Ontario

We are committed to providing accessible customer service.
If you need accessible formats or communications supports, please contact us.

Nous tenons à améliorer l'accessibilité des services à la clientèle.
Si vous avez besoin de formats accessibles ou d'aide à la communication, veuillez nous contacter.

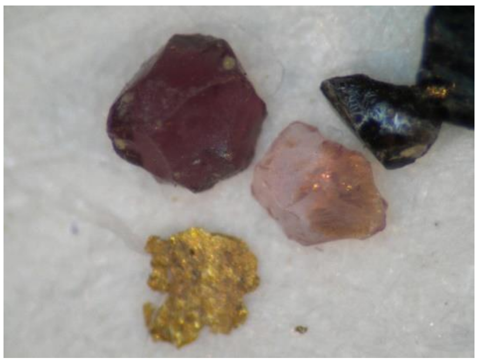
ASSESSMENT WORK REPORT

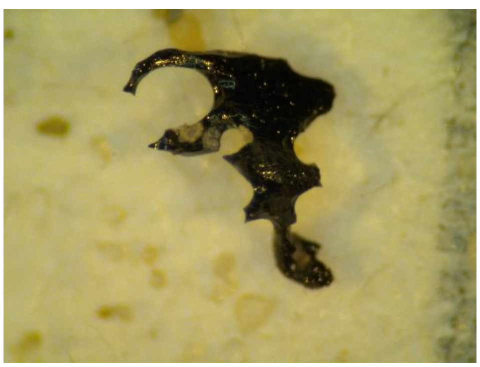
for CELL CLAIMS 549085, 549086, 555613, 549083, 549084, 549630, 549081, 549082, 556440, 549629, 549078, 549079, 549076, 554441, 549875, 549072, 549066, 549068

Barr, Lundy, Hudson, & Firstbrook Townships

Larder Lake Mining Division

Claim Holder - Brian Anthony (Tony) Bishop, client #108621




Report prepared by Tony Bishop, Graeme Bishop, Chloë Bishop

Report submitted by Tony Bishop

April 29, 2022

Table of Contents

Assessment Report for Bishop Diamond Exploration Block: Barr-Firstbrook-Lundy-Hudson Twps. claims

ASSESSMENT REPORT FOR CELL CLAIMS

549085, 549086, 555613, 549083, 549084, 549630, 549081, 549082,556440, 549629, 549078, 549079, 549076, 554441, 549875, 549072, 549066, 549068

Barr, Lundy, Hudson, & Firstbrook Townships, Larder Lake Mining Division

Prepared by Brian A. (Tony) Bishop, Graeme Bishop, Chloë Bishop, submitted April 29, 2022

INTRODUCTION:

Hereby submitted by Brian Anthony (Tony) Bishop [Client No. 108621, 100% holder on record], on April 29, 2022, an assessment report for work completed on contiguous claims 549085, 549086, 555613, 549083, 549084, 549630, 549081, 549082, 556440, 549629, 549078, 549079, 549076, 554441, 549875, 549072, 549066, 549068 in Barr, Lundy, Hudson, and Firstbrook Townships.

Total Value for Assessment Work for Cell Claims: $61,887

Staking Date & Township	Tenure ID #	Tenure Type	Grid Cell ID #	Expenses per Claim	Staking Date & Township	Tenure ID #	Tenure Type	Grid Cell ID #	Expenses per Claim
30/04/2019 Barr, Lundy	549066	Single Cell Mining Claim	31M05L037	**$2,327**	30/04/2019 Barr	549084	Single Cell Mining Claim	31M05L137	**$5,476**
30/04/2019 Firstbrook, Hudson	549068	Single Cell Mining Claim	31M05L039	**$2,748**	30/04/2019 Barr	549085	Single Cell Mining Claim	31M05L156	**$8,204**
30/04/2019 Barr, Firstbrook	549072	Single Cell Mining Claim	31M05L058	**$4,299**	30/04/2019 Barr	549086	Single Cell Mining Claim	31M05L157	**$5,530**
30/04/2019 Barr, Firstbrook	549076	Single Cell Mining Claim	31M05L078	**$2,404**	10/05/2019 Barr	549629	Single Cell Mining Claim	31M05L096	**$2,202**
30/04/2019 Barr	549078	Single Cell Mining Claim	31M05L097	**$748**	10/05/2019 Barr	549630	Single Cell Mining Claim	31M05L116	**$2,229**
30/04/2019 Barr, Firstbrook	549079	Single Cell Mining Claim	31M05L098	**$2,381**	14/05/2019 Barr	549875	Single Cell Mining Claim	31M05L056	**$2,380**
30/04/2019 Barr	549081	Single Cell Mining Claim	31M05L117	**$2,263**	17/07/2019 Barr	554441	Single Cell Mining Claim	31M05L055	**$2,243**
30/04/2019 Barr, Firstbrook	549082	Single Cell Mining Claim	31M05L118	**$2,261**	11/08/2019 Barr, Firstbrook	555613	Single Cell Mining Claim	31M05L158	**$2,724**
30/04/2019 Barr	549083	Single Cell Mining Claim	31M05L136	**$9,065**	24/08/2019 Barr	556440	Single Cell Mining Claim	31M05L095	**$2,403**

Work completed to date includes grass roots prospecting, a research component, a carefully planned and mapped out series of till sampling, screening, concentrating, sorting and examining potential kimberlite indicator minerals (KIMs), microphotography, and recording these and other findings.

Traverses occurred on the following claim numbers:

- Traverse 1: 549081, 549083, 549084, 549085, 549086, 549630
- Traverse 2: 549078, 549079, 549082, 549629, 549875, 554441, 556440
- Traverse 3: 549066, 549068, 549072, 549076,
- Traverse 4: 549083, 549085, 555613

Appendices include narratives, maps & field notes for 4 traverses, geology of the Bishop Claim-block area, detailed notes and pictures on picked grains and microscopy work, detailed methodologies for field work and till sample processing (including results of sluice efficiency test, a cost-breakdown chart for concentrating and retrieving KIMs, micropicking, & microphotography, an equipment list, and equipment photos). A Map Appendix includes general claim location and road access, geological types, magnetics, kimberlite diamond occurrences, and sample site locations from OGS-OFR 6259. Appendices also include excerpts from past Bishop report Grassy Lake, along with a kimberlite diamond table by Gary Grabowski.

PURPOSE:

The decision to stake claims in Barr Twp initially was to follow up on 7 till samples taken in an OGS survey between 2007 & 2009 in close proximity to each other, i.e. within a radius of 250 metres. The results were so excellent that it was concluded that "the KIMs in the samples in Area B [for Barr?] came from an unknown kimberlite pipe to the north … suggesting a diamondiferous source rock" (Gao, C. 2012, p 36).

A significant amount of space in OGS-OFR 6259 (maps, results, microprobes, etc.) is dedicated to Area B, i.e. the 7 till samples at the south-central end of my claim block.

Some of the results in OGS-OFR 6259 relating to Barr Twp, Area B will be included in this report along with my till sample results.

ACCESS:

From Kirkland Lake/New Liskeard from the North, head south on Highway 11 , turn due west (right) from Highway 11 at the Haileybury exit intersection toward Mowat Landing on Highway 558. (If coming from the South on Hwy 11, turn left at the Hwy 558 exit). You will reach a rocky trail that leads towards Le Moyne Lake, north of Highway 558. You can park approximately thirty feet north of the highway on this trail and traverse the rest of the way to Le Moyne Lake by foot (a small all-terrain vehicle or motorbike could also travel this trail).

PREVIOUS WORK:

Unpublished work on Barr Twp, now part of the Bishop-Barr Diamond Claim block, was obtained from a sampling and mag survey programs performed by Sudbury Contact/Contact Diamond, in which ~$3 million was spent in the time before the company ran out of funds and dissolved (Montgomery, J. K., 2003). Part of the survey was done over/in Barr Twp and a number of high-priority targets were identified. Down-ice of several of these, excellent till samples have been found.

Also included in this report is a 2nd derivative mag map (Map 1, p 8). At least 8 interesting kimberlite-like features can be identified up-ice of good-to-excellent till sample results.

Also in this report is a location map from OGS-OFR 6259 (Gao, C. 2012, Figure 2) of New Liskeard, Haileybury, and Cobalt area geology and known kimberlites including the recently discovered Bishop-Nipissing Diamond Claim kimberlites in Lorrain Twp, and the Kon Kimberlite in Gillies Limit, in relation to Area B and the Bishop-Barr Diamond Claims.

The diamondiferous 95-2 pipe is ~1.5km from the northernmost part of the Bishop-Barr Claim block and ~6km north of Area B in OGS-OFR 6259. The conclusion in the OGS-OFR 6259 is the results in Barr Twp are not from any known pipe. As well, the 95-2 pipe is so deep (150-160’) in till/lake sediments it is unlikely any KIMs could have reached the surface (resulting from conversations between Tony Bishop and Peter Hubacheck, PGeo, former geologist for Sudbury Contact).

GEOLOGY:

The Bishop claim-block in Barr-Firstbrook-Lundy-Hudson Townships is situated between the Latchford and Montreal River Faults, at the northern terminus of the South Montreal River Fault, and on the southeast fringe of the Temagami North-Wendigo Chain fault trend. Numerous smaller faults surround or traverse the claim-block area. The primary bedrock material is composed of Proterozoic metasedimentary strata of Gowganda formation overlying Lorrain Formation, affected by Nipissing Diabase intrusions. The majority of the claim-block was unaffected by fluvial deposition during deglaciation, and lies above the general levels of ancient shorelines of Lake Barlow during deglaciation. Numerous Jurassic age kimberlite pipes have been discovered in close regional proximity, spanning an eruption period of approximately 20 million years (156-133MaBP), in the areas to the northwest, northeast, east, and southeast of the Bishop claim-block, associated with eruptions associated with the Lake Temiskaming Structural Zone (the largest known geomorphological structure in North America which hosts the eruption of kimberlite magma):

> “The study area encompasses the Cobalt kimberlite field where more than 15 kimberlite pipes of Jurassic age have been discovered to date, mostly along the western flank of the Lake Timiskaming Structural Zone that is defined by the northwest-trending Paleozoic Lake Timiskaming graben and a group of faults in the same alignment across the map area”

> “The Archean bedrock consists of mafic flow-dominated volcanic rocks with mafic, ultramafic and granitic intrusives (Ayer et al. 2006). In the southwestern part of the report area, it is overlain by thick, flat-lying Proterozoic sedimentary rocks consisting of argillite, arkose, greywacke, conglomerate and tillite of the Cobalt Group within the Huronian Supergroup. The Archean and Proterozoic rocks were later intruded by a 300 m thick Nipissing gabbro sill of Neoproterozoic age (Ayer et al. 2006). Silver and cobalt mineralization often occurs in calcite veins in the Proterozoic sedimentary rocks, in particular, in the lower part of the Cobalt Group (Nichols 1988). Recent studies suggest that such veins may have the potential for hosting high grade gold deposits in this region (Temex Resources Corporation 2011). During the Paleozoic Era, the Lake Timiskaming Structural Zone, a northwest-trending rift system, developed, forming a large graben within which thick deposits of Paleozoic carbonate rocks accumulated (Russell 1984). The emplacement of the kimberlite pipes within this region appears to be closely related to this structure (Sage 2000).”
> (OGS-OFR 6259 (Gao, C. 2012, p 1 &3))

Geology of Bishop-Barr claims, as seen on Map 2474 (Johns, G.W. et al, 1979):

- The background rock is primarily Gowganda Formation 5a, thinly laminated, black-to-grey shaley argillite in the southern part of the claim block
- Nearing the Quartz Diabase Intrusion in the centre of the claims, the rock type is Coleman Member – Pebbly Wacke, and further to the northwest argillite, wacke, contact metamorphosed sediments
- Above (to the northern part of the claim block), the rock type is Pebbly Wacke

Please see Appendix No.3 (this report) for a more detailed study of the geology of the Bishop claim-block area, provided by Graeme Bishop.

I also have confidence there are more than one kimberlite pipe and an excellent potential for metallic/base metal type deposits, based on the Au, Ag, Cu, erythrite, and numerous sulphide grains I found in my till samples.

FIELDWORK:

30 till samples were collected during 4 traverses. General prospecting and site examination was undertaken on each traverse.

Traverse 1, July 22, 2020 with Graeme Bishop & Patrick Harrington.

Traverse 2, July 23, 2020 with Graeme Bishop & Patrick Harrington.

Traverse 3, August 15, 2020 with Graeme Bishop & Nathan Pullen.

Traverse 4, September 21, 2021 with Tony Bishop & Graeme Bishop.

Please refer to Appendix 1: Traverses for detailed narratives, maps, and coordinates/field notes, p 56.

METHODOLOGIES:

Please refer to Appendix 5, p 166, for Fieldwork and Till Processing methodologies, Sluice Efficiency Test, Cost Breakdown Chart for Concentrating, Picking, & Photographing KIMs, Equipment Photos, and an Equipment List.

RECOMMENDATIONS FOR FUTURE WORK:

In the last five years I've been making some unique advancements in the kimberlite/diamond exploration field. First in the work for myself, then with RJK Explorations Ltd on the Bishop Diamond Claims south of Cobalt, which led to the discovery of 8 large kimberlite deposits on or near my original claim block, with a remaining number of untested targets in the other Bishop Diamond Claims in Lorrain and to the west in Gillies Limit (now optioned by RJK Explorations Ltd.). I am now continuing the search for 'new' kimberlite pipes in the Bishop Diamond Exploration Block: Barr-Firstbrook-Lundy-Hudson Twps. claims. I have developed some interesting possibilities in locating new kimberlite pipes at the grass-root prospector level with, I think, a high degree of accuracy, and with minimal equipment, judge the location and depth of a pipe from surface, the 'value' of KIMs/DIMs, as well as the fugacity and rate of ascent & depth in the mantle the 'kimberlite' samples as it ascends, using the methodology presented in this report.

With that in mind, I will be testing several locations in the Barr claims where I have targeted possible kimberlite pipes, pipes that are unlike the flat-lying kimberlite structures on my previous claims in the Lorrain valley near Cobalt that RJK Explorations Ltd. is now working on. One new technique I now have might help discover the 'root' source of the Lorrain kimberlites.

I've discussed my new methodology with several well-known mining personalities locally, including a PEng geologist, and they have great enthusiasm as to the potential of new and important discoveries at Barr Twp; including the possibilities of metallic (gold & silver) and base metal deposit(s), as well as kimberlite, based on the grains in my till samples.

So, the next (warm weather) season will be more grass-roots prospecting, sampling, concentrating, and finally lab/microscope assessment of KIMs/DIMs. As well, I'm narrowing down several areas that should be flown with a magnetic survey drone to further verify my choice of targets.

As well, the modestly high numbers of pristine gold grains in 4 closely grouped samples along with silver nuggets/grains, erythrite, bornite, copper, and various sulphide grains suggest potential metallic and base metal targets on the Barr claims.

The KIM/DIM results of the OGS-OFR 6259 (Gao, C. 2012) combined with my results strongly suggests more than one kimberlite pipe/source in the Bishop-Barr Diamond Exploration Block, and separately the Bishop-Firstbrook-Lundy-Hudson Twps. claims. This will continue to be explored further.

During research and consultation with Graeme Bishop, there are several field investigations to conduct in the claim-block during the 2022 field season, including but not limited to: investigating bedrock composition at several locations (see Appendix 3: Geology, this report), searching for potential bedrock exposure of precious and base metal showings, and working to better define the presence and pattern of 'endogenic' fulgurites within the claim block.

RESULTS:

Excellent KIM results were found during assessment of the samples collected during the first four traverses on the Bishop claim-block; together with the KIM data published in OGS OFR 6259 (2012), there is almost certainly an undiscovered source-kimberlite pipe situated within the claim-block. See tables and descriptions of KIMs below (this report).

(Excerpt from Appendix 3: Geology, this report):

-"Of great interest is the abundance of 'weird black grains' found in nearly all of the 29 samples collected on-claim during the first four traverses. These 'weird black grains' are extremely fragile and exhibit very unusual and non-uniform shapes. Some also appear to contain and/or adjoin tiny roots and sticks of (apparently Holocene) organic origin: lab testing of selected grains is pending."

-"Of 29 samples collected for analysis on the Bishop claim-block during the first four traverses, all but sample Barr-4 exhibited an unusual and indurated 'coating' on the grains."

-"The samples hosting the indurated 'coating' on grains also host the 'weird black grains' … possibly indicating some type of genetic relation"

-"Barr-1 contained 9 pristine gold grains, very near the OGS 'Area B' pristine gold grains; immediately north are 3 additional Bishop samples containing pristine gold grains, accompanied by native silver, native copper, and sulphides. The tight pattern of sample sites containing these minerals, combined with the direction of glacial transport and the sampling methodology used to recover the grains, indicates strongly that there is a bedrock source for the gold, silver, copper, and sulphides somewhere nearby."

DISCUSSION/CONCLUSIONS

Sample Barr-6 has no KIMs but many E.F. BLKs (endogenic fulgurites, or 'weird black grains' pre-identification) with quite a few being larger and bulkier than typically found (see Appendix 4: Grain Notes with Microscopy Photos, Sample # Barr-6, p 103). Sample Barr-6 is ~375m up-ice of the best OGS-OFR 6250 (Gao, C. 2012) samples with incredibly high numbers of quality & sizeable KIMs taken 2 metres down, just above bedrock.

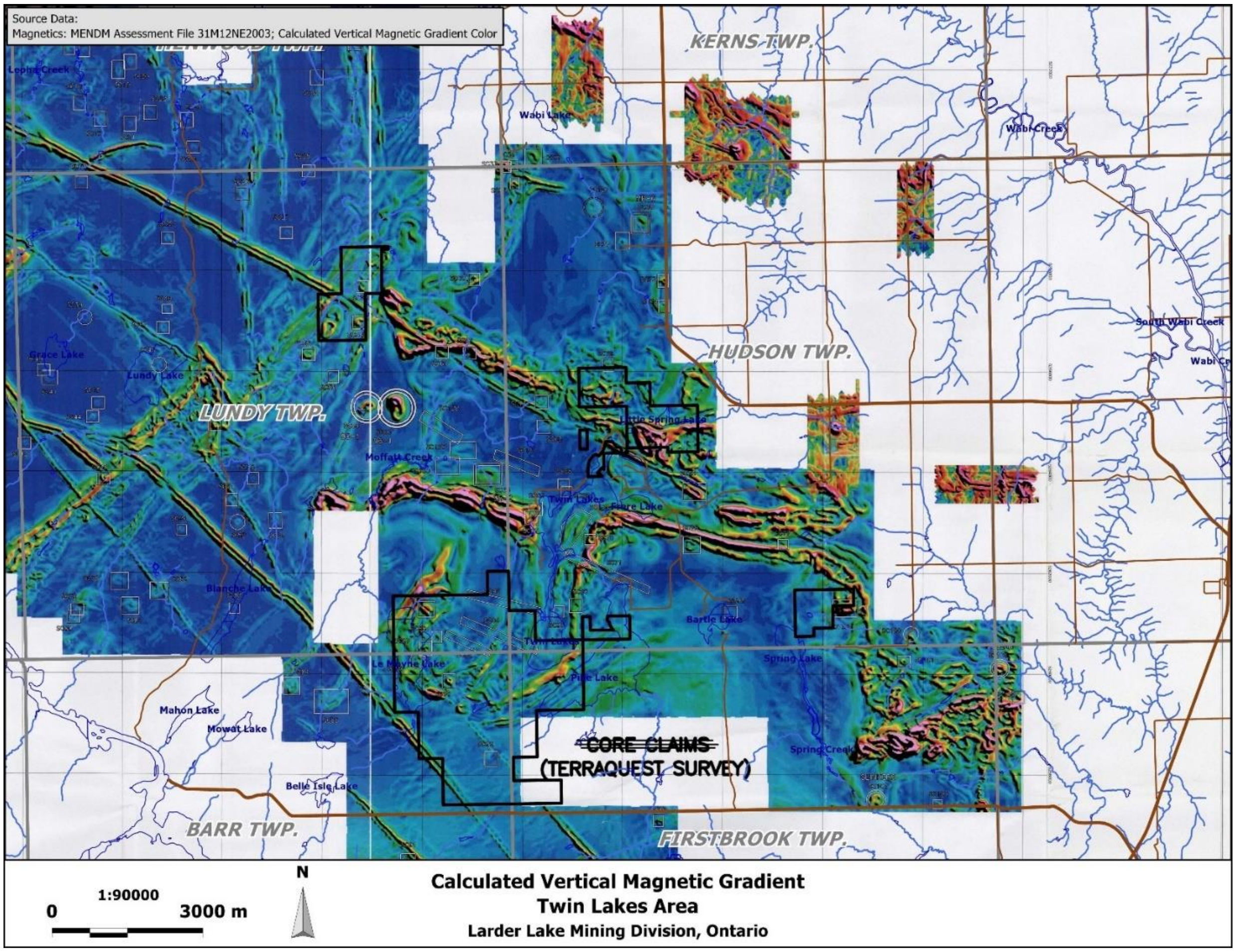
Sample Barr-4 was taken on surface in the vicinity of the 7 OGS-OFR samples, approximately 200m down-ice of Barr-6, and had no KIMs. This could be represented in the topography and/or depth of till. This is a proper result for Barr-6 to be a target.

This makes a good case for Sample Barr-6 to be in the vicinity or vertically above a kimberlite pipe. More testing on surface around Sample Barr-6 and testing with an auger to bedrock would help verify this hypothesis.

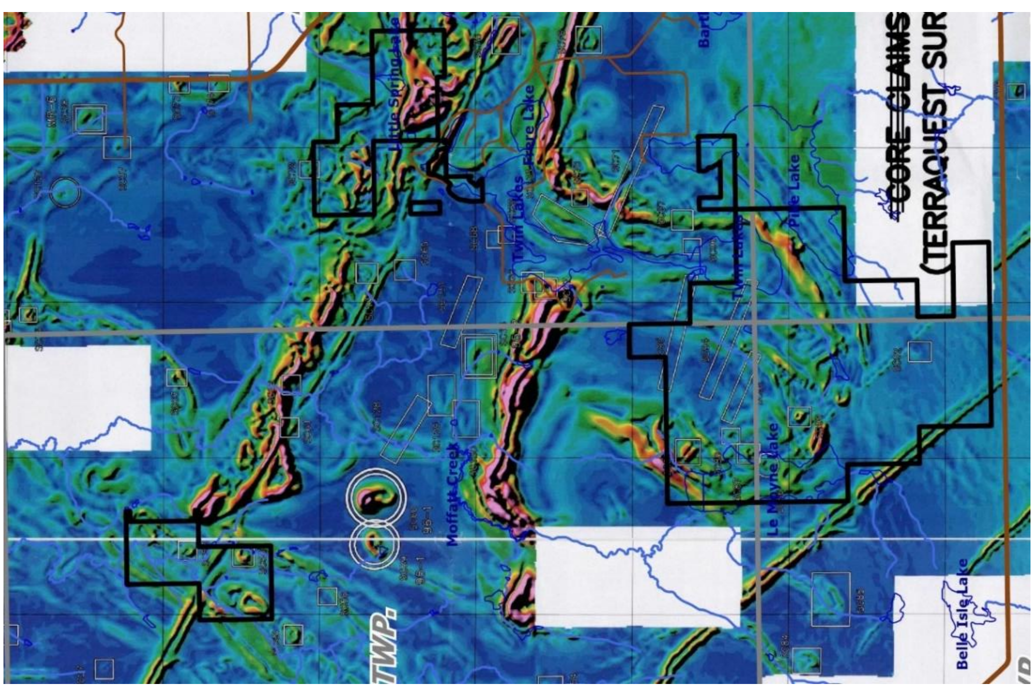
The other most likely target for the kimberlite pipe would be Barr-11, approximately 500m up-ice of Barr-6.

Terraquest Magnetics Survey

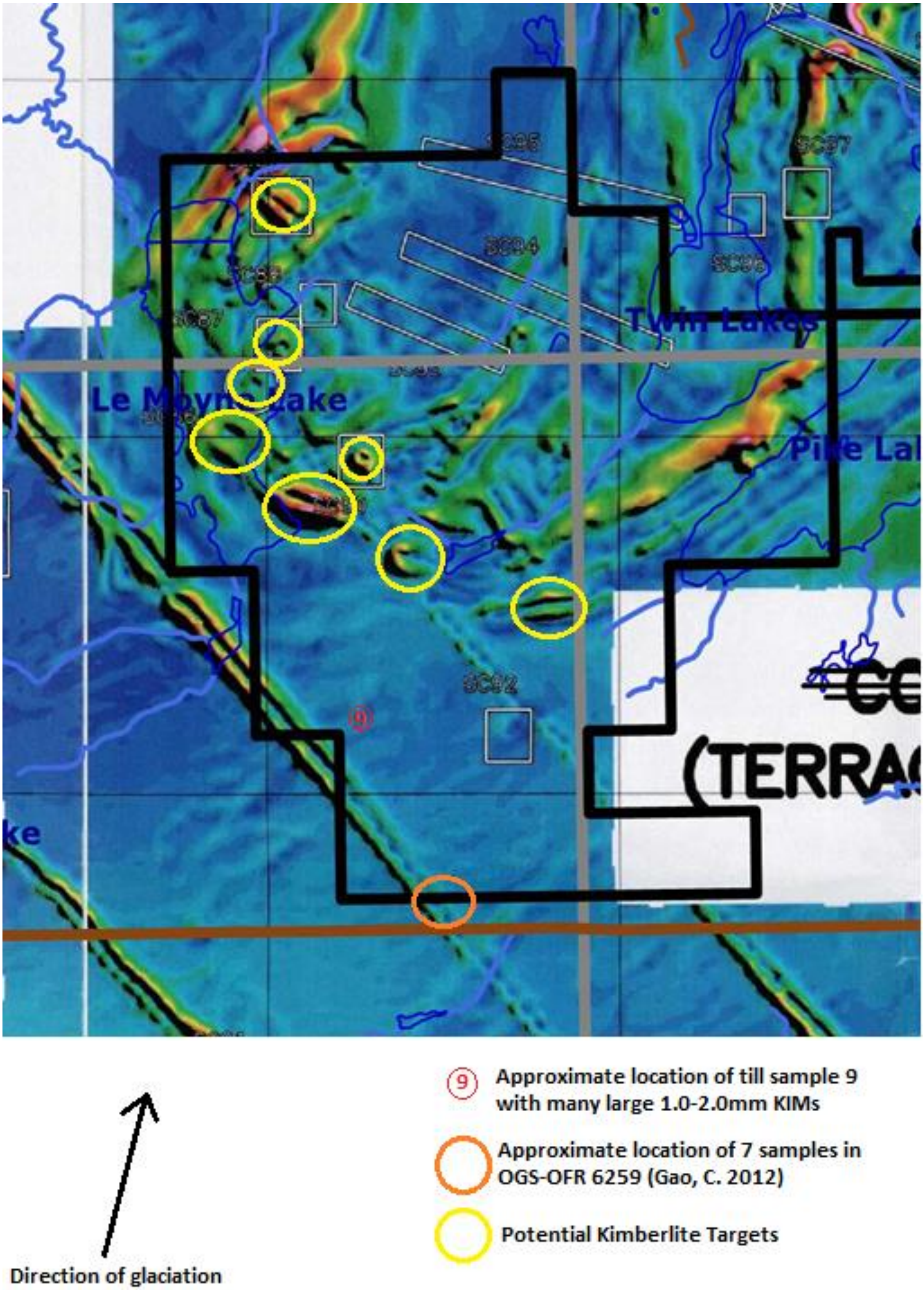
Zoomed in Map 1b (p 9) clearly shows a number of kimberlite-like targets (circled in yellow). Several of these are directly up-ice of high KIM numbers (with large grains). These will be further till sampled for KIMs & Endogenic Fulgurites, and a detailed, tight-line mag flyover is in the planning.



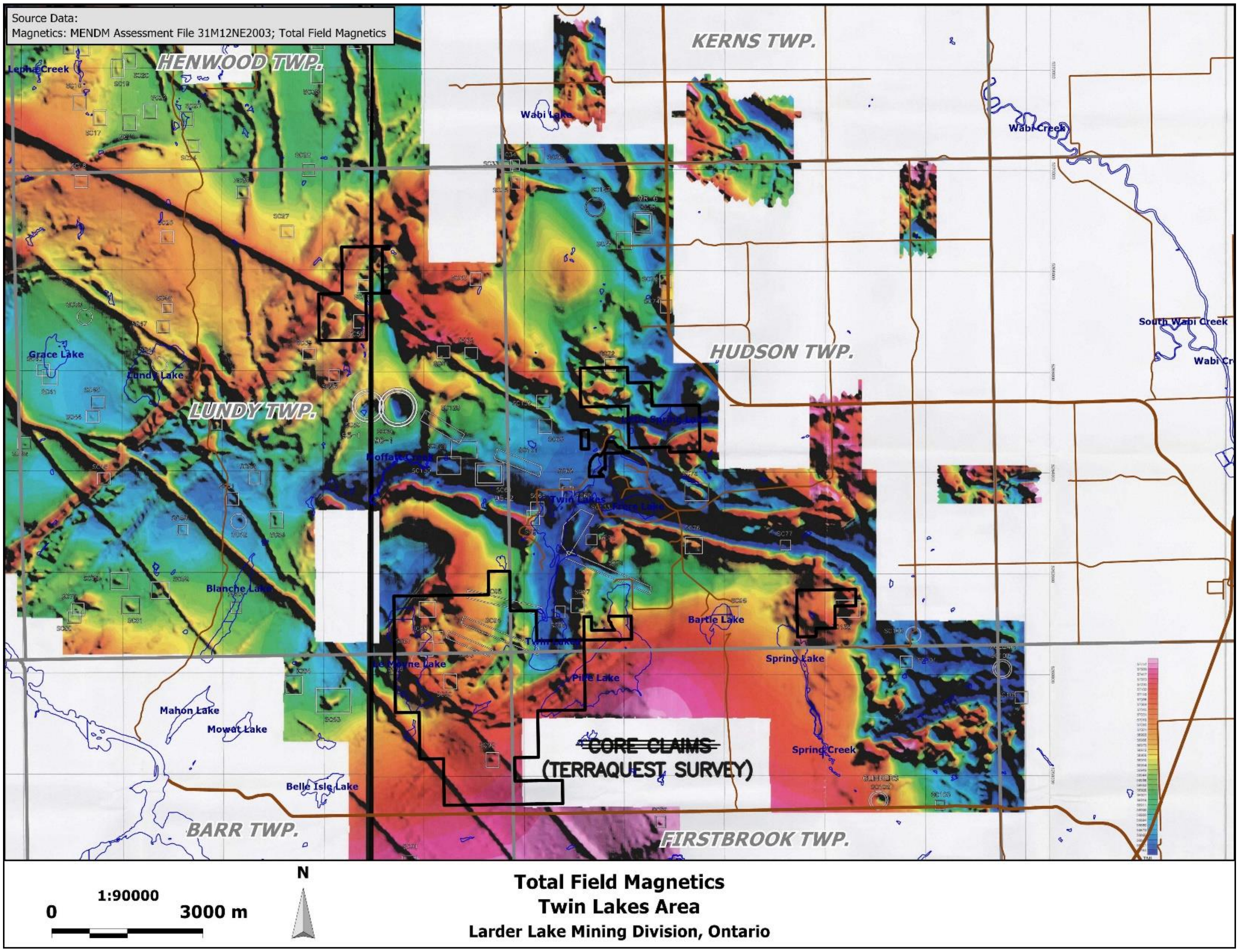
Map 1: Barr & Hudson Twp Area Compilation Map including Magnetics (CVMG), (Fugro Airborne Surveys, Terraquest Ltd. 2002)



Map 1a – clip of Map 1, (Fugro Airborne Surveys, Terraquest Ltd. 2002)



Map 1b – clip of Map 1, (Fugro Airborne Surveys, Terraquest Ltd. 2002)



Map 2: Total Field Magnetics, Twin Lakes Area, (Fugro Airborne Surveys, Terraquest Ltd. 2002)

RESULTS BREAKDOWN:

Term Descriptions & List of Shortforms

Micro(scope) Photographs

- Taken with a handheld Nikon ‘Coolpix’, 10mp digital camera in conjunction with an adapter, through the eyepiece (ocular) of a Nikon SMZ-745T, with a custom lighting configuration

- The subject grains are generally in the 0.25mm to 2.0mm range. On occasion I also pick important KIMs in the 2.0-3.0mm range: very uncommon grains, and especially if brecciated indicate very close to proximity to source (i.e. kimberlite pipe).

- This is the typical range in size of KIMs (Kimberlite Indicator Minerals), that are picked and tested as potential KIMs/DIMs.

- Select photos of grains have been placed in this report from Barr Twp. Diamond Claims

- Many more relevant and important photos were taken during the microscopic picking of KIMs from till sample concentrates for future reference. These will be available for viewing in a future update.

N-52 Magnets used for picking

Various rare earth N-52 magnets are used in magnetic susceptibility separation of cons, from diameters between 13mm to 90mm (600 lb pull). I find the most useful are 13mm and 23mm in diameter.

- M0 - Diamagnetic, magnetically inert, zero magnetic susceptibility

- M1 - Very weakly paramagnetic, falls off N-52 magnet with a gentle shake of the magnet.

- M2 - Stronger paramagnetic, doesn’t shake off magnet

- M3 - Ferromagnetic, magnetite or mineral with a high proportion of magnetic Fe. Grains ‘jump’ ½” or so to the magnet

Bishop’s Rules for KIMs/DIMs, fugacity, etc.

- Generally M3 is not picked

- *M0 garnets and other KIMs are considered high value KIM/DIMs; other non-KIM grains appear to prove sampling of the ‘super deep’ diamond zone of large Type IIA diamonds, and for determining rate of ascent & favourable fugaicty

- M1 garnets are considered to be KIMs

* This has been confirmed by hundreds of grains picked by Tony Bishop and subsequently micropicked by GeoScience Lab (Sudbury), Jim Renauld, and Fipke’s lab in British Columbia.

Microscope Photographs

- Grains testing as M0 that normally would be M2 and are identified (by microprobe to be a crustal grain), often with unique features such as a previously unrecorded colour, etc. are considered to have been subducted to the region of super-deep diamonds and resurfaced in a kimberlite. Two examples are kyanite and staurolite (I've identified these in the Lorrain Bishop Diamond Claims kimberlite field – with grain size, photographs, and microprobe data, plus they were in cons with high KIM counts).
- M0/M1 grains that normally would be M2/M3 and are identified by microprobe and N-52 magnet (for example, non-magnetic/diamagnetic/M0 to very weakly paramagnetic M1 magnetite and chromites, or M0 diamagnetic chrome pyropes or diamagnetic high Fe GO (eclogitic garnets)) are proof of kimberlitic origin and very favourable fugacity (low O_2 and quick transition from very hot to cool conditions in kimberlite ascent), perfect conditions for diamond preservation and minimal resorption (see Appendix 6: Grassy Lake Excerpts, p 182 for information on austenite & non-magnetic Fe)

E.F. BLKs

- When I first found a few of these strange, glassy, black grains with fantastical shapes while picking KIMs in the Lorrain Bishop Diamond Claims and again years later in far greater numbers in the Barr Twp Diamond Claims, I eventually called them weird blacks, in part due to not finding anything like them in literature/on the internet, or during consults with geologists. Recently, April 2nd, 2022. I finally found what they are, and named them 'Endogenic Fulgurites' or E.F. BLKs for short for this paper. A full explanation of their importance in diamond exploration follows in this report.

Shortform Descriptions for photographs & elsewhere in this report:

- A four-digit number refers to the number sequence that shows up on the digital camera for each photograph
- The size of the grain is in mm – millimetres
- 'f' – frosted, sub kelyphite rim
- Kely rim – kelyphitic rim
- GP – Garnet purple (generally a chrome pyrope)
- GO – Garnet orange (if M0/M1, an eclogitic garnet)
- DC – Chrome diopside
- CP – Chrome Pyrope
- CR – Chromite
- GE – Eclogitic Garnets
- IM - Ilmenite
- BLKs – generally any black grain that is/might be kimberlitic (as classified by C. Fipke, C.F. Mineral Research Ltd., Kelowna B.C)
- FO – Olivine (forsterite)
- SEM – Scanning Electron Microscope
- EF – Endogenic Fulgurites
- Cons – concentrates
- S.G. – Specific Gravity

Note: in Appendix 4: Grain Notes with Microscopy Photos (p 91-165), magnetic susceptibility and other information is recorded.

Microscope Photos

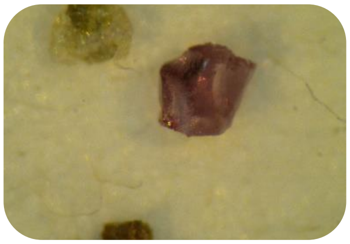


Photo 7350 - 0.4mm, GP, Barr 7

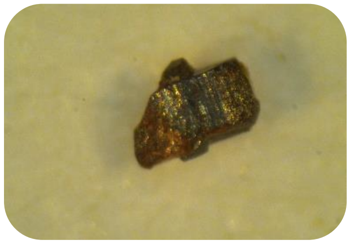


Photo 7320 - 0.5mm, See Grain Notes, Barr 5


Photo 7169 - 0.8mm, See Grain Notes, Barr 22


Photo 7286 - 1.3mm, See Grain Notes, Barr H


Photo 6903 - 0.6mm, GP, Barr E

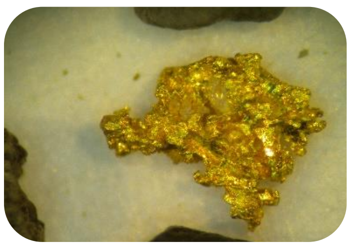


Photo 6909 - ~0.9mm, Gold & Quartz, Barr E


Photo 6929 - 0.6mm, GP, Barr C/D

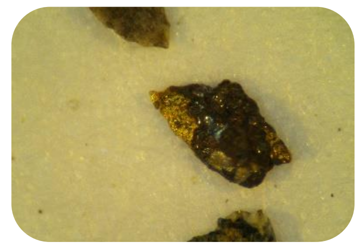


Photo 6965 - 1.2mm, Barr B


Photo 6966 - 2.4mm, DC, Barr B


Photo 6968 - 1.3mm, DC, Barr B


Photo 6969 - 1.7mm,GO, Barr B


Photo 6967 - 1.2mm, GP, Barr B


Photo 6977 - 2.0mm, Gold, Barr B


Photo 6978 - 1.2mm, GO, Barr B


Photo 6981 - 1.8mm, Gold, Barr B

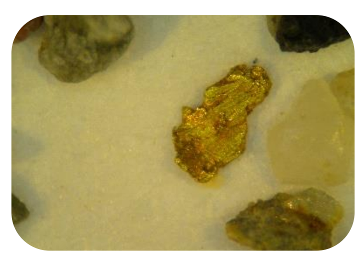


Photo 6982 - 1.3mm, Gold, Barr 2


Photo 6988 - ~3.0mm, Ag (etched) with Quartz, Barr B


Photo 6990 - 2.4mm, E.F., Barr B


Photo 7000 - 4.9mm, E.F., Barr 6

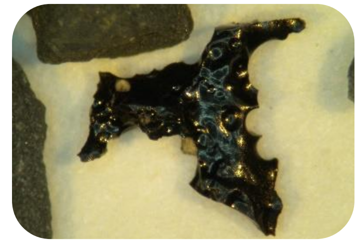


Photo 7001 - 2.7mm, E.F., Barr 6


Photo 7002 - 1.4mm, GO, brecciated, Barr A


Photo 7006 - 1.7mm, Brecciated Garnet, Barr A

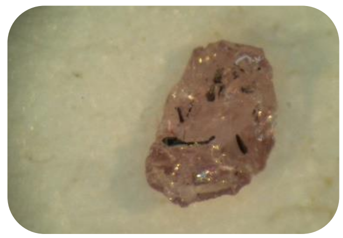


Photo 7330 – 1.0mm, GP, see Grain Notes, Barr 5


Photo 7273 – ~0.5mm, Blue on quartz? (inside rock not outside), Barr H. 3 similar grains were also found in Barr Samples.


Photo 7343 – 1.2mm, GO, Barr 7


Photo 7341 – ~1.0mm, See notes, Barr 6


Photo 7339 – ~0.3mm, Brilliant yellow & yellow/orange. Citrine or diamond?, Barr 5

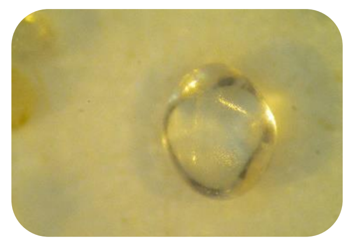


Photo 7344 – Barr 7


Photo 7055 – ~2.2mm, E.F., Barr 9

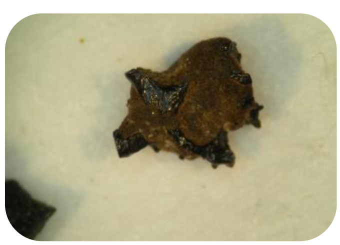


Photo 7057 – 2.2mm, E.F. partly encased in somewhat modified till? from lightning (it didn't dissolve in conc. muriatic acid), Barr 9


Photo 7077 – Unique, looks like GO/G-red intermix, Barr 15


Photo 7085 – 1.8mm, E.F., Barr 15

Photo 7043 – 0.6mm, GP, light pink, very similar to G10 found in Lorrain Twp kimberlite field, Barr 1

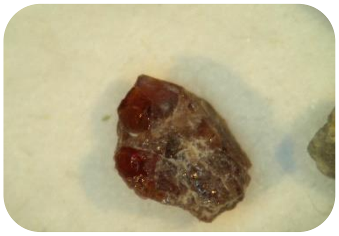


Photo 7045 – 2.6mm, GO, brecciated, exceptional, very little travel distance/abrasion, Barr 1

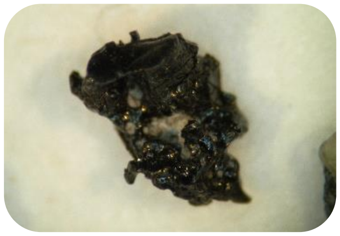


Photo 7048 – ~2.3mm, E.F., Note: not hollow, Barr 1

Photo 7052 – 2.7mm, E.F., Barr 1

Photo 7314 – 0.4mm, See notes, Barr 5

Photo 7026 – GP with 'f' & partial kelyphitic rim, Barr 5

Photo 7028 – Very unique, looks like GO & G4 (orange & yellow intermix of garnet), Barr 5

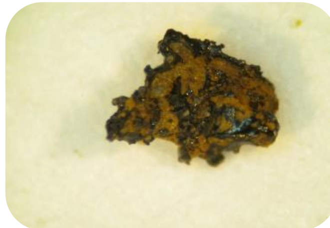


Photo 7039 – 2.0mm, E.F. with possible kimberlite infilling, Barr 6

Photo 7104 – 3.5mm, Partially solidified shell, this might be a fine-grained till that expanded due to gas/steam, and the E.F. formed around it – would explain round 'vesicles' & being brittle; these shells would break away in tumbling, etc., Barr 19

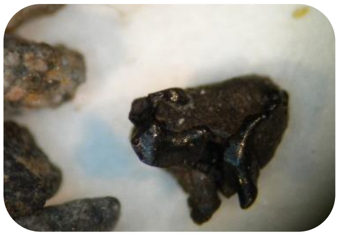


Photo 7059 – 1.4mm, E.F., Barr 9

Photo 7035 – 0.5mm, GO, Barr 6

Photo 7338 – 0.4mm, Red-wine garnet, Barr 5

Photo 7007 - 1.8mm, Brecciated Garnet, Barr A

Samples with 'cemented' coating of some sandy grains on most-to all of the concentrates from till samples in Barr, Lundy, Hudson, & Firstbrook Townships

The following charts were made early on when we first took the samples.

Sample Number	Coating	Description
1	Heavy coated	
3	N/A	No sample
4	No coating	
5	Heavy coat	Really nice Cr Diopside +1.0mm
6	Heavy coat	16C Tray
7	Heavy coat	
8	Fairly heavy coat	
9	Light coat	Lots of shinys ** Really Good
10	Fairly light coat	Few shinys, 16C Tray
11	Heavy coat	Few shinys
12	Heavy coat (2nd acid bath)	Few shinys
13	Heavy coat	Approximately no shinys, panned iffy
14	Very light coat	Possible kimberlite picked, looks really good panned
15	Heavy coat	Few shinys, looks really good
16	Approximately no coating	
17	N/A	No sample
18	Heavy coat, some uncoated	Some nice uncoated shinys, some E.F. BLKs, saved one uncoated GO. Otherwise heavily coated; GC 1 Tray
19	Medium-light – Medium-heavy coat, some uncoated	Quite a few uncoated shinys
20	Very lightly coated, some uncoated	Lots of shinys uncoated
21	Very, very heavy coat	Good number of shinys
22	Heavy coat	Some shinys, +1.2mm carbonised wood In oxalic acid most of the sample disappeared, drainage was black

Sample Number	Coating	Description
23	Heavy coat	Few shinys
24	Heavy coat	Approximately no nice shinys
25	Heavy coat	Few shinys
26	Very heavy coat	Some nice shinys

'Shinys' are transparent/colourless grains in few to modest numbers that are the only grains without the coating that obscures all other grains. More research will be done on these.

Note: This section of the report is rather extensive and complete so that someone with less experience does not get hurt while duplicating my results.

This coat is an unusual complete 'shell'/roundish coating of a light tan to light brown, cemented, fine-grained sand-like material.

