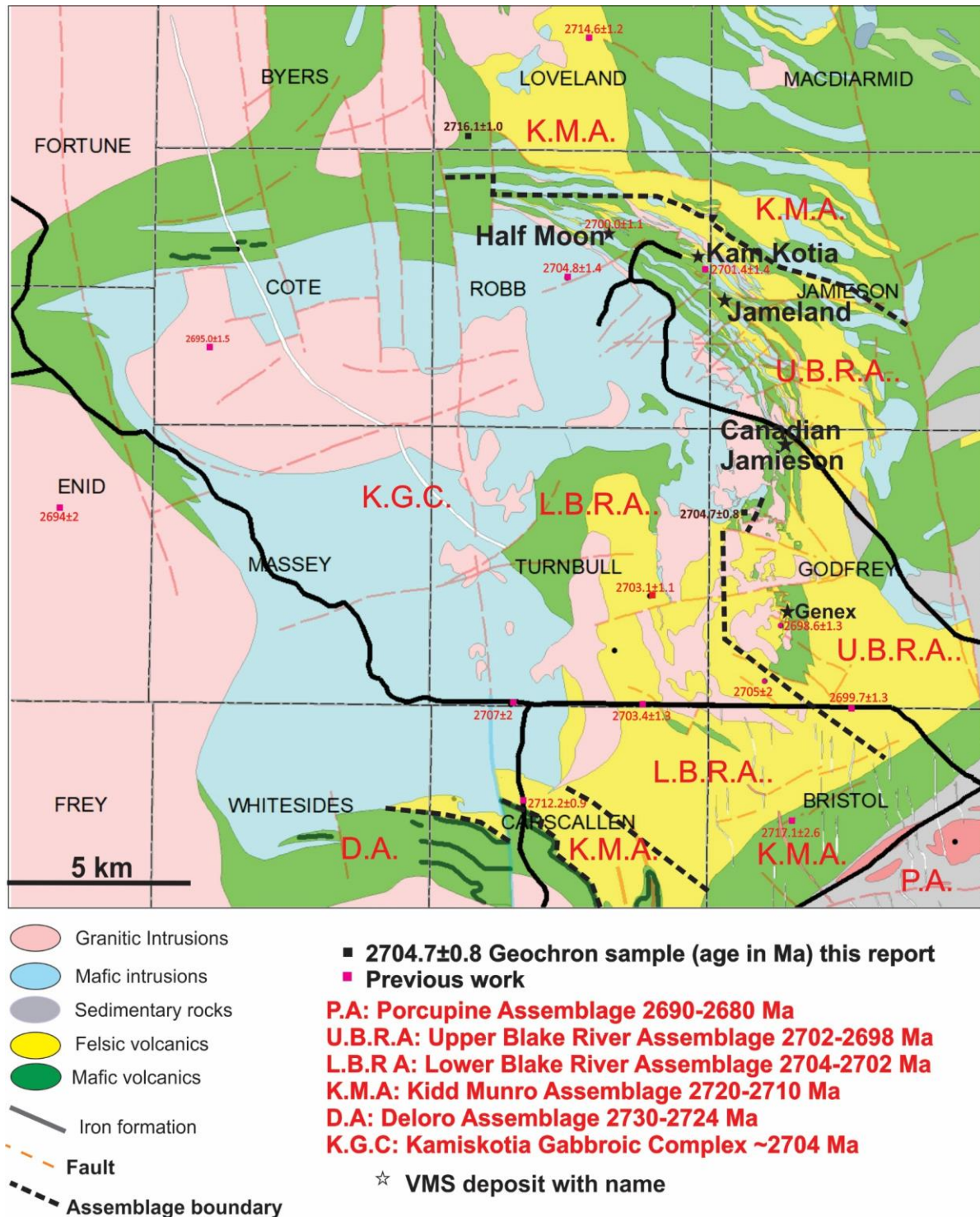


Figure 1. Kamiskotia area general geology with U-Pb zircon ages in Ma, VMS deposit locations and assemblage boundaries.