After sluicing, screening, and GoldCube concentration, I looked at the cons with a hand lens (and then microscope), and no grains of any kind other than the 'shinys' were visible through this 'coating' (interestingly, it is quite similar to a kelyphite rim found on kimberlitic garnets, until it is warn off by abrasion or weathering). This seems to be something (perhaps) unique to Barr Twp (except for a less problematic similar effect in Ice Chisel/Darwin Lake Area – Bishop-Nipissing Diamond Claims, but that was minor in comparison).

This, however, created a severe problem in finding & viewing KIMs, and quite possibly modified S.G. concentration of heavy mineral grains. So, I did some research and decided to try oxalic acid which dissolves calcite (and cleans stained wood). I could soak concentrates (in the laundry room, it was late fall – as long as you don't get it on your skin you're fine, there are no fumes), and it wouldn't affect the indicators. I tried a few samples (#1-9), and it only partially worked after a few hours to a few days of soaking in a recommended solution with water (it comes in powder form). It didn't give good enough results. Also, it is toxic if it contacts the skin.

Coated Grains

So, this is how pretty much all concentrated till samples at Barr looked like before tumbling in concentrated muriatic acid. Oddly, a very few grains were not coated and they were always shiny, transparent, colourless (and less often coloured) grains.

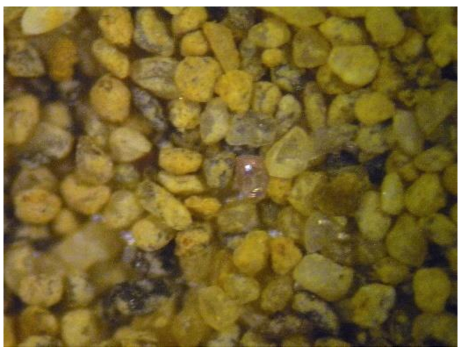


Photo 6421 – uncoated pink grain

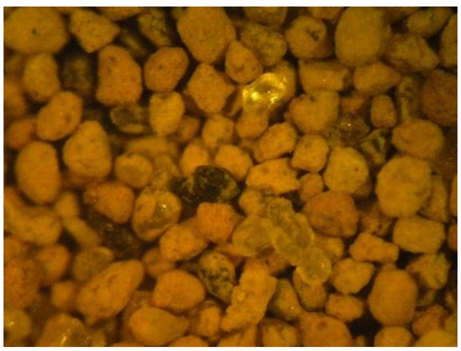


Photo 6425 – uncoated 'white' stone

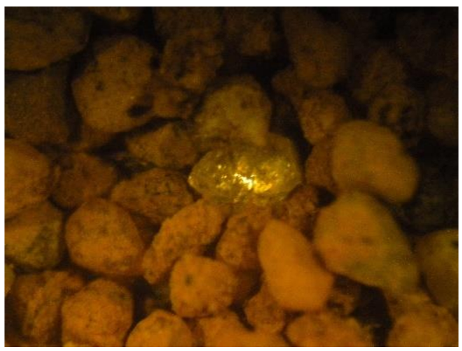
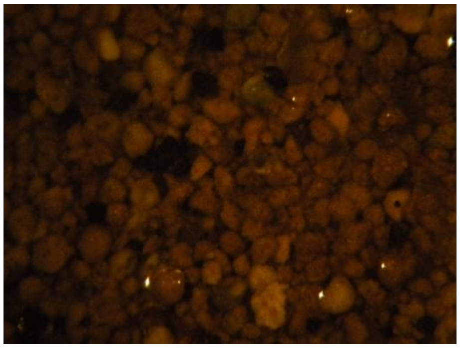
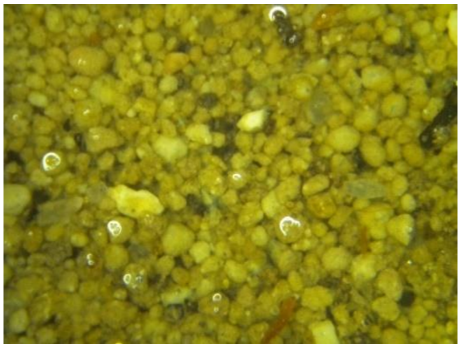


Photo 6439 – uncoated 'white' stone

The coating makes concentrating awkward and microscopy picking impossible without acid tumbling. Photos of early attempts at removing coat from grains are below.

Photos 6650 & 6651 – Coat on grains after 1 day in oxalic acid, different lighting under Microscope

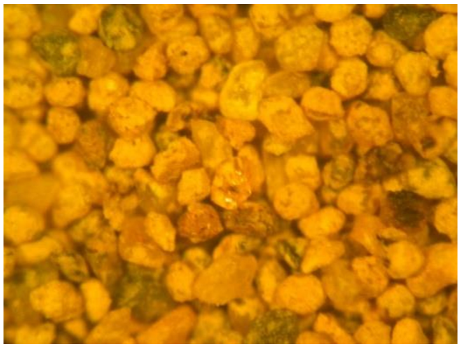


Photo 6625 – Barr 9

Photo 6639 – Barr 11 – Erythrite (pre-concentration)

Photo 6647 – 1st viewing of EF in Barr till samples

A similar looking 'coat' on an E.F. can be seen in the photo below, but it wasn't removed in acid bath/tumbling. This infers that this is partially fused grains of silica on the boundaries of the E.F. black glass core.

Photo 7302 – Barr X

Use of Oxalic Acid to remove coatings on concentrates from Barr Till Samples:

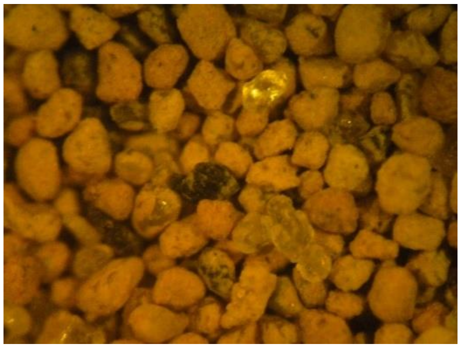


Photo 6425 – Barr till sample pre-acid/tumbling

Photo 6644 – Bar 13, Oxalic Acid colour after soaking cons. Didn't work very well.

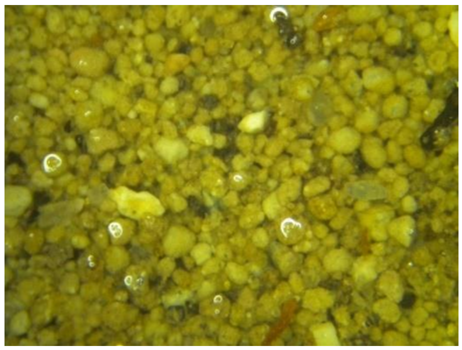


Photo 6651 – Grains in oxalic acid for 24 hours

Basically, this was unsuccessful, way too inefficient in time, and poor results overall. Later, I switched to acrylic tumblers with concentrated muriatic acid (see Appendix 5: Equipment Photos, Photos 17-18, p 178).

Use of Muriatic Acid to remove coatings on concentrates from Barr Till Samples

So, after more research, I decided to use dilute (too slow and ineffective) and then concentrated muriatic acid, which I could not use indoors. So, come Spring after most of the snow was gone, I tried muriatic acid in a plastic tub and it worked, but the problem was the acid immediately bubbled and clouded up so I could not view the results. Periodic draining, washing, deacidifying, and drying the grains for checking under magnification was painfully slow and risky (the fumes are very dangerous), and after often needed redoing. So, I thought awhile and figured that tumbling in acid might work. After much research I found smaller, clear acrylic motorised tumblers and bought one to try (see Appendix 5: Equipment Photos, Photos 17, p 178 of these in action).

Now, the (fortunate) first thought I had is that in a sealed container with acid and a gas being released would pressurise and possibly 'blow' the container, or when opened would explosively release dangerous fumes or acid. This was set-up outside under a tarp to keep the sun and rain off, and partly inside a car tent. The solution was to drill a small hole in the centre of the 'lid' to release gas which necessitated (with some experimentation) filling the tumbler (while lying on its side) somewhat less than ½ full so as to not release any acid through the drilled hole when turning on the tumbler base (nice, solid, and variable speed). See Appendix 5: Equipment Photos, Photos 18, p 178.

Each sample required from 10 minutes to 40 minutes to dissolve the coating. What is great is that after stopping the motor and letting the liquid settle for a short time, I could view the grains' condition and, if needed, tumble a bit longer. I bought several of these, at times it required 2 at once to hold a single concentrate

Then, wearing a mask, safety glasses, and rubber gloves (upwind), dump the contents into a plastic container of water for a first rinse, continue with fresh, clear water until most acid and 'mud' is removed, then wash in a sodium bicarbonate solution. Afterwards, with a fine sieve, remove the remaining bicarbonate and 'mud' in a clear water solution, and put the grains in a foil container and dry in a convection oven. I would repeat this process for each sample (in this case 29 times the till samples' individual size fractions from the GoldCube, as each was done separately). This was an extra, time-consuming undertaking.

Sluiced Barr Samples (Pre-sluiced Till Sample Weights)

Sample Number	Weight	Description on bag
#1	3.359 kg	Medium brown, sandy, damp
#4*	2.053 kg	Damp brown/black, coarser, fair bit of humus
#5	2.028 kg	Reddish brown, orange, fine ~dry, Lots of humus, etc.
#6	~2 kg	Reddish/orange, sandy, ~dry
#7*	2.025 kg	A bit damp, dark brown sand, lots of humus/moss, etc. (+Grease test)
#8	~2 kg	(Grease test) Darker sand/some clay, ~dry,
#9	2.952 kg	Light/medium brown, sandy, slightly damp (Grease test – too high temp)
#10	2.698 kg	Light brown fine sand, mostly dry (Grease test)
#11	2.728 kg	Dark brown, coarser sandy, damp Good sample, sluiced with extra screen (Grease test)
#12	3.187 kg	Darker brown, damp
#13*	1.779 kg	Medium brown sand, mostly dry (+Grease test) Too high temp and might have pressed together
#14	1.974 kg	Very dark brown/black clay, wet
#15	3.163 kg	Medium brown, sandy, dryish
#16	4.785 kg	Very dark brown, sandy, dryish
~~#17~~	~~1.342 kg~~	Humus/Muck, damp, probably useless
#18	1.878 kg	Medium brown, sandy, dryish A bit too much organic debris
#19	2.176 kg	Dark brown, sandy, dryish

Sample Number	Weight	Description on bag
#20	2.165 kg	Dark brown, sandy, dryish
#21	2.217 kg	Light tan colour, sandy, mostly dry (Grease test)
#22	3.764 kg	Dark brown/grey, mostly clay, wet (Grease test), very small sluiced cons
#23/25	2.725 kg	Medium tan, sandy
#24	2.081 kg	Light tan, sandy
#26	2.364 kg	Medium tan, sandy, slightly damp (Grease test)

Barr Resample

Sample Number	Weight	# of Samples
BARR-A	9.79 kg (combined weigh)	3 samples
BARR-B	2.3 kg	1 sample
BARR-C/D	3.57 kg (combined weight)	2 samples
BARR-E	4.26 kg (combined weight)	2 samples
BARR-F	2.07 kg	1 sample
BARR-H	5.3 kg (combined weight)	2 samples
BARR-X	4.92 kg (combined weight)	2 samples

Screened, GoldCube (GC), & Acid

Sample	Weight of Sluice Cons (in grams)	Weight of GC Cons (in grams)	Extra info
Barr 1	229	195	
Barr 4	127	75	No 2 or 3 sample
Barr 5	194	151	
Barr 6	74	40	
Barr 7	82	50	
Barr 8	49	27	
Barr 9	297	231	
Barr 10	274	182	
Barr 11	182	95	Recheck done
Barr 12	163	87	
Barr 13	70	52	
Barr 14	92	67	
Barr 15	277	142	

Sample	Weight of Sluice Cons (in grams)	Weight of GC Cons (in grams)	Extra info
Barr 16	262	140	
Barr 17	n/a	n/a	No sample – muck, not useable
Barr 18	286	59	
Barr 19	284	120	
Barr 20	129	61	
Barr 21	78	41	
Barr 22	115	62	
Barr 24	156	73	
Barr 23/25	141	87	In field, chose in-between
Barr 26	15	7	

Till Sample Number	Weight of Cons (g)	Weight of 0.25-3.00mm Fractions (g)
Barr A	219	112
Barr AB	144	82
Barr BA	197	186
Barr C + D	408	324
Barr E	180	133
Barr F	127	94
Barr H	173	149
Barr X	104	64
Barr E, Probably GC leftovers, Rechecked	56	44

Column 2, Weight of Cons (g): Refers to their weight after stage one of concentration (Stage One = blenderizing, sluicing, tumbling in acid, screening to various sizes prior to gold-cubing and/or panning) and subsequent screening to various fractions (i.e. +3.0mm, +1.3-3.0mm, +0.84-1.3mm, +0.42-0.84mm, +0.25-0.42mm, -0.25mm), minus the weight of aluminum pans used as containers for the various fractions. The pans individually weigh 4.5 grams (gold scales).

Column 3, Weight of 0.25-3.00mm (g): The +3.0mm and -0.25mm are stored and not used at this time. The weight of the 0.25-3.0mm fractions (minus the weight of containers) is recorded.

Weight of sample after acid tumbling and screened to microscope-viewing fractions

Note: The mettler PM 30 reads to 3 decimal places in kilograms. This is sensitive enough that blowing on the platform (fairly gently) gives a reading.

Sample	Fraction (mm)	Weight (g)	Panned Weight (g)	Sample	Fraction (mm)	Weight (g)	Panned Weight (g)
Barr A	+0.25-0.42	22.6		Barr E	+0.25-0.42	31.5	
	+0.42-0.84	36.5			+0.42-0.84	61.3	
	+0.84-1.3	18.5			+0.84-1.3	17.0	n/a
	+1.3-3.0	32.5			+1.3-3.0	21.7	n/a

Sample	Fraction (mm)	Weight (g)	Panned Weight (g)	Sample	Fraction (mm)	Weight (g)	Panned Weight (g)
Barr B	+0.25-0.42	18.9		Barr F	+0.25-0.42	20.7	
	+0.42-0.84	33.4			+0.42-0.84	40.5	
	+0.84-1.3	7.1	n/a		+0.84-1.3	13.5	n/a
	+1.3-3.0	25.0	n/a		+1.3-3.0	19.0	n/a
Barr B, rejects GC	+0.25-0.42	30.8		Barr H	+0.25-0.42	25.0	
	+0.42-0.84	97.8			+0.42-0.84	75.5	
	+0.84-1.3	21.6			+0.84-1.3	22.5	
	+1.3-3.0	27.8			+1.3-3.0	27.5	n/a
Barr C/D	+0.25-0.42	49.2		Barr X	+0.25-0.42	26.4	
	+0.42-0.84	142.8			+0.42-0.84	28.3	
	+0.84-1.3	53.1			+0.84-1.3	3.7	n/a
	+1.3-3.0	77.9			+1.3-3.0	9.9	n/a
Barr D	+0.25-0.42			Aluminum pan is 4.5g. All samples weighed on a Digiweigh Gold Scale, accurate to 0.1g			
	+0.42-0.84						
	+0.84-1.3						
	+1.3-3.0						
Barr 1	+0.25-0.42	42.0		Barr 10	+0.25-0.42	35.5	
	+0.42-0.84	76.7			+0.42-0.84	69.1	
	+0.84-1.3	24.3			+0.84-1.3	25.7	
	+1.3-3.0	49.6	Not panned		+1.3-3.0	51.3	
Barr 3	+0.25-0.42	16.2		Barr 11	+0.25-0.42	17.4	
	+0.42-0.84	26.3			+0.42-0.84	23.5	
	+0.84-1.3	10.2			+0.84-1.3	13.7	
	+1.3-3.0	21.6	n/a		+1.3-3.0	39.7	
Barr 5	+0.25-0.42	29.2		Barr 12	+0.25-0.42	3.2	n/a
	+0.42-0.84	59.2			+0.42-0.84	30.4	
	+0.84-1.3	13.1	n/a		+0.84-1.3	19.9	
	+1.3-3.0	46.8	n/a		+1.3-3.0	32.0	
Barr 6	+0.25-0.42	9.3		Barr 13	+0.25-0.42	3.2	n/a
	+0.42-0.84	6.2	n/a		+0.42-0.84	12.8	
	+0.84-1.3	7.1	n/a		+0.84-1.3	10.0	
	+1.3-3.0	16.4	n/a		+1.3-3.0	26.2	n/a
Barr 7	+0.25-0.42	14.6		Barr 14	+0.25-0.42	8.7	
	+0.42-0.84	8.8			+0.42-0.84	11.6	
	+0.84-1.3	7.4	n/a		+0.84-1.3	13.2	
	+1.3-3.0	18.4	n/a		+1.3-3.0	32.4	
Barr 8	+0.25-0.42	5.5		Barr 15	+0.25-0.42	28.3	
	+0.42-0.84	7.1			+0.42-0.84	47.3	
	+0.84-1.3	3.4	n/a		+0.84-1.3	14.4	
	+1.3-3.0	9.8	n/a		+1.3-3.0	59.1	
Barr 9	+0.25-0.42	30.0		Barr 16	+0.25-0.42	27.6	
	+0.42-0.84	79.5			+0.42-0.84	27.6	
	+0.84-1.3	42.6			+0.84-1.3	18.4	
	+1.3-3.0	75.6	n/a		+1.3-3.0	65.6	
Barr 17	No Sample			Barr 22	No Sample		

Sample	Fraction (mm)	Weight (g)	Panned Weight (g)	Sample	Fraction (mm)	Weight (g)	Panned Weight (g)
Barr 18	+0.25-0.42	5.4		Barr 23/25	+0.25-0.42	18.9	
	+0.42-0.84	13.9			+0.42-0.84	28.0	
	+0.84-1.3	8.6			+0.84-1.3	16.1	
	+1.3-3.0	30.8			+1.3-3.0	22.4	
Barr 19	+0.25-0.42	23.6		Barr 24	+0.25-0.42	13.6	
	+0.42-0.84	32.5			+0.42-0.84	21.4	
	+0.84-1.3	17.7			+0.84-1.3	8.2	
	+1.3-3.0	44.8			+1.3-3.0	29.3	
Barr 20	+0.25-0.42	11.9		Barr 26	+0.25-0.42	0.9	
	+0.42-0.84	14.2			+0.42-0.84	1.6	
	+0.84-1.3	7.7			+0.84-1.3	0.9	
	+1.3-3.0	20.8			+1.3-3.0	2.6	
Barr 21	+0.25-0.42	8.7					
	+0.42-0.84	14.1					
	+0.84-1.3	6.0					
	+1.3-3.0	11.8					

Numbers of Uncommon Size KIMs (1.0-2.0mm) found in various reports & their Importance in Determining Distance from Source (Kimberlite)

Following is a collation of 6 Ontario Geological Survey Open File Reports covering an area from Temagami to Kirkland Lake to Elk Lake, more or less central around Cobalt, except for one – OGS-OFR 6317 (van Hees, E. et al, 2016) – which is farther north in Ontario.

A total of 1540 samples were collected by OGS in 6 OGS-OFR Regional Surveys and shipped to ODM (Overburden Drilling Management) for processing and subsequently picked for gold grains, KIMs (Kimberlitic Indicator Minerals), and MMSIM (Metamorphic/Magmatic Massive Sulphide Indicator Minerals).

This section focuses on KIMs. KIMs are concentrated and typically separated into three size fractions: 0.25 to 0.5mm, 0.5 to 1.0mm, and 1.0 to 2.0mm. Grains larger than 2.0mm are too rare to be cost effective to look for and less than 0.25mm is too difficult to isolate and pick. By orders of magnitude the 0.25 to 0.5mm fraction will statistically have the most grains of interest. For this reason, many diamond exploration companies only request that fraction to be picked for KIMs to save costs and to report higher numbers of KIMs in press releases. The 1.0 to 2.0mm grains are exceedingly rare in comparison.

The ratio of large grains to smaller ones increases drastically the closer you are to the kimberlite source of these grains. As well, I did find a number of important KIMs in the 2-3mm size, and some brecciated garnets at Barr indicating very near proximity to the kimberlite source, typically within several kilometres or less. This was also verified with large, brecciated garnets recovered by me in Lorrain Twp immediately down-ice of near-surface kimberlite bodies.

The following chart shows three (easily recognised) of the most important KIMs (chrome pyropes [CP], eclogitic garnets [GE], and chrome diopsides [DC]) that appear in the six OGS-OFR reports in the 1.0 to 2.0mm size, which reflects close proximity to source rock (kimberlite), recovered from 1540 alluvium and till samples, each weighing 10 to 20 kg (22 to 44 lbs), or 15,400 to 33,880 kg (33,951 to 74,693 lbs).

I then compare these to the seven till samples taken at the south end of Bishop Barr Claims for the OGS-OFR 6259 report. The first samples in 2007 contained “anomalous numbers of KIM grains” (Gao, C. (2012) p35). “The area was resampled … Area B contains 7 samples within a radius of 250m and all have anomalous pyrope and chromite grains…

more than 20 G10s in one sample" (see the following chart). These are then compared to individual surface till samples collected and concentrated by me (author, Tony Bishop), from my Bishop-Barr claims, in the vicinity of the OGS samples and further to the north and northwest.

To explore the Bishop Block of claims in Barr, Lundy, Firstbrook, and Hudson Twps., traverses were planned and a sampling plan up-ice of these 7 OGS 6259 samples were initiated by Tony and Graeme Bishop. One sample, #9, was concentrated and partially picked by Tony (and later fully picked). Initially it seemed barren as no KIMs were obvious in the 0.25-0.5mm fraction (the most commonly and sometimes only picked size). Tony then looked at the 1.0-2.0mm size and was surprised to quickly pick a number of KIMs in this size. See results in the following chart, note the small sample size, taken from approximately one foot below surface. This result is clearly very close to source (unless by great improbability a kimberlite float was dug into, which can and will be determined by taking several samples several metres away from Sample #9 and see if result differ greatly).

Note that Erlich and Hausel recommend when till sampling in diamond explorations, a 20-45kg sample to find KIMs (Erlich, E.I., Hausel, W.D. (2002) p310).

Contrast this with the Bishop till sample weights which often are substantially less. Thus in principle the numbers of KIMs, metallics, etc. could be increased proportionately when reporting. This is standard practice and referred to as 'normalising' the sample. I will report actual and normalised (to 10kg, the industry standard) numbers in the chart below. The normalised chart will be easier (and more correct) to compare to OGS-OFR findings.

Somewhat related, when correlating KIMs by quality, size, transport damage, etc. you cannot reasonably compare the sampling and KIM results between the tundra and Boreal Forest as to size, condition, and transport distances of grains. and expect the same results. This is due to many factors and ignoring them will result in many failures at great expense if you attempt to use the same guidelines and interpretations.

Case in point: shortly after I first started finding KIMs in till samples in Lorrain Twp, I had a visit from one of *the* Major Diamond Companies. An executive and geologist sat at our dining table and I showed them my results, maps, etc. I was then told that my KIM ratios were similar to these pipes in the Haileybury/New Liskeard area, ~20km to the north/northwest. I explained all the reasons this could not be so, on some of the points only the geologist agreed with me.

> "In this respect it is important to bear in mind the research conducted by the Geological Survey of Canada (McClenahan et al., 1998, 1999) on the Kirkland Lake and Timiskaming kimberlites. They have determined that the shallowly covered Peddie (Bucke-F) Kimberlite for instance only has an indicator mineral anomaly in till that extends for 2km down-ice. For the deeply buried C-14 kimberlite at Kirkland Lake, the situation is much the same for basal till samples, and upper tills have no signature associated with the kimberlite at all. The Diamond Lake kimberlites, which are beneath an esker, appear to be reflected in the esker deposits for at least 10km, and within the tills for the same relative 2-3km distance." (Sobie, P. 2002)

A number of studies in Kirkland Lake and area on tracing KIMs down-ice of known kimberlites demonstrate that past 2km, no KIMs are found in till samples on surface from shallow (near-surface) pipes, deeper pipes have no surface KIMs, and KIMs remain near bedrock and also peter out at approximately 2km.

The exception is esker samples, which had KIMs up to 10km from source.

This also holds true for a study of gold grains in Kirkland Lake's E-W-trending gold mines, no Au grains were found beyond 2km down-ice, and of other examples in Float, Placer Gold, and other Heavy Minerals.

I did not sample an esker in Lorrain Twp or in Barr Twp. This furthers my conclusion that the source of the 7 OGS till samples and my own a bit to the northwest (Sample 9) come from separate but very proximal source, i.e. <2km. I'm quite confident these sources are within several hundred metres.

> Another example: I was correct about the KIMs I was finding being very close to, and indeed often on top of or in, the Lorrain Kimberlites. I'm fairly certain some of the 'clay' till samples on surface might have been weathered 'expanding clay' kimberlite – you can't get any more proximal than that. The very largest of KIMs, namely GO, were +3.0mm and found in the small creek that cuts through the 'Paradis' Kimberlite.
>
> The result is there are 6 large kimberlite ore bodies in my former claim block in Lorrain Twp, and 2 more, one on the south border and one on the north border (both of which I had slated for staking until the Cobalt rush over that winter had staked everything for hundreds of townships & tens of thousands of claims in just a few months, all around Cobalt/Gowganda and more. This was curious because there were no available stakers (that I know of) available and my stakers trying to tie onto some of those properties could find no claims posts, trail markers, or snowshoe/ski tracks, or any other indication of staking)

So, to recap, the number of easiest to recognise important KIMs – as in garnets: GP (chrome pyropes – lherzolitic), GO (eclogitic garnets), and DC (chrome diopsides) – in the 1.0 – 2.0+mm range found in all six OGS-OFR reports were counted and charted. Additionally, the numbers of such grains in the 7 till samples collected in OGS-OFR 6259 in Barr Twp. is charted.

Then, in subsequent rows, the number of such grains are charted in select till samples from the Bishop-Barr Claims, collected & processed by Tony Bishop for similar large indicators, i.e. 1.0-2.0mm & larger (generally not looked for nor picked), first in 'normalised' to 10kg samples, then in actual weight/results.

All Bishop-Barr samples are till samples and screened to <5mm and weighed less than the 10-20kg individual samples in the OGS-OFR reports.

Also, you might have noticed the KIM counts were very high in the OGS samples taken at 2m deep. I took new samples at surface in the same vicinity and found few to no KIMs. This also indicates a proximal source up-ice of the OGS samples (see Diagrams A-C, p 28-29).

"Till deposits at the base of ice sheets contain rock fragments and minerals that are closely related to and, generally, not far from their source areas in the up-ice direction." (Gao, C., 2012, p1)

Determining the Distance to a KIM Source (Kimberlite Pipe) Using Numbers of & Size of KIMs

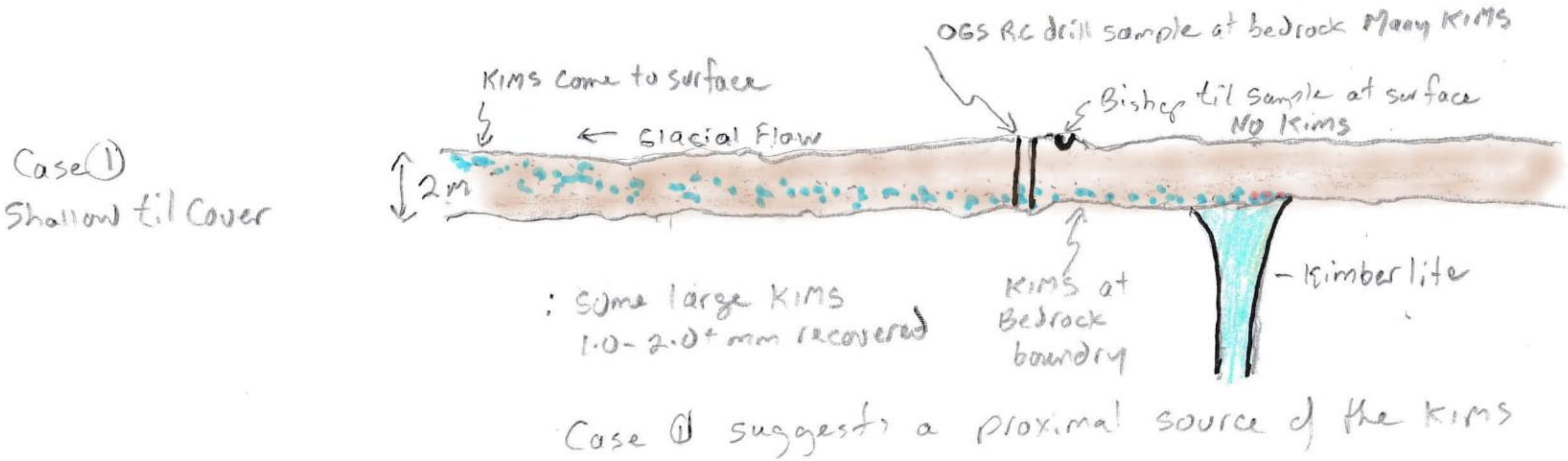


Diagram A

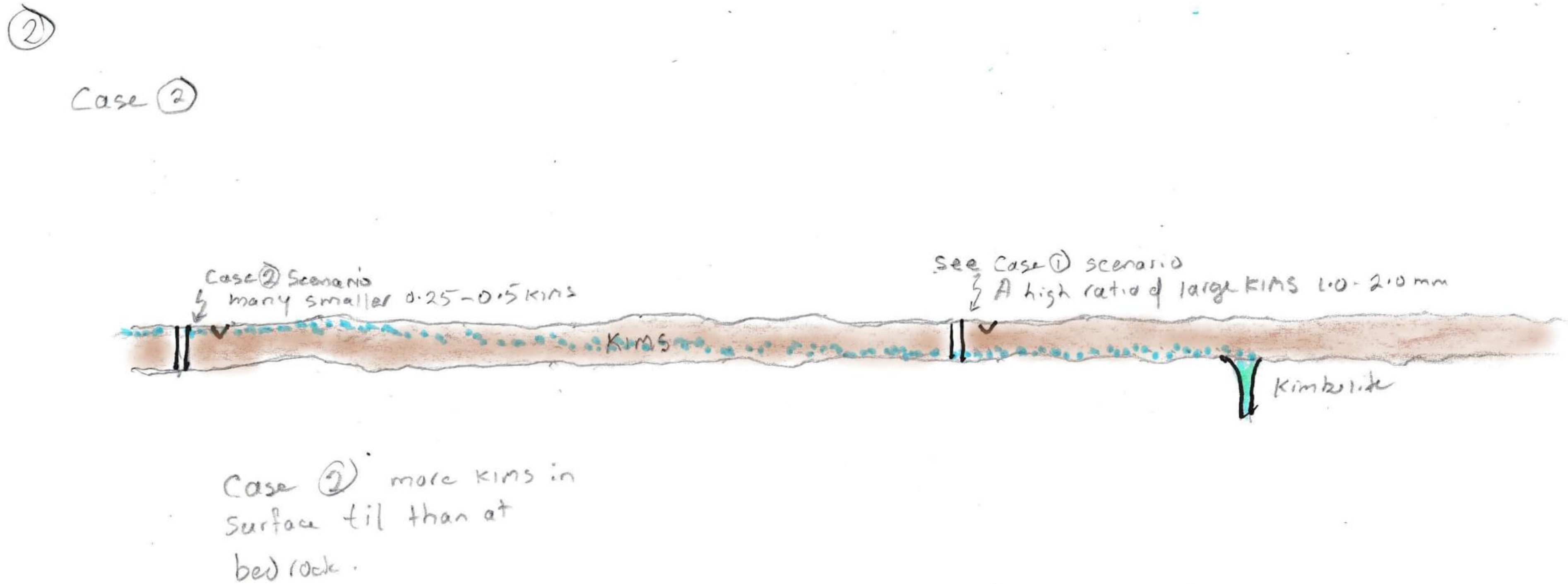


Diagram B

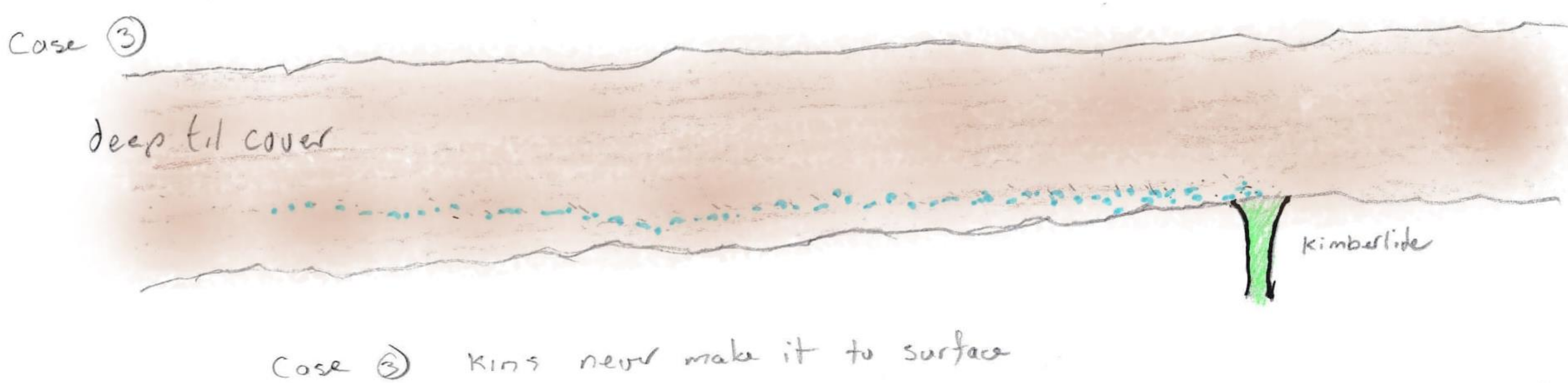


Diagram C

Number of GP, GO, & DC in the 1.0-2.0mm size range in Various OGS Reports & Bishop Till Samples

Ontario Geological Society – File # - Date	**Number of Samples Collected**		**Weight of Samples in kg**	**Samples screened to size in mm**	**# of GP 1.0 – 2.0 mm (Purple)**	**# of GO 1.0 – 2.0 mm (Orange)**	**# of DC 1.0 – 2.0 mm (Green)**
	Alluvium	**Till & Other**					
OGS – OFR 6043 – 2001	256	2	10 to 20	< 5	3	2	0
OGS – OFR 6088 – 2002	254	23	10 to 20	< 5	4	1	0
OGS – OFR 6119 – 2004	175	8	10 to 20	< 5	0	0	0
OGS – OFR 6124 – 2005	317	40	10 to 20	< 5	1	1	0
OGS – OFR 6297 – 2015	0	305	10 to 20	< 10	0	0	0
OGS – OFR 6259 - 2012	0	160	10 to 20	< 7	8 [Note: 7 are from Barr]	8 [Note: 2 are from Barr]	5 [Note: 3 are from Barr]
Total numbers in all 6 reports	1540 samples at 10 to 20 kg			--	16	12	5
Total numbers in 6 reports, minus the 7 Barr samples in OGS-OFR 6259	1533 samples at 10 to 20 kg			<7	9	10	2
OGS – OFR 6259 – 2012 – Barr	0	7	10 to 20	< 7	7	2	3

Normalised Weights/KIM counts to 10 kg for Barr-Bishop Samples, 1.0-2.0mm	**Weight of Samples in kg**	**Samples screened to size in mm**	**# of GP 1.0 – 2.0 mm (Purple)**	**# of GO 1.0 – 2.0 mm (Orange)**	**# of DC 1.0 – 2.0 mm (Green)**
Bishop – Barr 1	10	<5	0	3	0
Bishop – Barr 5	10	<5	5	0	5
Bishop – Barr 9	10	<5	10	24	10
Bishop – Barr A	10	<5	0	3	0
Bishop – Barr B	10	<5	13	17	17
Bishop – Barr C/D	10	<5	0	3	0
Bishop – Barr H	10	<5	0	2	0

Actual Weights/KIM counts for Bishop-Barr Samples, 1.0-2.0mm	**Weight of Samples in kg**	**Samples screened to size in mm**	**# of GP 1.0 – 2.0 mm (Purple)**	**# of GO 1.0 – 2.0 mm (Orange)**	**# of DC 1.0 – 2.0 mm (Green)**
Bishop – Barr 1	3.36	<5	0	1	0
Bishop – Barr 5	2.03	<5	1	0	1
Bishop – Barr 9	2.95	<5	3	7	3
Bishop – Barr A	9.79	<5	0	3	0
Bishop – Barr B	2.3	<5	3	4	4
Bishop – Barr C/D	3.57	<5	0	1	0
Bishop – Barr H	5.3	<5	0	1	0

Notes: Brecciated Garnets indicate:

1. Minimal transport distance
2. The kimberlite source is very close physically, and close to surface

- Barr 1 had a brecciated GO
- Barr 9 has a separate source from the other samples, possibly except for Barr 1 which is directly up-ice of Barr 9
- In Barr A, all GO are brecciated
- Barr H had a brecciated GO

So, this is a consistent, important fact: find large 1.0-2.0mm+ KIMs and you are very close to the kimberlite source. This is reflective in all the data from the OGS-OFR reports and was duplicated in many till samples by myself (Tony Bishop) pre-RJK Explorations Ltd. and after my claims were optioned. A large-scale survey initiated by Graeme Bishop (with some input by Tony) and grains picked for microprobe by Tony for RJK reflected large grains = close to or in the kimberlite. One large GO was ~3.5mm and other GP and GO were in the 2.0-3.0mm range.

Barr Samples 9 & B had more large KIMs than any till sample I've seen recorded anywhere. Barr B is probably same source as OGS samples. Barr 9 is not from the same source.

In the various OGS reports, virtually all 9 GP, 9 GO, and 2 DC in the 1.0-2.0mm range were within several kilometres directly down-ice of known kimberlites. (Sobie, P. 2002, section 5-3)**.**

Frankly, I'm amazed with the quantity of large indicators I'm finding, especially since in concentrates while picking under a microscope for KIMs, the largest are very easy to spot. This bodes well for being very close to near-surface kimberlites.

On KIM Grain Size Recovered When Sampling

An interesting read is GSC-Open File 7111. This report's basic premise is

> "indicator minerals break down (comminute) during transport [(glaciation)] as they contact each other or the bed … which causes a decrease in mineral frequency and size … and an increase in mineral roundness downflow in dispersal trains … the larger, more numerous and more angular … the closer the ore body source." (Cummings et al. (2014))

So, the investigators tumbled each individual type of KIMs (**importantly they were sourced from various kimberlites**) with stainless steel shot and at various intervals, checked the results for grain size and mass lost to 'mud'. The KIMs were pyrope garnet, ilmenite, and Cr diopside. However, chromite and olivine were not tested due to problems related to equipment and test parameters. Chromite, however, is typically considered to be very durable.

The results were surprising as they contradict many previous assumptions (other previous test experiments used **non-kimberlitic** industrial garnets). GP (pyrope garnets) & GO (mostly eclogitic orange garnets) have the same physical characteristics, i.e. they wear down the same, and lost mass and broke into small 'pieces' way faster than industrial garnets and other KIMs.

> "The experimental results have several implications for mineral exploration. One of these relates to the use of KIM abundance as an indicator for proximity to source. Kimberlite indicator minerals are typically picked and counted from a portion of the sand fraction … If larger pyrope garnets, such as those analyzed in the experiment, were present in the kimberlite source rock, break down of these grains at the head of the dispersal train could flood the sand fraction with garnet fragments. This could potentially lead to an *increase* in the number of garnet and total KIM fragments moving downflow, with a commensurate increase in angularity of garnet grains [Fig. 7]. In situations where

> this occurs, **the total mass of KIM fragments in the sand and gravel fraction might serve as a better proxy for transport distance than KIM counts**, given that it [total mass of grains] should always decrease downflow in dispersal trains due to some combination of comminution, dilution, and/or selective sorting." (Cummings et al. (2014))

Sand fractions in this case refers to the 0.25-0.5mm KIMs.

In a nutshell, one large KIM grain (especially garnet) is equivalent to many smaller grains and better indicates proximity to a pipe.

The following two diagrams are very important in diamond exploration.

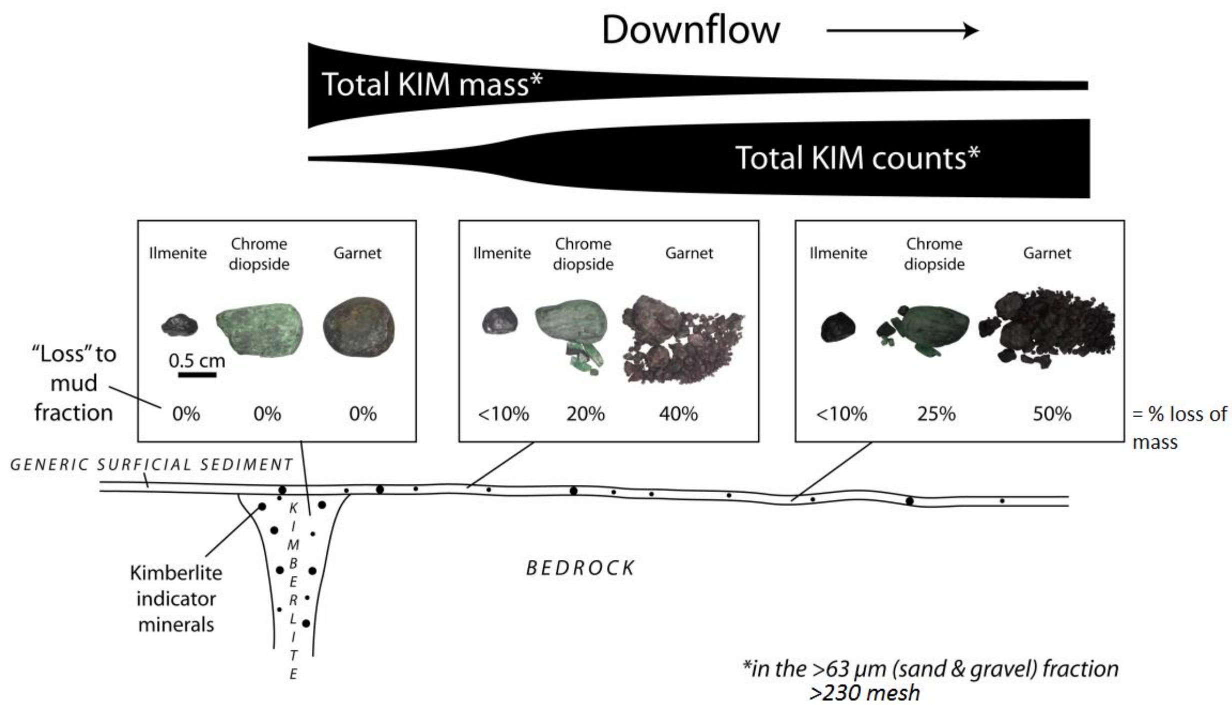


Diagram D: Farther downflow, total KIM counts would decrease, assuming continued comminution (in addition to selective sorting and/or dilution). (Cummings et al. (2014))

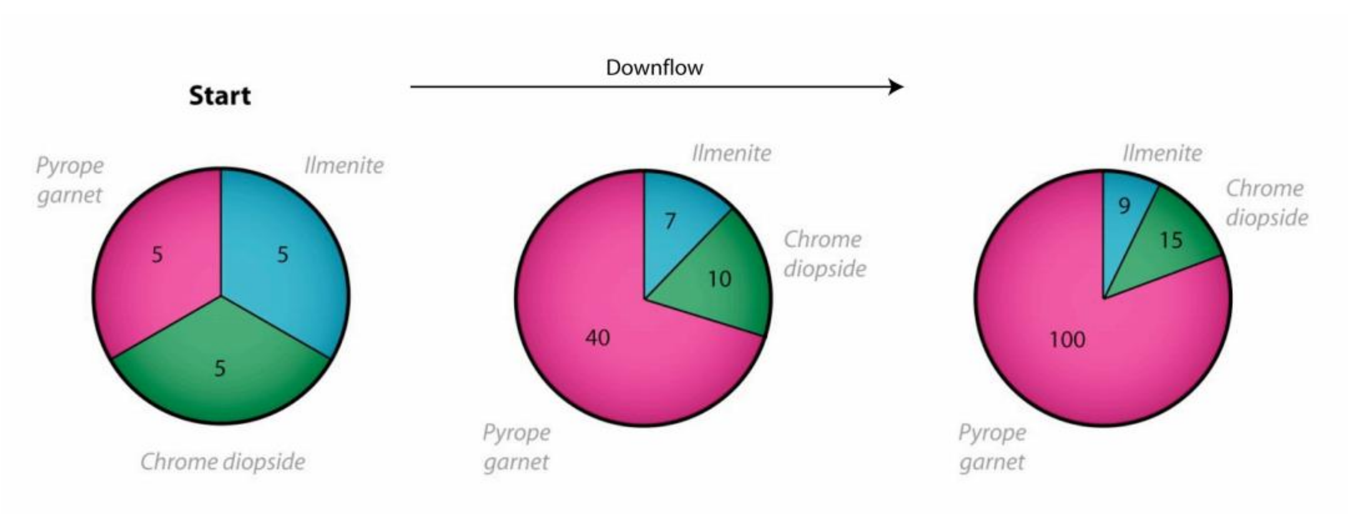


Diagram E: Downflow evolution of indicator mineral assemblages … in which rapid break down of larger pyrope garnets produces abundant sand-sized grains. … Numbers refer to grain counts. (Cummings et al. (2014))

There would appear to be several issues that must be addressed if a company or individual relies on KIM pie charts in tracking down the source of KIMs (see pie charts above). As explained in the comminution article (Cummings et al, (2014)) on the breakdown of kimberlitic grains of garnets, chrome diopsides, and ilmenites, the garnets break down very quickly and continue to break down with transport in a glacier, etc. until, at a certain distance from their source, garnets in the 0.25-0.5mm size will actually increase in numbers relative to other KIMs.

The author of the comminution study (tumbling KIMs in a rock tumbler with stainless ball bearings) discovered that previous tests on KIMs, and specifically garnets, used easily obtained industrial garnets (i.e. the toughest, least likely to break garnets). Cummings used kimberlite garnets (KIMs) and discovered they break down by far the quickest and easiest of any other KIM, very quickly turning into many smaller garnets with quite a bit lost to mud. So, finding large garnets equates to minimal transport distance from source, which, of course, severely skews pie charts in quick order.

Chrome diopsides do the same although to a lesser extent, whereas the more resistant ilmenites' and chromites' numbers will remain essentially unchanged. However, this effect is mitigated by the increase in 'mud' (mud isn't exactly defined but related to KIMs it could be thought of as any grain <0.25mm or fine sand → very fine sand → silt → clay (Wentworth Classification, Crompton, R.R. (1967) p 213) and so for KIM grains that break down easily and transported a certain distance will eventually decrease somewhat due to some combination of comminution, dilution (more mud, less grains) and/or selective sorting. Therefore, the total mass of KIM fragments in the sand → gravel section might serve as a better proxy for transport distance than KIM counts (Cummings et al, 2014).

The author of GSC Open File 7111 (Cummings et al, (2014)) (select extracts are included in this report), then laments that there is no method of weighing grains this small.

However, I realised that a 'pure' mineral has a known specific gravity/S.G. (mass vs. volume), so I developed the chart and explanation that follows (see Grain Size in mm chart below), that accomplishes a method of calculating a ratio of the mass of KIMs relative to size of individual grain size.

For instance, in my Lightning Lake report, I found a 2.3mm Cr Pyrope (G9), easily identified as it is brecciated and has kimberlite attached (see (Bishop, B.A., 2017h, Photo 8, p 8). The easily seen 'fractures' allow the grain to break into many smaller grains, however this grain is intact and therefore was transported a very short distance from the kimberlite it derived from. Indeed, the large area Lightning Lake Kimberlite is very near to the north, i.e. up-ice. If you find many small grains of similar Cr Pyrope and no large ones, the transport distance is greater, in some examples much greater.

Using the formula for volume of a sphere ($V = \frac{4}{3}\pi r^3$), where r = radius of the grain, will reflect an equal relative increase in mass in KIMs from 0.25mm to 2.5mm in diameter, as shown in the following chart.

Kim Grains

Diameter (mm)	Radius (mm)	Volume (mm^3)
0.25	0.125	0.00818
0.375	0.1875	0.028
0.5	0.25	0.065
0.75	0.35	0.22
1.0	0.5	0.52
1.5	0.75	1.77
2.0	1.0	4.19
2.5	1.25	8.18

The next chart shows the total number of smaller grains required to equal the mass of larger grains (number of grains increases as size decreases). (Read: left to right)

Size of grain (mm) ⟶ decreases

2.5	**2.0**	**1.5**	**1.0**	**0.75**	**0.5**	**0.375**	**0.25**	**Grain Size**
1.0	1.95	4.6	15.7	37	126	292	1000	**# of grains required to maintain same total mass**
	1.0	2.4	8	19	64.5	150	512	
		1.0	3.4	8	27	63	216.4	
			1.0	2.4	8	18.6	63.5	
				1.0	3.4	8	27	
					1.0	2.3	8	
						1.0	3.4	
							1.0	

So, as you can see, **finding one 2.5mm grain is potentially equivalent to 1000 0.25mm grains**. Companies generally recommend only looking in the 0.25-0.5mm fraction for KIMs in order to report high numbers of KIMs found – this chart explains why.

Therefore, looking for 1.0-2.0mm and 2.0-3.0mm grains becomes much more important (especially Cr pyropes) as one or two of this size indicates a proximal source, even (especially) if many small grains are also encountered. Knowing this, **a few larger grains should be given more value than many smaller grains.** I'm regularly finding Cr pyropes and other KIMs in the 1.0-2.0mm and often +2.0mm sizes. **I'm also finding in my till samples from the Bishop-Barr claims intact larger garnets with 'visible' fractures [brecciated], which indicates minimal transport distance.**

In Barr I have found a number of large, brecciated garnets (see Appendix 4: Grain Notes & Microscopy Photos, p 91), indicating a very near source.

So at least in this area of Ontario (Cobalt/Haileybury), the use of pie-charts and KIM grain counts must be carefully interpreted as they will drastically change the further down-ice you sample (especially in till samples) in determining the distance to a pipe and indeed whether you can determine if you are following the same KIM train as you get closer to a kimberlite source can be problematic.

In Barr Twp many large kimberlitic GP & GO (garnets) were found in OGS-OFR 6259 (Gao, C. (2012)), and subsequently in till samples processed by Tony Bishop.

So far, through interpreting my results, there are definitely 2 and highly likely 3 (or more) source pipes in the claim block.

Take special note of 1.0-2.0mm KIMs (normalised to 10kg)

- Barr 1 – 3 GO
- Barr 9 – 10 GP, 24 GO, 10 DC
- Barr B – 13 GP, 17 G0, 17 DC

And other grains found (actual count)

- Barr 1 – 9 pristine gold grains
- Barr B – 4 pristine gold grains, 1 gold with sulphide, 1 native Copper, lots of sulphides

Chart on Gold Grains & Other Metallics Found in Barr Till Samples by the Ontario Geological Survey (2 of) & the Author of this Report (See Appendix 4: Grain Notes & Microscopy Photos (p 91), for size & other comments)

Sample #	# of Gold (Au) Grains	Other Metallics	Other
Bishop Barr 1	9 – pristine		
Bishop Barr 6		Grey/Ag metallic	
Bishop Barr 7			Brassy sulphides
Bishop Barr 8		Silver nugget	
Bishop Barr 9			Sulphides
Bishop Barr 16			Sulphides
Bishop Barr 22			Sulphides
Bishop Barr 23			Bright yellow/silver cube
Bishop Barr 24		Copper	
Bishop Barr A		Leaf silver	
Bishop Barr B	4 – pristine 1 – with sulphide	Copper	Sulphides (lots)
Bishop Barr C/D	1		
Bishop Barr E	1 – in matrix		Sulphides
Bishop Barr H			Rusty sulphide
Area 'B' Samples			
OGS-OFR 08-CG-17 [Gao, C. 2012, p8]	7		
OGS-OFR 08-CG-19 [Gao, C. 2012, p8]	21		

On the importance of G10 garnets in kimberlites worldwide vs their relevance in Canadian Diamond Mines

Please refer to articles on the Victor Mine Diamond Inclusions (Statchel, T. et al, 2018)**,** and 'Diamond exploration on the Sask craton: A challenge for the current paradigms' (Creighton, S. 2011), (based largely on the Forte a la Corne – Star Orion Diamond Mine). The diamond grades of both mines is very low compared to world average. However, both host high quality larger Type IIA diamonds. Both mines have a very small G10 population and G9 is the primary diamond indicator.

Worldwide Diamond Inclusions are 86% G10s, Lac de Gras – 16%, Saskatchewan – 5%, and Victor – 0% G10s. All Canadian mines have low-to-no levels of G10s but high levels of G9, and favourable levels of eclogitic garnets. The Canadian results are extremely skewed for G9s being favourable. This, however, does not make finding G10s unfavourable.

So, the Cl_sO_3 vs CaO for garnets need to be reinterpreted in Canada, as well as the MnO content. 88% of garnets found as inclusions in diamonds at Victor plotted in the graphite field (previously/typically interpreted as not sampling the diamond inclusion zone of the mantle.

"The overall chemical signature of the Timiskaming Kimberlite Field is a promising one that includes sampling of diamondiferous mantle, and a good to excellent diamond preservation potential during ascent of the pipes. Research has shown as well that the diamond stability field has been sampled, and that a garnet-consuming metasomatic event is down-rating the G10 garnet signature of these pipes, without having a discernible effect on diamond preservation."

(Sobie, P. 2002, p 44 Section 8-1)

See overlay of Victor/Barr GP & GO results, p 54.

Fulgurites as Kimberlite Indicator Minerals

The use of a newly discovered kimberlite indicator mineral in diamond/kimberlite exploration which I've named "Endogenic Fulgurites" and a possible mechanism for their formation in soil/sandy till.

- Tony (Brian Anthony) Bishop, April 13th, 2022

Pressure & Temperature Conditions of a Lightning Strike:

Lightning … an electrostatic discharge … upon striking sand or soil it vaporises, melts, & fuses material, producing a tubular body of glass and fused clasts known as a fulgurite [there are multiple variations] … at temperatures in excess of 3000k (2730°C) over 0.5-3 seconds, cooling to below 1000k (730°C) in approximately 2 minutes. Lightning can induce pressures >7GPa, and modelling suggests >10GPa, other evidence suggests a 25GPa possibility. (Kenny, G.G., 2021)

Lightning is produced when colliding particles of ice, rain, or snow in a cloud create a negative charge in the lower regions of the cloud. The electrostatic imbalance between the cloud and ground creates an equally large positive charge. At a certain point the two charges meet each other, and a lightning bolt equalises the charges. This flash can be 5x hotter than the surface of the sun and for a few milliseconds a shock wave with pressures that exceed any other natural mechanism on or in the mantle – the closest is an asteroid striking the earth. The actual lightning bolt travels up from the ground, down from the cloud, and meets somewhere in between. When lightning hits sandy ground, it melts silicates and forms a 'fulgurite.' The enormous heat and pressure from lightning can also form very unusual glassy 'sculptures' in rocky-sandy/clay till (see photos in this report). Certain conductive features in the ground are especially good at creating the positive charges and are thus much more likely to be struck multiple times in the same location repetitively over a long period of time. Kimberlites are one of the most 'attractive' targets (no pun intended).

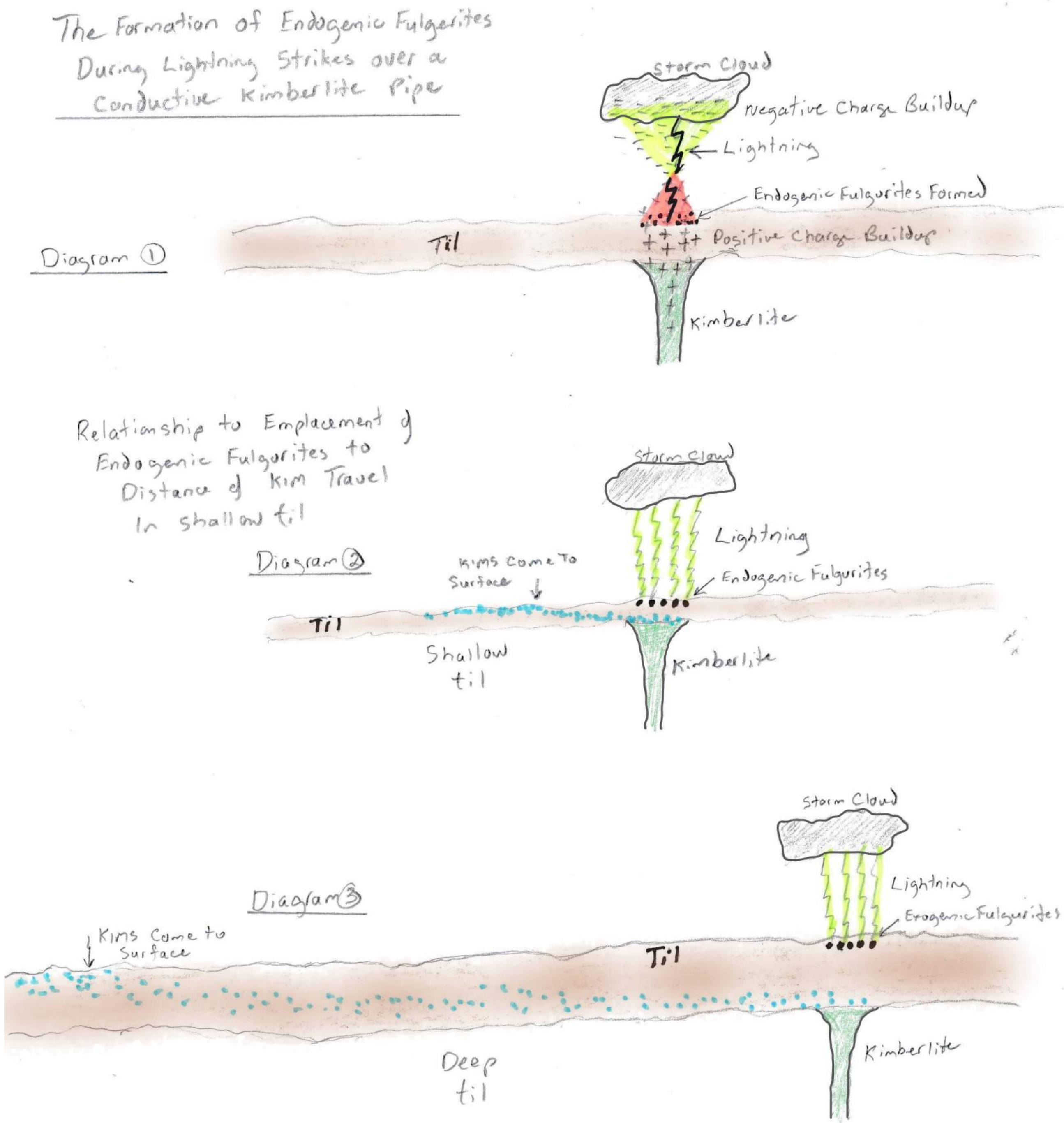
Of interest for my prospecting efforts, lightning has a recognised affinity for kimberlite pipes:

"A dozen studies over the last five years show lightning strike locations are not random. We mapped faults, showed relationship to sediment thickness, possibly predicted seeps, and mapped anisotropy which has the potential to differentiate between ductile and brittle shales in resource plays. We demonstrated lightning strike locations are not dominantly tied to infrastructure (wells and pipelines), nor are locations controlled only by topography or vegetation or water depth.

Lightning is a meteorological phenomenon. However, lightning strike location and lightning strike attributes appear to be controlled by geology. Telluric currents - which are modified by faults, mineralization, anisotropy, fluids, and **geology like kimberlite pipes - control lightning strike locations.** When we mapped the various attributes recorded in the lightning databases from Texas, New York, North Dakota, and Michigan we found the same spatial variation and temporal consistency. Lightning strike density varies spatially, and these variations are somewhat consistent over time. Data mining databases of lightning strikes provides a new geophysical data type, which can be integrated with other potential field data types and with seismic data to explore for natural resources." (Nelson, Jr. et al, 2013)

Basically, a negative charge in 'storm' clouds is attracted to a comparable positive charge in/on the ground. The positive charge has been found to be most likely over certain conductive structures, one geological structure that is most likely to attract lightning discharges is a kimberlite pipe. To qualify for the study quoted above, lightning had to strike the same location at least once a year, every year. For example, then it is quite possible that since the last glaciation a single kimberlite pipe might be struck by lightning 10,000 times.

Endogenic Fulgurites



So, finding Exogenic Fulgurites above a kimberlite and relating the distance to first locating Kims in surface til can be used to estimate depth of the Kimberlite from the surface.

Pertaining to the Bishop claim-block, up-ice (in the direction of glaciation) of high to very high levels of KIMs in till samples (and large 1.0-2.0mm+ garnets), I'm finding these visually amazing, unusual, very rare black glassy grains. In some of my till samples there are hundreds. These grains are often so brittle that trying to gently pick them up with carbon fibre-tipped medical tweezers breaks them – because of this, I could not figure out how they survived glaciation and transport. It took me approximately five years to find any reference or photos of them and then just a month or so ago (as of the writing of this section) I determined what they are, and then put my previous work and this new 'knowledge' to reconsider them as one of the most important KIMs, with major implications for the diamond exploration field.

So, when a lightning strike hits/originates at the ground, specifically in a sandy/clay till, the heat (and perhaps combined pressure wave) creates these black grains that so entranced me.

I've named them Endogenic Fulgurites for this report. 'Endo' for formed within the till instead of 'Exo' meaning formed outside of the ground/till.

But here's the important thing – they are basically silica and only form directly over the (kimberlite) pipe, to a depth of 1-2 feet.

So, if you sample the till deeper than one or two feet and process the final-concentrate of samples with heavy liquid (which every lab does), you won't find these grains.

These grains must be picked manually during microscopy. The obvious effect of this is that the cost of finding these endogenic fulgurites and the large 1.0-2.0mm+ KIMs drives the labour, and therefore the cost, up many times for any lab/exploration company that decides to attempt this method of sample assessment for diamonds for each exploratory till sample collected. P.S. These methodologies will not work on alluvium (stream) samples.

Just recently I discovered articles on another type of fulgurites formed during lighting strikes; 'Exogenic Fulgurites' are formed in a dry environment and the fulgurites get physically blasted in a molten state into the air by the shock wave of a lightning strike where they form elongated 'tendrils', but they all have round to teardrop-shaped 'fronts' and generally a 'tail', much like a liquid raindrop shapes itself.

The fulgurites I'm finding are not like this: they have no teardrop shapes and are way more 'artistic' and varied in shape. They do not resemble other published descriptions of fulgurites. Also, the fulgurites I'm finding are always glassy black.

I then imagined a lightning strike in damp till topped by some amount of humus, leaf litter, etc. in a relatively thin layer. Now two things singly or in conjunction would happen: first, the huge, positive charge just before a lightning strike would dry the sandy particles in the till and create an enormous 'like' charge driving them apart leaving channels for the molten silica; however, the second is probably far more immediate and powerful, namely the moisture in the damp till would flash into superheated steam and physically blow the till grains apart, following the shape of the dendrite like channels. This would allow the molten silica to fill the gaps, thereby forming Endogenic Fulgurites, i.e. in-the-ground formations. This would explain finding these in the till samples, which I'm generally taking from the surface to between 1'-2' and less often as deep as 3'. This is how deep lightning effects are greatest before dissipating rapidly.

There are several reasons why these have not been reported (so far as I can find). The main reason is that I am working with no formal preconceptions about diamond exploration. I started looking for kimberlites in 2014 at the age of 60 with absolutely no experience or knowledge of what I was doing, beyond having been told by close friends who had been part of the Big Diamond Rush in the Kirkland Lake and New Liskeard areas in the 1980s-1990s to take till samples, concentrate them down to 'cons', and look for pretty red garnets. Another preconception I lacked was that you are supposed to dig down to the B & C layers (still not sure what they are)- instead, I just took shallow till samples of 2-5lbs or so instead of the recommended 10-20kg samples. The other thing is most exploration companies (and indeed OGS prefers) recommend stream samples to better find KIMs. I only take till samples.

However, I must be doing something right as my first staked claims revealed (by RJK Explorations Ltd's drilling) 8 large surface area kimberlites in Lorrain Twp just southwest of Cobalt.

My second attempt at diamond exploration in Barr Twp (and area) looks equally promising, but from more traditional pipes. The grain chemistry and size of grains point to diamondiferous kimberlite ore bodies.

These Endogenic Fulgurites, I think, will aid me into locating the exact location of these pipes pre-drilling. Another advantage is that some of the most productive pipes in Canada have no discernable magnetic signatures, and often the lack of EM makes finding their location very problematic using traditional techniques.

These Endogenic Fulgurites can also be used to find metallic gold & silver, or base metal deposits/any highly conductive ore body. Concerning Barr Twp, this complicates things a bit as I'm finding KIMs, pristine gold & silver grains, and sulphides, but more interesting are grains with E. Fulgurites that were formed amongst quartz (with some grains having been partially melted), and slender gold-coloured & pink/copper coloured hair-like wires intertwining and extruding out of these grains. The only explanation would seem to be these are formed in the extreme heat/pressure of a lightning strike.

The grains just described, and many E. Fulgurites were photographed through the microscope to aid other prospectors/explorationists to utilise in recognising them when till sampling.

Photo 7187 - ~2.5mm, from Barr 22. Fine green crystals & black/brown crystals, very fine, on an enlarged wire/crystal? The crystals are actually bright green-yellow in colour.

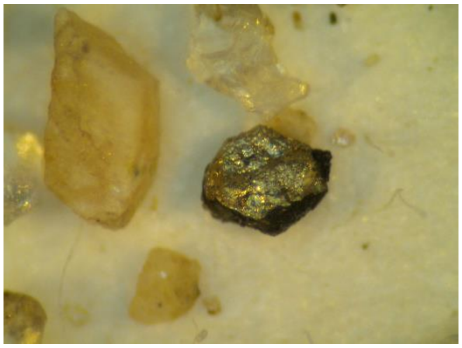


Photo 7184 – 0.5mm, from Barr 22. M0 sulphides (pyrite?) with Endogenic Fulgurites.

The high number of E.F. with sulphide suggests a metallic or base metal source very close.

See 'The Formation of Endogenic Fulgurites during Lightning Strikes over a Conductive Kimberlite Pipe' diagrams on p 38.

'Wirey' Endogenic Fulgurites: The rarest mineral grains?

These are formed with many other really nice Black Endogenic Fulgurites and KIMs in the till sample from Barr 26. They remind me of native silver specimens from Cobalt/Silver Centre in my collection of wire silver with calcite and quartz. It strongly suggests a metallic ore body is vey close, the grains of metal-rich quartz were struck by lightning and the extreme pressure/temperature extruded the metallics into very fine wires and actually partially melted some of the quartz grains.

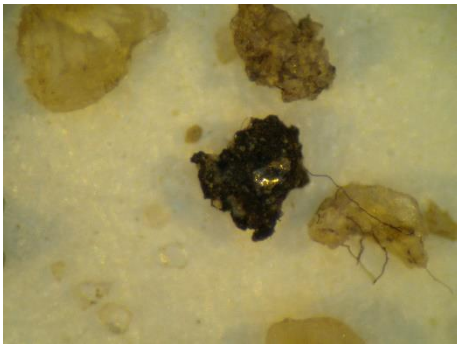


Photo 7142 – 0.5mm, The EF & quartz appear to be joined by pink/Cu-coloured wires, a transparent/colourless grain can plainly be seen.

Photo 7146 – 1.0mm, Similar to Photo 7142

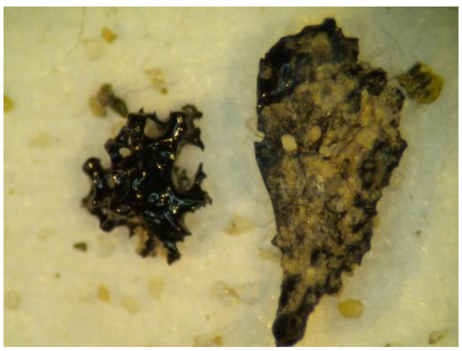


Photo 7154 – 1.0mm, The E.F. on the right has a pale, white mineral with many radiating pink/Cu-coloured wires.

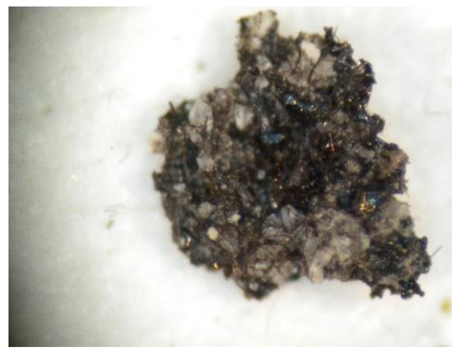


Photo 7194 – ~1.5mm, E.F. with (molten) quartz & many pink/Cu wires.

So, at 5 or 10x the temperature of the surface of the sun, and pressures beyond anything else in the mantle, this could melt and send (extrude) molten metal out of a mineralised rock to form 'wires' (these look just like native wire silver). Photo 7142 shows wires growing from the E.F. and a white (melted?) grain. Lightning can melt/shock silica (quartz)..

Photos 7195-7206 below are increased magnification of an E.F. (glassy black) mixed in with quartz (obviously molten from great heat) with many pink/Cu-coloured wires over much of the surface area. On Photo 7195, you can see one very long pink/Cu wire.

Photo 7195 – 3.1mm, Barr 26

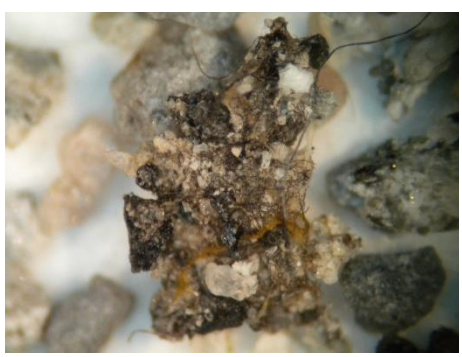


Photo 7196 – See Photo 7195

Photo 7197 – See Photo 7195


Photo 7198 – See Photo 7195

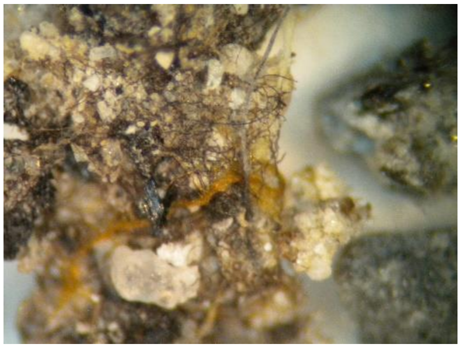


Photo 7199 – See Photo 7195


Photo 7200 – See Photo 7195


Photo 7201 – Barr 26

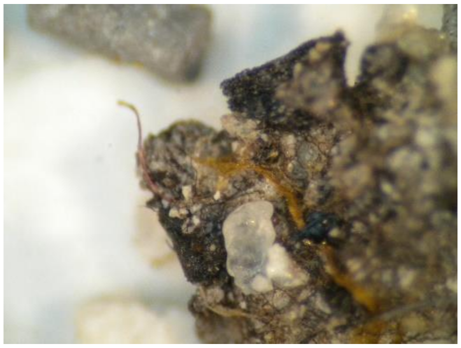


Photo 7202 – See Photo 7195


Photo 7203 – See Photo 7195

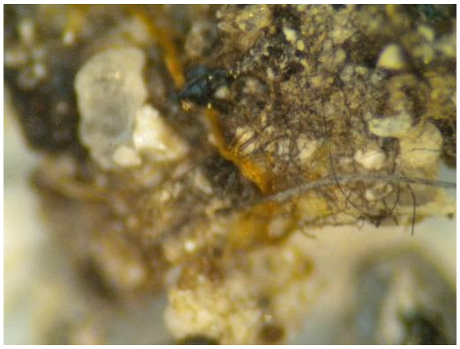


Photo 7204 – See Photo 7195


Photo 7205 – See Photo 7195


Photo 7206 – See Photo 7195

Fused Grains

Further evidence of lightning is from Barr 22, where large numbers of endogenic fulgurites were recovered, is the photo shown in the centre of the Cover Page photos, shown again below. This is an actual fused (as in 'welded' together by extreme heat) grain that appears to be quartz and GO (orange garnet), with two smaller grains to the upper left and right. These would require extremely high temperature/pressure to form.

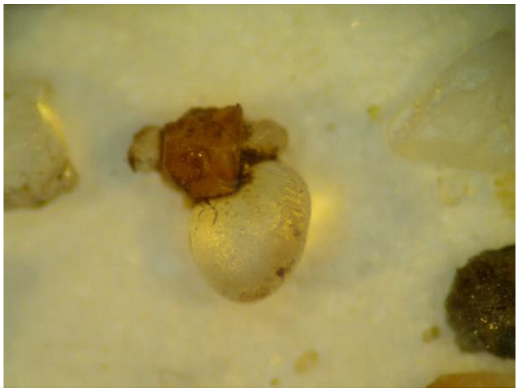


Photo 7169 - 0.8mm, Fused GO & Quartz, Barr 22

Bishop-Barr Diamond Claims / Area B – excerpts from OGS-OFR 6259 (Gao, C. 2012)

The following notes and charts on the next 11 pages (p 43 – 53), excerpts from OGS-OFR 6259 (Gao, C. 2012), relate to Area B. These detail the importance and quality of KIMs (kimberlite indicator minerals) & DIMs (diamond indicator minerals), found in 7 till samples on and near the south-central part of the Bishop-Barr Diamond Claims. Much of the OGS report centres on these 7 till samples taken at Barr Twp due to the phenomenal results of KIMs/DIMs and other metallics (gold, silver, etc.). In this report, it was concluded that the source of these minerals was an undiscovered pipe, probably diamondiferous.

"AREA B

Area B is located 5.5 km east of Mowat Landing on Municipal Road in the eastern part of Barr Township (see Figure 24 and Figure 2 for locations). After anomalous numbers of KIM grains were counted from a sample collected in 2007, this area was resampled to confirm this anomaly. Area B contains 7 samples within a radius of 250 m and all have anomalous concentrations of pyrope and chromite grains (see Figures 10, 13, 16 and Figure 2 for sample locations). The samples were collected from a noncalcareous stony to sandy till containing numerous argillite boulders, with a thickness of no greater than 2 m. Measurements of striae in the vicinity indicate an ice flow direction of 190° (Baker, Gao and Perttunen 2010). There were a dozen G3D, G4D and G5D garnets recovered from the heavy mineral concentrates, notably, from samples 08CG17, 19 and 18, as well as 07CG734, and, in addition, chromites in the diamond inclusion and intergrowth field are present in the latter 2 samples (see Tables 5, 6 and Figures 10, 13, 16). This suggests a source area or kimberlite pipe that contains diamond-bearing chromite harzburgitic peridotite and eclogite/pyroxenite.

The samples have a similar mineral composition dominated by pyrope garnets with a moderate level of ilmenite (see Figure 26). Their composition differs from the known kimberlite pipes 95-1 and 96-1, located about 8 km to the north in Lundy Township, where ilmenite predominates in the heavy mineral concentrates of the pipes (Contact Diamond Corporation 2003). Diamondiferous pipe 95-2, about 6 km to the north in the eastern part of Lundy Township, is rich in pyrope garnet but has limited ilmenite. It has a distinct dispersal feature and the till samples in the immediate down-ice direction have a mineral composition similar to that of this pipe (Contact Diamond Corporation 2003). The presence of moderate numbers of ilmenite grains suggests that the KIMs in the samples of Area B came from an unknown kimberlite pipe to the north.

[Peter Hubachek, PGeo (formerly with Sudbury Contact] and I, Tony Bishop, have discussed the 95-2 pipe and concluded that due to the great depth under lake sediments (150'-160'), it's unlikely the KIMs came to surface. That combined with the distance from Area B along with the OGS determination all agree that the grains from Area B are unique. This is further verified by a number of studies. See p 25-27 of this report.]

The similar KIM composition among these closely clustered samples suggests a single source or kimberlite pipe. The geochemical data reflect the nature of this unknown kimberlite pipe (Figures 29 to 32). On the binary plot of CaO vs. Cr_2O_3, more than 20 grains are tightly clustered together in the G10 field (Figure 29). Because all of them are from a single sample (08CG-18), they probably result from the break up of a single large garnet or a single piece of xenolith. The ilmenite grains, in general, have low concentrations of Cr_2O_3 (less than 0.8 weight %) (Figure 30), but exhibit compositional ranges of the ilmenite grains in the regional samples (see Figure 17). Abundant chromites exist in the samples in Area B, but only a small portion of them were analyzed. The scatter plots (Figures 31, 32) show several grains within or bordering the diamond inclusion and intergrowth field, further suggesting a diamondiferous source rock."
(Gao, C. 2012, p 35-36).

Area B

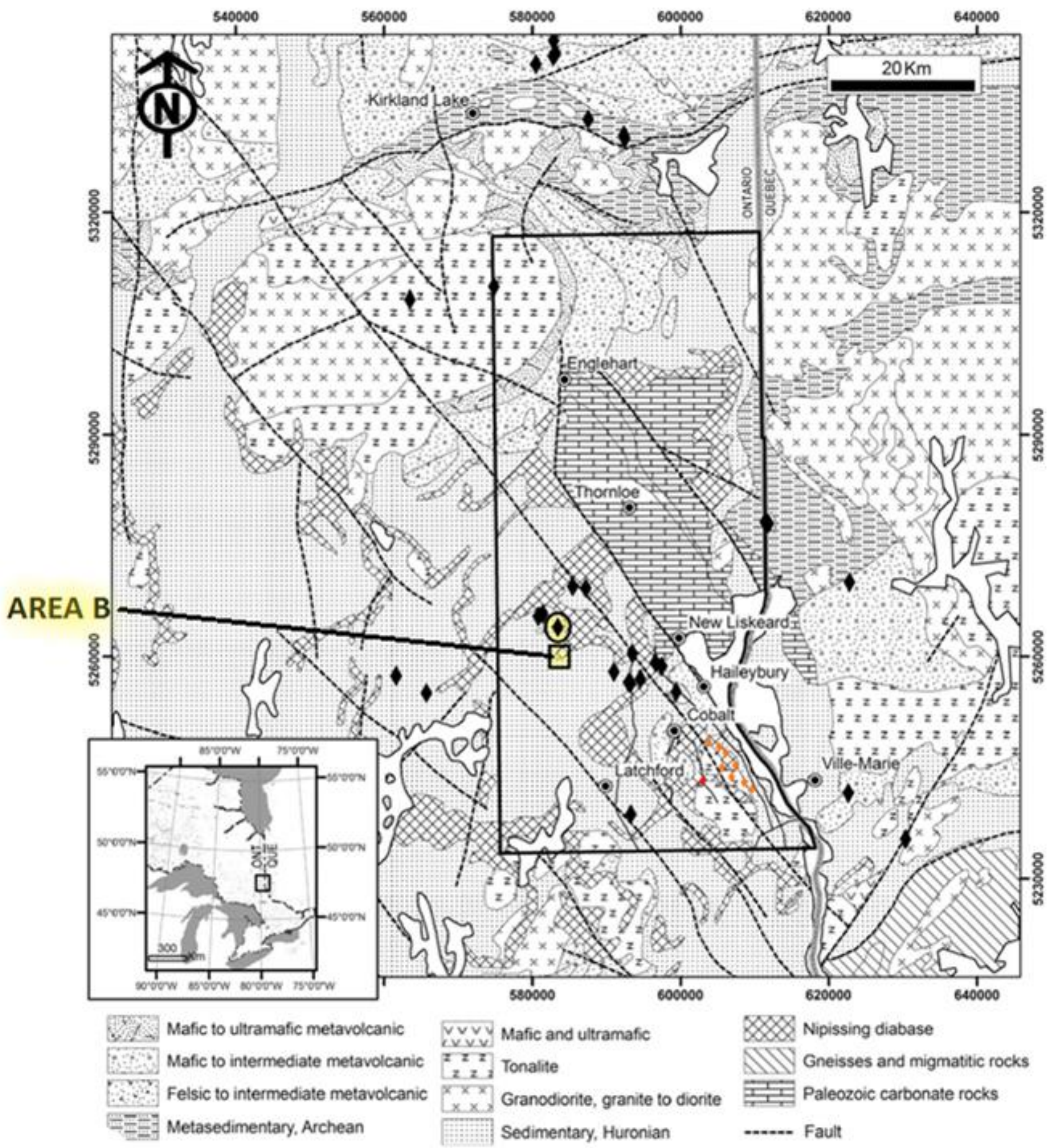


Figure 1. Location map and bedrock geology of the study area (*after* OGS 1991).

95-2 Pipe

Bishop-Barr Diamond Claims / Area B

Approximate location of 8 Lorrain Twp Kimberlites (Bishop-Nipissing Claims)

Approximate location of Kon Kimberlite

Figure 1 from OGS-OFR 6259 (Gao, C. 2012, p 2). Approximate locations of Lorrain Twp Kimberlites (Bishop-Nipissing Claims) and Kon Kimberlite have been labelled and highlighted. Approximate locations of 95-2 Pipe and Area B & Bishop-Barr Claims have also been highlighted.

Quotes pertinent to this report from OGS-OFR 6259 (Gao, C. 2012).

Pg 1: **Introduction**

> *"Till deposits at the base of ice sheets contain rock fragments and minerals that are closely related to and, generally, not far from their source areas in the up-ice direction."*

Pg 3: **Quaternary Geology**

> *"The regional ice flows, as indicated by striae, exhibit a south-southwest (180 to 220°) direction which later changes to the south-southeast (130 to 170°) (McClenaghan and Veillette 2001; Baker, Gao and Perttunen 2010; Gao 2010a, 2010b). There is little evidence to suggest that the cross striations are associated with more than one major ice advance during the Late Wisconsin in this region (Baker, Gao and Perttunen 2010; Gao 2010a, 2010b). They probably resulted from the same ice mass that deposited the Matheson Till but were subjected to a change in the general flow direction from the south-southwest to the southeast (Veillette 1986)."*

Pg 35: **Area B**

> *"The samples were collected from a noncalcareous stony to sandy till containing numerous argillite boulders, with a thickness of no greater than 2 m."*

This helps determine that the 7 amazing till samples, 07CG-734, 08CG-15, 08CG-16, 08CG-17, 08CG-18, 08CG-19, & 08CG-24 are proximal to the source 'kimberlite'. As well, Figure 27 also demonstrates that these samples are from a unique kimberlite source.

Pg 10: **Kimberlite Indicator Minerals**

> *"The most important source rocks for diamonds are peridotite and certain eclogitic rocks in the upper mantle. Harzburgite, lherzolite and wehrlite are the most common types of peridotite. Garnet harzburgite is the dominant source for diamonds, followed by chromite harzburgite and lherzolite."*

This conclusion is based on a worldwide (mostly African) model for garnet harzburgite, but the very high value diamonds in the Victor pipe kimberlite have essentially no G10s and the diamond population is represented by G9 lherzolite. See Victor and other graphs of G10, etc. populations, Graphs A & B, p 54

Pg 13: **Discussion of KIM Results**

> *"The presence of G10D, G5D, G4D and G3D garnets, as well as chromites in the diamond inclusions and intergrowth field suggests a high potential of the source rocks or kimberlite pipes for diamonds."*

For the OGS-OFR 6259, 1270 garnets were microprobed from the 7 till samples in Area B (I didn't count the number of Cr Diopsides, ilmenites, chromites, or forsterite olivines, but the numbers appeared similar in numbers of the garnets.

The results for garnets, ilmenites, and chromites indicate a diamondiferous source of KIMs.

Area B

Table 5. Geochemistry (in weight %) of diamondiferous G10D, G5D, G4D and G3D garnets (*after* Grütter et al. 2004).

Sample	Grain Label	SiO_2	TiO_2	Al_2O_3	V_2O_3	Cr_2O_3	MgO	CaO	MnO	FeO*	Na_2O	K_2O	Total	Classification
07CG-734	07CG-734-107	40.596	0.688	22.266	0.027	0.062	14.426	8.838	0.261	12.398	0.158	0.000	99.72	G3D
08CG-17	08CG-17-249	39.535	0.157	22.266	0.008	0.058	10.544	6.936	0.434	19.948	0.072	0.000	99.96	G3D
08CG-17	08CG-17-269	39.586	0.142	22.354	0.013	0.064	10.739	6.996	0.440	19.989	0.071	0.001	100.39	G3D
08CG-17	08CG-17-272	39.850	0.149	22.302	0.018	0.041	10.593	7.009	0.433	20.053	0.071	0.000	100.52	G3D
08CG-17	08CG-17-200	41.334	0.578	22.355	0.030	0.215	18.575	4.531	0.421	11.761	0.075	0.000	99.88	G4D
08CG-17	08CG-17-235	41.569	0.584	22.401	0.039	0.243	18.638	4.710	0.439	11.968	0.085	0.000	100.67	G4D
08CG-17	08CG-17-240	41.543	0.471	22.797	0.033	0.151	18.845	3.982	0.446	11.613	0.075	0.000	99.96	G4D
08CG-18	08CG-18-136	41.819	0.343	20.637	0.031	3.369	20.308	4.927	0.404	8.247	0.084	0.017	100.19	G5D
08CG-19	08CG-19-105	40.182	0.584	22.484	0.021	0.060	12.662	7.771	0.346	16.110	0.168	0.000	100.39	G3D
08CG-19	08CG-19-108	40.389	0.382	22.490	0.016	0.226	12.267	8.670	0.305	15.509	0.116	0.000	100.37	G3D
08CG-19	08CG-19-132	40.428	0.563	22.364	0.020	0.055	12.614	7.763	0.347	16.193	0.161	0.000	100.51	G3D
08CG-19	08CG-19-112	42.052	0.545	22.340	0.041	0.321	19.269	4.497	0.395	11.261	0.079	0.000	100.80	G4D

Excerpt of Barr Twp. Samples from Table 5, Geochemistry (in weight %) of diamondiferous G10D, G5D, G4D and G3D garnets (*after* Grütter et al. 2004)., from OGS-OFR 6259 (Gao, C. 2012, p 15).

Area B

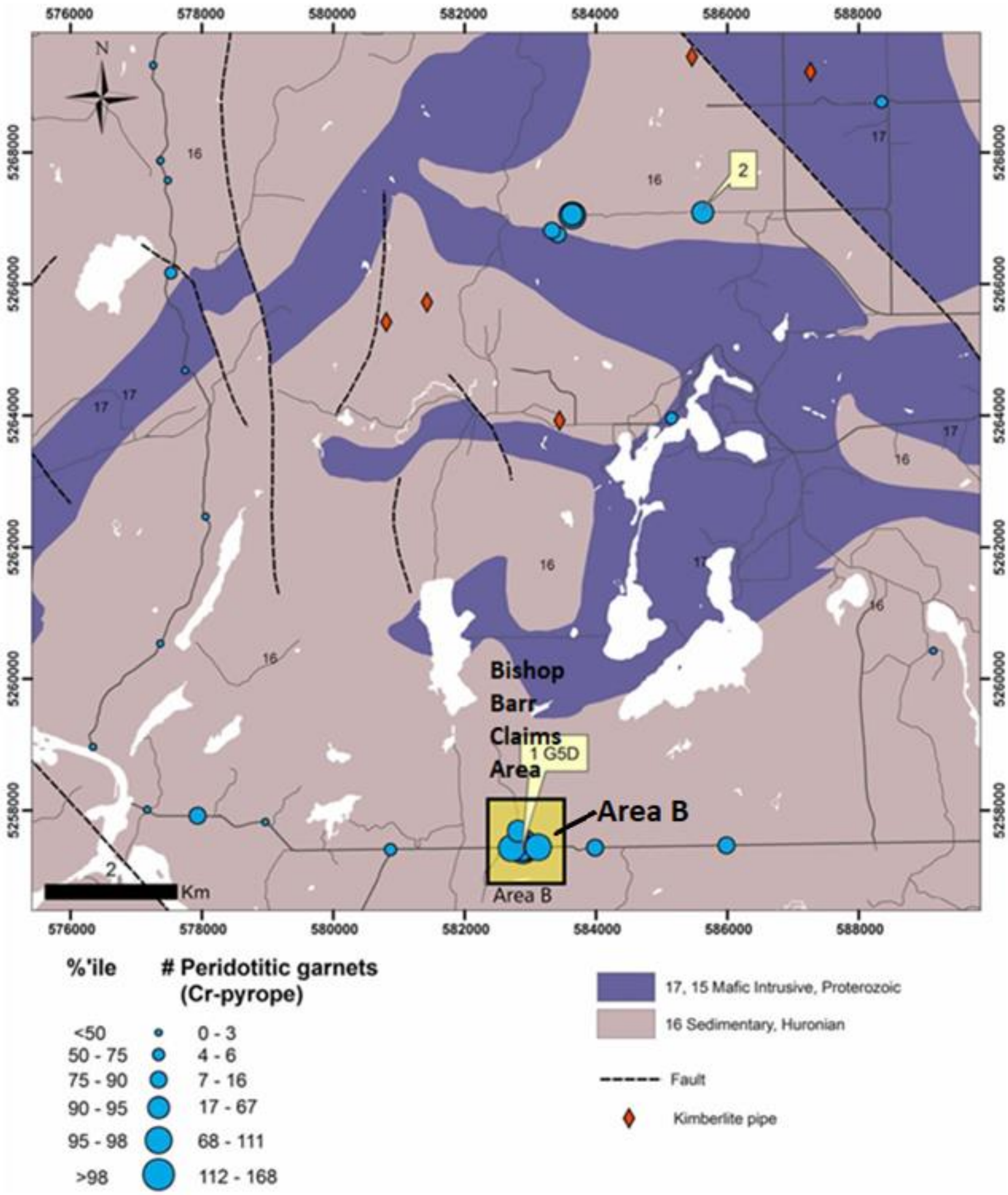


Figure 10. Enlarged view of regional distribution of peridotitic garnet grains in the western part of the New Liskeard area (*see* Figure 8 for location). Annotation with numbers indicates G10D garnets unless it is specified, e.g., '1 G5D' indicative of 1 G5D garnet.

Figure 10 from OGS-OFR 6259 (Gao, C. 2012, p 20). Area B has been highlighted along with a label showing the general location of the Bishop-Barr Claims. Note that the 7 Barr samples are in Area B.