Based on the IEP geochronology report (Ayer and Hamilton, 2017), there is a good correlation between an age of  $2703.1 \pm 1.1$  Ma in central Turnbull Township and the  $2703.4 \pm 0.9$  Ma age in southern Turnbull Township and provides further stratigraphic evidence that the western Kamiskotia Volcanic complex in this area is the lower member of KVC (Lower Blake River assemblage) (Fig. 1). An age of  $2699.3 \pm 1.7$  in northern Bristol Township correlates well with the age of  $2698.6 \pm 1.3$  (Hathway et al., 2008) at the Genex mine, located about 4 km to the NNW. This age data indicates that in the south, the KVC is a thick, dominantly felsic volcanic sequence which strikes southeasterly and faces to the east. A conformable contact and an age of  $2712.9 \pm 0.9$  in northern Carscallen Township suggests the lowermost contact of the KVC with the underlying Kidd-Munro assemblage represents a disconformity between the assemblages (see Thurston et al., 2008), in the southwest. However, the abrupt change from northeast-trending mafic volcanic rocks of the lower Kidd-Munro assemblage, with an age  $2717.1 \pm 2.6$  Ma in an intercalated felsic volcanic unit, to lower KVC rhyolites with an age of  $2699.3 \pm 1.7$  in northern Bristol Township Bristol indicates a fault contact between the assemblages. These upper KVC rhyolites in southern Godfrey and northern Bristol townships thus represent a good target area for discovery of VMS deposits, extending the favourable VMS stratigraphy of the upper KVC (i.e.  $2700 \pm 1$  Ma) another 6 km south of Genex.

## **Kidd-Munro Assemblage**

The Kidd–Munro assemblage (2720–2710 Ma) is host to the Kidd Creek Mine, a giant volcanogenic massive sulfide (VMS) deposit that contains over 150 million tons of copper and zinc mineralization (Fig. 5). The assemblage extends continuously over 250 km from the Kamiskotia area into Quebec and also occurs in a number of isolated sequences throughout the Abitibi (Thurston et al., 2008). Berger et al., (2011) subdivided the Kidd–Munro assemblage into 4 distinct stratigraphic subdivisions as indicated below, based on mapping, geochemistry and an intensive campaign of high-precision U-Pb zircon geochronology. These stratigraphic subdivisions are 2720 to 2717 Ma, 2717 to 2715 Ma, 2715 to 2712 Ma and 2712 to 2710 Ma (Fig. 5). Each age is spatially restricted within the Kidd–Munro episode, has dominant rock types, volcanic morphologies, geochemical affinities and distinctive base metal prospectivity.

The 2717 to 2715 Ma age interval is characterized by a bimodal suite of tholeiitic mafic and high silica felsic metavolcanic flows with lesser pyroclastic deposits, a komatiitic suite composed of subvolcanic dikes, sills and thick cumulate-textured flows, and a transitional suite of mafic, intermediate and felsic metavolcanic rocks. These rocks occur as intercalated units throughout the Kidd–Munro volcanic episode with the greatest concentration in the area of the Kidd Creek base metal deposit. Rare calc-alkalic rocks occur as spatially restricted mafic flows that are intercalated with mafic and intermediate tholeiitic flows.

Tholeiitic felsic metavolcanic rocks of this age are widespread and are host to VMS mineralization such as the giant Kidd Creek deposit and several smaller occurrences. Mafic magma that was erupted synchronous with the komatiite locally hosts potentially economic copper-zinc VMS mineralization (such as the Potter Mine deposit) and account for over 5 million tons of ore. This style of mineralization is poorly understood and under explored given that over 80% of the Kidd–Munro episode is composed of mafic metavolcanic rocks. Kambalda-

style nickel-copper-(platinum group element) mineralization (over 500 000 tons) occurs in thick komatiite flows (sills) within footwall embayments produced by thermo-mechanical erosion and are spatially associated with peperitic komatiitic dikes and sills within this cycle. These prospective units appear to be under explored given the extent of komatiite magmatism of this age. The 2717 to 2715 Ma age bracket appears to be the most prospective for base metal mineralization in the Kidd–Munro episode (Berger et al. 2011).

### **2019 IEP geochronological sampling**

This program was focused on understanding the broader extent of known VMS-bearing stratigraphy, and to better define the location of the assemblage boundaries in the Kamiskotia area (Fig. 1). The results of the 2019 dating are discussed below, with U-Pb isotopic data provided in Table 1, and presented graphically as concordia plots with paired zircon population images in Figure 2; The 2019 sample locations are shown as black squares in Figure 1.

Sample 97418 was collected from an outcrop in the Steep Lake area in NW Godfrey Township (Fig. 1). This area is in the vicinity of trenches of 1940s vintage in rhyolite with disseminated pyrite and chalcopyrite identified as the Phillips Oneill Group #1 occurrence (MDI42A12SE00057). Outcrops in this area consist of rhyolite fragmental and flow units. The geochronology sample (UTM: 457119E, 5373353N, NAD 83, Zone 17) is from a reddish-coloured, fine-grained massive rhyolite flow consisting of quartz and feldspar phenocrysts in a very-fine grained groundmass. A heavy mineral concentrate consisted of a small quantity of zircon amongst abundant pyrite. Zircon is present as mostly small, sharply faceted, clear to slightly cloudy prismatic euhedra or broken equivalents. Minor hematite staining is common. Four zircon grains were analyzed and yielded a magmatic age of  $2704.7 \pm 0.8$  Ma (Fig. 2, Table 1). This new age indicates this unit is part of the Lower Blake River assemblage and suggests the contact between upper and lower Blake River assemblage is located further to the east than was previously suggested (Ayer and Hamilton, 2017, Hathway et al. 2008). This eastward modification of the boundary between lower and upper Blake River stratigraphy better explains the age of  $2705 \pm 0.8$  Ma from a rhyolite unit 2.5 km SSW of the Genex deposit (Barrie and Davis 1990) and indicates several kms of dextral displacement of this boundary across a NW trending fault (Fig. 1). This also has implications for exploration focus on the now better delineated and more VMS-favourable Upper Blake River stratigraphy in Godfrey Township.

A second sample was collected from Noranda DDH FPL-89-1 (collar UTM: 447377E, 5386170N, NAD 83, Zone 17) located in SW Loveland Township (Fig. 1). The sample was collected from the 511-516' interval consisting of fine-grained rhyolite tuffs with minor fine-grained quartz and feldspar crystals. The heavy mineral concentrate from this sample also yielded a very small quantity of zircon (<20 grains) amidst considerable pyrite. The zircon population is represented by a relatively uniform collection of small, pale yellow to pale brown, up to 3:1 euhedral prisms and broken grains. Rare grains show signs of minor pitting and rounding, suggesting that the rhyolite may have a volcanoclastic component. Four best-quality (non-pitted/rounded) zircons were analyzed and yielded a uniform magmatic age of  $2716.1 \pm 1.0$  Ma (Fig. 2, Table 1), without obvious signs of inheritance or older clastic input.

The implication of this new age is that this particular dated volcanic interval coincides with the most highly prospective, yet brief, mineralized event identified just to the east within the VMS-favourable part of the Kidd-Munro assemblage hosting the Kidd Creek Mine (i.e. 2717-15 Ma;

Berger et al., 2011). This interval is now known to extend further west and south into NW Robb Township. A DDH drilled in 2001 by IEP (ERN-01-02) located approximately 400 m south of the above geochronology sample intersected 3.6 m of altered felsic tuff and graphitic argillite with sulfide stringers containing semi-massive sphalerite and pyrite with values of up to 3.4% zinc.