Area B

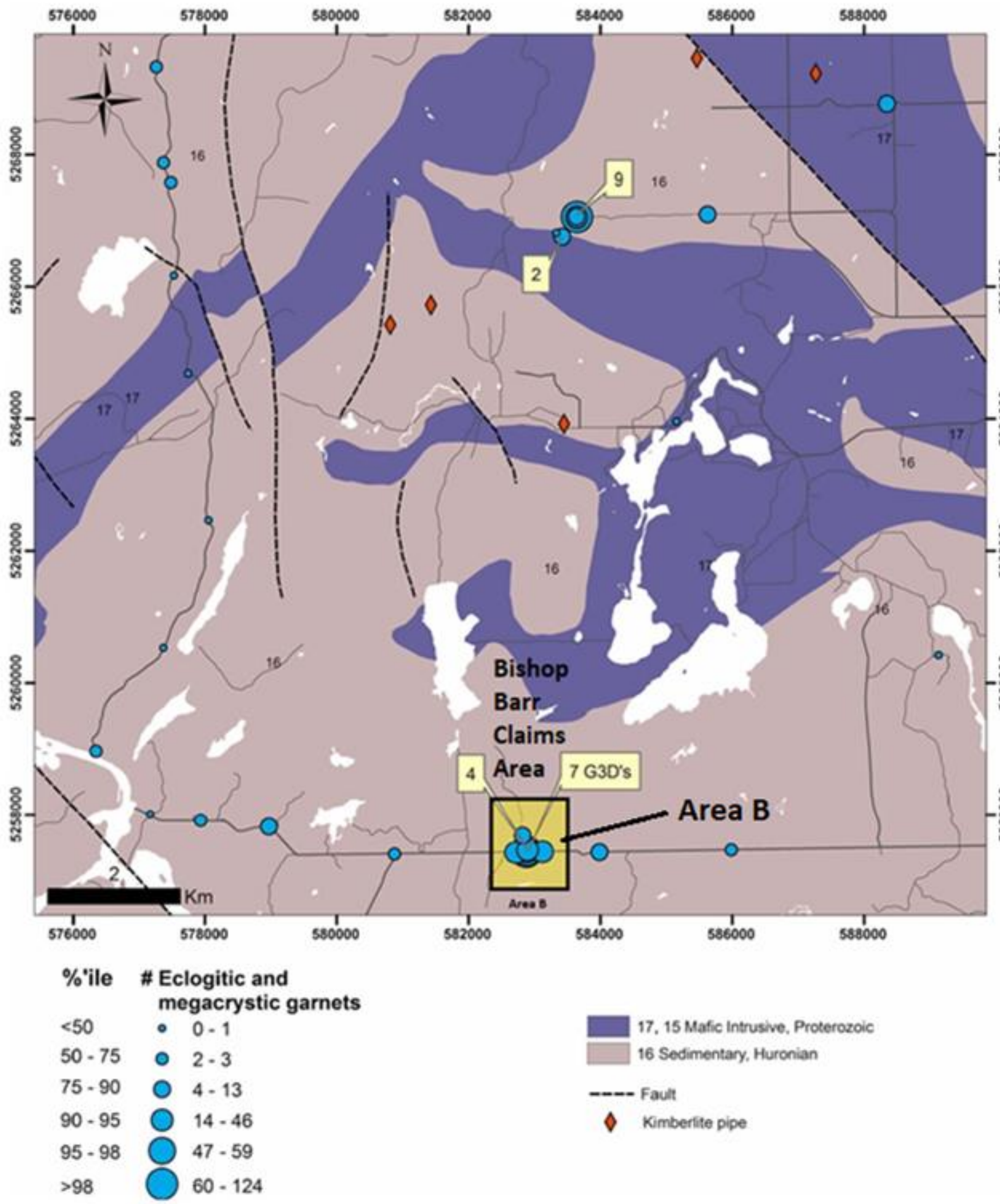


Figure 13. Enlarged view of regional distribution of eclogitic and megacrystic garnet grains in the western part of the New Liskeard area (*see* Figure 11 for location). Annotation with numbers indicates G4D garnets unless it is specified, e.g., '7 G3D's' indicative of 7 G3D garnets.

Figure 13 from OGS-OFR 6259 (Gao, C. 2012, p 23). Area B has been highlighted along with a label showing the general location of the Bishop-Barr Claims.

Area B

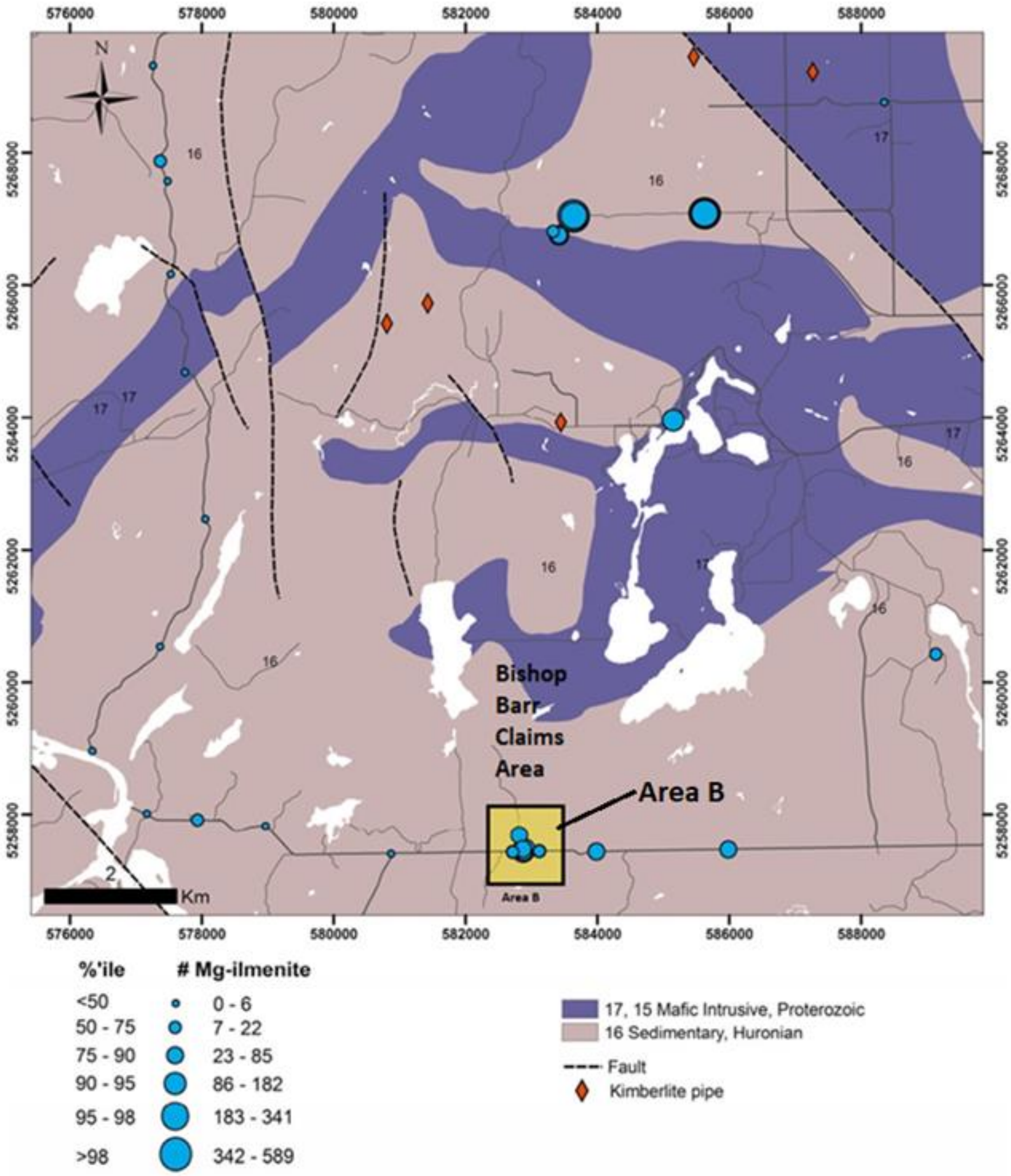


Figure 20. Enlarged view of regional distribution of Mg-ilmenite grains in the western part of the New Liskeard area (*see* Figure 18 for location).

Figure 20 from OGS-OFR 6259 (Gao, C. 2012, p 31). Area B has been highlighted along with a label showing the general location of the Bishop-Barr Claims.

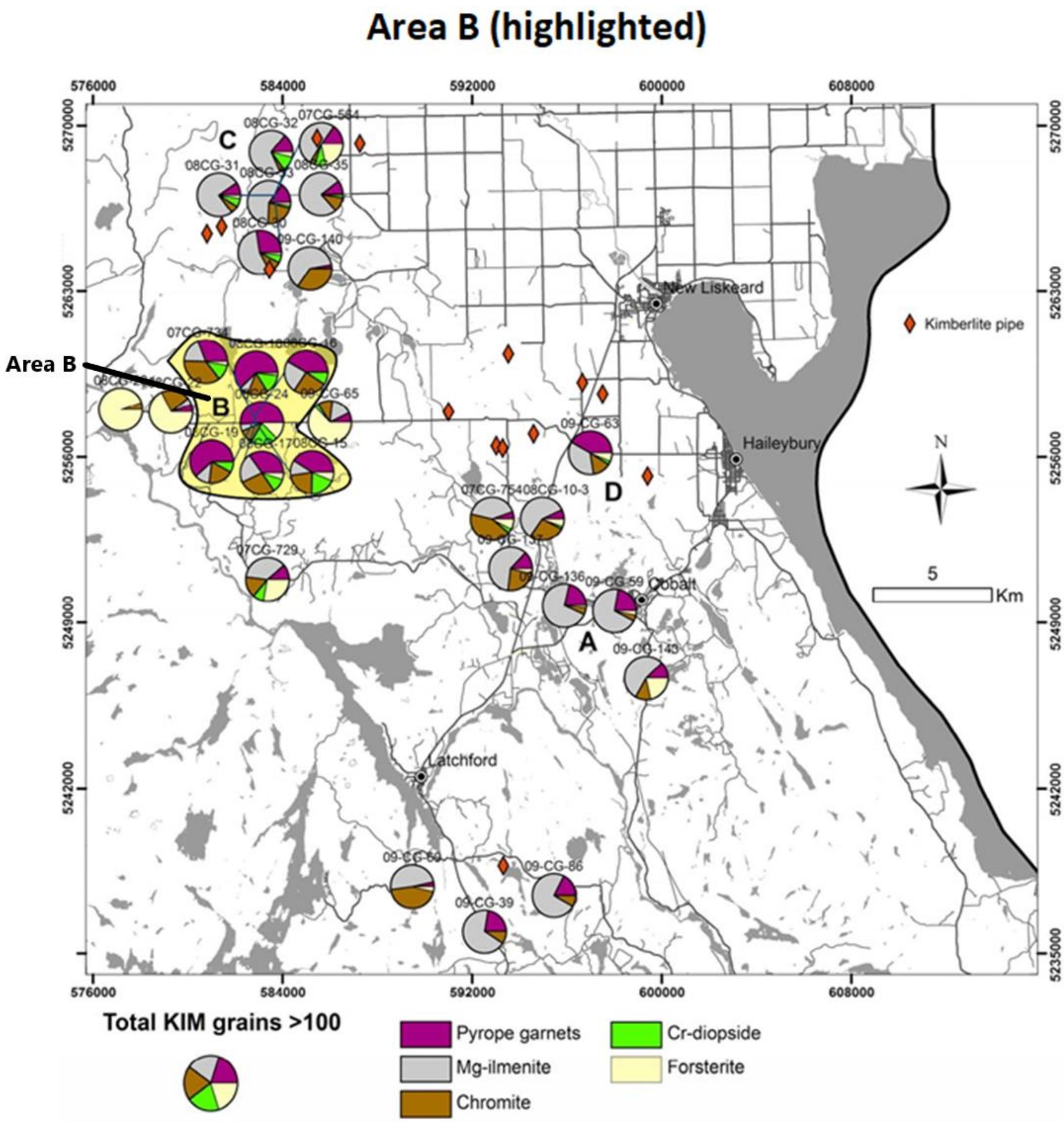


Figure 26. Enlarged view of regional distribution of samples containing more than 100 KIM grains, with pie charts showing mineral compositions in the Cobalt area.

Figure 26 from OGS-OFR 6259 (Gao, C. 2012, p 43). The 7 Barr till samples have been highlighted.

Area B

Table 9. Samples containing more than 100 KIM grains (0.25-2.0 mm) based on adjusted KIM counts (*see* Appendix 9).

Sample	GP	GO	DC	IM	CR	FO	Total	Low-Cr diopside
07CG-734	113	41	59	93	179	13	499	20
08CG-17	98	72	53	109	134	23	489	31
08CG-15	131	58	88	53	103	29	462	50
08CG-18	168	55	52	25	53	6	359	28
08CG-24	92	44	54	15	28	34	267	49
08CG-16	32	13	10	26	27	1	109	18

Excerpt from Table 9 from OGS-OFR 6259 (Gao, C. 2012, p 39). All 6 are from Barr Area B.

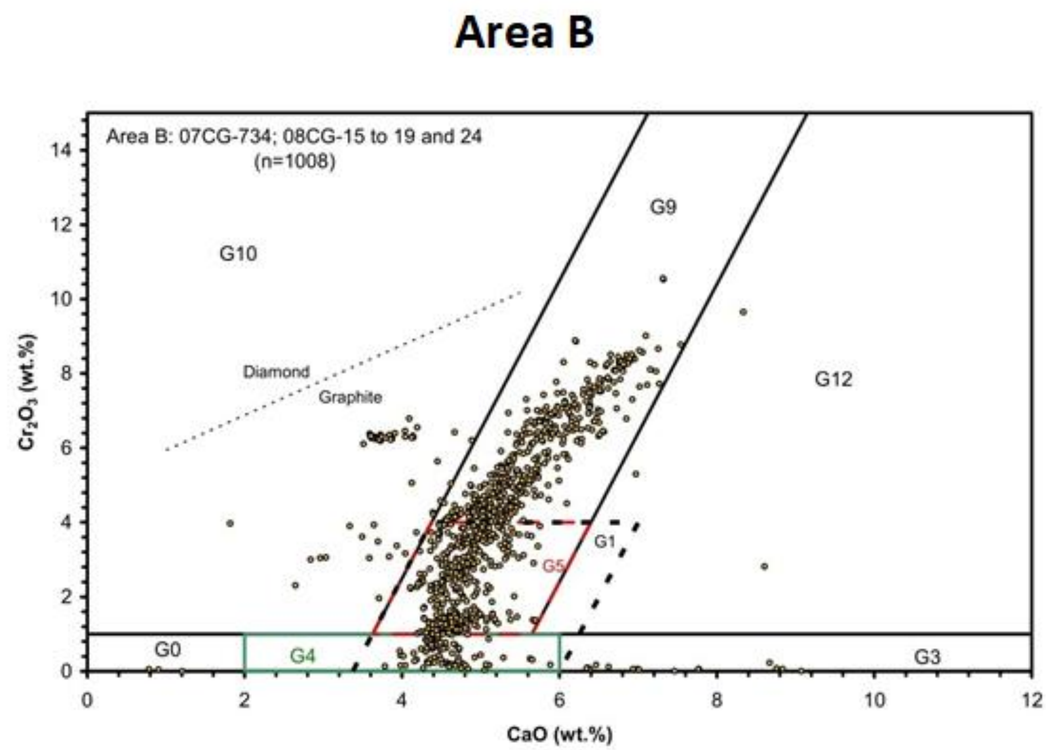


Figure 29. CaO versus Cr_2O_3 binary plot of pyrope garnets recovered from samples 07CG-734, 08CG-15 to 19 and 24 in Area B (*after* Grütter et al. 2004).

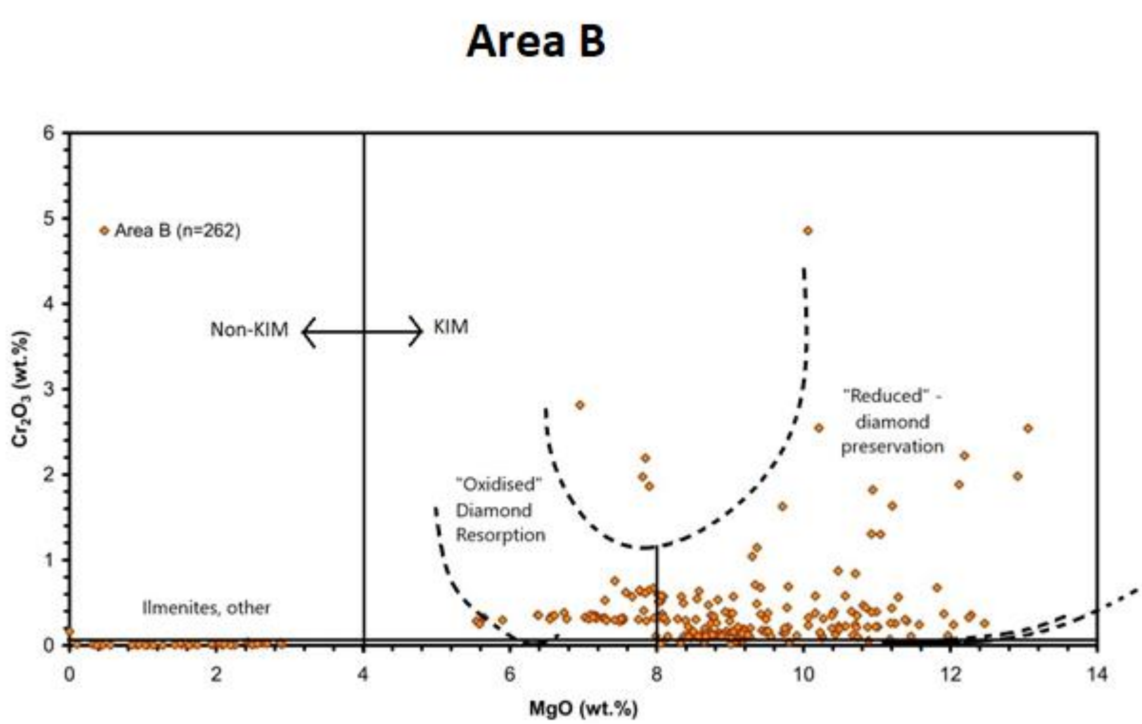


Figure 30. MgO versus Cr_2O_3 binary plot of ilmenite grains recovered from samples 07CG-734, 08CG-15 to 19 and 24 (Area B).

Figures 29 & 30 from OGS-OFR 6259 (Gao, C. 2012, p45). Additional lines and labels added to Figure 30.

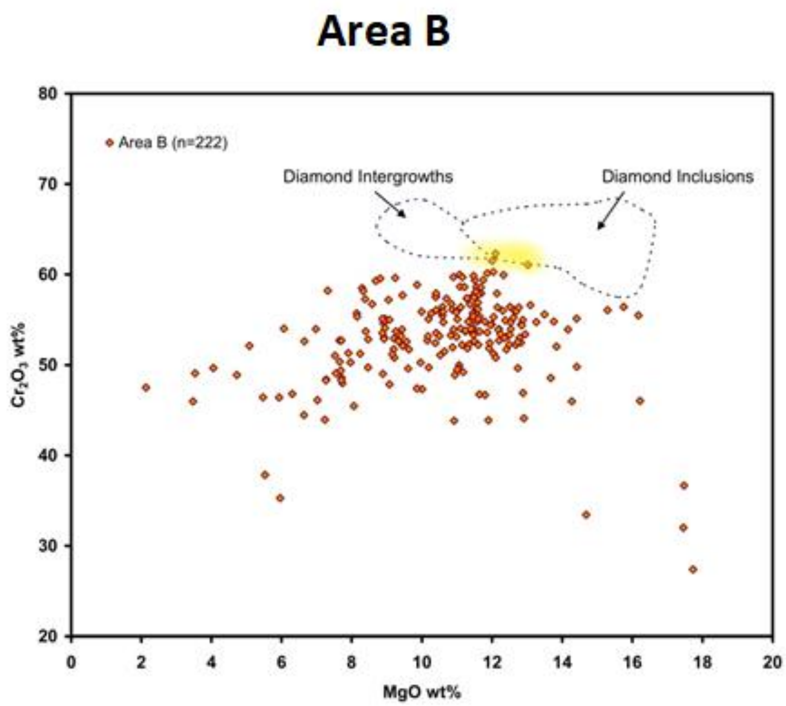


Figure 31. MgO versus Cr_2O_3 binary plot of chromite grains recovered from samples 07CG-734, 08CG-15 to 19 and 24 in Area B (*after* Fipke et al. 1995).

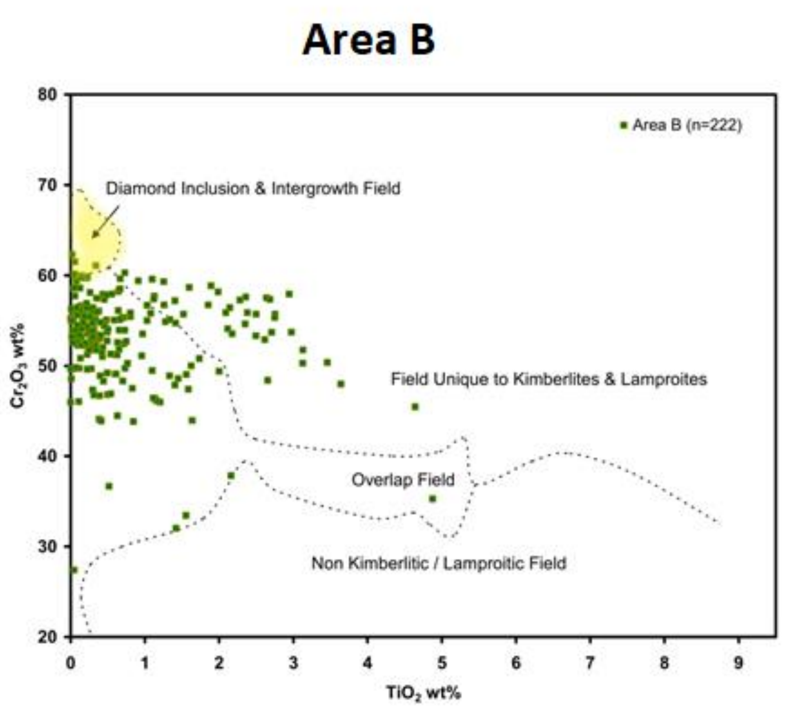


Figure 32. TiO_2 versus Cr_2O_3 binary plot of chromite grains recovered from samples 07CG-734, 08CG-15 to 19 and 24 in Area B (*after* Fipke et al. 1995).

Figures 31 & 32 from OGS-OFR 6259 (Gao, C. 2012, p 46). Highlighted areas added in.

Graph A below is the plot of garnets from Barr Twp - Area B. Graph B is an overlay of Victor Diamond Inclusion garnets over Graph A.

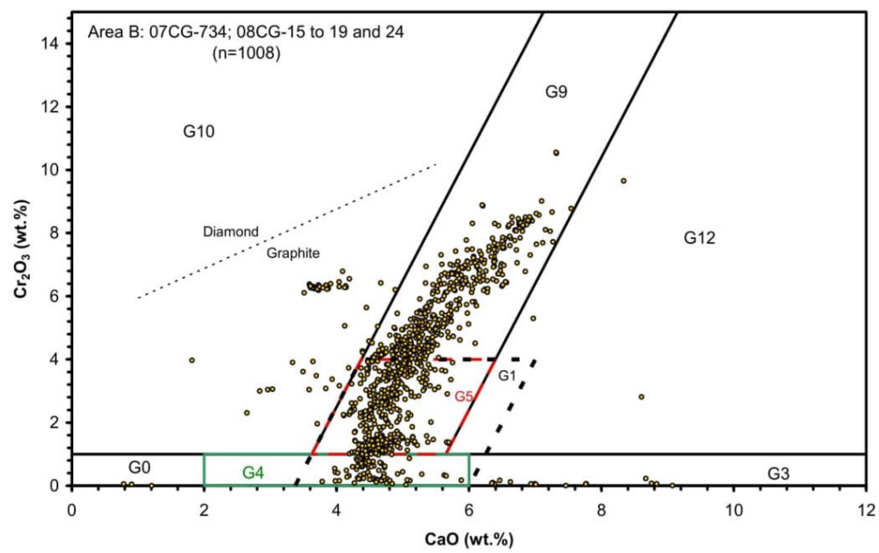
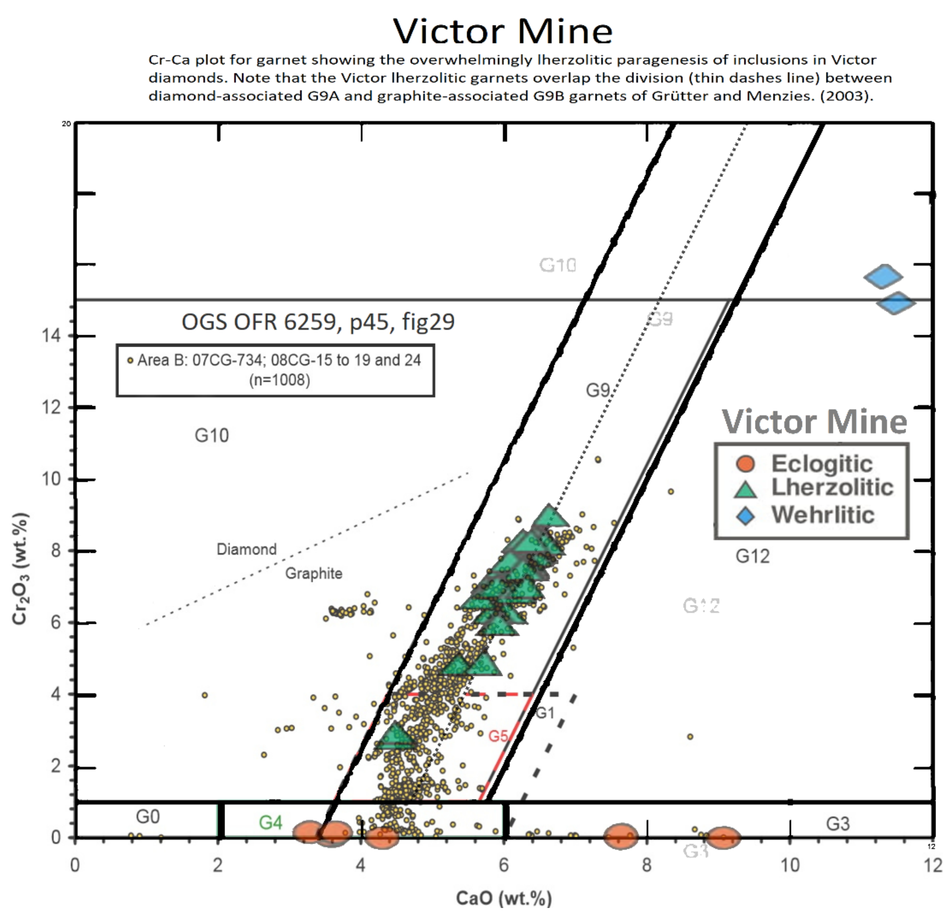


Figure 29. CaO versus Cr_2O_3 binary plot of pyrope garnets recovered from samples 07CG-734, 08CG-15 to 19 and 24 in Area B (*after* Grütter et al. 2004).

Graph A: Figure 29 from OGS-OFR 6259 (Gao, C. 2012, p 45)



Graph B: Victor Mine Diamond Inclusion plot (from Stachel et al, 2017. Figure 3 p2), overlaying OGS-OFR 6259 Barr Twp KIMs/DIMs (Gao, C. 2012)

Appendix Overview:

Appendix 1: Traverse Reports

- Traverse 1, July 22, 2020 with Graeme Bishop & Patrick Harrington.
- Traverse 2, July 23, 2020 with Graeme Bishop & Patrick Harrington.
- Traverse 3, August 15, 2020 with Graeme Bishop & Nathan Pullen.
- Traverse 4, September 21, 2021 with Tony Bishop & Graeme Bishop.

Appendix 2: Maps

- Map 3: Claim Locations
- Map 4: Road Access
- Map 5: Kimberlite Diamond Occurrences and Bishop Claim Blocks
- Map 6: Map of sample site locations from OGS-OFR 6259 (Gao, C. 2012. Figure 2)

Appendix 3: Geology

- On the Location and Bedrock Geology of the Bishop Claim-block Area
- On the Structural Geology of the Bishop Claim-block Area
- On the Quaternary Geology of the Bishop Claim-block Area
- On Preliminary Results from Bishop Claim-block sampling 2020-2021: Gold, Copper, Sulphides, Silver
- On Preliminary Results from Bishop Claim-block sampling 2020-2021: Coated and Weird Black Grains
- Relevant Maps

Appendix 4: Grain & Microscopy Notes with Microscope Photos

Appendix 5: Methodologies for Field Work and Till Sample Processing

- Preface
- Methodology for Processing Till Samples
- Sluice Efficiency Test Results
- Cost Breakdown Chart for Concentrating and Retrieving KIMs, Micropicking, & Microphotography
- Equipment Photos
- Equipment List

Appendix 6: Excerpts from Bishop Grassy Lake Report (Bishop, B.A. 2018b)

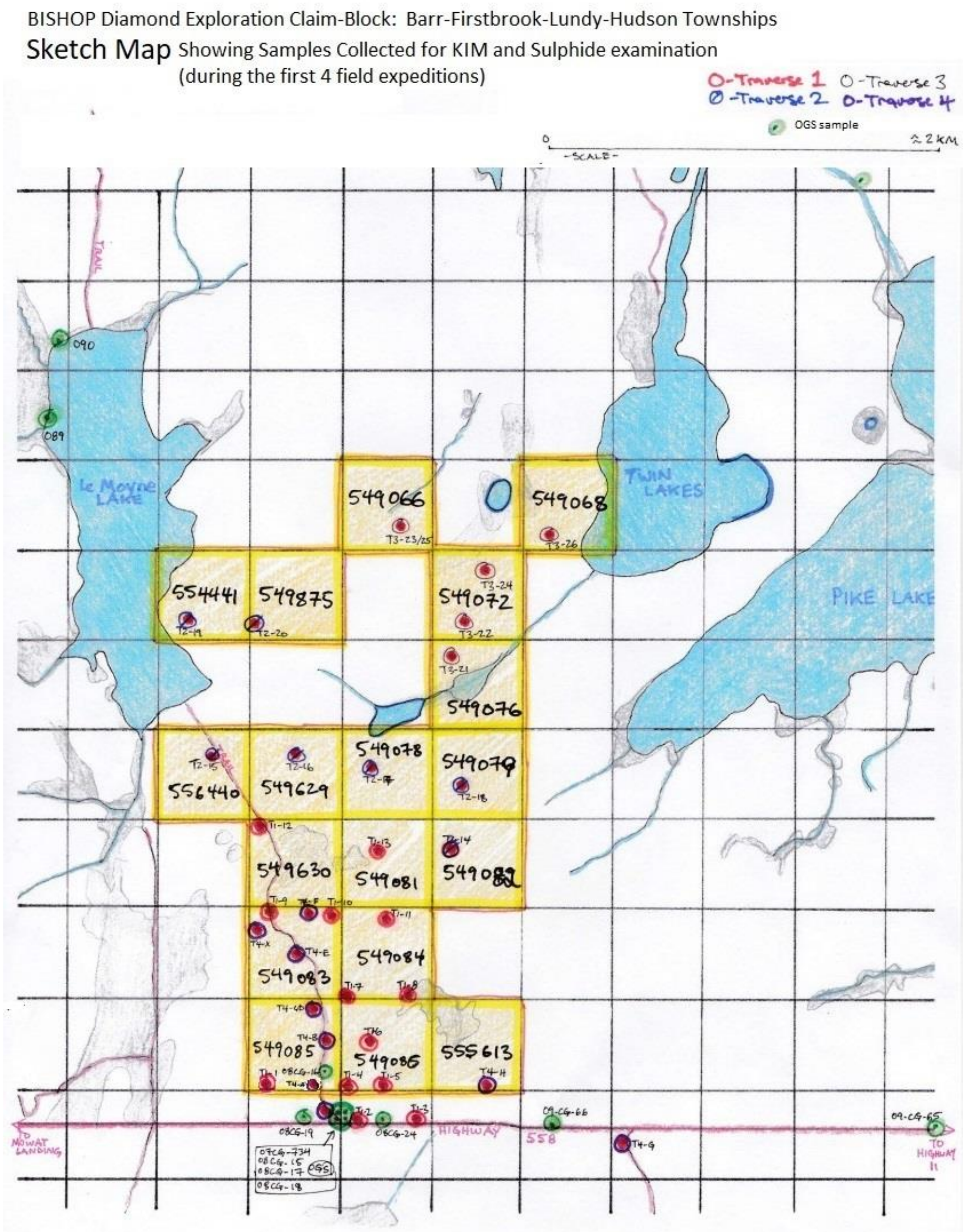
Appendix 7: Kimberlite Diamond Table, excerpt from Gary Grabowski (2013)

Appendix 1: Traverse Reports for Sampling 2020-2021;
BISHOP Diamond Exploration Claim-Block: Barr-Firstbrook-Lundy-Hudson Townships

- Prepared and written by Graeme Bishop, March 13, 2022

ORIGINAL WORK PLAN FOR CLAIM-BLOCK MADE BY TONY BISHOP

<u>(Note on sample-number nomenclature</u>: during traverses and initial logging, samples were named T1-x during first traverse, T2-x during second traverse, T3-x during third traverse, and T4-x during fourth traverse. This system was used for initial organizational purposes. All samples were renamed 'Barr-x' and throughout the rest of the Report, samples are referred to using the 'Barr-x' nomenclature.)



Traverse 1: July 22, 2020 Graeme Bishop, Patrick Harrington

After staking a block of claims immediately north of Highway 558 in Firstbrook and Barr township, Tony Bishop designed a sampling outline to further investigate for the origin of extremely good KIM results collected by the OGS and reported in their 2012 OFR. I picked my helper up in Kirkland Lake at 7 AM and we headed south on Highway 11, until turning due west toward Mowat Landing on Highway 558, and arrived at the OGS sample location by checking the easting reading on a GPS. The OGS samples were collected very near to a rocky trail that leads to Le Moyne Lake, north of Highway 558. We parked the truck about thirty feet north of the highway on this trail at 0582861 E/5257476 N (a small all-terrain vehicle or motor-bike could traverse the rest of the trail to Le Moyne Lake, but even with a small bush-truck, the rest of the trail is rocky and would be difficult). Patrick Harrington ("Mookie") and I had been working together for much of the previous summer conducting a KIM sampling program for RJK Explorations Ltd. in Lorrain Township, and we were accustomed to working together in the bush. As such, and because we had a multi-day sampling plan to work on, as directed by Tony Bishop, we had decided before leaving town that we would separate and each collect samples before meeting up again at the end of the day. We brought medium-wattage walkie-talkies with us in case we needed to communicate during the day. Before heading north into the claims, I collected sample T1-1 on claim west of the OGS samples, just north of the highway, while Mookie collected sample T1-3 off-claim east of the OGS samples, just north of the highway. I tried to collect a good sample T1-2 off-claim just north of the highway, very near to where the excellent OGS samples were taken, but encountered many feet of black cedar-muck, and probably did not get a representative sample: an auger would be needed to penetrate to the sampling strata. We tossed these three samples in the truck to lose the weight, and after making a plan to check in at 11 AM with the walkie-talkies, I headed north, and Mookie headed east from the truck park to start collecting the on-claim samples. Both the ground and the forest in Barr and Firstbrook Townships have a completely different feel than the ground and the bush in Lorrain Township; the Lorrain claims had seen recent forestry practices and the logging roads were about a decade old- the Lorrain bush was mostly swamp and re-growth, i.e. 'dirty bush' to walk in. In Barr and Firstbrook, however, the forest is quite mature, and there are many large trees, influencing a lighter undergrowth and easier traverse in well drained areas. The trail to Le Moyne Lake, which I used as a traverse-conduit to branch out from while sampling, was underlain by locally-derived rocky cobble-till composed mostly of a range of size of angular cobbles of Gowganda formation. I headed north to collect samples T1-9 through T1-13, while Mookie branched east from the truck-park to collect samples T1-4 through T1-8. Samples T1-9 and T1-10 required several attempts before a good sample was collected, owing to the rocky ground. Sample T1-11 encountered good mixed till and was collected in one attempt. Traversing north from T1-11 to T1-13, I hiked into a swampy area and had to try several holes before collecting sample T1-13, due to black muck. I headed west toward the trail to collect my final sample for the day, T1-12, which was a good hole. Mookie and I had tried our radio-test earlier, and found patchy results, probably owing to the low-relief but hummocky-ground. We met up again at around 2 PM on the trail, about a half kilometer north of the truck, after he had finished collecting sample T1-7, and Mookie reported that the ground he had been sampling was also very cobble-dense and all holes had been tried multiple times before a good sample hole could be made. We headed back to the truck and organized our samples and notes. Working with Tony Bishop's sample outline, we made sure to note the true coordinates of samples collected, which were sometimes off by up to 5 meters from the plan. We had collected 13 samples for investigation, with 11 of the samples being on-claim. We left and got a bite to eat in New Liskeard before heading home. We arrived back in Kirkland Lake around 5 PM.

Traverse 1: field notes July 22, 2020 Graeme Bishop, Patrick Harrington

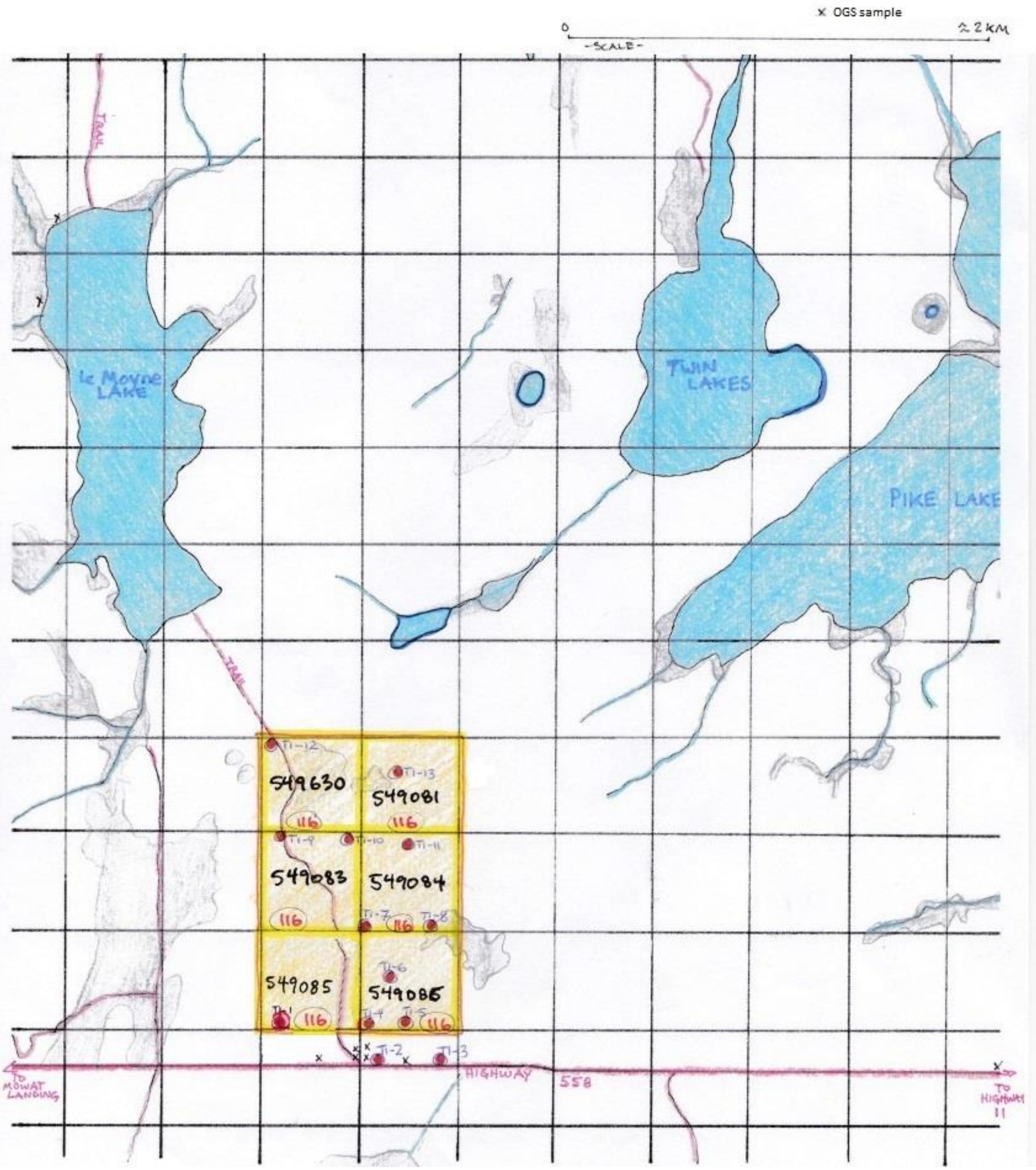
Sample #	**Coordinates 17T UTM**	**Claim ID**	**Activity/Description**
T1- 1	0582472 E 5257622 N	549085	Till sampling for KIMs and sulphides
T1- 2	0582996 E 5257472 N	(off-claim)	Till sampling for KIMs and sulphides
T1- 3	0583303 E 5257479 N	(off-claim)	Till sampling for KIMs and sulphides
T1- 4	0582932 E 5257648 N	549086	Till sampling for KIMs and sulphides
T1- 5	0583126 E 5257657 N	549086	Till sampling for KIMs and sulphides
T1- 6	0583039 E 5257875 N	549086	Till sampling for KIMs and sulphides
T1- 7	0582925 E 5258094 N	549084	Till sampling for KIMs and sulphides
T1- 8	0583220 E 5258106 N	549084	Till sampling for KIMs and sulphides
T1- 9	0582538 E 5258509 N	549083	Till sampling for KIMs and sulphides
T1- 10	0582849 E 5258504 N	549083	Till sampling for KIMs and sulphides
T1- 11	0583117 E 5258504 N	549084	Till sampling for KIMs and sulphides
T1- 12	0582480 E 5258963 N	549630	Till sampling for KIMs and sulphides
T1- 13	0583070 E 5258852 N	549081	Till sampling for KIMs and sulphides

BISHOP Diamond Exploration Claim-Block: Barr-Firstbrook-Lundy-Hudson Townships

Sketch Map for Traverse 1 - July 22, 2020

Samples collected in claims: 549630, 549081, 549083, 549084, 549086

Graeme Bishop, Mike Harrington



Traverse 2: July 23, 2020 Graeme Bishop, Patrick Harrington

I picked Patrick Harrington ("Mookie") up at 7:30 AM the day after Traverse 1, and we headed back to Tony Bishop's Barr-Firstbrook claim-block to continue the sampling program we had initiated the day before. On the drive south, we discussed the work plan for the day. We would again split and work separately once in the bush and each collect samples, and agreed to give the walkie-talkies another try, since I would be moving into higher ground for some of my sampling, and the reception might be better. Because we had not explored further north in the claim block but had oriented ourselves with Google-Earth and MLAS, we were not sure how many samples we would be able to collect due to topographic restraints but decided to split the work in a similar way as the day before. I would head north, into the high ground that bordered Le Moyne Lake's east side, and Mookie would head east from the trail, north of the swampy area which was approximately a kilometer down-ice of a topographically identified potential kimberlite target. We parked the truck in the same spot just north of the highway and headed north on the trail for about a kilometer before hiking our separate ways. Mookie cut east from the trail to collect T2-16, T2-17, T2-18, and T2-14, while I took sample T2-15 just west of the trail in a dense cedar-balsam nightmare. I left T2-15 on the trail to pick up on my way back and headed north to the south shore of Le Moyne Lake, where the trail ended. Just before reaching the lake, the trail intersected an open rocky creek area whose drainage was confused, coming mostly from the higher ground to the east. Further toward the lake there was an old aluminum boat cached in the bushy flat ground about fifty feet from the lake shore, and some evidence that every year or two recently, visitors had used this trail to spend time on the lake. My next sample was T2-19, on the west facing lee of the hill which shored Le Moyne Lake's east side. I made my way along the fringe of the east shore, which was composed mostly of angular boulders and cobbles of Nipissing diabase and Huronian sediments- difficult to identify unless you chip them; due to environmental weathering, the shore material looked very homogenous (faint lamination or angular qualities were the only clues for the Huronian sediments). I reached sample site for T2-19 after a difficult walk- retrospectively (and knowing the general spot better now)- I would travel up the higher ground and then come down to the lake next time, instead of going along inland near the lake shore. I crossed two animal-paths, open and recently used (beaver most likely, but evidence for bears having bedded along one) which led from higher ground directly toward the lake on the way to T2-19. Collected a good sample in an area of mostly level ground, with six inches of rootmass/soil, then brown mixed till. The bush was very dense with groundcover. I stopped for lunch, then headed up the hill due east toward sample T2-20. The hill which rises east from Le Moyne Lake rises steeply and bedrock outcrop with patchy bush is extensive along the high ground. I radioed Mookie from the top and after he dug the radio out of his backpack, we had intermittently clear radio contact. He had collected samples T2-16, T2-17, and just finished T2-18, in cobbly-till and mostly high ground. Mookie reported the ground required trying several times before getting a good place to sample. We agreed to collect one more sample each and then meet up to head out to the truck. I found a good spot between rock exposures on top of the big hill, which is quite wide and wooded with mixed forest including many hardwoods and collected sample T2-20. I angled south-west down the hill, trying to find the easiest route back to the trail at the shore of Le Moyne Lake. The view to the west from the top of the hill was very nice. On the way down the outcropping at times seemed to make a terrace that had the false appearance of once having been a road, but the bush was quite thick during the descent. Returning to where I had earlier left sample T2-15, I collected it and had a drink of water before hearing Mookie further south down the trail. We exited the bush together and headed home, having collected 7 samples on claim. It was a long day in the bush.

Traverse 2: field notes July 23, 2020 Graeme Bishop, Patrick Harrington

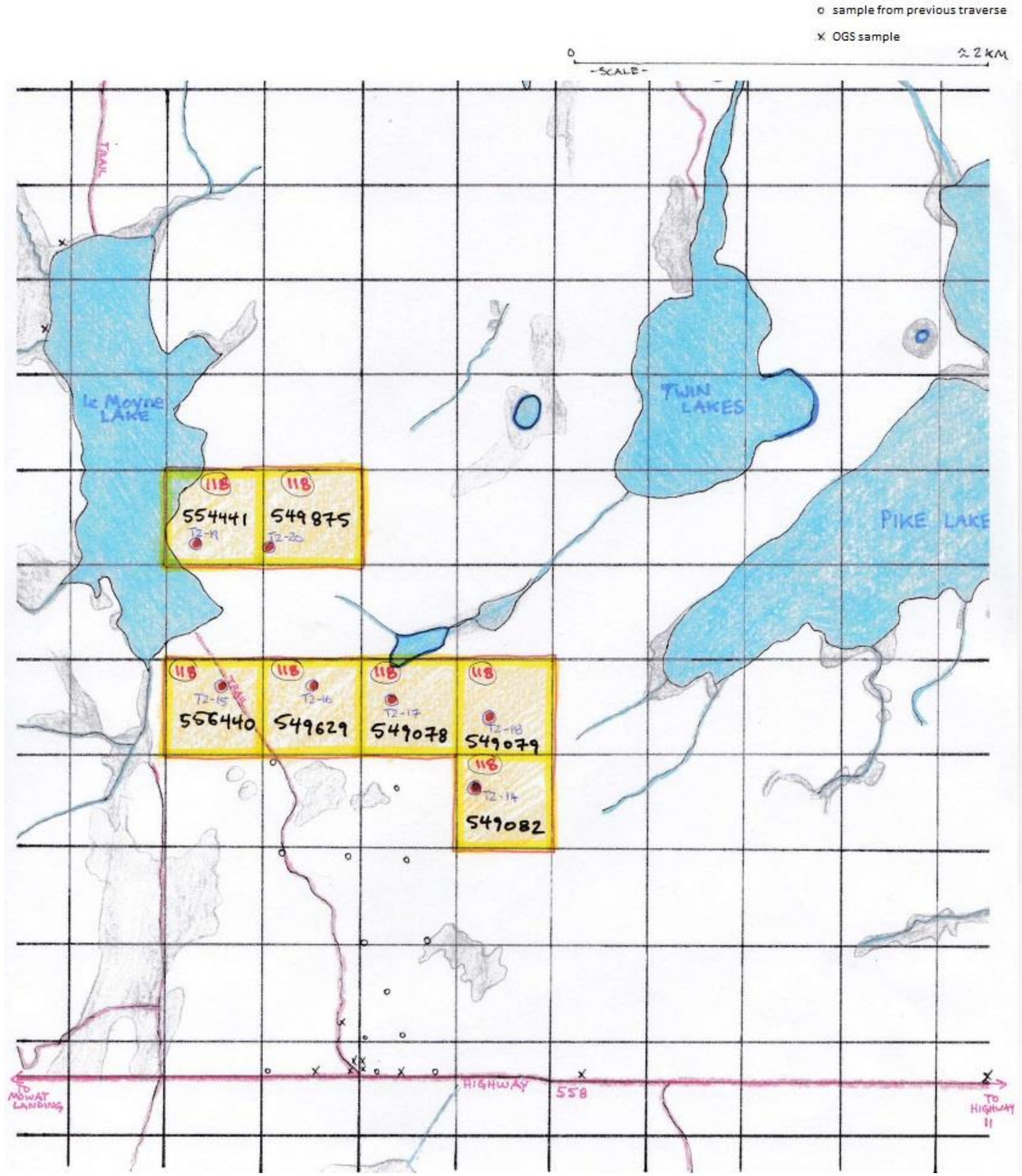
Sample #	**Coordinates 17T UTM**	**Claim ID**	**Activity/Description**
T2- 14	0583448 E 5258873 N	549082	Till sampling for KIMs and sulphides
T2-15	0582200 E 5259310 N	556440	Till sampling for KIMs and sulphides
T2- 16	0582636 E 5259336 N	549629	Till sampling for KIMs and sulphides
T2- 17	0583035 E 5259270 N	549078	Till sampling for KIMs and sulphides
T2- 18	0583500 E 5259196 N	549079	Till sampling for KIMs and sulphides
T2- 19	0582064 E 5260000 N	554441	Till sampling for KIMs and sulphides
T2- 20	0582420 E 5260000 N	549875	Till sampling for KIMs and sulphides

BISHOP Diamond Exploration Claim-Block: Barr-Firstbrook-Lundy-Hudson Townships

Sketch Map for Traverse 2 - July 23, 2020

Samples collected in claims: 549078, 549079, 549082, 554440, 554441, 549875, 549629

Graeme Bishop, Mike Harrington



Traverse 3: August 15, 2020 Graeme Bishop, Nathan Pullen

Tony Bishop and I had spent the previous two weeks carefully processing the samples from traverse one and two, using his customized Loewan sluice, then screening concentrated samples into fractions before running them through the 'Goldcube' heavies-collector, before doing preliminary microscopy for KIMs and sulphides in the concentrated fractions. The summer was ending, and we decided to make additional traverses to collect more samples before winter. Patrick Harrington was unavailable, and Nathan Pullen agreed to join the excursion as a helper. Nathan had previously worked with me during several prospecting and sampling excursions in Gillies Limit, Lorrain and Eby Townships. I picked Nathan up around 8 AM near Kirkland Lake, and we drove south to the claim-block, having breakfast in New Liskeard before we headed into the bush. Our goal was to collect six samples in the northern part of the claims, where Barr, Firstbrook, Lundy, and Hudson Townships juncture. [Note: The geological map sheets (from all paper cartographic geological sources) meet at this north-south boundary between townships, and I had found three maps which contradicted each other pertaining to bedrock composition at the map boundary, therefore, in addition to sampling, I had an ambition to better ascertain the bedrock composition during the traverse. However, regardless of the extensive bedrock outcropping in the high ground of the traverse area, the drift and forest in the area of the traverse obscured any clarity on the matter. The Mining Lands Administration System map viewer 'Bedrock Geology' layer is most likely the best source at this time, although further work certainly needs to be done to clarify the compositional anatomy of bedrock exposure at this location]. We parked the car on the north shoulder of highway 558 at the same easting as the truck-park in traverse one and two and collected our gear before heading north on the Le Moyne Lake trail. The hike to Le Moyne Lake is approximately 2 kilometers long, and the sample area for the traverse was between 1.5 to 2 kilometers east of Le Moyne Lake and into high ground, closer to the west shore of the southern body of Twin Lakes, so we had a significant hike before we could even begin our sampling. When we reached Le Moyne Lake, we climbed through the bush in roughly the same path that I had used to exit the hill during traverse 2 and arrived at the summit very near to my sample area for T2-20. We stopped to eat and enjoyed the view. We made our way east, trending a little south, for about a kilometer through mixed bush and outcrop, with some careful footing at times and collected sample T3-21 on high ground along the south-facing outcrop system which borders the two curious (structurally controlled) swampy ponds that drain north-east into the southern Twin Lake [based on preliminary KIM results from the first two traverse samples, the ponds represent potential kimberlite targets]. Our next two samples were intended to test for the potential kimberlite target (a small oval pond in the high ground west of the south Twin Lake) and we traversed north in a north-west trending trough, collecting T3-22 in one attempt, in good ground, beneath rootmass. The hike to T2-24 was through difficult ground, with careful footing. From T2-24, we trended east and north to collect sample T2-26, moving through some dense bush. At the T2-26 coordinates, we had an excellent view of the southern Twin Lake; some truly massive trees are growing on the hill slope which makes up the south-west shore of the lake. Nathan and I were both becoming tired from traversing the difficult high ground, and it was already late afternoon. We traversed due west, down into the depression occupied by the oval pond, and crossed swampy ground, seeing the clearing just to our north where the pond was. I wished we could go and investigate the pond itself, but we were short on time. Ascending west back into the high ground, we decided to collect only one sample, T2-23/25, between the coordinates for those two samples. We trekked back to Le Moyne Lake and exited south on the trail. By the time we reached the car, the sun was beginning to go down. It was a long arduous day, and we were both exhausted. We had collected 5 samples on claim.

Traverse 3: field notes August 15, 2020 Graeme Bishop, Nathan Pullen

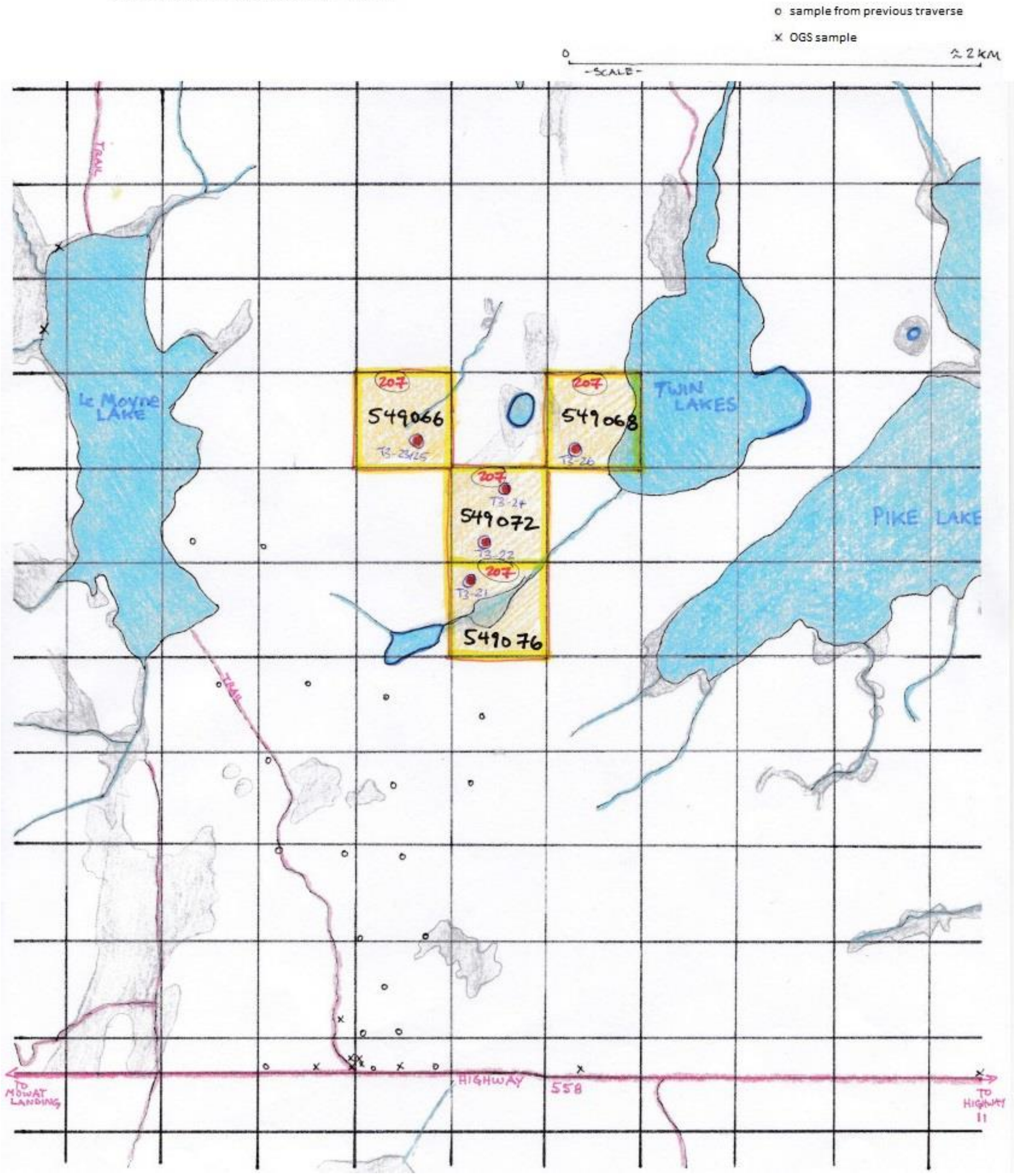
Sample #	**Coordinates 17T UTM**	**Claim ID**	**Activity/Description**
T3- 21	0583445 E 5259844 N	549076	Till sampling for KIMs and sulphides
T3- 22	0583520 E 5260023 N	549072	Till sampling for KIMs and sulphides
T3- 24	0583602 E 5260290 N	549072	Till sampling for KIMs and sulphides
T3- 26	0583914 E 5260480 N	549068	Till sampling for KIMs and sulphides
T3- 23/25	0583161 E 5260516 N	549066	Till sampling for KIMs and sulphides

BISHOP Diamond Exploration Claim-Block: Barr-Firstbrook-Lundy-Hudson Townships

Sketch Map for Traverse 3 - August 15, 2020

Samples collected in claims: 549066, 549068, 549072, 549076

Graeme Bishop, Nathan Pullen



Traverse 4: September 21, 2021 Tony Bishop, Graeme Bishop

After having conducted intensive examination of the samples of the Barr-Firstbrook-Lundy-Hudson claim-block collected during traverses in 2020, Tony Bishop decided to make another sampling excursion to collect samples from the area covered primarily in traverse 1 to better profile the area immediately north of the OGS samples collected in 2011. Years ago, exploration company Sudbury Contact had previously sampled several locations in the Bishop claim-block during their exploration phase that found the 95-2 and 96-1 kimberlites, several kilometers north of the Bishop claim-block, and Tony Bishop had access to their sampling data through geologist Peter Hubachek and Glenn Kasner of RJK Explorations Ltd., and from the May 30, 2003 Sudbury Contact Assessment Report "31M12SW2017" (Montgomery, J. K., 2003). Sudbury Contact also made an exploratory drillhole SC92-1 into a mag anomaly at 583402.5 E /5258373.5 N but encountered only the Huronian strata (brecciated siltstone). The Bishop KIM results from samples collected in 2020 were very interesting, however, and Tony Bishop wanted to replicate the results and also collect new samples to assess for KIMs and sulphides, so on September 21 he and I left the Kirkland Lake area around 7 AM to collect additional samples from the claim-block area. We parked the truck in the same location as I had during Traverse 1 and 2, and after collecting our gear (this time including a camera) we headed north on the Le Moyne Lake trail. When we reached the area that sample T1-9 was collected in during my first traverse with Mookie, we stopped to collect several samples. The T1-9 sample results contained very interesting KIMs, and dad wanted to profile that location better. He collected sample T4-x just off the trail, west and south a short distance from T1-9 while I hiked east to collect sample T4-F, about 160 meters east of T1-9. I was finished first and rejoined dad while he finished with his sample hole, taken in till under a rotted-out tree stump. We traversed south along the trail and collected sample T4-E near the trail. Heading south again, we decided to collect sample T4-C/D between those two intended coordinates, due to an excellent rootwall ground exposure. We planned to collect samples T4-B and T4-A closer to the highway, just north a-ways of the 2011 OGS samples. Dad stopped to collect T4-B on-claim while I continued south to collect T4-A nearer the highway. We were very close to the truck and decided to collect double-size samples for T4-A and T4-B. During my collection of T4-A I had to try several shallow holes due to extensive cobbles at surface, and dad reported the same for sampling T4-B. We deposited our collected samples in the truck and stopped for a late lunch while we compared notes then pulled back onto the highway. There are several excellent flat-lying bedrock exposures which exhibit glacial striations along the highway, which we stopped to photograph next to a compass. Dad spent time looking for more exposed bedrock striations while I geared up and headed north into claim 555613 to collect another sample, T4-H. The traverse north from highway 558 to the sample location for T4-H was incredibly difficult, going through a hummocky swamp with nightmare level underbrush which included many tightly-recessed waterways you could disappear into: probably the dirtiest bush I've ever had to trek through. I finally reached solid ground and collected a good sample in mixed till, collecting a double-sized sample for T4-H. There was no chance of retracing my path through the bad ground, so I followed the solid ground further east and then angled south to reach the highway. We collected one additional sample, off-claim, just south of the highway to help contextualize OGS sample 09-CG-66. We organized all the samples in the box of the truck and headed home. We had collected 8 good samples, with 7 on-claim.

Traverse 4: field notes September 21, 2021 Brian A. (Tony) Bishop, Graeme Bishop

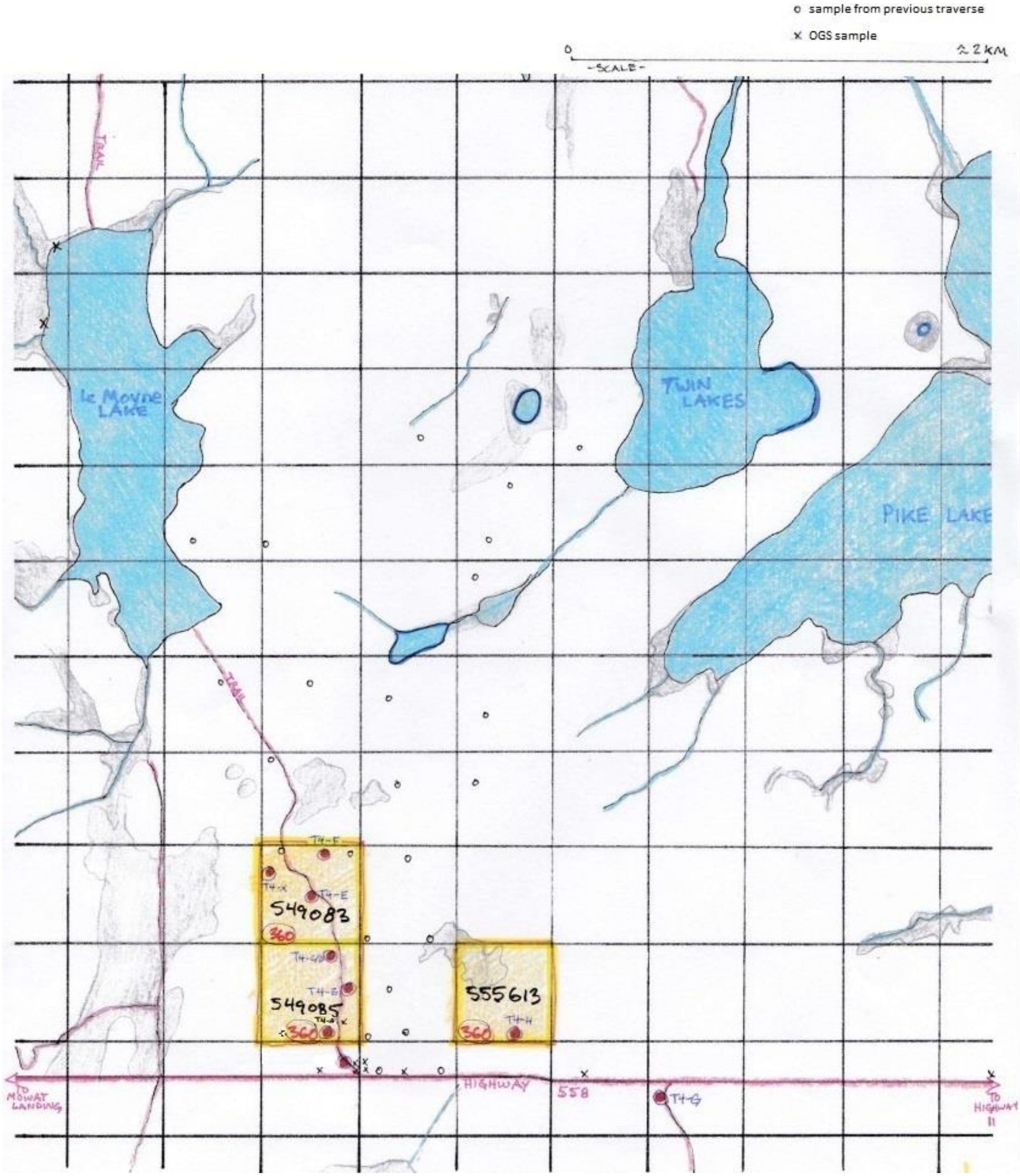
Sample #	**Coordinates 17T UTM**	**Claim ID**	**Activity/Description**
T4- x	0582450 E 5258420 N	549083	Till sampling for KIMs and sulphides
T4- F	0582718 E 5258522 N	549083	Till sampling for KIMs and sulphides
T4- E	0582686 E 5258318 N	549083	Till sampling for KIMs and sulphides
T4- C/D	0582780 E 5258028 N	549085	Till sampling for KIMs and sulphides
T4- B	0582817 E 5257855 N	549085	Till sampling for KIMs and sulphides
T4- A	0582832 E 5257620 N	549085	Till sampling for KIMs and sulphides
T4- H	0583668 E 5257627 N	555613	Till sampling for KIMs and sulphides
T4- G	0584382 E 5257381 N	(off-claim)	Till sampling for KIMs and sulphides

BISHOP Diamond Exploration Claim-Block: Barr-Firstbrook-Lundy-Hudson Townships

Sketch Map for Traverse 4 - Sept. 21, 2021

Samples collected in claims: 549083, 549085, 555613

Brian A. (Tony) Bishop, Graeme Bishop

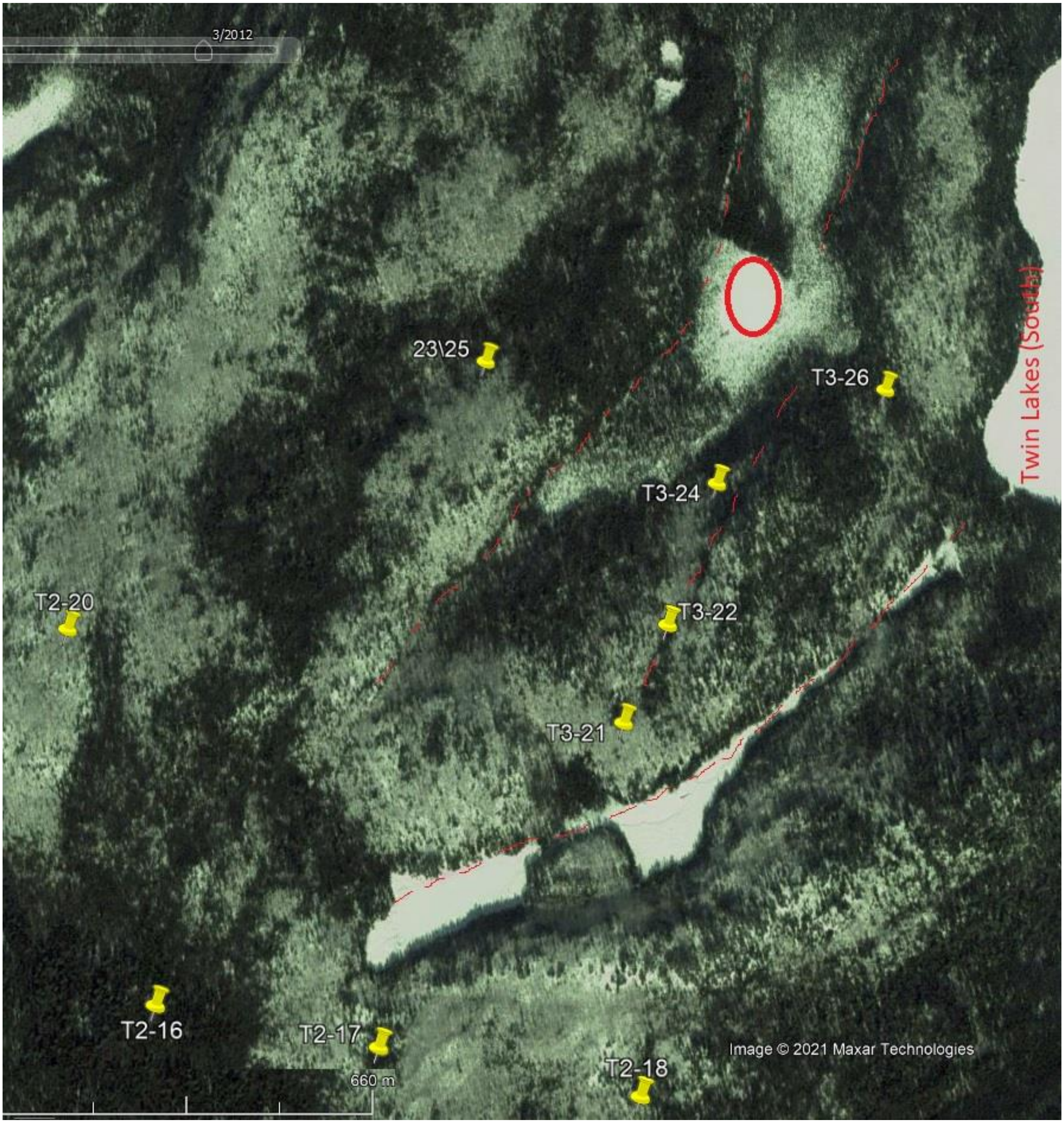


Photos from the field:

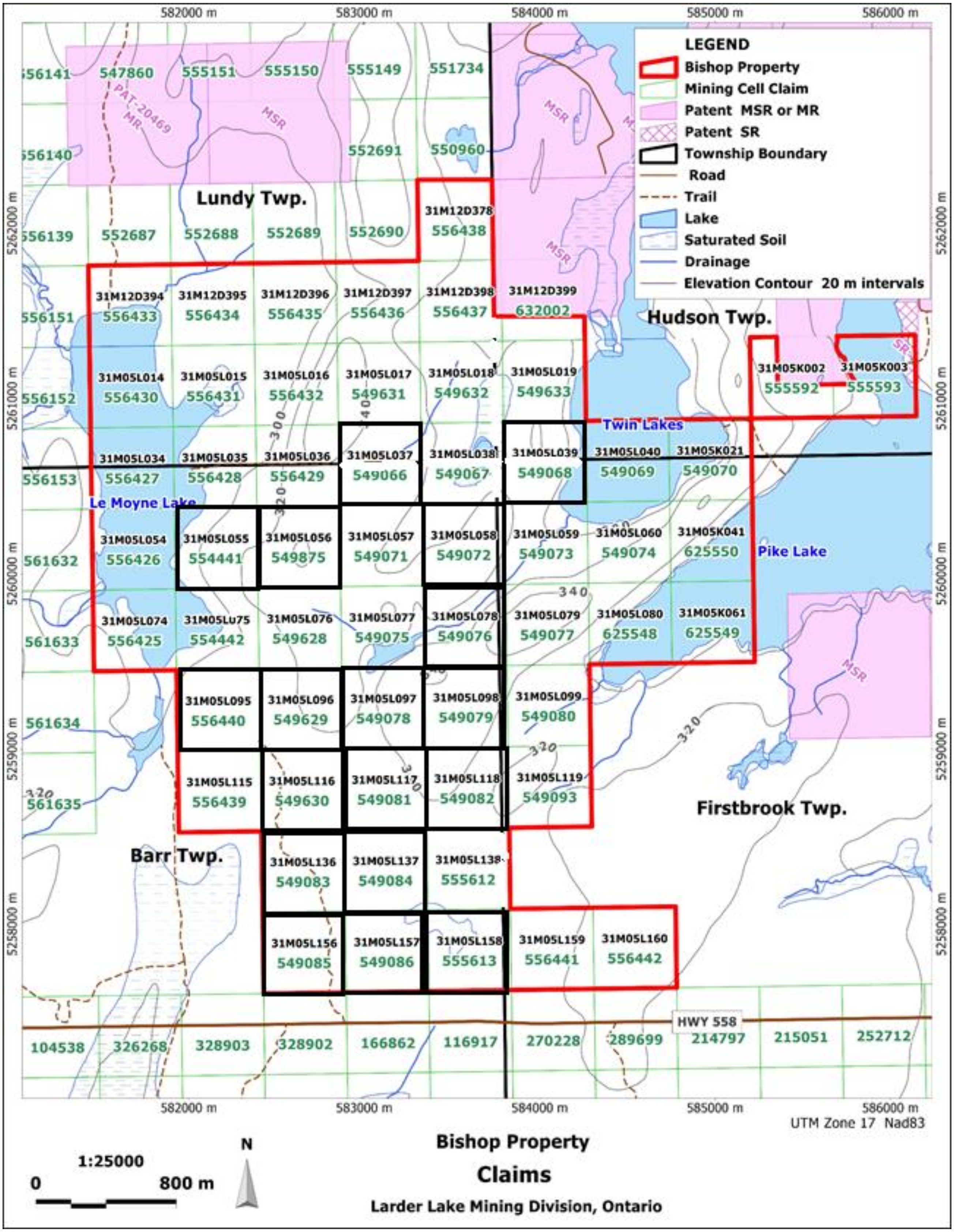
Photos from the field:

Tony Bishop collecting sample T4-x

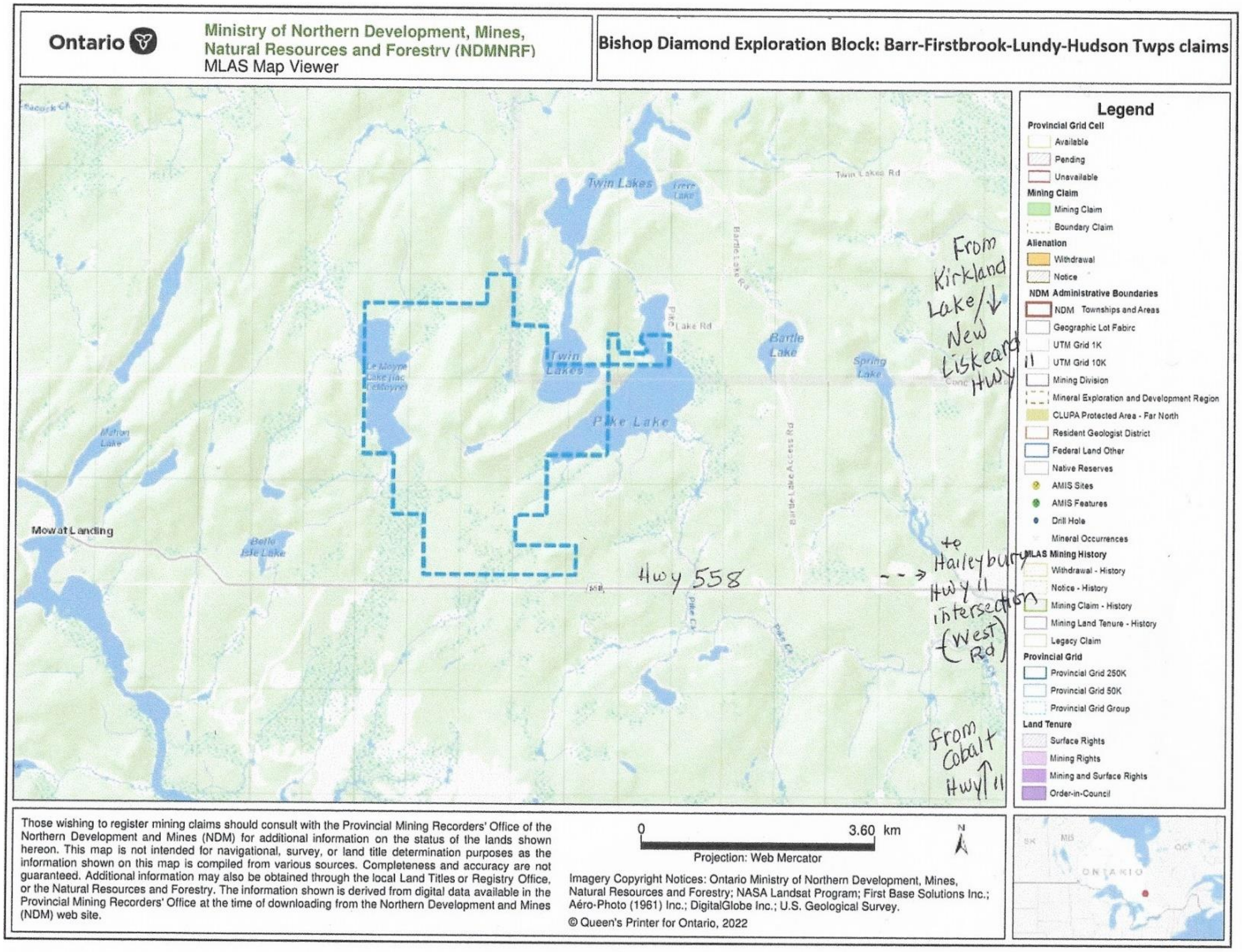
Google Earth image showing Traverse 3 area:



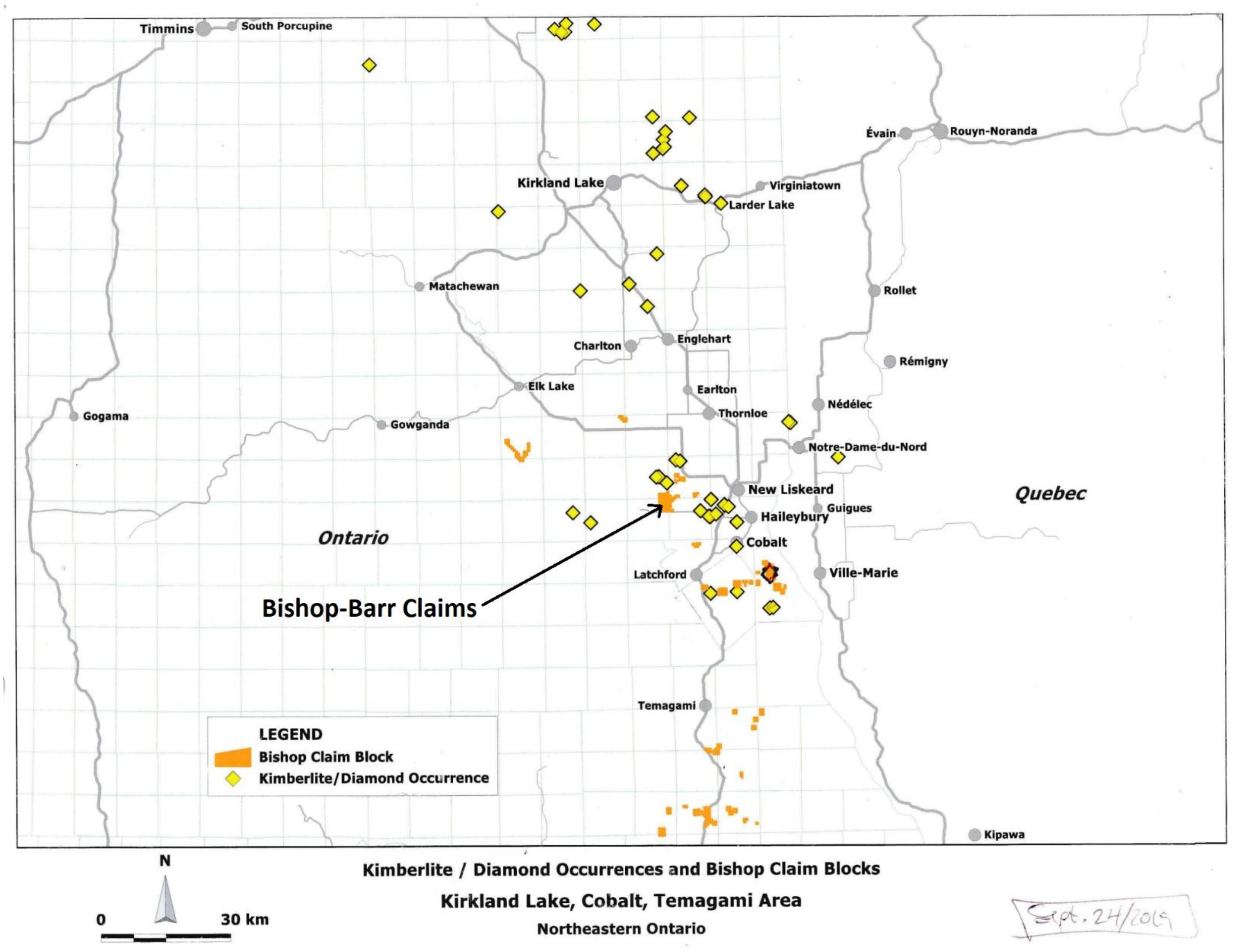
Appendix 2: Maps



Map 3: Claim Locations (outlined in black)



Map 4: Road Access



Map 5: Kimberlite Diamond Occurrences and Bishop-Barr Claim Locations, (Thanks to Terry Link)

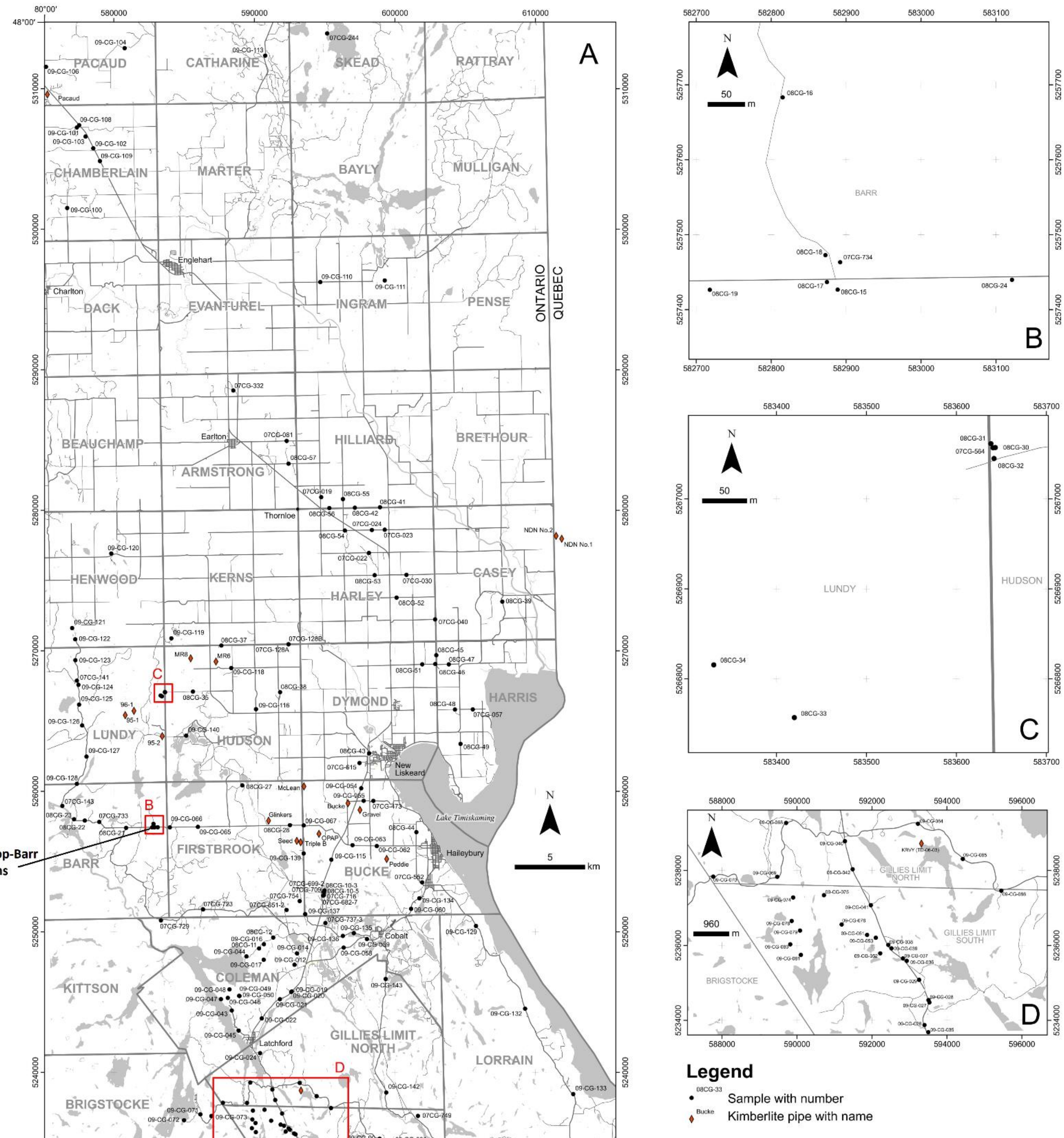


Fig. 2. Map of sample site locations.
Boxed areas in A are enlarged in B, C and D
Accompanies Open File Report 6259.

Map 6: Sample Site Locations from OGS-OFR 6259 (Gao, C. 2012. Figure 2)

Appendix 3: Notes on the geology of the Bishop claim-block area

- by Graeme S. Bishop (2022)

On the Location and Bedrock Geology of the Bishop Claim-block Area:

The claim-block straddles four townships, being Barr and Firstbrook Townships to the south, and Lundy and Hudson Townships to the north, in the District of Temiskaming, Larder Lake Mining Division. All cartographic sources produced prior to digitization and the introduction of MLAS in 2018 meet at this east-west boundary between Barr-Firstbrook on the south, and Lundy-Hudson on the north, i.e. *the center of the claim-block straddles the north or south boundary of geological map-sheets*. Possibly for this reason, there is disagreement about the bedrock geology at this location within different map sources [See Figure 1]. As mentioned in Traverse No.3 field notes (Appendix 1, this report), on-the-ground investigation of bedrock type needs to be conducted between Le Moyne Lake and Twin Lakes.

Regardless of this cartographic inconsistency, the bedrock geology is composed of two main types, being Huronian aged metasedimentary rocks of the Gowganda Formation, and mafic intrusive Nipissing diabase. The claim-block area is situated in the north-east portion of the robust Cobalt Embayment (aka Cobalt Plain) hosting Proterozoic age Huronian Supergroup rocks, but it is on the west shoulder of the younger Lake Temiskaming Structural Zone, which was traversed northwest-to-southeast by the Meteoric Hot Spot during the Jurassic Period, influencing the eruption of Jurassic aged Kimberlites in the Temiskaming Rift Valley (See: L.M. Heaman, B.A. Kjarsgaard. 2000. Timing of eastern North American kimberlite magmatism: continental extension of the Great Meteor hotspot track? Earth and Planetary Science Letters 178).

Two decades ago, Sudbury Contact discovered a sub-cluster of kimberlite pipes west of the main New Liskeard cluster, including the 95-2 and 96-1 pipes which are situated several kilometers north of the Bishop claim-block (See: Assessment Report 31M12SW2017 (Montgomery, J.K. 2003)). Years later, sampling work conducted by the OGS found incredible and anomalous KIM results in their 'Area B' study, overlapping and adjacent to the south boundary of the Bishop claim-block, published by C. Gao in OGS OFR 6259; the KIMs analysed by the OGS in the 2012 OFR did not derive from any known kimberlite pipe, leading Tony Bishop to stake the claim-block to investigate for their source rock. Based on thorough assessment of all the data collected so far [See Figure 9], the kimberlite source-rock which produced the KIMs found by the OGS in Area B of the OFR 6259 (2012) are certain to have originated from an undiscovered kimberlite pipe somewhere within the current Bishop claim-block.

On the Structural Geology of the Bishop Claim-block Area:

The Bishop claim-block is situated squarely between the Latchford Fault and the Montreal River Fault.

Sage (2000) extends the South Montreal River Fault as far north as Twin Lakes [See Figure 3].

Grant and Owsiacki (1987) extend the Temagami North Arm Faulting system northeast through the claim area, as far north as the Wendigo Chain, on the east side of the Temiskaming Rift Valley [See Figure 2]. This is not a linear fault, but a faulting stress zone that exhibits as many smaller disconnected faults which occupy spaces between the parallel major northwest faults which define the Lake Temiskaming Structural Zone. It is possible the north-east trending faults are better defined in the Archean basement and date to the Archean deformations (ca. 2.6 Ga) and exhibit a less linear anatomy in the overlying Proterozoic rocks. If not, the northeast trending faults are most likely associated with adjustment during the tectonic advance of the Grenville Front (ca. 1.1 Ga). In either case, the north-east trending faults are much older than the primary faulting associated with the Lake Temiskaming Structural Zone, aka LTSZ (ca. 0.25-0.15 Ga). The LTSZ hosts several clusters of Jurassic aged kimberlite pipes, from Attawapiskat and Kirkland Lake in the north, to the Lake Temiskaming Field in the south. Near the area of the Bishop claim-block, kimberlite pipes erupted over an approximately 20-million-year period, indicating prolonged conditions for the ascent of kimberlite magma. Nearby, the oldest kimberlites in the Lake Temiskaming field, including the 95-2, Bucke, Gravel, Peddie, and Seed pipes range from 155-152 Ma, while the MacLean dates to approximately 141.9 Ma, the OPAP to 138.8 Ma, and the Glinker to 133.9 Ma (See: L.M. Heamana, B.A. Kjarsgaardb, R.A. Creaser. 2004. The temporal evolution of North American kimberlites. Lithos 76). The Bishop claim-block is situated between the 95-2 and Glinker pipes, and thus could host a kimberlite eruption aged anywhere between 155 Ma and 133 Ma.

On the Quaternary Geology of the Bishop Claim-block Area:

A complex anatomy of surficial pro-glacial and terminal-glacial characteristics affects the land surface in the region around the Bishop claim-block exploration area. Owing to the KIM sampling methodologies developed by Tony Bishop during diamond exploration, he contracted me to research the Quaternary characteristics of the area to aid in exploration and interpretation of results from overburden KIM sampling. I conducted research and sketch-mapping of land characteristics and surficial geology compiled from Google Earth, MLAS Map viewer, and OGS Quaternary Geology Maps [See Figure 4], and laboriously outlined the maximum extent of Lake Barlow shorelines according to OGS observations and topographic relief [See Figure 5]. The final direction of glaciation which would influence float-trains can be clearly discerned in local glacial fluting of till in Firstbrook township [See Figure 8], which is also discernable in bedrock striations along Highway 558; the final glacial direction was south south-westerly.