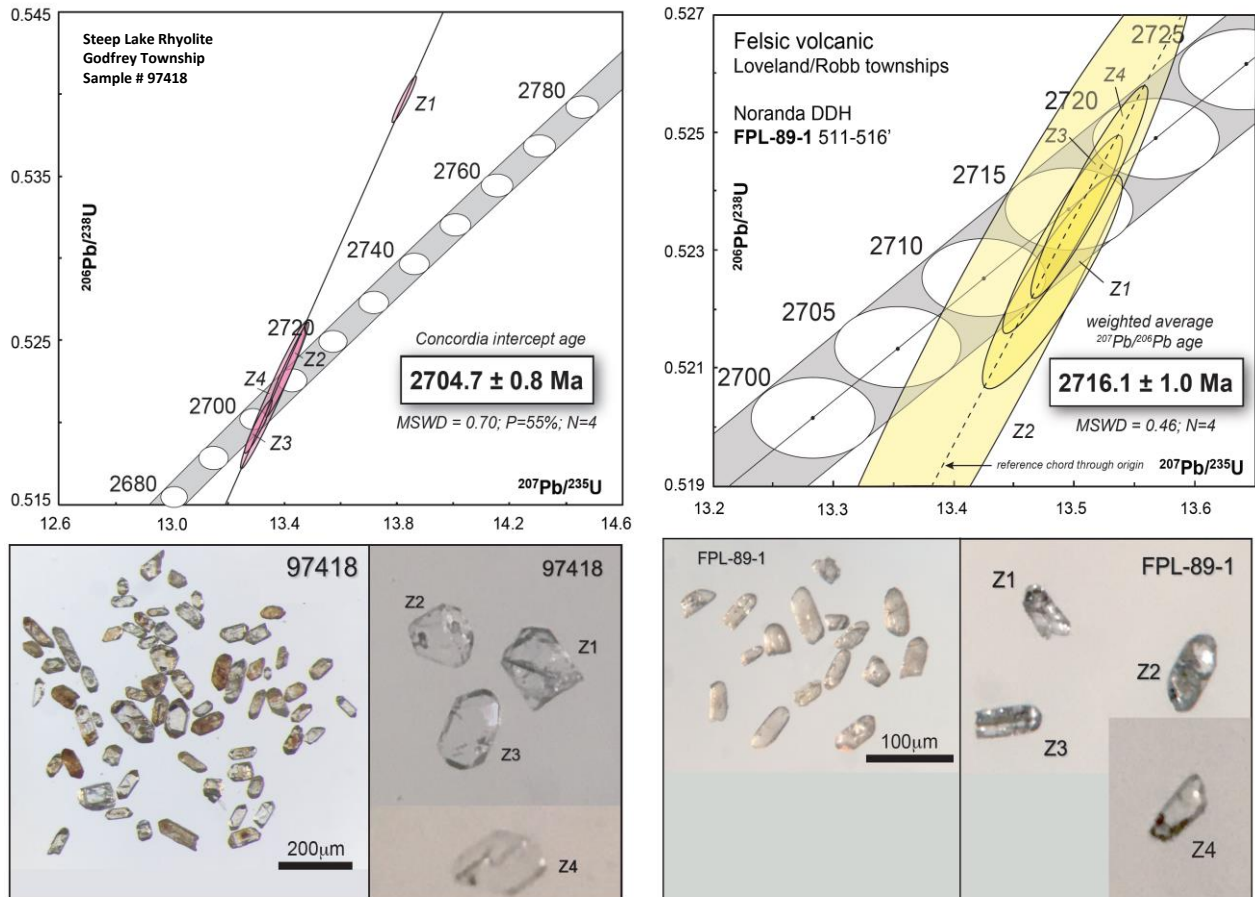


Figure 2. Concordia plots and images of selected zircons from the Kamiskotia area (see text for details).

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**Table 1.** Zircon U-Pb isotopic data for felsic volcanic rocks from the Kamiskotia area.