Immediately north of the claim block is an extent of mostly exposed bedrock of hilltop, which faces north, possibly wave washed during deglaciation and proglacial water movement associated with the outwash deposits collected north and east of the claim block, in Hudson township. Further east, and in larger exhibition, is the associated large glaciofluvial ice-contact sediment arrangement which appears to have melt-flowed from north-west to south-east during deglaciation, which collected and deposited fluvial material through Coleman township and into Gillies Limit along the structural trend of the Montreal River Fault. North and east of this large fluvial complex begins the primary body of the 'Little Clay Belt' glaciolacustrine sediments at lower elevation which continues to the north within the Temiskaming Rift system.

To the north-west of the Bishop claim-block, some quiet water glaciolacustrine sediment was deposited in Lundy township, affecting the area around the north end of Le Moyne Lake and west of the big hill between Le Moyne and Twin lakes. In-person small-auger work in an area adjacent to Le Moyne lake immediately north-east of its north shore is planned for the 2022 field season, to investigate a small area indicated on OGS Map 2685 (Baker, C.L. et al, 2010) in which the quiet water glaciolacustrine deposit extends past the general elevations these sediments are locally deposited at, possibly indicating cartographic error, hyper-localized irregular isostatic rebound, or temporary ice-damming and proglacial water collection against the north shore of the big hills between Le Moyne and Twin lakes.

To the west, there is a general exhibition of typical glacial till-bedrock/drift-bedrock arrangement, until the Latchford fault structure, which hosts an esker deposit, and further glaciofluvial ice-contact sediments trending south along the fault and continuing south-southwest from Lady Evelyn Lake towards Temagami Lake.

Within the claim-block, a small esker is deposited along the west shore of the connection between the north and south Twin Lakes, and a sandy beach deposit has collected at the south-west shore of Twin Lake south. Adjacent to this sandy deposit is a small area of apparently wave-washed bedrock which follows a fault which extends due south-west from the south shore of the southern Twin Lake. This bedrock area hosts two small fault-controlled swampy ponds at the south face of the big hills between Le Moyne and Twin lakes; based on KIM sampling analysis completed by Tony Bishop this part of the claim-block is a primary candidate for a potential kimberlite pipe.

The Bishop claim-block area is located at the north-east extent of a set of major till deposits which were dumped along the higher ground west of the Lake Temiskaming Rift system, but the presence of fluvial complexes to the west and east, and the many lake-phases of proglacial Lake Barlow created the possibility for disruption of typical glacial-trains of KIMs from a bedrock source [See Figure 7]. To investigate the possible influence of Lake Barlow sorting or otherwise disturbing the till being sampled in the Bishop claim-block, an assessment of elevation and known ancient shorelines was compared with sample sites from the first four traverses. Most sample sites lie above known levels of extended freshwater inundation during the pro-glacial lake phases, and thus are subject to traditional glacial-train till interpretation [See Figure 6]. Some of the sample sites adjacent to the swampy area due south of Le Moyne Lake were subject to transitory wave-action during maximum inundation of Lake Barlow; interestingly, sample site Barr-9 lies near wave-action susceptible elevation, and the area exhibits many cobbles with limited fine-till, indicating wave action, but this sample site contains large and uneroded KIM grains (see main body of this report). This preservation of large KIM grains at this high-energy location indicates proximity to a KIM bedrock source within the claim-block.

On Preliminary Results from Bishop Claim-block sampling 2020-2021: Gold, Copper, Sulphides, Silver

The 'Area B' study by the Ontario Geological Survey in OFR 6259 by Gao (2012) found anomalous concentrations of not only KIMs but also pristine gold grains in their samples adjacent to and overlapping the south boundary of the current Bishop claim-block. Of 29 samples I collected during four traverses on the Bishop claim-block, 4 samples contained grains of gold float (See photo section, this report); these samples (Barr-E, Barr-C/D, Barr-1, Barr-B) were collected in the south-west corner of the claim-block, all within several hundred meters of the samples hosting pristine gold grains found by the OGS. Two samples collected during sampling also contained native silver (Barr-8, Barr-A) and are in the same area near the south-west corner of the claim block. Sample Barr-B also showed sulphides and native copper. Sulphides were noted in samples Barr-9, Barr-E, Barr-7, Barr-6, Barr-B, Barr-16, Barr-H, Barr-22, and Barr-23/25. Native copper was also observed in Barr-24. [See Figure 10].

Barr-1 contained 9 pristine gold grains, very near the OGS 'Area B' pristine gold grains; immediately north are 3 additional Bishop samples containing pristine gold grains, accompanied by native silver, native copper, and sulphides. The tight pattern of sample sites containing these minerals, combined with the direction of glacial transport and the sampling methodology used to recover the grains, indicates strongly that there is a bedrock source for the gold, silver, copper, and sulphides somewhere nearby. The Bishop claim-block extends four to five kilometers north-east in the direction of glaciation from the gold grains; due to the pristine state of so many gold grains (slightly re-worked grains were also found), it is worthwhile to conduct careful exploration within the Bishop claim-block to investigate for showings of both precious metals and base metals.

On Preliminary Results from Bishop Claim-block sampling 2020-2021: Coated and Weird Black Grains

Of 29 samples collected for analysis on the Bishop claim-block during the first four traverses, all but sample Barr-4 exhibited an unusual and indurated 'coating' on the grains. This initially made grains of all kinds appear homogenous (see photos, this report) and required acid-bathing combined with tumbling to remove the coating (see discussion by Tony Bishop, this report). At this time, the composition of the coating has not been determined, but Tony Bishop has saved some for lab analysis to determine the chemical nature of the coating. Samples Barr-12, Barr-21, Barr-26 exhibited 'extremely heavy coating.' Samples Barr-1, Barr-5, Barr-6, Barr-7, Barr-8, Barr-11, Barr-13, Barr-15, Barr-22, Barr-23, Barr-24, and Barr-25 exhibited 'heavy coating.' Samples Barr-18 and Barr-19 exhibited 'medium-heavy coating' but also contained some uncoated grains. Samples Barr-9 and Barr-10 exhibited 'light coating', and samples Barr-14 and Barr-20 exhibited 'very light coating.' Strangely, certain samples with heavy coating of grains also contained completely uncoated clear grains in the same size fraction (see photos, this report). Pending lab analysis of the coating, it is impossible to determine its genesis or composition.

Of great interest is the abundance of 'weird black grains' found in nearly all of the 29 samples collected on-claim during the first four traverses. These 'weird black grains' are extremely fragile and exhibit very unusual and non-uniform shapes. Some also appear to contain and/or adjoin tiny roots and sticks of (apparently Holocene) organic origin: lab testing of selected grains is pending. Further, perplexing also are the fragile microscopic 'wires' which appear metallic that have grown on (or else formed with) the ‘weird black grains’ in several samples collected, especially Barr-x, Barr-E, and Barr-26 (see photos, this report). The ’weird black grains’ appear in all size fractions, some being very large, including the +3mm fraction. The ’weird black grains’ are discussed by Tony Bishop in the main body of this report; currently, the best theory is that they result from lightning striking the till. In mixed-till containing many cobbles with small voids between them, the presence of silica is limited, compared with the volume of silica on a sandy beach; on a sandy beach, the hyper-localized heat and pressure of a lightning strike melts and fuses silicates into ‘fulgurites.’ In cobbly-till, a lightning strike apparently creates myriad little ‘bits’ of fulgurite, which Tony Bishop is calling ‘endogenic fulgurite’ [i.e. grains of fulguritic nature which form within the cobbly till during lightning strike].

If it can be confirmed that these ‘endogenic fulgurites’ indeed derive from lightning strikes, and if they are found to exhibit distinct patterns of occurrence across the claim-block, it would indicate *localization and preferential recurrence of lightning strikes*. Owing to the positive bias of electrical conductance of many ore bodies (both kimberlitic, and metallic) amidst the general bedrock background, lightning may be striking conductive ore bodies at much higher frequency than the general land surface. Sampling is planned for the 2022 field season to better delineate patterns of occurrence of the ‘weird black grains’ within the claim-block. It is exciting to consider the possibility that these grains, if resultant from lightning, and if associated with increased ground-conductivity, could be ‘ore-body’ indicator minerals; more exciting, within the same theory, is the idea that these ‘weird black grains’ have formed since deglaciation, and remain in-situ, i.e. their presence is not part of a glacial ‘train’, but a direct indication of an ore body buried beneath them. These ‘weird black grains’ might be a material product of lightning as a geophysical exploration tool.

The samples hosting the indurated ‘coating’ on grains also host the ‘weird black grains’ [See Figure 11] possibly indicating some type of genetic relation. Work is being conducted to solve the mystery of these grains and determine their potential significance for mineral exploration.

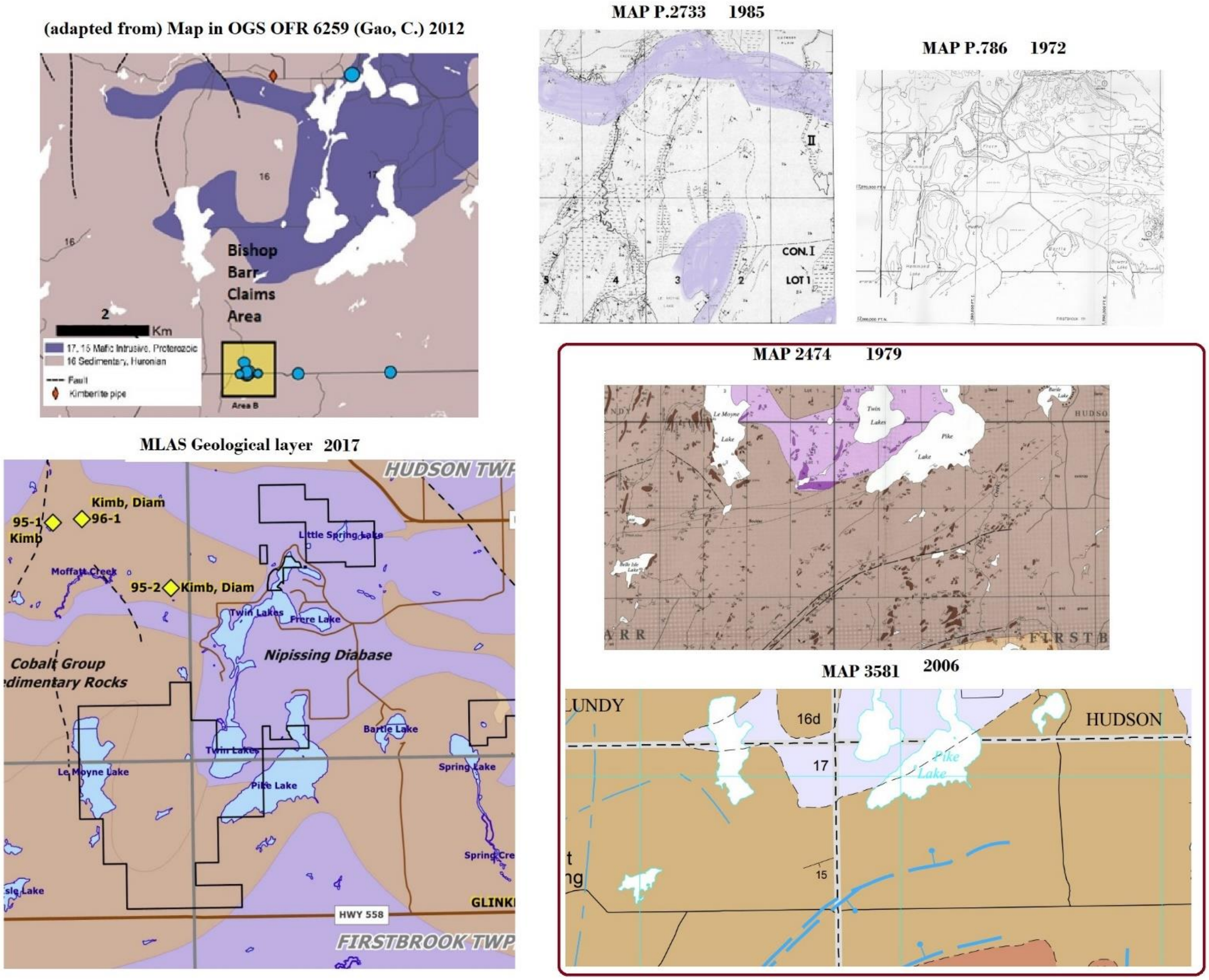


Figure 1 – showing various cartographic representations of the bedrock geology situated at the juncture of Hudson-Lundy-Barr-Firstbrook townships. Note the inconsistency in bedrock composition between the Nipissing Diabase and the Huronian sediments. Map 2474 (1979) shows the same Nipissing bedrock between Pike Lake and Le Moyne Lake as Map 3581 (Ayer, J.A., et al, 2006) and maps used in OFR 6259 (Gao, C., 2012). Map 2474 (Johns, G.W., et al, 1979) shows Huronian, instead of Nipissing bedrock, on the west shore of Le Moyne Lake: this will be investigated in the 2022 field season. Alarmingly, the 2018 Bedrock Geology Layer provided by the Mining Lands Administration System shows a termination of the Nipissing Bedrock immediately west of Twin Lakes, which contradicts several decades of geological mapping by the OGS: this inconsistency will be investigated in the 2022 field season. The 2018 Bedrock Geology Layer provided by the Mining Lands Administration system also shows Nipissing Diabase occupying that part of Highway 558 south of Pike Lake, again in conflict with decades of OGS bedrock geology mapping: this inconsistency will be investigated in the 2022 field season. Similarly, conflicts exist between OGS Quaternary Geology Maps 2685 (Baker, C.L. et al, 2010) and 2657 (Gao, C., 2010) and the Quaternary map layer provided by MLAS. For those interested in the surficial geology of the area, OGS Maps 2685 and 2657 should be consulted, rather than the MLAS system, which seems to have a slight west-shifted distortion and far less detail.

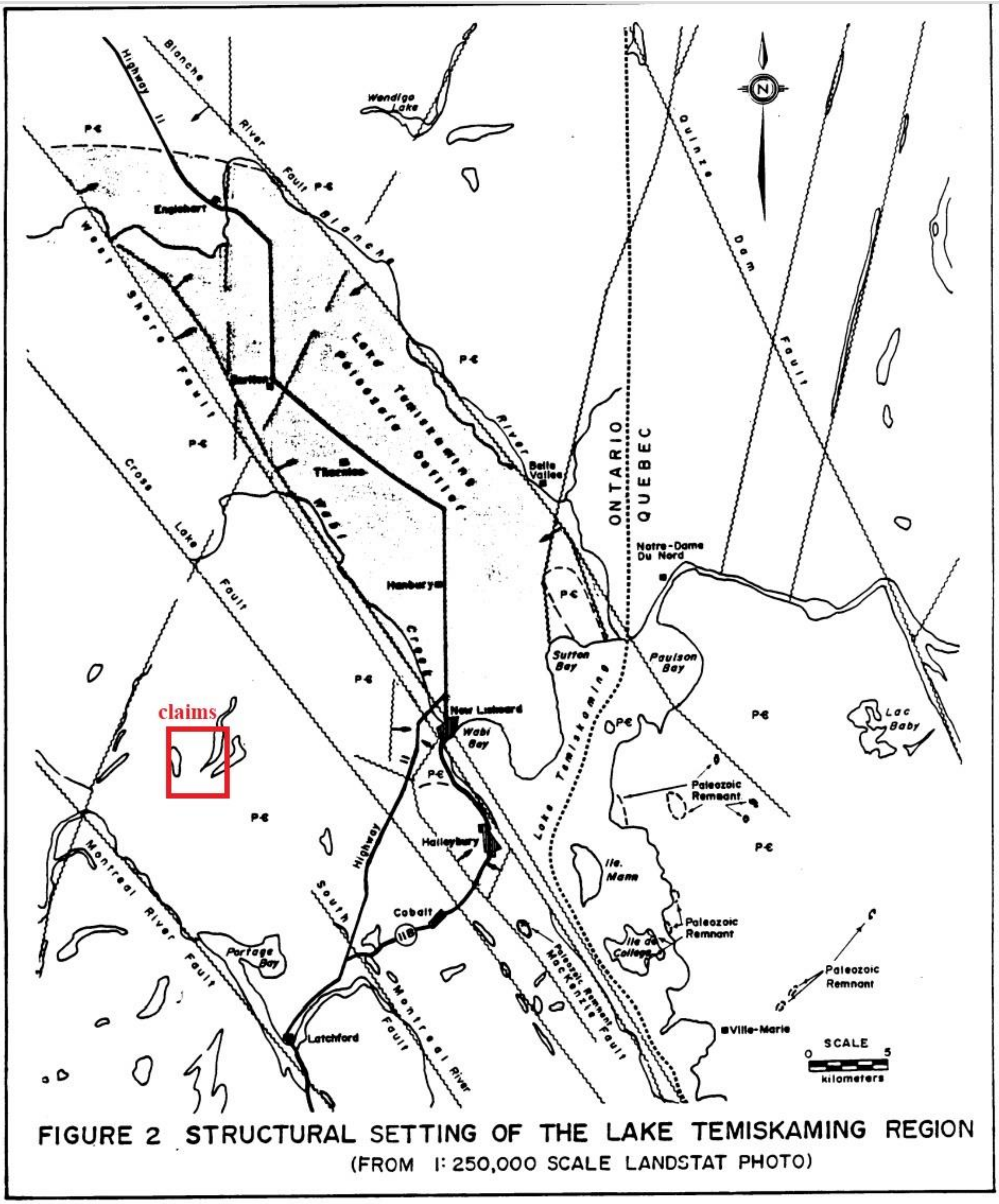


Figure 2 – (from: W.T. Grant and Leo Owsiacki. 1987. An Evaluation of the Lake Timiskaming Paleozoic Outlier for Potentially Exploitable Limestone and Dolostone Deposits. OGS, Open File Report 5661)

Note the fault which transects the Montreal River Fault at Mowat Landing; this fault extends north from the north reach of Lake Temagami, through the east side of Lady Evelyn, and crosses north east across the major Rift Valley faults to the Wendigo Lake area east of the Blanche River Fault. This map from OFR 5661 is the only source I can find which displays this regional fault structure.

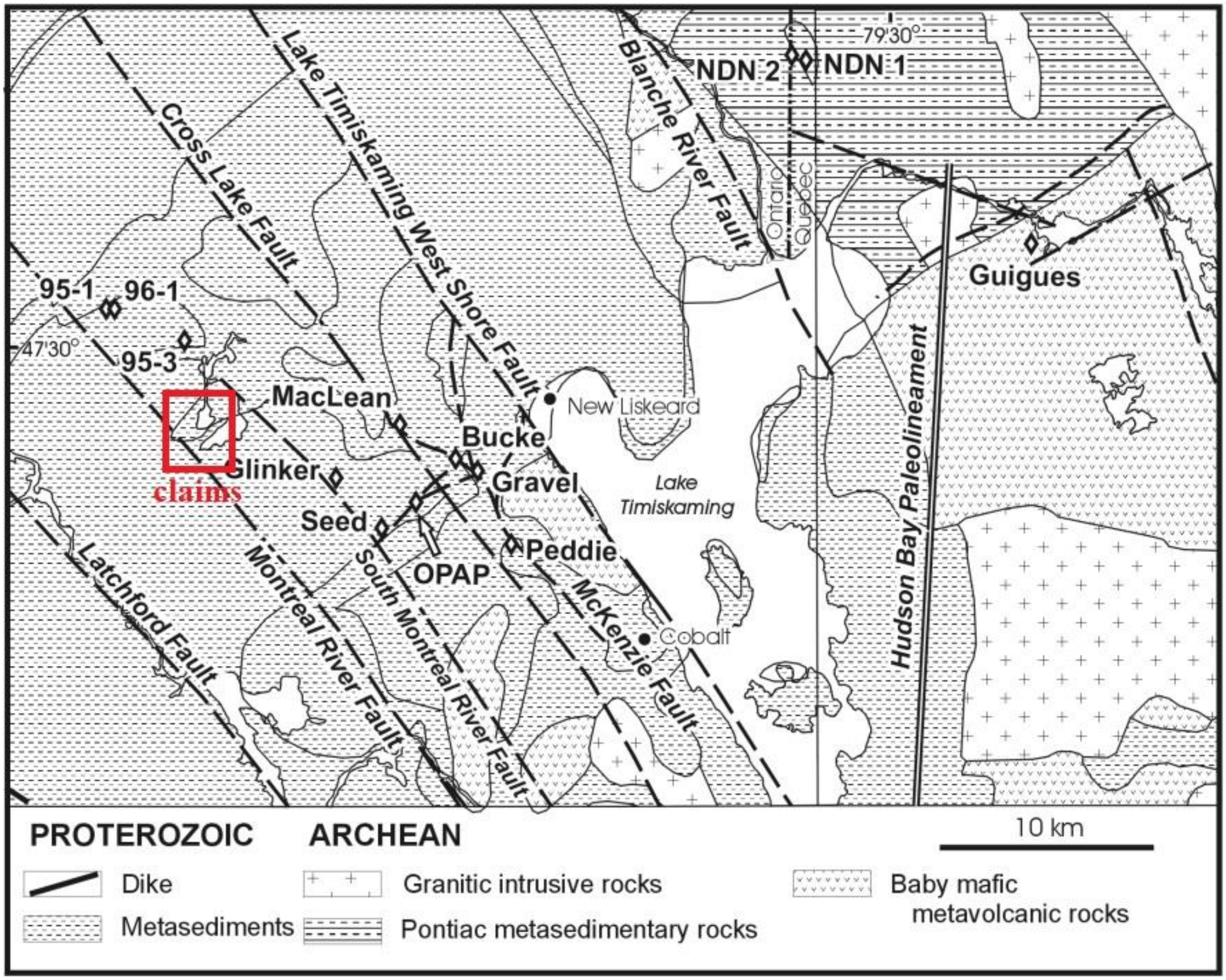


Figure 2. Location of kimberlites in the region of Cobalt and New Liskeard (*compiled from* Kutina and Fabbri 1972; Russell 1984; Thomson 1956, 1960). *Modified from* Sage (1999). Abbreviation: NDN, Notre-Dame-du-Nord.

Figure 3 – (from "Sage, R.P. 2000. Kimberlites of the Lake Timiskaming structural zone: supplement; Ontario Geological Survey, Open File Report 6018)

[Note: the '95-3' pipe shown here is more often known as the '95-2']
Note the location of the Bishop claim-block between the northwest subcluster of kimberlites, and the kimberlite cluster west of New Liskeard. Also, Sage extends the fault structure of the South Montreal River Fault north into the Twin Lakes area adjacent to the Bishop claim-block area. This map from OFR 6018 is the only source I can find which displays this extended reach of the South Montreal River Fault.

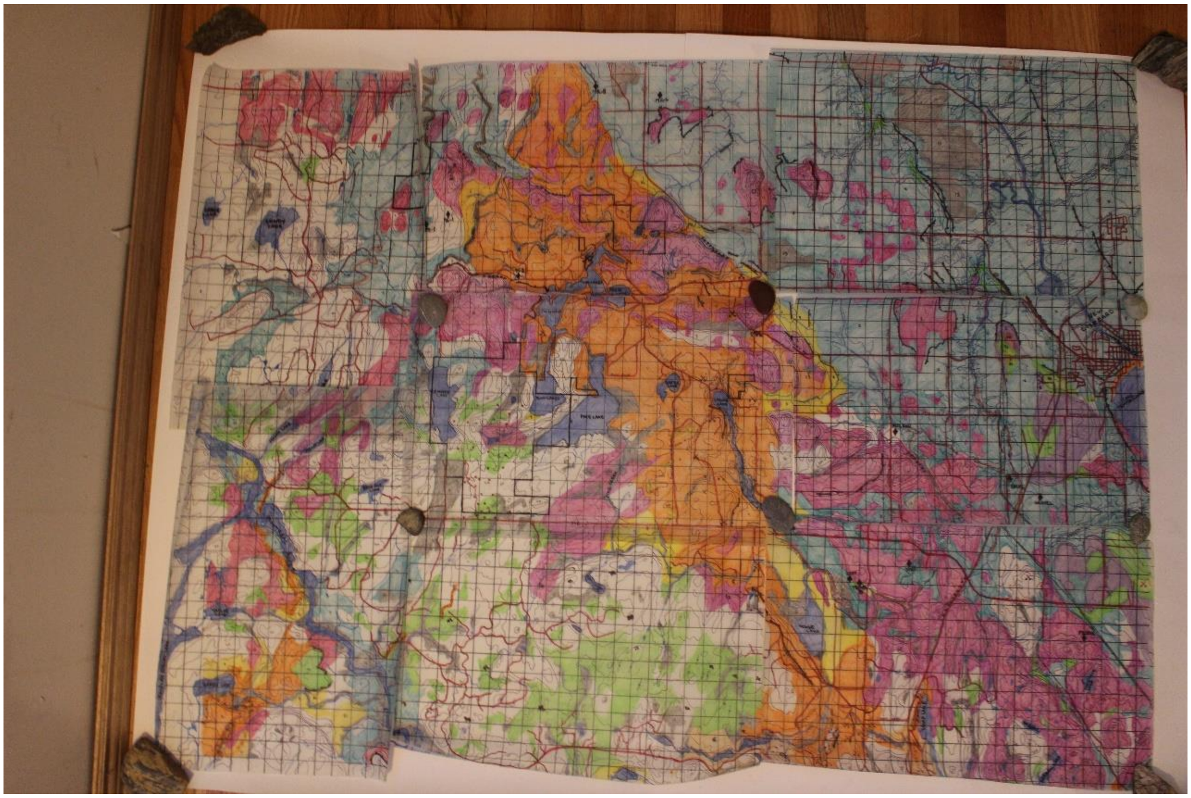


Figure 4- compilation sketch-map showing Bishop Claim-block, Bishop sample sites, roads, Provincial grid-cells, and Quaternary Geology (from OGS Map 2685 and OGS Map 2657) Produced by Graeme Bishop. (~3'x5')

Figure 5- compilation sketch map Figure 1, now including ancient shorelines from Lake Barlow according to topographic relief and OGS observations. Produced by Graeme Bishop.

Figure 6 – compilation sketch-map showing detail of Bishop claim-block, indicating sample sites by OGS, Sudbury Contact, and Bishop work, with elevation, faults, quaternary geology, and ancient shorelines. Produced by Graeme Bishop. (26"x30")

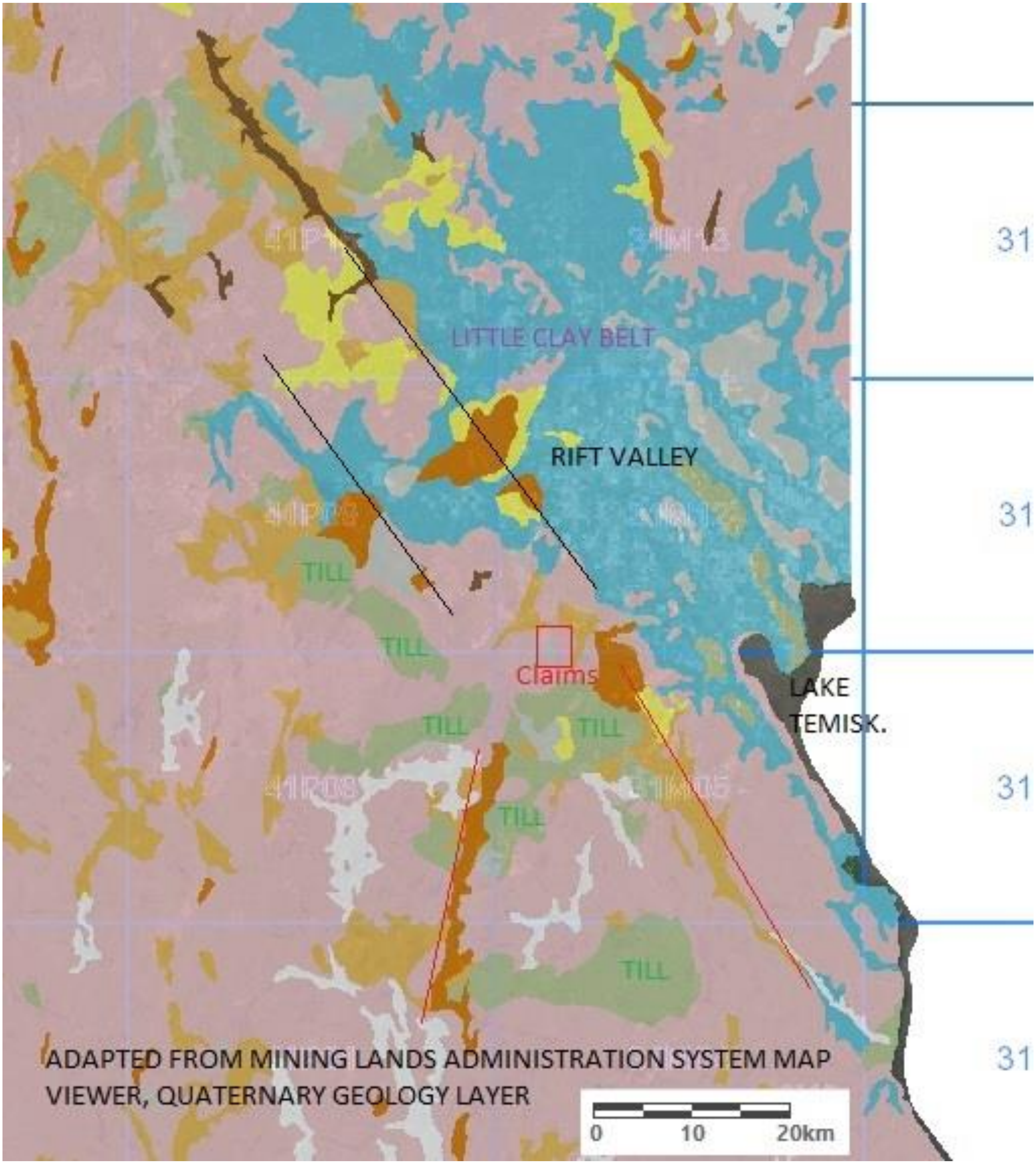


Figure 7- showing the Bishop Claim-block area in a regional context. Note the situation of the quiet water glaciolacustrine 'clay belt' (blue), the glacial till deposits (green) on higher ground west of the rift valley, and the fault-guided bias of fluvial complexes (light brown, dark brown, yellow). The claim-block area is adjacent to, but largely undisturbed by the ice-contact fluvial deposits and outwash deposits.

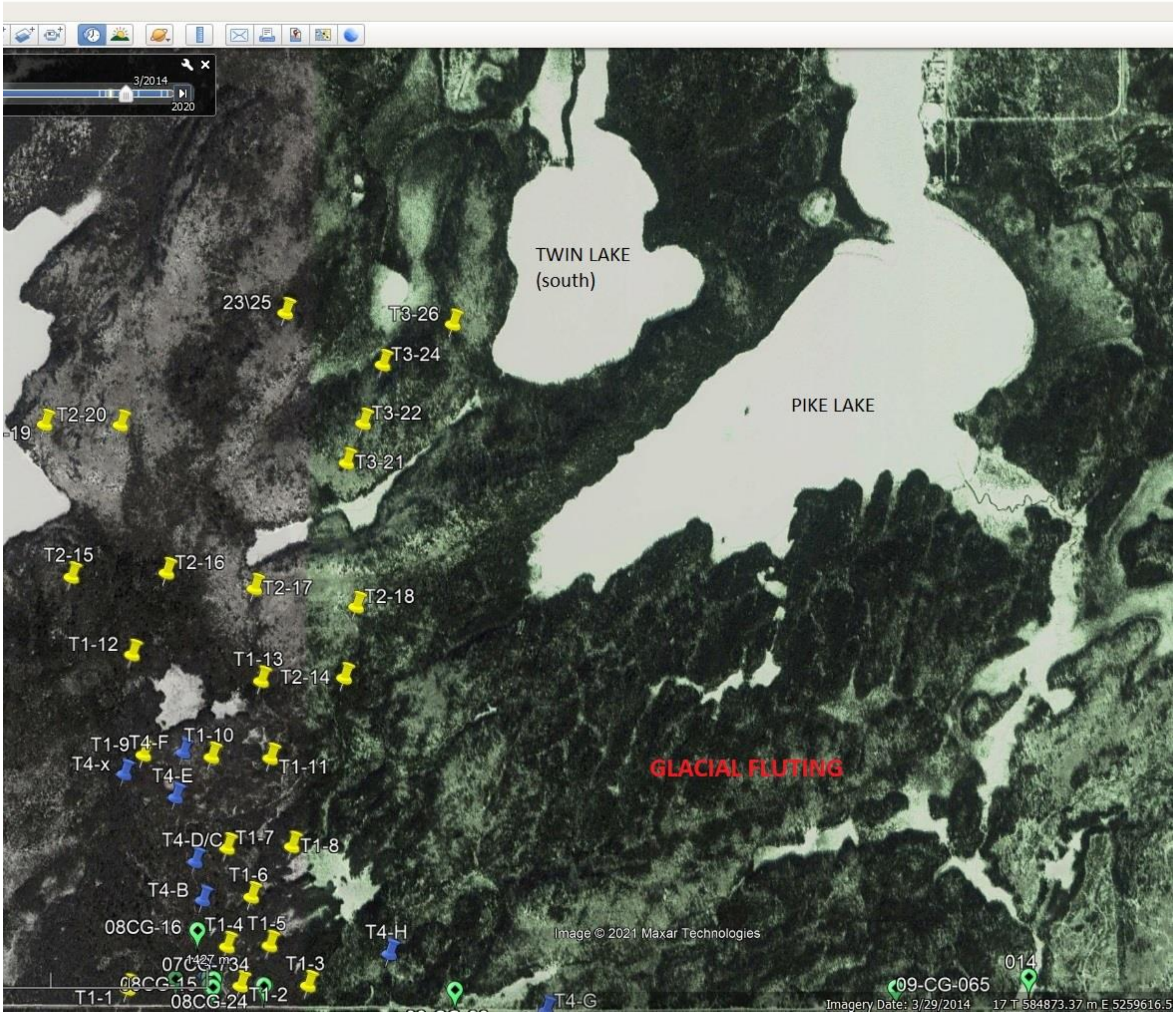


Figure 8 – showing clear glacial fluting in Firstbrook Township till deposits south of Pike Lake, immediately east of Bishop till-sample sites (represented by yellow and purple pins), undisturbed by outwash or fluvial action. The glacial fluting is oriented to terminal-glacial direction and corresponds with the orientation of bedrock striations on Highway 558, immediately south of the glacial till fluting. (OGS samples represented by Green Pins)

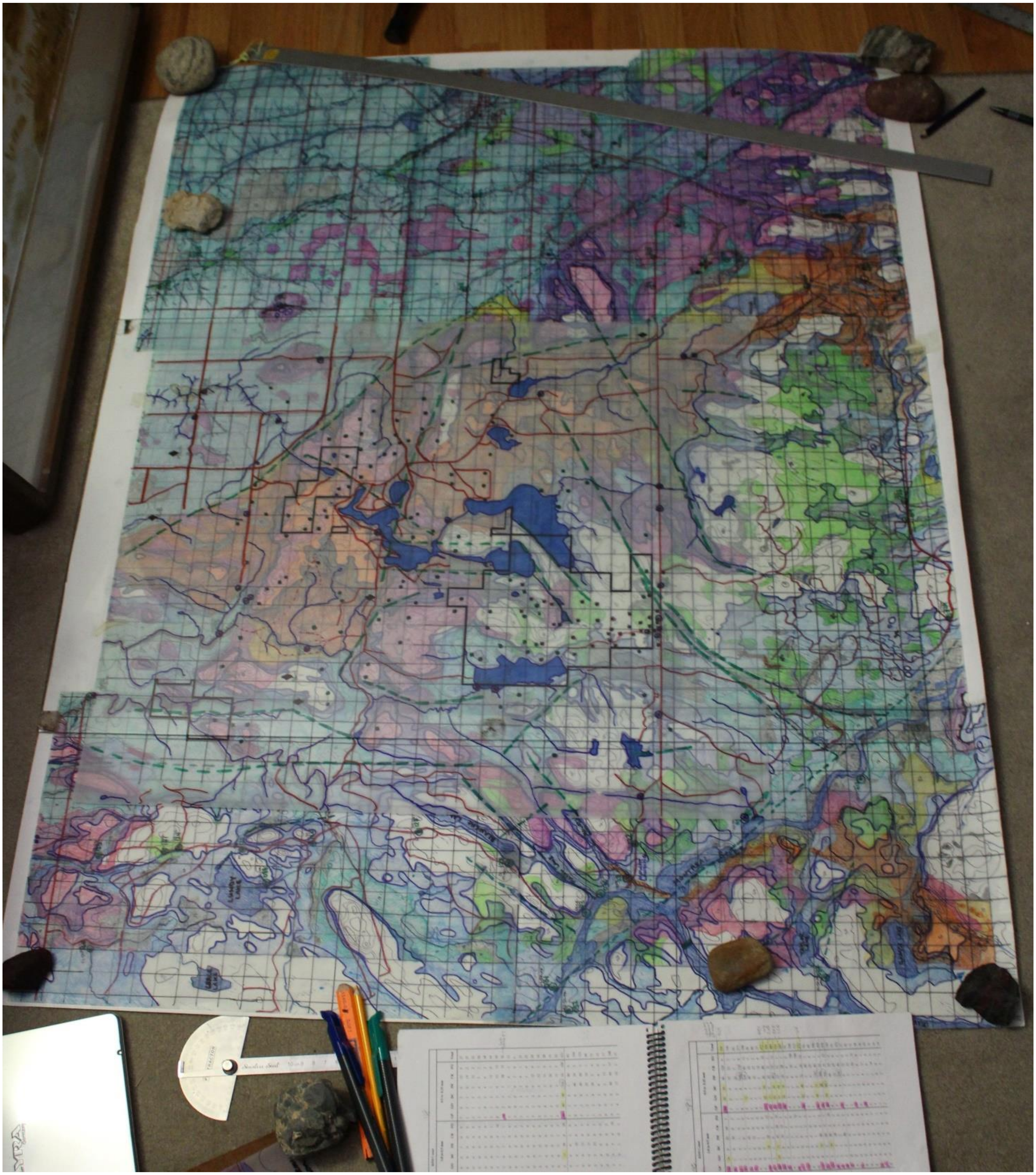


Figure 9 – showing Fig.1/Fig.2 map of Quaternary geology and ancient shorelines, overlayed by Bishop sample sites, Sudbury Contact sample sites, and OGS sample sites, with major faults and KIM data associated with surficial geology and known kimberlites. Produced by Graeme Bishop.

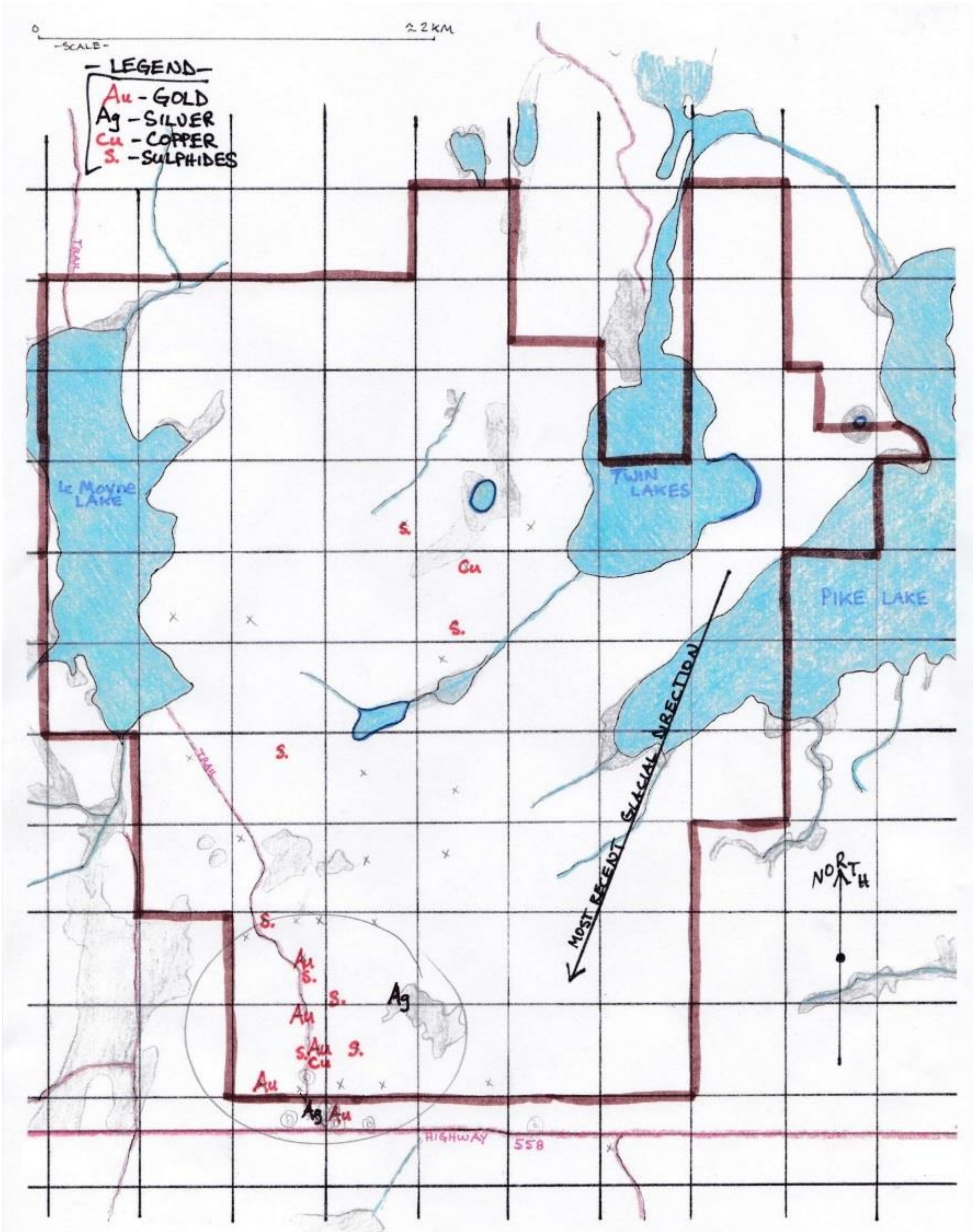


Figure 10 – Showing distribution of Gold, Silver, Copper, and Sulphides found in samples collected during first four traverses. (Note the localization of these minerals in the southwest section of the claim-block)

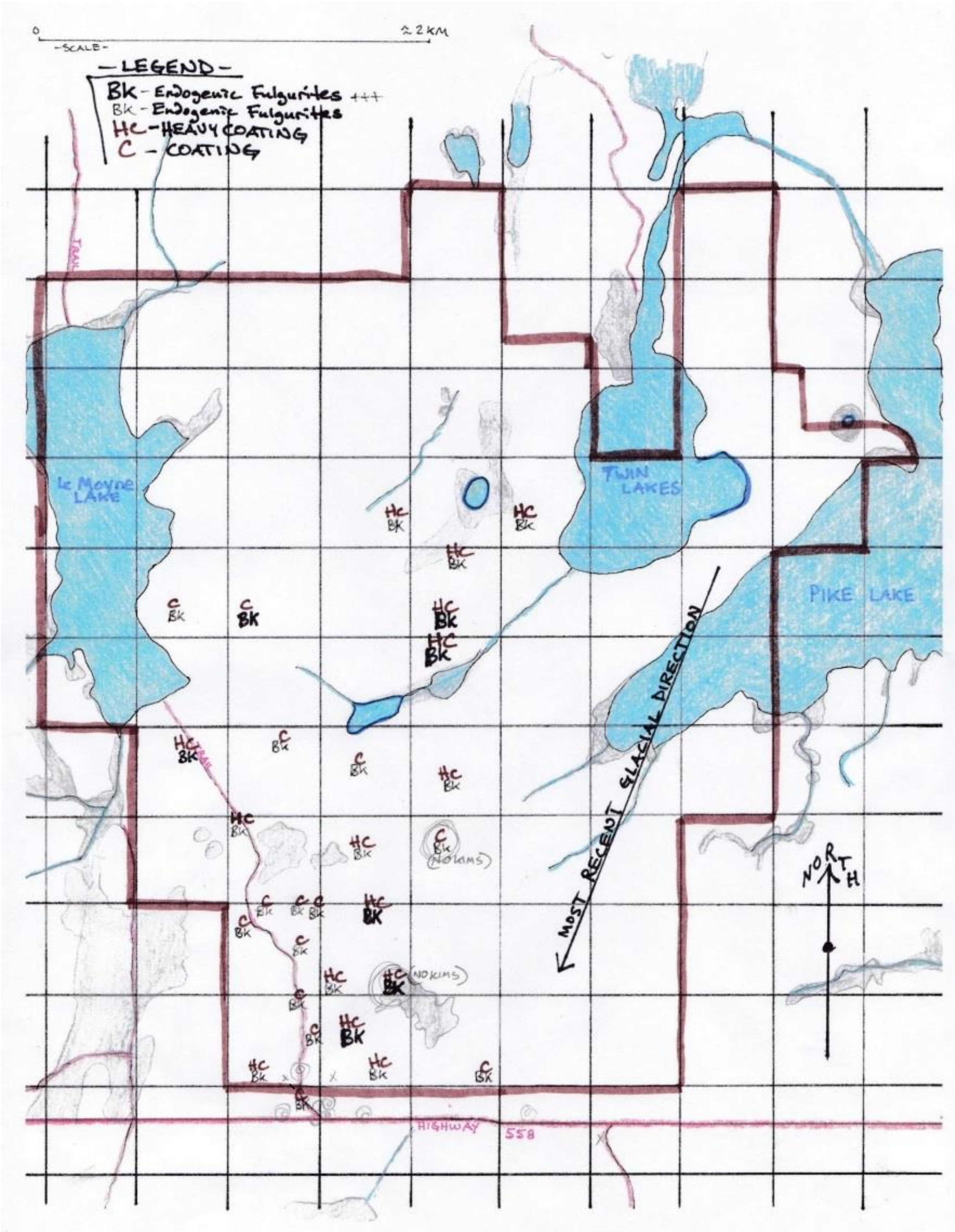


Figure 11 – Showing distribution of Endogenic Fulgurites and grains with Heavy Coating found in samples collected during first four traverses.