Fraction	Description	Sample wt. ( $\mu\text{g}$ )	U (ppm)	Pb <sup>T</sup> (pg)	Pb <sub>c</sub> (pg)	Th/U	<sup>206</sup> Pb/ <sup>204</sup> Pb	<sup>206</sup> Pb/ <sup>238</sup> U	$\pm 2s$	<sup>207</sup> Pb/ <sup>235</sup> U	$\pm 2s$	<sup>207</sup> Pb/ <sup>206</sup> Pb	$\pm 2s$	Ages (Ma)				Disc. (%)		
														<sup>206</sup> Pb/ <sup>238</sup> U	$\pm 2s$	<sup>207</sup> Pb/ <sup>235</sup> U	$\pm 2s$		<sup>207</sup> Pb/ <sup>206</sup> Pb	$\pm 2s$
<b>JAA-14-01 Felsic lapillistone, Turnbull Township. DDH ETC-07-5 (97.5-99.0m).</b>																				
Z1	1 clr, cls sml brkn pr	0.51	39	11.90	0.50	0.518	1354	0.532527	0.003016	13.69155	0.08901	0.186470	0.000472	2752.1	12.7	2728.6	6.1	2711.3	4.2	-1.8
Z2	1 clr, cls lrg 2:1 pr, incl	1.10	58	34.68	2.05	0.513	968	0.521298	0.001496	13.33928	0.06974	0.185586	0.000639	2704.7	6.3	2704.0	4.9	2703.4	5.7	-0.1
Z3	1 clr, cls, el, sl flat	0.49	55	16.60	1.96	0.527	492	0.526241	0.002385	13.44741	0.11308	0.185333	0.001050	2725.6	10.1	2711.6	8.0	2701.2	9.4	-1.1
Z4	1 clr, cls, el, sq, brkn	0.82	56	28.29	0.78	0.799	1934	0.519887	0.001045	13.30156	0.03047	0.185560	0.000191	2698.7	4.4	2701.3	2.2	2703.2	1.7	0.2
Z5	1 clr, cls, el rect, brkn	0.63	50	18.35	0.84	0.624	1224	0.520655	0.001209	13.32412	0.03672	0.185605	0.000248	2702.0	5.1	2702.9	2.6	2703.6	2.2	0.1
<b>JAA-14-03 Felsic-intermediate, heterolithic lapilli tuff to breccia, Bristol Township. DH EB I-00-01 (23.7-238.2m).</b>																				
Z1	1 clr, cls, lrg 2.5:1 shrp pr, incl	0.95	122	75.05	0.66	0.685	6224	0.519552	0.001134	13.30875	0.03364	0.185783	0.000209	2697.3	4.8	2701.8	2.4	2705.2	1.9	0.4
Z2	1 clr, cls, brkn shrt shrp pr, incl	0.52	97	28.88	0.30	0.545	5326	0.520062	0.001457	13.27452	0.04183	0.185124	0.000181	2699.4	6.2	2699.4	3.0	2699.3	1.6	0.0
Z3	1 clr, cls, sl flat, 2:1 shrp pr, incl	1.03	75	44.36	0.51	0.548	4864	0.516022	0.001205	13.20084	0.03651	0.185538	0.000186	2682.3	5.1	2694.1	2.6	2703.0	1.7	0.9
Z4	1 clr, cls, 4:1 shrp brkn, incl	0.61	84	30.46	0.80	0.637	2113	0.515005	0.001432	13.13210	0.04559	0.184936	0.000284	2678.0	6.1	2689.2	3.3	2697.6	2.5	0.9
<b>JAA-14-04 Quartz porphyritic rhyolite breccia, NE Reid Township.</b>																				
Z1	1 gemmy, crkd, 2.5:1 sq pr	1.02	149	93.13	0.44	0.764	11321	0.519486	0.001030	13.27449	0.03156	0.185329	0.000164	2697.0	4.4	2699.4	2.2	2701.1	1.5	0.2
Z2	1 gemmy, crkd, brkn sq pr frag	0.98	105	62.71	1.32	0.554	2670	0.517392	0.001201	13.05411	0.03723	0.182989	0.000283	2688.1	5.1	2683.6	2.7	2680.2	2.6	-0.4
Z3	1 gemmy, crkd, 2:1 sq pr, incl	0.59	140	50.40	0.46	0.592	6129	0.518520	0.001253	13.26009	0.03725	0.185472	0.000173	2692.9	5.3	2698.3	2.7	2702.4	1.5	0.4
<b>JAA-14-05 Quartz and feldspar phenocryst-bearing tuffaceous rhyolite, SE Reid Township.</b>																				
Z1	1 clr, cls, 2:1 shrp pr, incl	1.15	126	75.87	0.61	0.573	6900	0.521284	0.001038	13.31619	0.03227	0.185270	0.000173	2704.6	4.4	2702.3	2.3	2700.6	1.5	-0.2
Z2	1 clr, cls, shrt pr, incl	0.85	114	34.55	0.57	0.608	3344	0.520546	0.001347	13.30108	0.04089	0.185322	0.000213	2701.5	5.7	2701.3	2.9	2701.1	1.9	0.0
Z3	1 clr, cls, 2:1 brkn pr	1.12	128	78.89	0.96	0.675	4468	0.520592	0.001067	13.30155	0.03398	0.185312	0.000187	2701.7	4.5	2701.3	2.4	2701.0	1.7	0.0
Z4	1 clr, cls, short, sl flat, shrp pr	1.05	180	113.69	0.48	0.823	12445	0.520488	0.000993	13.29576	0.03093	0.185268	0.000156	2701.3	4.2	2700.9	2.2	2700.6	1.4	0.0

**Notes:**

All analyzed fractions represent best optical quality (crack-, inclusion-, core-free), fresh (least altered) grains of zircon available. All zircons were chemically abraded.

Abbreviations: Z - zircon fraction; clr - clear; cls - colourless; fr - fragment; pr - prism/prismatic; el - elongate; sl - slightly; sml - small; lrg - large; sq - square x-section; shrp - sharp; brkn - broken; rect - rectangular; incl - inclusion-bearing.

Pb<sup>T</sup> is total amount (in picograms) of Pb.

Pb<sub>c</sub> is total measured common Pb (in picograms) assuming the isotopic composition of laboratory blank: <sup>206</sup>Pb/<sup>204</sup>Pb - 18.221; <sup>207</sup>Pb/<sup>204</sup>Pb - 15.612; <sup>208</sup>Pb/<sup>204</sup>Pb - 39.360 (errors of 2%). Pb/U atomic ratios are corrected for spike, fractionation, blank, and, where necessary, initial common Pb; <sup>206</sup>Pb/<sup>204</sup>Pb is corrected for spike and fractionation.

Th/U is model value calculated from radiogenic <sup>208</sup>Pb/<sup>206</sup>Pb ratio and <sup>207</sup>Pb/<sup>206</sup>Pb age, assuming concordance. Disc. (%)

- per cent discordance for the given <sup>207</sup>Pb/<sup>206</sup>Pb age. Uranium decay constants are from Jaffey et al. (1971).