Appendix 4: Grain & Microscopy Notes with Photographs

Some of the notes below are from an early, quick preliminary view of panned concentrate. They were fully picked at a later date and adjusted & are included in the final report. Each till sample in the charts below is preceded by a selection of photographs of grains described in the results. I did not edit the 'best' description of the grains to show the continuation of knowledge I gained as I viewed more and more grains as viewing time progressed.

One example is the 'weird black' grains, I had been trying for about 5 years to find any other reference or description (including Google Images) to no avail. Then, just a month or so ago, I found an article with some similar photographs, but not quite the same. Following up with more research, I found the particular grains I was finding are somewhat unique in a number of ways, and have named them Endogenic Fulgurites. I believe they are a new KIM of great importance in Diamond Exploration, as described within this report.

My knowledge and the information available to me expanded over the last 3 years of working on the Barr claims and several years before that in Lorrain Claims, which involves a great deal of picking grains, and has continuously evolved since writing some of these earlier notes until the present.

The following charts are the accumulation of 3 years of part-time work looking for KIMs and other minerals of interest from Barr Twp. Most of this work generally involved breaking down samples in a 5-gallon pail with a ½ industrial low-speed drill and large drywall mixer → concentrating with sluice → GC (Goldcube) → gold panning → viewing the results under a microscope to pick KIMs, etc. As this is a simplified chart, details of this process with extra necessary steps will be better described elsewhere in this report. I've also included many photos of grains from most samples within the charts below. The photographs are invaluable to future and present grass-root prospectors for use in identifying potential KIMs and other minerals of interest. I included a number of E.F. photos to help other prospectors/researchers to identify these peculiar/very rare mineral specimens. Notice that the pattern of the E.F. grains changes from till sample to till sample. This could relate to distance from the centre of the lightning strike or intensity of the strike. This could be used to calculate boundaries of the attractor (i.e. kimberlite pipe or metallic ore body).

Further, they are a great teaching tool for all levels of exploration from prospectors on up. If KIMs are searched for in Google or especially Google Images, very few are found (some of which are mine), and Major exploration companies do not willingly share information that might aid competitors. Thus, making it extremely difficult for grass-root prospectors.

The picking of cons under a microscope is the most labour-intensive as well as the most critical part of the process. ODM and other companies charge $400-500 per sample for concentrating and 'basic', i.e. partial, picking. This goes up depending on the level of microscopic time involved. Many exploration companies only request the (smallest) 0.25-0.5mm fraction to be picked to save money.

I tend to do extra levels of 'work' – some very time-consuming – than the typical lab (the per hour cost for this for exploration companies would be too prohibitive if sent to a commercial lab). I have equivalent equipment as that of any commercial lab in concentrating and microscopy but being semi-retired I have more time available in the off-prospecting long winter season for the time-consuming microscopy work. This leads to precise counts of KIMs of all sizes, as well as detailed descriptions and photographs of important grains.

This has resulted in some new, unique, and important discoveries that have aided me and RJK Explorations Ltd. In discovering new kimberlites and interpreting the potential for 'super deep' diamonds. Recently, I made a 'new' discovery discussed in this report that one PEng geologist called a 'game changer' in the locating of kimberlite pipes, previously a technique that was developed that virtually negates the need to microprobe grains and delivers more information in the process. RJK's geologist expressed the opinion it should be proprietary.

Important KIMs and other minerals of potential importance have been microphotographed with size, colour, surface features, magnetic susceptibility, probable identity, and other information included. This is very time-consuming – few companies offer this service. The few I've found, including Kevin Cool (out of Timmins, now retired – I bought his lab equipment) several decades ago charged $20 per photo. Another lab in Australia was charging $10 per photo. It is extra time-consuming work, but the results can be very useful in future interpretation and exploration, and very importantly it's possible to see physical features, such as colour variation, surface textures, inclusions (or lack thereof), and combine that with magnetic susceptibility before choosing to utilise microprobing to predict the value of grains in a given pipe for potential diamond content, and preservation of 'deep' diamond potential and other. If this information is not taken and preserved prior to microprobing it is permanently lost (to microprobe they mount the grain in epoxy and grind the surface flat to expose a fresh face for the microprobe).

Sample # Barr 1

Photo 7043 – 0.6mm, GP, light pink, very similar to G10 found in Lorrain Twp kimberlite field

Photo 7045 – 2.6mm, GO, brecciated, exceptional, very little travel distance/abrasion

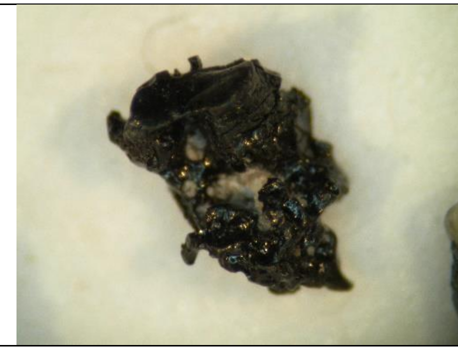


Photo 7048 - ~2.3mm, E.F., Note: not hollow

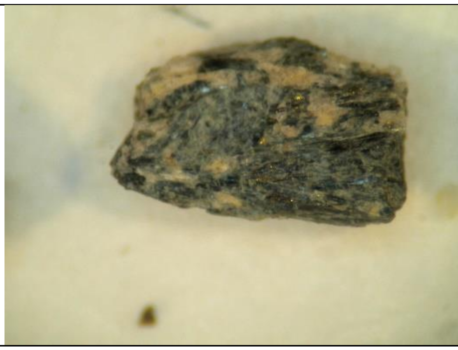


Photo 7049 – Kyanite

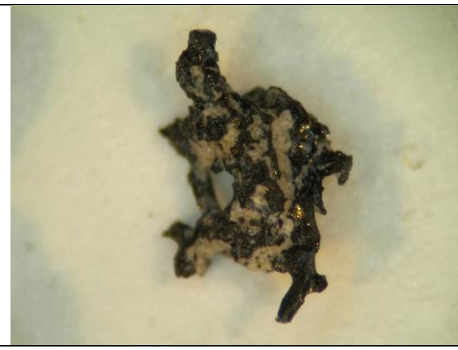


Photo 7051 – 2.7mm, E.F., front of Photo 7052

Photo 7052 – 2.7mm, E.F., back of Photo 7051

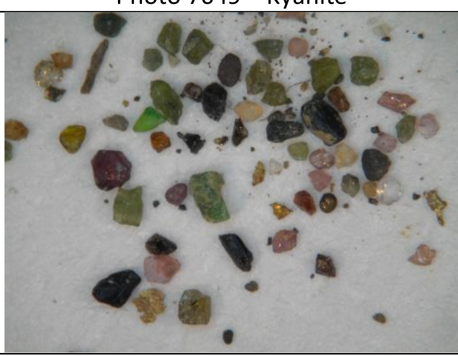


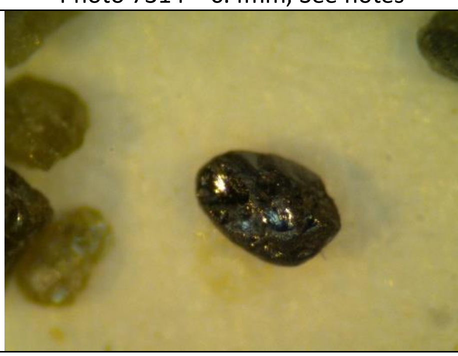
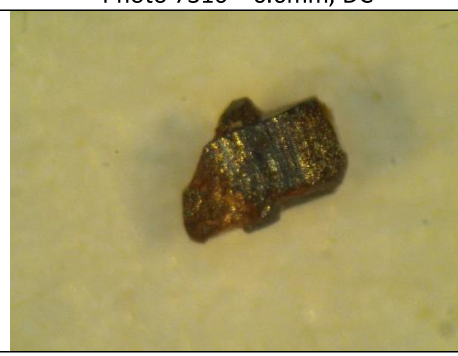
Photo 7364 – See notes

Photo 7365 – 0.6mm, Au grain

Sample # Barr 1					
Pic #	**Size (mm)**	**Magnetic Susceptibility (M0, M1, M2, M3)**	**Description**	**Notes**	**Other**
	0.25-0.42		Massive amount of very small sulphide shards	.	
		M0	Blue, green (probable) kyanite crystal, elongated, striated		
		M0	Small weird BLK, some possible DC		
		M1	Round, almost BLK FeO grain		
		M2	Another 2 colourless/transparent grains. GO-BLK inclusions		
			Again, using heavy liquid on concentrates would preclude finding these at Barr and in Lorrain & Gillies Limit, and here they are definitely associated with KIMs/DIMs. Mike Leahy identified them as (unknown), but definitely mafic.		
			So, GO brecciated 2.6mm is approximately equivalent to 1000 0.25mm or 126 0.5mm grains in mass, and coating and size indicates very close proximity, and approximately 500m up-ice is sample 9 with multiple very large garnets (KIMs). - This is very likely a different source pipe from the 2012 report (Gao, C. 2012) till samples to the east, it aligns with up-ice sample Barr-9, which had very large 1.0-2.0mm KIM garnets	(see Grain Size in mm chart, p 34)	
		M1	Probable chromite		
	0.4	M1	GO (some ‘f’)		
			Really nice KIMs, very best DC - 3 brilliant Green (0.4, 0.5, 1.0mm) - ~27 good colour - 3 pristine Au grains (~0.5mm) - 6 pristine Au grains (<0.5mm) - GP - GO - Other	Good till Sample	
7043	0.6	M2	G-pink P, very small black inclusions would explain M2, looks like a KIM		In vial
	~0.3	M2	GO, M2 might be explained by very small BLK inclusions, probably magnetite		

7045 7046	2.6	M0	A perfect GO, large, brecciated, f (sub-kely), kelyphitic rim, very close to source		
7047 7048	~2.3	M0	Large, pristine weird BLK (therefore very close to source)		
7049 7050		M0	Slender blue/green elongated crystal, looks like kyanite crystals layered together, with a kely rim (?)		
7051 7052	2.7	M0	Large weird BLK, ‘f’ kely rim.		
7053	0.6	M1	GP deep Pp, (shard, see photo), long		In KIMs
7054	0.5	M2	G-pink Pp (other colours are lighting),		
7364			4 x Au grains		
7365	0.6		Au grain		
7366	0.5		Pristine Au, flat		
	0.8		GP, ‘f’, undamaged from transport, no fractures, very nice		
7367			- DC (0.6mm) - G-red - Yellow (?) - E.F. BLK		
7368	1.1		DC		

Sample # Barr 4					
Pic #	**Size (mm)**	**Magnetic Susceptibility (M0, M1, M2, M3)**	**Description**	**Notes**	**Other**
7065	~0.3	M1, magnetic	Spherical, round BLK		
7066	1.4		Weird BLK		

<table>
<tr><th colspan="3">Sample # Barr 5</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Photo 7026 – GP with ‘f’ & partial kelyphitic rim</td><td>Photo 7028 – Very unique, looks like GO & G4 (orange & yellow intermix of garnet)</td><td>Photo 7029 – DC with crystal formation?</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Photo 7314 – 0.4mm, See notes</td><td>Photo 7316 – 0.6mm, DC</td><td>Photo 7317 – 0.5mm, Interesting garnet, M1</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Photo 7318 – 0.6mm, G-black-red ?</td><td>Photo 7320 – 0.5mm, See notes</td><td>Photo 7321 - ~0.4mm, See notes</td></tr>
</table>

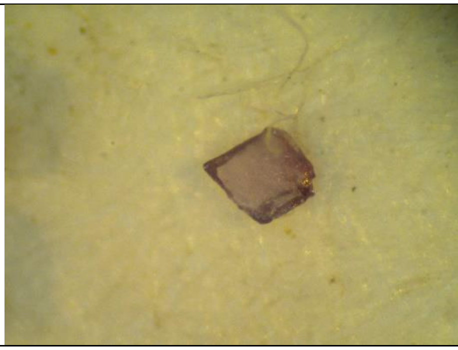
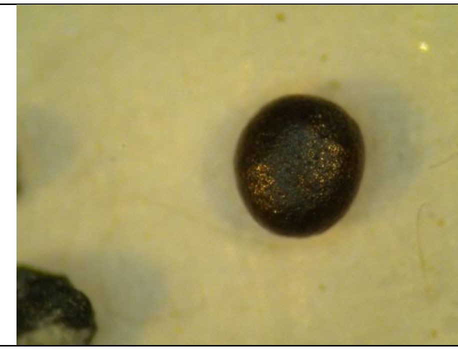
		

Photo 7322 – 0.3mm, GP	Photo 7323 – 0.6mm, GP	Photo 7324 – 0.6mm, FeO

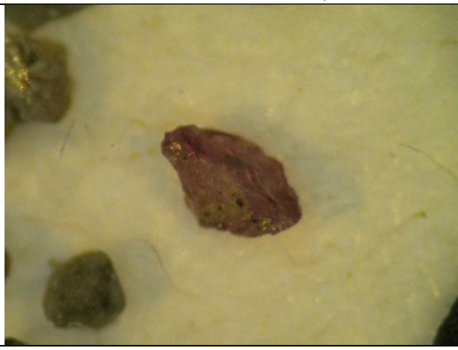



Photo 7325 – 0.5mm, GP	Photo 7326 – 0.8mm, GP-pink	Photo 7327 – 0.3-0.4mm, GP/pink, DC & unknown crystal grain

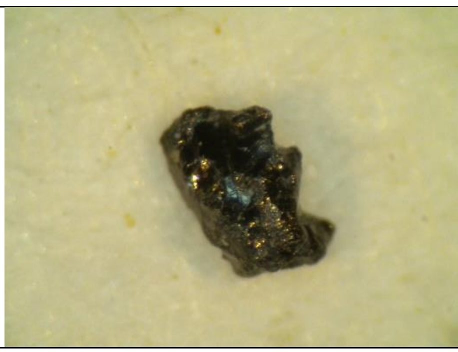
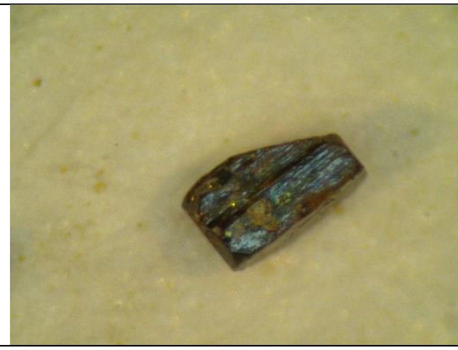
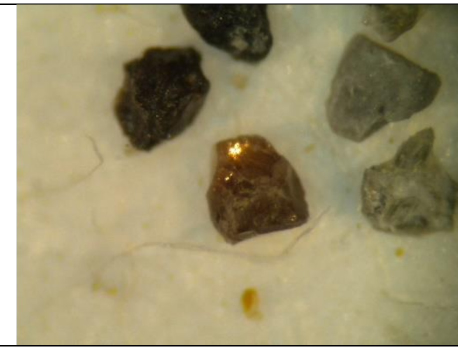
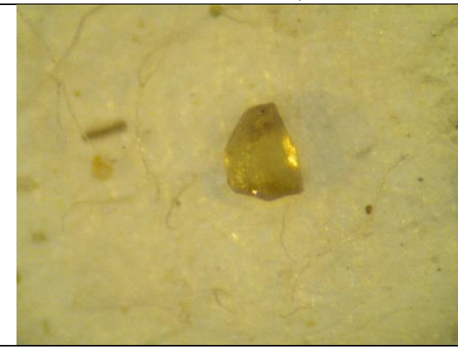



Photo 7328 – 0.7mm, See notes	Photo 7329 – 0.7mm, G-pink	Photo 7330 – 1.0mm, GP, see notes

		
Photo 7333 – 0.7mm, GO	Photo 7334 – 0.6mm, Translucent red crystal	Photo 7337 – 0.3mm, See notes
		
Photo 7338 – 0.4mm, Red-wine garnet	Photo 7339 - ~0.3mm, Brilliant yellow & yellow/orange. Citrine or diamond?	Photo 7340 - ~0.4mm

Sample # Barr 5

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
	0.25-0.42		No weird BLKs in Barr 5, in this size fraction. The weird BLKs might be lightning strikes on base/metal deposits?		
		M0	Some possible DC, ilmenite		
			No KIMs, but in M1 & M2 considerable transparent/colourless		
	0.42-0.84	M0	Perhaps DC		
		M1	No KIMs		
		M2	Weird BLK (large)		
7029	1.8		DC, ‘f’ sub-kely, rounded, both ‘ends’ are fractured (see Photo 7030), non-conchoidal		
		M0	Potential DC	Repicked from leftover drawer	

		M1	GO, potential KIM		
		M1	Re-mag from old M1		
		M0	Quite a few potential DC		
		M1	FeO (recheck N-52)		
	~0.4	M0	Looks like fractured brown garnet (?)		
	0.3	M0	G0, light orange		
	0.4	M0	GO, medium orange		
	0.3	M0	Mg-ilmenite		
		M0	A number of potential GP, they are darker red-black than usual. Need microprobing in the 0.25-0.5mm range.		
	0.25	M0	G-pink		
		M1, barely magnetic	- 15 x GO (0.25-0.5mm) - 1 x G-pink (0.9mm) - 4 x G-pink (0.25-0.5mm)		
			Many potential DC		
	0.5		Round 'f' brown, FeO		
		M1	- 12 x probable Mg-ilmenites (KIM), very weak - 5 x probable Chromites (KIM) - 7 x probable Rutile (KIM) - 2 x FeO round 'f'		
		M1	Kyanite (blue)		
7325	0.5	M1	GP with kely-rim		
	0.4	M0	GO		
	0.4	M0	GO		
		M0	DC		
	0.25	M0	G0		
		M0	Ilmenite		
	0.4	M0	GO		
	0.3	M0	G-pink		
	0.4	M0	G-pink		
	0.25- 0.5	M1	Generally very good eclogitic garnets & BLKs		
		M1, barely magnetic	- 2 x Ilmenites - 69 x G-pink - 48 x GO light orange - 21 x GO medium/dark orange		
		M1	Diopside, nice green but M1 (9) visually very difficult to distinguish from DC M0		
		M1	- 43 x Ilmenites		

			- Several Chromites (?) - 1 x G-brown - 1 x G-red - 2 x Yellow - 1 x Rutile red (in DC M1) - 4 x FeO, brown		
		M1	FeO, brown		
		M1	BLK (in DC M1)		
		M2	GO (M2 orange garnets are crustal or very poor KIMs)		
		M2	Interesting, there are garnets in M2 that look identical to those in M0 & M1, which means there are several pipes and/or phases that came up at different velocities and O_2 levels (fugacity).		
		M2	The M2 grains have a greater static charge on them, making pickup & release more difficult. Need to retest – N-52		
	0.25-0.5	M2	- 22 x GO - 30 x G-pink - 8 x Diopside Probably not KIMs		
	0.25-0.5	M3	M3 - Jump up to magnet, e.g. magnetite Quite a few BLKs, hard to identify, a few garnets, a few greens, and oddly a number of transparent/colourless grains, some with tiny black inclusions, but several (4) with no inclusions.		In vial M3 Rechecked several times
			Round FeO, brown		
7026 7027	0.9	M0	GP, some kely & sub-kely 'f', sharp edges on fractures, therefore local.		
7028	0.6	M1	Probable chromite, slightly rounder edges, GO, sharp fractures, a number of possible ilmenites		
7314	0.4	M0	Seems to be rounded crystalline shape	Revisited in drawer	
7315 7316	0.6	M0	DC (very good KIM), etching/wear can be seen. Rear of grain (7316) – fractured, smooth surface. Possibly indication of transport some distance		
7317	0.5	M1	G-pink, frosted on back, fractured on front. Conchoidal, sharp edges, not transported far since fracture (KIM),		
7318	0.6	M1	G-black-red (?)		
7319		M1	Same grain as 7318, comparison of a KIM grain to other grains in the concentrates, most KIMs/DIMs stand out		In vial, microprobe

7320	0.5	M0	Reddish/black, smooth striated		In vial, microprobe
7321	~0.4	M0	Reddish/black cubic (mostly), sparkly-shiny surface		In vial, microprobe
7322	0.3	M1, barely magnetic	Nice GP, very good colour/clarity, definite G9, maybe G10		
7323	0.6	M1	GP		
7324	0.6	M1	Round 'f' brown FeO	There is a good possibility I'm using stronger magnets than I did at Lorrain, and the M1 is very, very weak (for an easy shake off). (This is where I found out about Rutile, which I also found commonly in Lorrain Kimberlite KIMs, so I perhaps should recheck cons at some future time – 22/03/18)	Double-check M1
7326	0.8	M0	G-pink		
7327	0.3 – 0.4	M0	GP/pink, DC & unknown crystal grain		
7328	0.7	M0	BLK, ilmenite probable		
		M1, barely magnetic	Barely magnetic (especially for GO – eclogitic garnets, as they tend to be quite high Fe % content and would normally be very magnetic M2/M3)		
7329	0.7	M1	G-pink, conchoidal fracturing, sharp edges (which denotes minimal transport)		
7330	1.0	M1	GP (very light), black, liquid-like inclusions. I've seen similar inclusions in several garnets from the Lorrain Twp. Kimberlites		In vial
7332 7333	0.7	M1	GO medium orange with kely-rim. Back view with another GO with kely-rim (7333)		7332 with M1 garnets 7333 in vial
7334	0.6	M1	Translucent red crystal	Personal note: like M0/M1 magnetite microprobed from Lorrain	
7337	0.3	M1	GB, looks like brown garnet, unique. Conchoidal fracture, sub-kelyphitic rim (f – frosted), would have been unremarkable and hard to spot except for the lighting		In vial, microprobe
7338	0.4	M1	Red (wine) garnet		
7339	~0.3	M0	Brilliant yellow & yellow/orange. Citrine or diamond?		SEM, in vial
7340	~0.4	M0	Yellow		SEM

Sample # Barr 6		

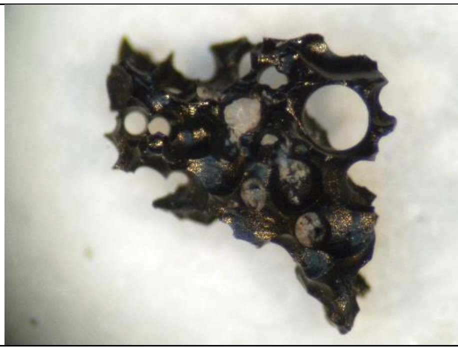
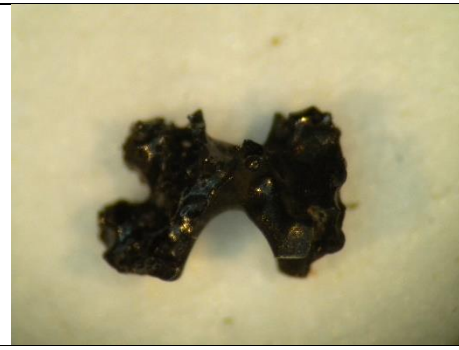
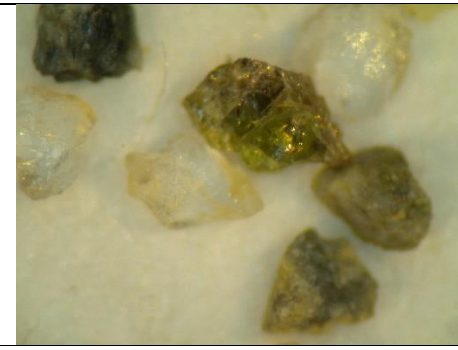

		

Photo 6997 – 1.9mm, E.F.	Photo 6998 – 1.8mm, E.F.	Photo 7031 – Green & yellowish olivine/DC?
		
Photo 7033 – 0.6mm, Red garnet	Photo 7035 – 0.5mm, GO	Photo 7038 – ~3.0mm, E.F. with round vesicles formed by gases/steam/forming around till grains?

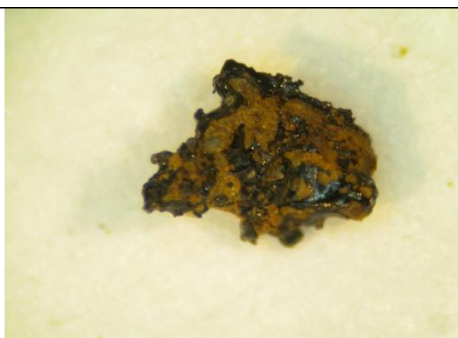
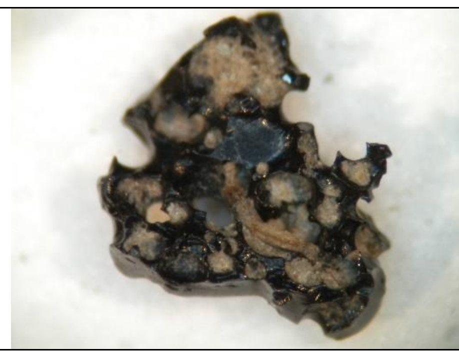

	

Photo 7039 – 2.0mm, E.F. with possible kimberlite infilling	Photo 7041 - ~3.0mm, E.F. These are definitely endogenic fulgurites, i.e. no teardrop/tail shape	Photo 7341 - ~1.0mm, See notes

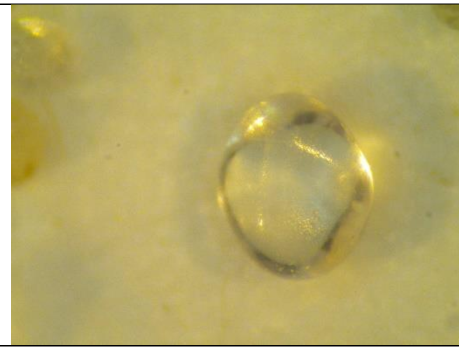
Photo 7342 – 1.0mm, G-pink

Sample # Barr 6

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
		M1	No KIMs, lots of colourless/transparent	1st	
		M2	No KIMs, lots of colourless/transparent		
		M3	Mag tray - no KIMs, but several dozen colourless/transparent grains with no inclusions. Static? But mag tray is lined with aluminum foil which should remove/negate any charge.		
		Mag tray	Overall a couple of weird BLKs		
		M1, M2, Mag tray	No KIMs		
			DC, rounded ‘f’ brown FeO	2nd	
			Brown FeO		
			Another FeO		
		M0	There are many larger weird BLKs in Barr 6		
	0.25-0.5	M0	- 5 x Potential DC - 9 x BLKs (most can’t identify without SEM/microprobe) - No KIMs		
	0.5-1.0	M0	No KIMs. Took ~ ½ day		
6994	1.1	M0	Weird BLK, some kely-rim		
6995	0.7	M0	Some secondary (silver) mineral? I’ve seen similar in cobalt/Ag specimens, grey/Ag metallic		In vial, microprobe
6996	2.5	M0	Weird BLK, I can see where the sharp tips are broken off so the original grain must have been sharper. Reflects their		

			fragility – probably happened during concentrating – how did they survive glaciation?		
6997	1.9	M0	Weird BLK, note frosting on all surfaces		
6998	1.8	M0	Weird BLK		
6999	0.6	M0	Weird BLK		
7000	4.9	M0	Weird BLK (if the white/brownish 'kely-rim' etched away it would expose the round 'holes' in these grains). Not sure how they formed. I seem to find weird BLKs in association with KIMs and secondarily with sulphides, etc. (i.e. no KIMs, no sulphides → no weird BLKs)		
7001	2.7	M0	Weird BLK		
		M0	~No KIMs		
7031 7032		M0	DC (?), green mineral		In vial
7033	0.6	M0	Blood-red coat on grain?		
7034 7035	0.5	M0	Orange layered grain		In vial
7037	~2.8	M0	Weird BLK, interesting. Larger & bulkier, surface texture (sub-kely 'f') is rougher than usual. Complete grain, only fractured on one branch (the largest) on the end, the other 'branches' are complete and terminate. Weird BLK – large, heavy kely-coat on 1/3 of surface		In vial, microprobe
7038	~3.0	M0	Weird BLK, sub-kely (f), the structure (semi-crystalline) could be grain growing through a matrix? (i.e. pseudo crystal)		In vial
7039	2.0	M0	Weird BLK with possible kimberlite infilling, comprising in the sample ~2/3 material which is visually identical to some of the Bishop 'Lorrain Kimberlites' – brownish compacted till in appearance. This furthers my opinion of these grains being primary KIMs, they are also found in areas of high KIM counts in Lorrain Twp. It's probable that being lighter, in other labs that routinely use heavy liquid separation they would not have been found/recovered, hence not hereto reported.		In vial in scales
7040	~2.0	M0	Blue stone in grain. Total width of grain ~2.0mm, of blue stone ~0.5mm. Host rock not calcite (acid), probable GO		In vial in scales
7041	~3.0	M0	Weird BLK (kind of resembles meteorite), These are the biggest, most intact weird BLKs → very close to kimberlite? Very likely		In vial in scales

7042	2.0	M0	Kimberlite probably, not like Lorrain. This is likely a grain of more 'traditional' kimberlite than that in Lorrain. I've seen quite a few of these in Barr 2.0mm till samples		
7341	~1.0	M1, magnetic weak	Interesting colourless/transparent grain, looks like quartz with one tiny black speck (probably magnetite) that causes a pickup effect (N-52 magnet) on a vastly larger grain.	I've noticed this on a number of similar grains from various cons. Contrast this with 3 magnetite grains from Lorrain which had a similar weak (almost 0 magnetic susceptibility) that microprobed as magnetite in Fipke's lab in Kelowna, B.C. See info on non-magnetic Fe in report (Appendix 6: Grassy Lake Excerpts, p 181)	Drawer
7342	1.0	M1-M2	G-pink, heavily fractured but sharp edges all around, therefore minimal travel. Fairly large grain for a remnant of a bigger one. Probably kimberlite. Originally tested M1, retested M2, might be crustal/kimberlitic but not a best KIM and found another similar garnet		In M1 vial drawer

Sample # Barr 7		
		
Photo 7343 – 1.2mm, GO	Photo 7344 -	Photo 7347 – 0.4mm

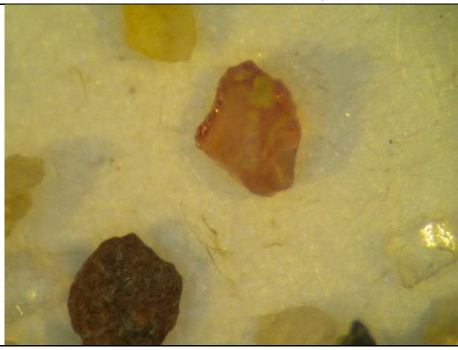
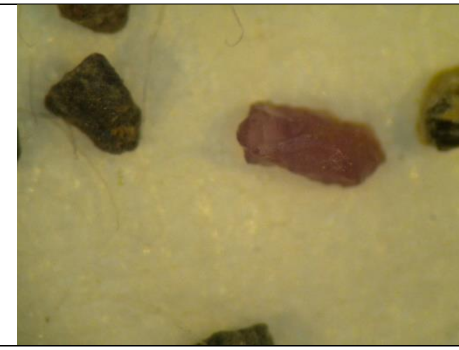

		

Photo 7349 – 0.6mm, G-pink	Photo 7350 – 0.4mm, GP	Photo 7351 – 0.6mm, GP
		
Photo 7352 – 0.4mm, GO	Photo 7353 – 0.7mm, GO	Photo 7354 – 0.4mm, See notes

Photo 7355 – 0.33mm, 3 x Chromites

Photo 7356 – 0.8mm, G-pink

Sample # Barr 7

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
6940	0.25-0.42	M0	Grey/very light purple grain	(never seen this before)	Microprobe
6942 6943	1.0	M0	DC, no other KIMs		Microprobe
	0.25-0.42	M1	Lots of transparent/colourless grains		
		M2	Lots of transparent/colourless grains, No KIMs		
	0.42-0.84	M0	Some of weird black grains, No KIMs		
		M1	No KIMs		
		M2	No KIMs, but colourless/transparent grains		
	0.84-1.3	M0	No KIMs		
		M1	No KIMs		
		M2	No KIMs		
	1.3-3.0		No KIMs		
	0.25-0.5	M1	- 31 x G-pink - 10 x GO - 2 x G-red Lots of potential DC visually, but M1		Drawer
7343	1.2	M0	GO (eclogitic garnet) inclusion in a colourless/transparent grain		
7345, 7346	0.5	M0	Colourless/transparent ‘shell’ over a frosted translucent core. Looks like a transparent egg and yolk.	Note: the yellow is lighting effect	
7347	0.4	M0	- 12 x DC, best colour DC		
		M0	- 2 x Brassy sulphides		
		M0	Weird BLK (okay, small)		

	0.4	M0	G-pink		
7348		M0	I regularly find these colourless/transparent grains with blob-like inclusions, most often in the centre of the grain.		
7349	0.6	M0	G-pink		
7350	0.4	M1	GP		
	0.25-0.5	M0	- 2 x Ilmenite - 3 x GO		
7351	0.6	M0	GP, partial sub-kely (f)		
7352	0.4	M0	GO, f surface		
7353	0.7	M0	GO, Sub-kely		
7354	0.4	M0	? Pale yellow, looks like (f) sub-kely		In vial, microprobe
7355	0.33	M1	- 3 x Chromites, essentially non-magnetic, very high Fe (hurrah!), I've been predicting these for a while		In vial, microprobe
7356	0.8	M1	G-pink		

Sample # Barr 8

		
Photo 7359 – 1.6mm, Same as Photo 7360	Photo 7360 – 1.6mm, Ag nugget	Photo 7361 – 1.6mm, Same as Photo 7360

Sample # Barr 8

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
	0.25-0.42	M0	Lots of weird BLK, No KIMs		
		M1	No KIMs, some transparent/colourless		
		M2	No KIMs, some transparent/colourless		
	0.42-0.84	M0	Lots of weird BLK, No KIMs		
		M1	No KIMs		
	0.84-1.3	M0, M1, M2	No KIMs, 1 weird BLK		
7357	0.5	M0	Colourless/transparent with odd inclusion(s)		
7358	0.4	M0	Nice green (it's actually a uniform light green, transparent)		In vial, ** SEM ◇ test
	0.25-0.5		- 3 x BLKs - 1 x light yellow transparent? - 4 x Mg-ilmenite 3 x BLKs		
	0.25-0.5	M1	Black FeO, rounded 'f'		
7359-7361	1.6	M0	Ag (silver) nugget		In vial in drawer
		M1	- 9 x GO - 10 x G-pink - 1 x light yellow transparent		In drawer

Sample # Barr 9

Photo 7010 – 0.6mm, GP, DC, Other?

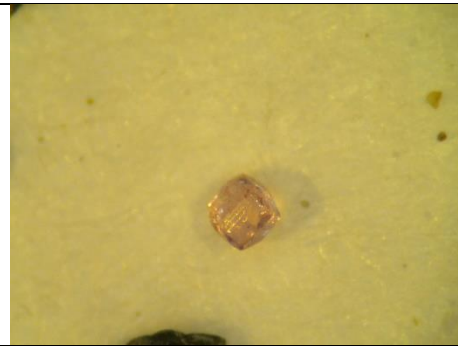


Photo 7011 - ~0.4mm, Pink grain

Photo 7012 - ~0.6mm, Yellow grain

Photo 7055 - ~2.2mm, E.F.

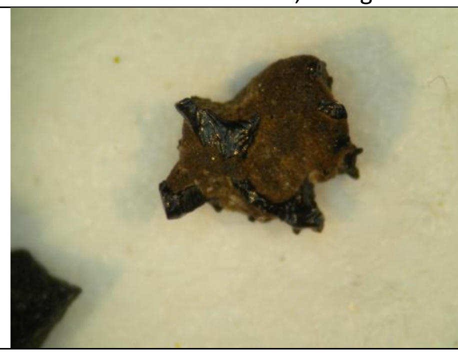


Photo 7057 – 2.2mm, E.F. partly encased in somewhat modified till? from lightning (it didn't dissolve in conc. muriatic acid)

Photo 7059 – 1.4mm, E.F.

Photo 7061 - ~1.5mm, E.F.

Photo 7063 – 1.1mm, Blue grain (Cu mineral?)

Sample # Barr 9

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
7010	0.6	M0	GP, sub-kely rim, DC, other?		

7011	~0.4	M1	Pink	[Redone Dec 12/21, rescreened, remag, repicked]	In vial, microprobe
7012	~0.6	M1	Yellow (photo colour shows orange but is yellow)		In vial, microprobe
	0.25-0.42	M2	Chromite & ilmenites		
		Mag-tray	No KIMs, transparent/colourless		
	0.42-0.6	M0	No KIMs		
		M1	No KIMs		
		M2 & Mag-tray	No KIMs		
	0.25-0.5	M0	- 7 x DC (potential) - 3 x GO - 2 x Light yellow/green? 2 x Sulphide	Re-re-checked	
	1.0- 2.0		So all garnets and a few DC are mostly in the 1.0-2.0mm size with a few in the 0.5-1.0mm, none found in the <0.5mm fraction.	Barr 9 – very good	
	~1.0- 1.5	Non-mag	- 2 x GP - 3 x DC - 1 x GO - 1 x FO Other: shiny opaque red, non-mag magnetite?, green coated		
	0.5-1.0	M1	- 1 x G-pink - 2 x Pink-orange - 4 x GO 2 x Sulphides	Somewhat more magnetic	
		Shake-off N-52	- 2 x GP - 2 x DC (potential) - 1 x GO - 1 x Other No KIMs	These have been mag-trayed	
7055	~2.2	M0	Weird BLK	[Checking pan rejects from Barr 9]	In vial in scales
7056 7057	2.2	M0	Weird BLK, almost completely coated in kimberlite (?), kely-rim?		In vial in scales
7058	~1.6	M0	Weird BLK (similar to grain in 7056/7057 except for a much darker coat – of equal importance) with very dark, almost black matrix		In vial in scales

7059	1.4	M0	Almost identical to 7058, in same vial		
			Weird BLK, very delicate, partly crumbled under gentle tweezer pick (therefore didn't travel far)		
7060 7061	~1.5		Weird BLK with matrix		
			Interesting, no traditional KIMs, which are heavier and were found in the panning cons		
	~1.5		Ilmenite		
			Consistent with 1st picking, I am finding interesting grains (many) in the largest sizes and fewer as the grains get smaller (opposite to normal), therefore, very close to target		
7062	0.8	M0	Nice, in KIMs, Barr 9 ◇?		In vial
7063 7064	1.1	M0	Blue grain (?)		In vial
			Note: in the panned leftovers, no garnets or other heavy minerals also in the smaller fractions, no weird BLK, further evidence of proximity. So, in traditional 0.25-0.5mm no KIMs would be recovered, therefore would have missed a proximal kimberlite. So panning for 'heavy' KIMs is very effective (as many past tests in Lorrain have shown).		

Sample # Barr 10

		
Photo 6871 – 0.7mm, DC	Photo 6872 – 0.6mm, DC	Photo 6873 – 0.5mm, Shiny?
		
Photo 6878 – 0.8mm, Inert GO		

Sample # Barr 10

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
			Done, no KIMs		
	0.25-0.42	M0	- 3 x V.G. brilliant green chrome diopsides, other less so DC - 1 x Pink garnet - 2 x Yellow grains?		
		M1	- 1 x Nice shiny (see photos) - 1 x DC - 1 x Probable chromite - Some BLKs		
		M2	Nothing		
6783			Mag tray		
6871	0.7		Nice DC		

6872	0.6		DC		
6873	0.5		? Shiny		
6877	~0.5		With KIMs		
6878	0.8		Inert GO		
	0.42-0.84	M1	~None		
		M2	~None		
	0.84-1.3	M0	None		

Sample # Barr 11

Photo 6938

Photo 6942

Sample # Barr 11

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
	0.25-0.42	M0	No KIMs, several odd grains, lots of quartz		
		M1	No M1		
		M2	Lots of interesting grains, especially colourless/transparent		
	0.42-0.84	M0	Elongated greenish crystal x lots of kyanite?		
			Weird black grains		
		M1/M2	Not much (KIMs)		
	0.84-1.3	M1/M2	Nothing	Not good	
6942 6935	2.0	M0	Weird black grain with kelyphite.	I find this in all good samples from Lorrain, I think it might be associated with base metal.	

Sample # Barr 12		
		
Photo 6900 - ~0.3x1.0mm, GP	Photo 6902 - ~0.5mm, GO	

Sample # Barr 12

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
6900	~0.3x1.0	M0	Nice light GP		
6902	~0.5	M0	GO		
		M1	Garnets, probable chromites/ilmenites. Lots of BLKs		
		M2	Lots of BLKs, some definite chromites		
	0.42-0.84	M0	Nil except for weird BLKs		
		M1	Nothing		
	0.84-1.3		- 1 x GP - 1 x GO - Chromites? - ~No KIMs		

Sample # Barr 13		

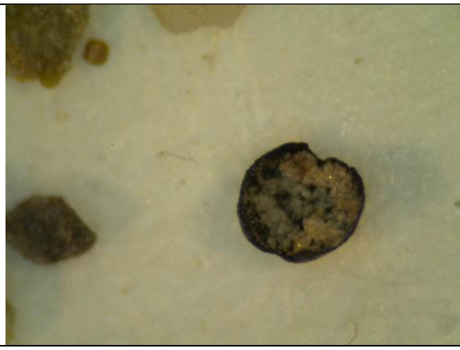
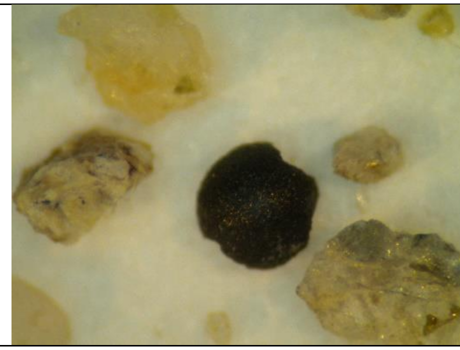

	

Photo 7067 - ~0.5mm, E.F. shell around crystals (it would be very interesting to microprobe the white mineral)	Photo 7068 - ~0.5mm, Back of Photo 7067	Photo 7070 – See notes below

Sample # Barr 13					
Pic #	**Size (mm)**	**Magnetic Susceptibility (M0, M1, M2, M3)**	**Description**	**Notes**	**Other**
7067 7068 7069	~0.5	M0	Lots of 'small' weird BLK, front & back of ½ of a hollow sphere with white crystals growing inside, frosted (sub-kely) surface. Too delicate to pick up, broke apart	Could be big→many small. Could be glacial transport or tumbling/handling, they are very delicate	
7070			Magnetite grains on the viewing/picking plate after using an N-52 magnet to separate into magnetic susceptibility fractions		
7071	~3.1	M0	Weird BLK, looks intact, not broken ends, ~size of largest KIMs. Part kely-rim		In vial in scales
		M0	Lots of larger BLKs		
			No sulphides		

Sample # Barr 14		
		
Photo 7072 - ~3.0mm, E.F., note: end solid glass, not hollow	Photo 7073 - ~3.0mm, close up of Photo 7072	Photo 7075 - ~3.0mm, E.F.

Sample # Barr 14

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
7072 7073	~3.0	M0	Weird (linear, tube-like) BLK (one end which appears to be hollow), frosted surface overall & end is ‘shiny’ BLK.	I found a number of these in Lorrain cons (from various till samples), & also in some Barr samples. At first glance a charcoaled branch, but this is the same mineral as other weird BLKs	In scales
7074 7075	~3.0	M0	Weird BLKs in unpicked cons from Goldcube. Coloured sparkles in lighting, No KIMs		In scales
		M0	Some (a few) tube/stick-like weird BLKs found	Note: the weird BLKs are far fewer than Barr 13	
			No KIMs		
	<3.0		Lots of weird BLK up to 3.0mm		

Sample # Barr 15		
		
Photo 7076 – 0.5mm, DC	Photo 7077 – Unique, looks like GO/G-red intermix	Photo 7079 - ~0.5mm, GP-pink
		
Photo 7080 - ?	Photo 7081 - ~1.0mm, Potential diamond?	Photo 7082 – 1.3mm, GO ? 'f'
		
Photo 7085 – 1.8mm, E.F.	Photo 7086 – 2.1mm, E.F., Front of Photo 7087	Photo 7087 – 2.1mm, Back of Photo 7086

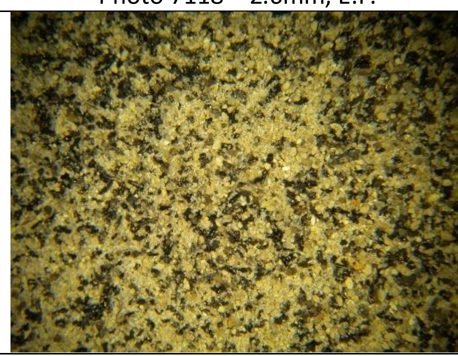
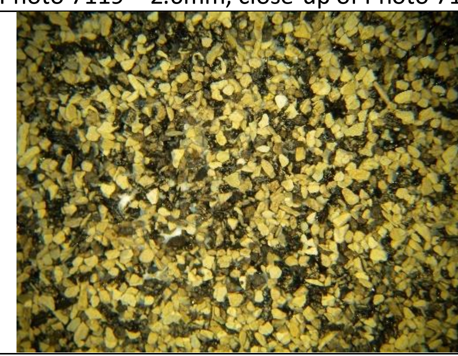
		
Photo 7089 – 2.8mm, E.F.	Photo 7090 – 2.8mm, Back of Photo 7089	

Sample # Barr 15

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
7076	0.5	M0	DC		
	~0.5		DC	*The variety and more vivid colours of grains (not traditional KIMs) increases with increase in KIMs (Lorrain & Barr)	
	0.25-0.5		DC, ilmenite (fractured), ‘f’ surface, Looks like nice round weird BLK as do all ilmenites (SG is probably different in heavy liquid)		
			Lots of DC		
7077 7078			Garnet? Orange-yellow/orange-red, ‘f’		In vial, **microprobe**
		M1	- 1 x Chromite (probable) A good number of ilmenites		
		M1	Nice G-pink, some nice DC	*Recheck M1 on this as many colourless/transparent , DC, & G-pink	
7079	~0.5	M1	Very nice G-pink (hint of purple) (the yellow is light refraction/reflection)	Recheck mag for this & transparent/colourless grains	
		M1	- 2 x G-pink - 1 x GO		
		M2	GO, G-pink (not as nice)		
			G-pink		
7080		M2	Unusual semi-transparent to transparent orange-**yellow** (almost citrine) ‘f’ grain with black inclusions (probably magnetite). **Unique**	Picked similar but mostly opaque	In vial, microprobe

7081	~1.0	M0	? Looks like a diamond? No LW fluorescence		In vial
7082	1.3	M0	Deep red-wine colour, f on all sides, possible G deep red		In M0 KIMs
7083		M0	Round, ‘f’, black,	Test?	
		M0	Probable DC		
	<1.0	M0	No weird BLKs in smaller sizes, i.e. <1.0mm	**	
			Probable ilmenites, large ‘f’		
7084 7085	1.8	M0	Weird BLK, very nice. This is probably very near source, little-to-no transport damage/large size/delicate		In vial in scales
7086 7087	2.1		Heavily coated (kelyphite rim probable) weird BLK. Again, due to large size, near pristine condition & heavily coated strongly implies that transport distance and & due to surface frosting & coat leans toward kimberlitic origin	I’m finding a great many of these ‘cemented’ grains that look very much like Paradis & other kimberlites in Lorrain Twp. on/in the Bishop Diamond Claims, now held by RJK Explorations.	
			Weird BLK, large		
7088	2.0		A green DC is apparent in the photo under magnification		In vial in scales
			Weird BLK with kely-rim, can see weathered tan colour on surface and ~white underneath (as kelyphitic rim does).		
7089 7090	2.8		Weird BLK, Pristine ‘f’, I think this is a whole grain with weathered kelyphitic rim/kimberlite		In vial in scales

Sample # Barr 16					
Pic #	**Size (mm)**	**Magnetic Susceptibility (M0, M1, M2, M3)**	**Description**	**Notes**	**Other**
	0.25-0.42	M0	Very weathered erythrite grain (almost powder)		
		M0	No KIMs, sulphides, garnets, or KIMs/crustal		
		M1/M2	No KIMs, etc.		
	0.42-0.84	M0	No KIMs		
		M1	Sulphides		
		M2	No KIMs		
	0.84-1.3	M0	No KIMs		
		M1	No KIMs, opaque white-orangish grains with small inclusions on surface, very magnetic? Picked a few, lots!		

Sample # Barr 18		
		
Photo 7114 – 2.1mm, E.F.	Photo 7115 - ~1.5mm, E.F.	Photo 7116 – 8.5mm, E.F., When I first found/photographed a # of E.F., I thought that either the kimberlite eruption or lightning had carbonised/fused roots/branches, and it was hard to internalise/explain. Now I know they are glass formed along lightning 'channels'.
		
Photo 7117 – 8.5mm, Back of Photo 7116	Photo 7118 – 2.6mm, E.F.	Photo 7119 – 2.6mm, close-up of Photo 7118
		
Photo 7120 – 3.6mm, E.F.	Photo 7121 – 0.25-0.42mm, Cons with E.F.	Photo 7122 – 0.42-0.84mm, Cons with E.F.

Sample # Barr 18

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
7114	2.1		Weird BLK (?) with sandstone (?)		In vial in scales
7115	~1.5		Similar as above, in same vial		In vial in scales
7116 7117	8.5		Branch? Carbon, silica sand in centre? (fulgurites?), everywhere Lorrain, Barr, All tiny? Very staticky	So, by order of magnitude, this is the most magnetic cons I've seen, and equally the most large weird BLKs. (Lightning? / ore body? Big stretch)	In vial in scales
7118 7119	2.6		Weird BLK	Are these weird BLKs formed from the silica in the sands (kely or otherwise) by electrostatics in a kimberlite (ore body formation)? Lighting? Impact crater?	
7120	3.6		Weird BLK		In vial in scales
7121	0.25-0.42		Ratio of weird BLK to flat, sandy, magnetic grains		
7122	0.42-0.84		Ratio (in GC Rejects)		
			The BLKs are fairly light, the larger GC rejects contains many, many weird BLKs	(See photo notes for 7121, 7122)	
			No KIMs or anything except mag-sandy and weird BLKs.	Does mag attract lightning → fulgurites? Also found them in Lorrain..	
			Odd, like sandstone, flat grains, mostly very magnetic, ~98% of sample, and many, many large weird BLKs		
			Used 600lb magnet at ~1/4 – ½", 9cm N-52		
			Many, many very large weird BLKs	This example of magnetic grains and E.F. BLKs is easily explained if the source of the magnetic mineral is conductive, i.e. a lightning attractor	

Sample # Barr 19

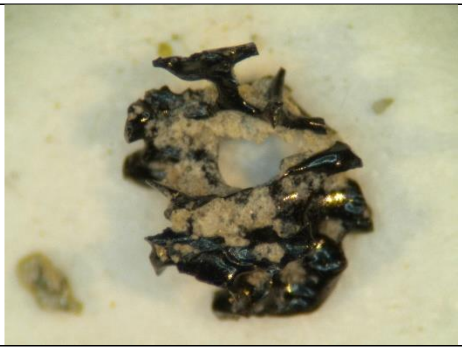


Photo 7103 – 2.3mm, E.F.

Photo 7104 – 3.5mm, Partially solidified shell, this might be a fine-grained till that expanded due to gas/steam, and the E.F. formed around it – would explain round 'vesicles' & being brittle; these shells would break away in tumbling, etc.

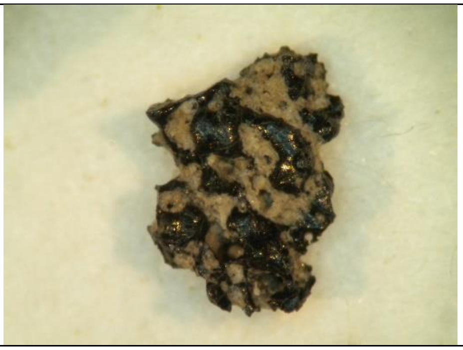


Photo 7105 - ~2.5mm, E.F.

Sample # Barr 19

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
	0.25-0.42	M0	No KIMs, no weird BLKs	Base metal or kimberlite?	
			So far no interesting grains at all		
			One probable DC (nice green)		
	0.42-0.84	M0	No KIMs		
	0.84-1.3	M0	No KIMs, 1 uninteresting weird BLK		
7103	2.3		Weird BLK (the 1st, they are very uncommon in this sample). Large, mostly pristine		In vial in scales
7104	3.5		Curious, a (partial) part of an empty rim (as in kelyphite rim)		In vial in scales
7105	~2.5		Another 'large' weird BLK with kely-rim, looks mostly 'intact'	Note: 'many' weird BLK in Barr 20, less in Barr 19 but big – some source up-ice	
	~2.6		Weird BLK	Therefore weird BLK source very proximal	
	1.8		Another weird BLK		

Sample # Barr 20

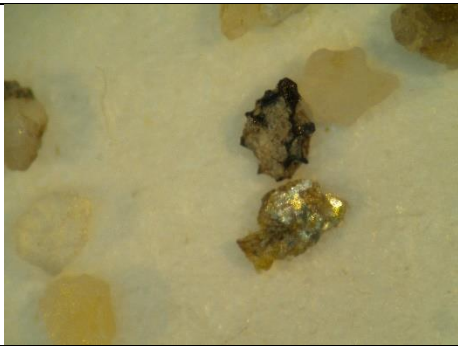


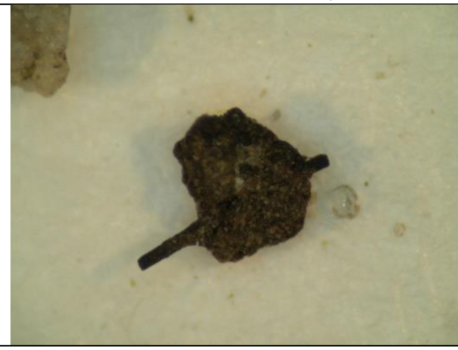
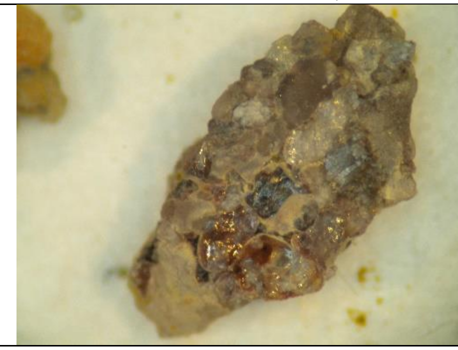
Photo 7091 - ~0.5mm, E.F. & unknown shiny	Photo 7093 - ~2.8mm, E.F.	Photo 7094 - ~2.5mm, E.F.
		
Photo 7095 - ~2.7mm, E.F.	Photo 7097 – 1.4mm, E.F.	Photo 7098 - ~2.6mm, looks kimberlitic
		
Photo 7099 - ~1.4mm, E.F.	Photo 7100 - ~2.0mm, E.F.	Photo 7101 – 1.8mm, E.F.

Photo 7102 - ~2.0mm, E.F.

Sample # Barr 20

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
7091 7092	~0.5	M0	Weird BLK with mica? Silvery/bluish sulphide/metallic?		
7093	~2.8	M0	Weird BLK (nice!), measure wide tip to tip as photographed		In vial in scales
7094	~2.5	M0	Weird BLK		
7095 7096	~2.7	M0	Weird BLK (wow!)		In vial in scales
7097	1.4	M0	Weird BLK-rod in 'matrix'		In vial in scales
7098	~2.6	M0	First Brook Formation? Common in samples in picked grains		
7099	~1.4		Weird BLK		In vial in scales
7100	~2.0	M0	Weird BLK (nice)	No actual KIMs, Lot of weird BLKs, some probable sulphides (unknown). Might be near a base metal/metallic source	
7101	1.8		Weird BLK		In vial in scales
7102	~2.0		Weird BLK		

Sample # Barr 21

Photo 7106 – 1.0mm, Nice blue grain?

Photo 7107 - ~1.4mm, E.F.

Photo 7108 - ~1.9mm, E.F.

Photo 7109 – 2.0mm, E.F.

Photo 7110 – 3.5mm, E.F.

Photo 7111 – 3.5mm, E.F., back of Photo 7110

Photo 7112 – 5.4mm, E.F.

Sample # Barr 21

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
7106	1.0	M1	Very nice ‘f’ transparent blue grain (not mica, didn’t crush)	Recheck mag susceptibility	In vial
7107	~1.4	M0	Weird BLK		

7108	~1.9	M0	Weird BLK		
7109	2.0	M0	Weird BLK		
7110 7111	3.5		Weird BLK (I think the largest one yet, therefore close to source? + Large numbers of big ones)		In vial in scales
7112 7113	5.4		Weird BLK (largest yet!)		In vial in scales
	0.25-0.42	M0	Very low magnetite		
			No KIMs, also no sandy round grains (which probably means they're not Firstbrook)		
			- 3 x weird BLKs		
		M1	Nice pink garket		
			A lot of M1, few M2 & mag)		
	0.42-0.84		Quite a few BLKs (not photographed), some very delicate, as in break with gentlest tweezers		
	<1.3		Up to 1.3mm and still no 'sandy' grains		
			No KIMs		

Sample # Barr 22		
		
Photo 7166 – 0.9mm, E.F.	Photo 7167 – 1.2mm, E.F.	Photo 7168 – 1.1mm, E.F.
		
Photo 7170 - ~1.0mm, E.F.	Photo 7172 – 1.3mm, Hollow tubular E.F.	Photo 7173 - ~1.8mm, E.F. (primary & secondary formation)
		
Photo 7176 – 1.3mm, E.F.	Photo 7177 – E.F.	Photo 7178 – 1.7mm, E.F.

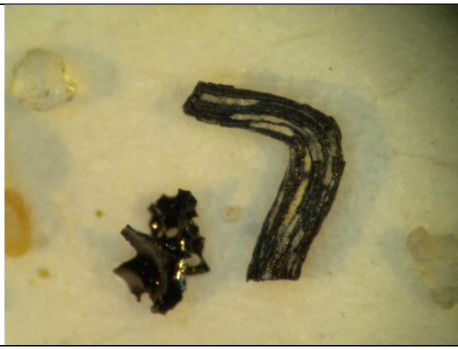
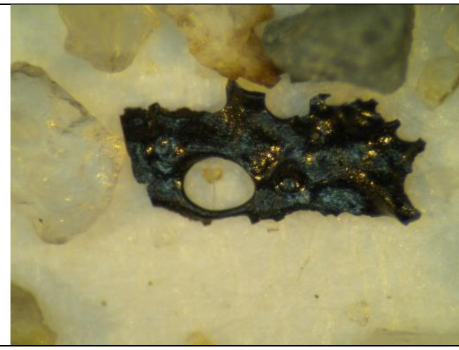
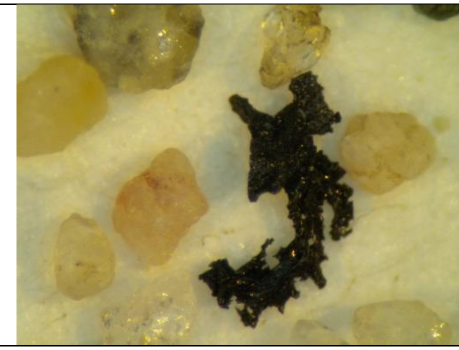
		

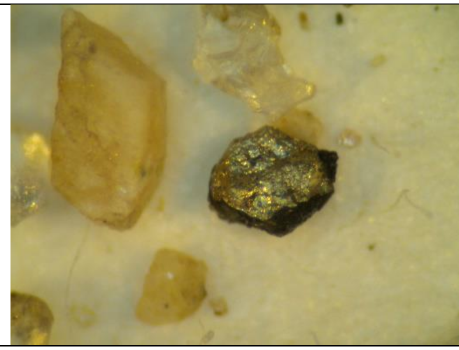
Photo 7179 - ~1.0 & 1.8mm, E.F.s	Photo 7181 – E.F.	Photo 7182 – 1.7mm, E.F.
		
Photo 7183 – E.F.	Photo 7184 – 0.5mm, Sulphide	Photo 7187 - ~2.5mm, Fine bright green-yellow crystals & black/brown crystals,
		
Photo 7188 – 1.3mm, E.F.	Photo 7189 – E.F., this is one of a few that are not just blacks, combined with Photo 7187 – secondary mineralisations?	Photo 7190 – 3.1mm, E.F.

Photo 7191 – 5.6mm, E.F.

Photo 7192 – 3.5mm, Lower temperature E.F.?

Photo 7169 – 0.8mm, Round frosted grain, 'glued' to yellow cubic? grain

Sample # Barr 22

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
			Very few cons, but many E.F. BLKs		
7165	1.2	M0	Weird BLK – looks like black 'paper', frosted on outside, granulated inside. Very different. It's actually somewhat flexible.	A reminder that these are 'BLACK', the other colours are reflecting from light source(s)	
7166	0.9	M0	Weird BLK		
7167	1.2	M0	Weird BLK		
7168	1.1	M0	Weird BLK		
7169	0.8	M0	Round frosted grain, 'glued' to yellow cubic? Grain	(Yellow is lighting)	In vial in scales
7170 7171	~1.0	M0	Weird BLK (dragon scales)	***	
7172	1.3	M0	Weird BLK, remember I've etched these grains, this was probably/possibly full of white mineral (calcite?)	***	
7173	~1.8	M0	White & 'black' silica? branches	** This is actual photo of how grains arranged - nice	In vial in scales
7174	~0.7 – 1.3	M0	Weird BLKs & 'branches' in relative concentrations in cons (non-heavy liquid, just panning)		
7175		M0	Weird BLK, hollow cylinder		
7176	1.3	M0	Weird BLK		
7177		M0	Weird BLK		
7178	1.7	M0	Weird BLK		
7179	~1.0 & 1.8	M0	Weird BLK		
7180	1.0	M0	Weird BLK		

7181		M0	Weird BLK		
7182	1.7	M0	Weird BLK		
7183		M0	Weird BLK, the top looks like charcoaled wood		
7184, 7185, 7186	0.5	M0	Sulphides (pyrite?) with 'weird BLK' (or other BLK?)	The high number of E.F. BLKs with sulphide suggests a metallic or base metal source 'very' close	In vial in scales
			No KIMs, small cons		
	0.25- 0.42	M0	Note: there are so many 100s of weird BLKs, most of which are so visually spectacular that I'm putting the whole cons (0.25-0.42 M0) in a separate container with KIMs picked		
7187	~2.5	M1	Fine green crystals & black/brown crystals, very fine (small) on an enlarged wire/crystal? (they are actually bright green-yellow in colour).		In vial
		M1	2 x Garnets (pink spessartine crystal) 1 x Orange grain		
7188	1.3	M0, Larger grains	Weird BLK		
7189			The top bigger piece looks like weird BLK & wood or oxidised iron		
7190	3.1		Weird BLK		
7191	5.6		Weird BLK (biggest so far)		
7192	3.5		**This is identical to Lorrain Bishop Diamond Property kimberlite (but very fine-grained, colour & texture are correct)		
			Some of these weird BLKs I've found are too large and therefore heavy to have been transported by wind more than a very short distance, also in some individual till samples, such as Barr 22, there are many hundreds, possibly thousands if very small fractions are included, plus some are obviously from a molten glass-like mineral, others from apparent burnt/carbonised/glass-like twigs. The only two extremely rare such occasions are a large crater impact/above-surface explosion, or volcanic (i.e. kimberlitic). These are now known not to be the cause. Consider I've found these in till samples from Lorrain Twp. Bishop Diamond Properties and Barr Twp where it is very highly probable, due to extremely high, chemistry and large size, KIM counts in multiple samples by the OGS in 2012 report and my personally collected till samples over a much wider area of Barr than the OGS report covered.		

Sample # Barr 23/25

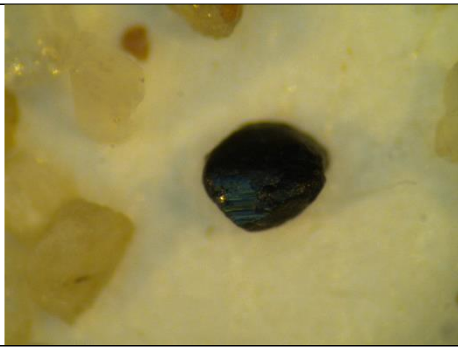


Photo 7132 – 0.5mm, Blue/black grain?


Photo 7134 – 1.8mm, E.F.


Photo 7136 – 2.0mm, E.F.

Sample # Barr 23/25

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
7132	0.5	M0	Deep, transparent blue, 'f', somewhat rounded	No other KIMs	
		M0	Some probable DC		
7133	0.4	M0	DC (much nicer grain than photo)		
		M0	BLK, probable chromite		
		M0	Bright yellow/silver cube sulphide		
7134 7135	1.8	M0	Weird BLK, 'f', shiny black, broken surface		
7136	2.0	M0	Weird BLK		
	3.5	M0	Serpentine (asbestos) crystal		

Sample # Barr 24


Photo 7123 - ~0.4mm, Green ?


Photo 7124 - ~1.1mm, Green ?


Photo 7125 – 0.8mm


Photo 7126 – 1.4mm, E.F.

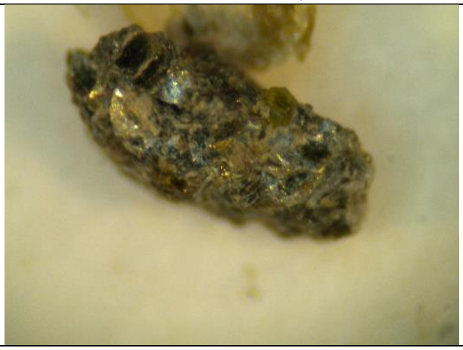


Photo 7127 - ~2.0mm, Mica, DC (?), Kimberlite?

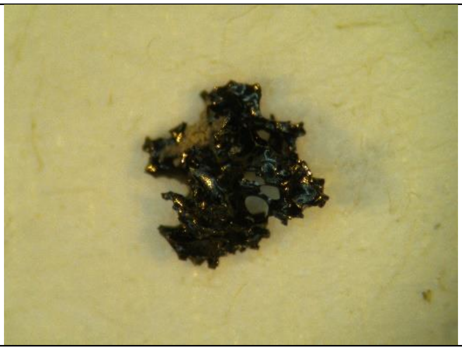


Photo 7128 - ~1.5mm, E.F.


Photo 7130 - ~2.0mm, Mineralised grain


Photo 7131 - ~3.0mm, E.F.

Sample # Barr 24

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
7123	~0.4	M0	Pretty green stone, actually somewhat lighter and brighter than photo (tourmaline?)	No KIMs	In vial, microprobe

7124	~1.1		Green tourmaline?	*No sandy brown round grains, these are somewhat probable kimberlite fragments, which would be very abundant in a till sample anywhere below a kimberlite (i.e. down-ice)	
			A few tiny weird BLK		
			Nice rounded ‘f’ GO		
7125	0.8	(magnetic)	Not a KIM, etc. – just cool looking		In vial in scales
7126	1.4		Weird BLK, nice		
7127	~2.0	M0	Mica with (what looks like) partial kely-rims, and a green inclusion, i.e. a green crystal, very similar in colour to a DC, probably a pegmatite mineral (beryl?)		In KIMs M0
7128 7129	~1.5		Weird BLK (very nice)		In vial in scales
7130	~2.0		Looks like Cu/Copper mineral		
7131	~3.0		Weird BLK		In vial in scales

Sample # Barr 26


Photo 7144 - ~1.1mm, E.F.


Photo 7145 - ~3.0mm, E.F.

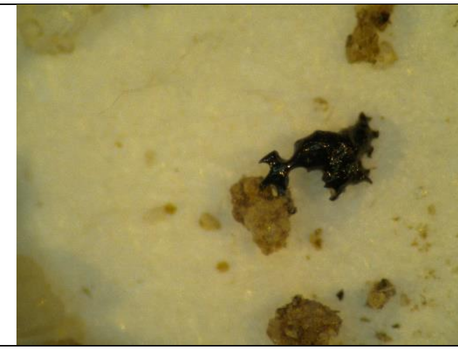


Photo 7148 – E.F.

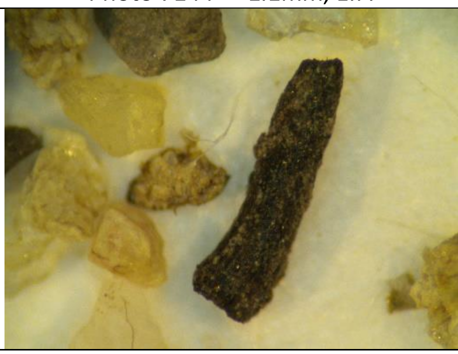


Photo 7149 – 1.4mm, E.F., a ‘hollow’ shell partially filled with white grains/crystals?


Photo 7150 – 1.4mm, Back of Photo 7150, Secondary minerals formed on surface? Microprobe would be interesting

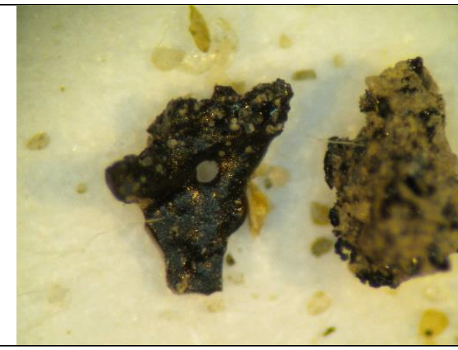


Photo 7151 – 1.3mm, E.F.


Photo 7152 – 1.8mm, E.F.

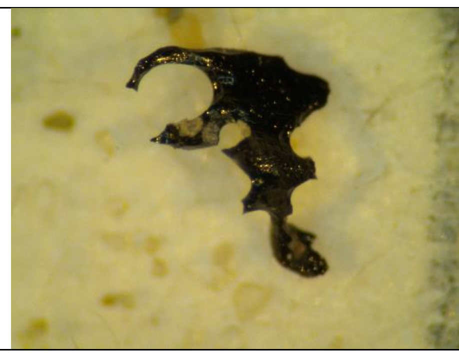


Photo 7153 - ~1.2mm, E.F.

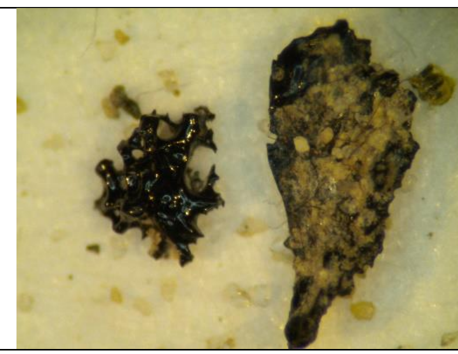


Photo 7154 – 1.0mm, E.F.

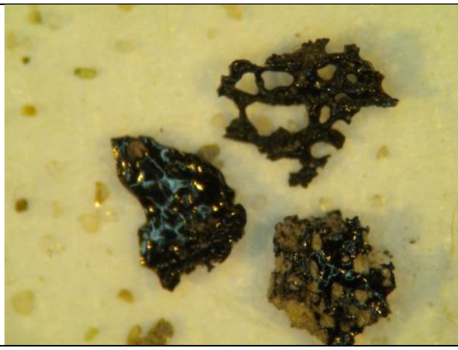


Photo 7155 – ~1.2-1.4mm, E.F.	Photo 7156 - ~3.1, E.F.	Photo 7157 - ~1.8mm, I'm sure this is created by an E.F. lightning strike, but it's hard to explain (I found a # of these); notice the 'main' tube down the centre & a secondary lattice around it. Very strange.
		
Photo 7159 - ~2.7mm, E.F. with secondary fused 'crust'	Photo 7160 - ~1.0mm, One of a 'few' hollow E.F. shells	Photo 7162 – 1.8-3.6mm, E.F.s

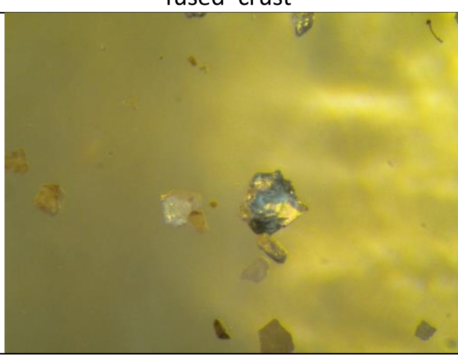



Photo 7163 - ~0.1mm, Shiny	Photo 7164 – 2.0mm, Perhaps a 'whole' E.F. shell	Photo 7193 – 1.0mm, E.F.

Photo 7195 – 3.1mm, See notes

Sample # Barr 26

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
7137-7141	2.0- 4.0	M0	Barr sandy grains 'kimberlite' ?	****	
7142	~0.5	M0	Poorly crystallised, weird BLK with embedded transparent/colourless grain *note all the 'holes' line up in one direction and continue going through grain, i.e. not a bubble	Very few cons in each size from this till sample.	In vial in scales
7143	~2.0	M0	Poorly crystallised, weird BLK, looks like a twig/branch	Some of the weird BLKs from here just crumble when tweezered	
7144	~1.1	M0	Weird BLK (delicate)		
7145	~3.0 or so	M0	2 weird stick-like, poorly crystallised BLKs	Photo referencing the two grains in Photos 7143 & 7144	In vial in scales
7146	~1.0	M0	Poorly crystallised weird BLK; attached/intertwined white quartz crystals/grains	In this sample there seems to be a number that have very fine/slender filaments (kind of rootlike)	
7147	1.2	M0	Weird BLK parallel striations lengthwise		
7148		M0	Weird BLK (nice), partly encased in white/sandy lightly cemented matrix		
7149 7150	1.4	M0	Rounded stick-like grain (weird BLK), inside is a 'hollow' shell partially filled with white grains/crystals?		In vial in scales
	0.25-0.42	M0	Many partially/poorly formed weird BLKs, but also some nice	A relatively high proportion of grains in Barr 26 are magnetic	
	0.42-0.84		A very large number of poorly crystallised weird BLKs		
7151	1.3	M0	2 weird BLKs		

7152	1.8	M0	Weird BLK		In vial with picked grains, microprobe
7153	~1.2		Weird BLK		In vial in scales
7154	1.0		2 weird BLKs – smaller grain is 1.0mm		
7155	~1.2- 1.4		3 weird BLKs		
7156	~3.1		Stick-like weird BLK	**	In vial in scales
7157 7158	~1.8		? ~flat like paper		
7159	~2.7		Weird BLK		
7160 7161	~1.0		Weird BLK, ½ shell-round. BLK inside (7160), sandy (kimberlite kely?) outside (7161).	Very many good size weird BLKs in Barr 26 – well formed & poorly formed	In vial in scales
7162	1.8- 3.6	M0	Weird BLKs		In M0 picked grains
7163	~0.1		Transparent/colourless stone	(yellow is due to lighting effect)	
7164	2.0	M0	Perhaps a 'whole' E.F. shell	I don't think I've found many in Barr. I think this is bigger [need to check] or it's a seed.	In vial, picked grains, microprobe
			** Bottom of foil pan "acid & GC cons". Was a good size till sample but <1 tbsp left in Goldcube. Most dissolved in muriatic acid.		
			Lots of poorly partially crystallised weird BLKs, very brittle, almost soft		
	0.25-0.42	M0	Many partially/poorly formed weird BLKs, but also some nice	A relatively high proportion of grains in Barr 26 are magnetic	
	0.42-0.84		A very large number of poorly crystallised weird BLKs		
7193	1.0	M0	Weird BLK	(photo taken later)	
7194	~1.5	M0	Weird BLK, intergrown with quartz (?) crystals and what looks like fine root(lets) but under the microscope a number of these can be seen plainly to be metallic reddish/copper coloured. I've seen (somewhat) similar micrograins (visually, of course) of silver and quartz from Silver Centre, and other grains with millerite.	I've seen other grains just like this but they appeared to be loosely cemented grains of weird BLK & quartz & rootlets, so I mostly discarded them, and didn't look closely (high x power) at them. Some crystal structures apparently form at some higher heat and quickly. More	In KIMs

				research and consulting with mineral specialists is forthcoming.	
7195-7206	3.1		Long wire, quartz, etc. cemented or natural growth? The fine long wire is the colour of breithauptite, the gold-like Au. It's very delicate		In vial with Barr 26 'KIMS' etc.
7207	0.7		Weird BLK		

Sample # Barr A

Photo 7003 – 0.5mm, DC

Photo 7005 – 1.7mm, See Photo 7006

Photo 7006 – 1.7mm, GO, all sides 'f', brecciated, see notes

Photo 7007 – 1.8mm, See notes

Photo 7008 - ~2.0mm, E.F.

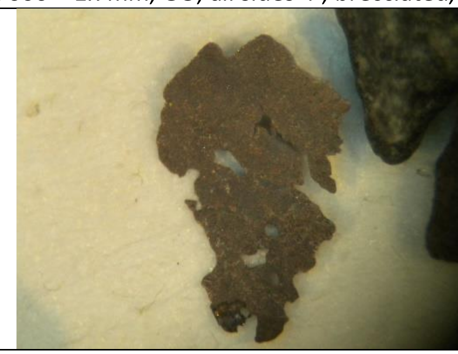


Photo 7009 - ~3.0mm, E.F., looks like leaf Ag

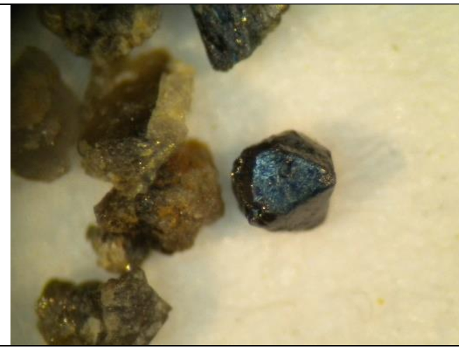
Sample # Barr A

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
	0.25-0.42	M0	Nice DC, lost, ilmenite (complete grain, 'f')	So we know amazing results the MNR found in 2012 2m (6') down, and I'm not finding at surface, so the kimberlites are very close to the north	
		M1	Many transparent/colourless, almost DC		
		M2	Many transparent/colourless, some BLKs		
	0.5	M0	DC		
7002	1.4	M0	GO, 'f', brecciated		
7003	0.5	M0	DC		
7004	~0.5	Very magnetic – Mag tray	A small portion of colourless/transparent grains that are very magnetic	(The slight off-colour is from lighting, these grains are colourless except for 2 yellowish grains in left-centre).	Microprobe several

7005 7006	1.7	M0	GO, all sides 'f', brecciated (nice photos), therefore separated from a macrocryst as an intact unfractured grain. Very large for a KIM		
7007	1.8	M1	Garnet – very odd colour, pink-orange? Looks somewhat brecciated		In vial
7008	~2.0	M0	Weird BLK		
7009	~3.0	M1	Weird BLK with kely-rim, Looks like thin leaf Ag		In vial
	0.84-1.3	M1	Another weird BLK		
		M1	Weird BLK		
		M1	~5 or 6 grains, all large, sulphides etc. No pretty grains		
		M2	Nothing		
	1.3-3.0	M0	Not much		

Sample # Barr A – GC Rejects					
Pic #	**Size (mm)**	**Magnetic Susceptibility (M0, M1, M2, M3)**	**Description**	**Notes**	**Other**
	0.25- 0.42		No KIMs	*This is another example of the effectiveness of my concentration technique, as no KIMs or grains of interest (except for one weird BLK, heavily coated which probably has a low S.G.). The rejects were discarded after microscope viewing	
	0.42- 0.84		No KIMs		
7303 7304	2.0	M0	One heavily coated weird BLK. Front (7303), Back is M0 (7304)		
	0.84-1.3		No KIMs		
	1.3- 3.0		No KIMs		

Sample # Barr B		
		
Photo 6945 – 0.5mm, FeO	Photo 6946 – 0.6mm, GP, see notes	Photo 6947 – 0.5mm, See notes
		
Photo 6952 – Shiny, See notes	Photo 6953 – 1.0mm DC, 0.6mm GP	Photo 6955 – 0.7mm GP
		
Photo 6956 – 0.9mm, GP	Photo 6957 – 0.5mm, GP	Photo 6958 – G-pink/P

		
Photo 6959 – 0.5mm, GP	Photo 6960 – 0.4mm, M1 Chromite	Photo 6961 – 0.7mm, M1 Chromite, See notes
		
Photo 6963 – 0.4mm, See notes	Photo 6964 – 0.6mm, 3 Garnets	Photo 6970 – 1.3mm, DC
		
Photo 6971 – 1.1mm, GP	Photo 6972 – 0.8mm, GP	Photo 6973 – 1.2mm, See notes

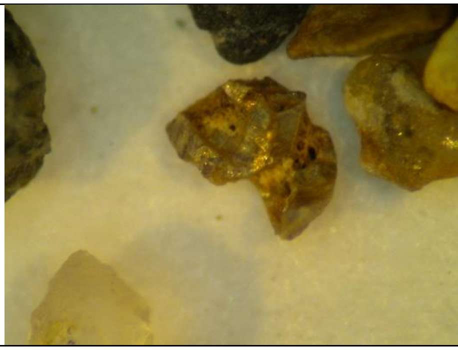
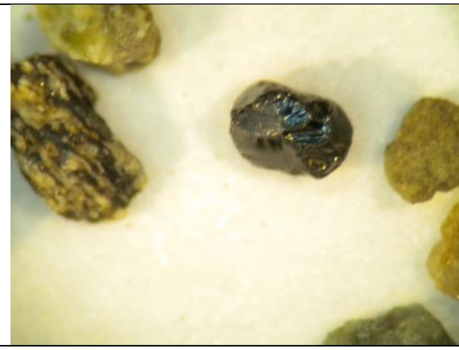
	

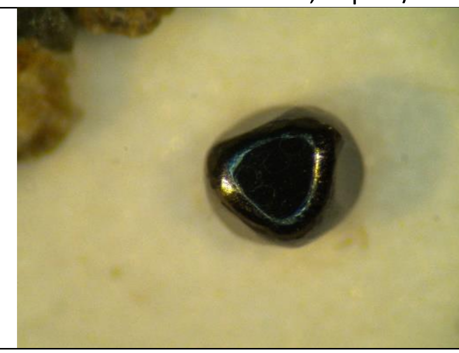
Photo 6974 – 0.9mm, Unknown,metallic?	Photo 6975 – 0.9mm, Chromite	Photo 6976 – 0.9mm, G-pink/P
		
Photo 6979 – 1.0mm, GO	Photo 6980 – 0.7mm, GO & GP	Photo 6983 - Chromite
		
Photo 6984 – 3.6mm, E.F.	Photo 6985 – 2.8mm, E.F.	Photo 6986 - ~1.7mm, Looks like Cu


Photo 6989 - ~3.0mm, Silver


Photo 6991 – 2.5mm, E.F.

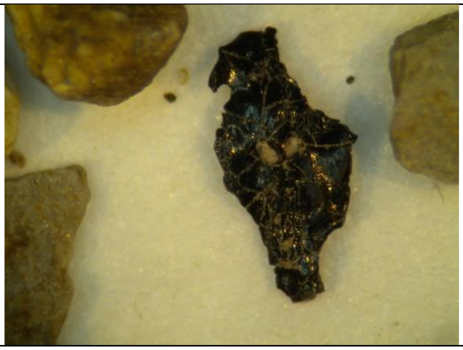


Photo 6992 – 2.5mm, E.F.

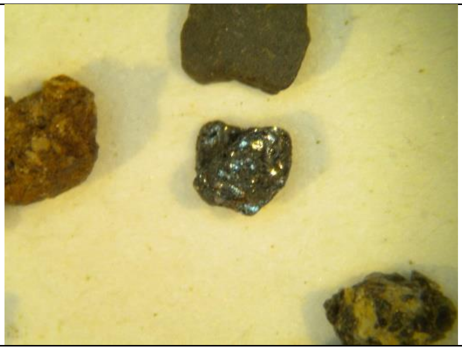


Photo 6993 -


Photo 6994 -

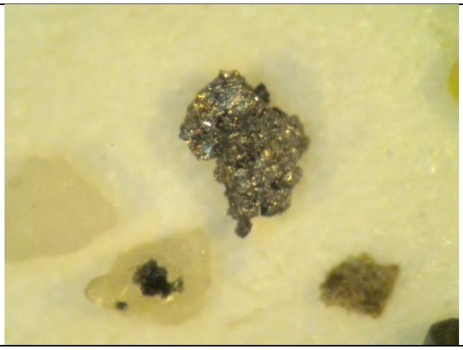


Photo 6995 -

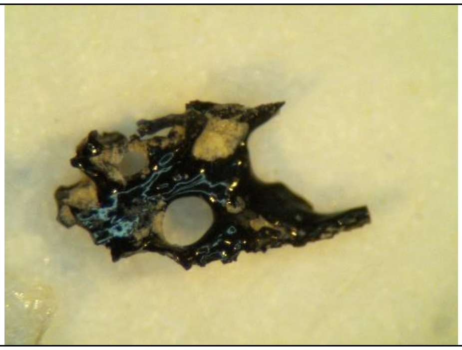


Photo 6996 - ~2.0mm, E.F.

Sample # Barr B

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
	0.25-0.42	M0	Sulphide	It would seem that sulphides co-exist with KIMs in a same & vice versa	
6944	~0.5	M0	FeO, round grain, DC		

			This is the 1st one I've seen one of these outside of Lorrain/Gillies Limit found with good KIM samples.		
		M0	DC		
6945	0.5	M0	FeO		
6946	0.6	M0	GP, mostly unfractured, sub-kelyphitic/frosted, Bi-colour, similar to G10 from Lorrain/Gillies Limit		
		M0	A number of G-pink		
6947	0.5	M0	Red sparkly, has the appearance of the M0 magnetite		Microprobe
6949		M0	DC-frosted, grain is nicer than the photo		
			Frosted ilmenite, rounded		
6950		M0	G-pink/P		
6951 6952		M0	Shiny (diamond?) Right ocular (6951), Left ocular (6952)		In vial, SEM
6953	1.0 0.6	M0	DC (1.0mm), & GP (0.6mm)		
6954	0.7	M0	Red inclusion in grain		
6955	0.7	M0	GP		
6956	0.9	M0	GP, 'f' sub-kely		
6957	0.5	M0	GP		
6958		M0	G-pink/P, with kely		
6959	0.5	M0	GP		
		M0	Lots of KIMs		
6960	0.4	M1	Chromite, frosted, rounded edges		
		M1	A number of FeO round grains as well as odd 'cubes' of shiny reddish surface (like M1 magnetite)		
6961	0.7	M1	Fairly large, a fine example of a partly resorbed chromite. This chromite typically should be M2→nearly M3		
		M1	Many chromites & other BLKs		
		M1	Many garnets, not pretty, some classic crystals (crustal),		
		M1	Many Fe/sulphides		
6962	0.6	M2	Weird chromite, sharp-edged, pyramid top		
6963	0.4	M2, magnetic	Transparent/colourless/yellow		
6964	~0.6	Very magnetic	- 3 x Garnets		
			Also colourless/transparent grain(s)		
6994	~0.6	M2	3 very magnetic garnets (crustal)		
6965	1.2	M2	Magnetic sulphide, gold & silvery metal		In vial
		M2	Mag tray used on M2 picked grains, remained on Mag tray: - 5 x Colourless, transparent	See Mag tray cons & picked	

			- 1 x GO - 1 x G-pink - Various sulphides & magnetite		
6966	2.4	M0	DC		
6967	1.2	M0	GP		
6968	1.3	M0	DC with coat – kimberlite (remember acid) & outside of shell (rounded)		
6969	1.7	M0	GO, kely		
6970	1.3	M0	DC		
6971	1.1	M0	GP, frosted, kely		
6972	0.8	M0	GP		
6973	1.2	M0	G odd colour, frosted (sub-kely) all sides		
6974	0.9	M0	Unknown, Metallic?		
6975	0.9	M0?	Chromite		Microprobe
6976	0.9	M0	G-pink P, partially frosted		
6977	2.0		Gold, frosted surface (pristine)		
6978	1.2		GO, some sub-kely		
	0.42-0.84		A couple GO		
			A nice number of DC		
6979	1.0	M0	GO with kelyphite (partial) rim		
6980	0.7	M0	GO, GP, with some kely-rim		
6981	1.8	M0	Gold (Au)-frosted & sharp edges (pristine)		
6982	1.3		Gold frosted (pristine)		
	0.42-0.84	M0	Enough grains to fill 3 plates for picking, random at first, only the 3rd plate contained the most KIMs (garnets) and all 4 Au grains		
6983		M1	Chromite, rounded, somewhat frosted		
		M1	Quite a few garnets but dull, sometimes crystals		
		M1	Quite a few colourless/transparent grains, some with small black inclusions		
		M1	Some really nice black ilmenite of a good size		
		M2	Quite a few transparent/colourless grains Nice big ilmenites (some might be chromites), some with partial frosting		
		M2	Lots of Sulphides		
		Mag tray	Colourless transparent grains, some with very small black inclusions		
		Mag tray	Sulphides		

6984	3.6	M0	Weird black grains (tektites? From pipe eruption), generally found with KIMs, too brittle to survive glaciation and **all** are essentially pristine/sharp-edged/intact.	[Note: I now know (April 2^{nd}, 2022) that these weird black grains are 'E.F. BLKs' – see Fulgurites as Kimberlite Indicator Minerals, p 36 for more]	
6985	2.8	M0	Weird black grain, frosted surface		
6986	~1.7	M0	~Looks like Cu		In vial, microprobe
		M0	Weird black grain with what appears to be kelyphite rim, pretty much identical to KIMs from Paradis, Gillies Limit, etc.		In vial
6987	2.0	M0	GP		
6988 6989	~3.0	M0	Silver (very pure, untarnished, very similar to Ag/calcite and I etched these grains in a tumbler with muriatic acid), with quartz (which didn't dissolve), presumed etched out of calcite		
			- 3 x pristine Au grains (large) - 1 x Au with sulphide Native Cu, native Ag, and many sulphides of various shapes & magnetic & visual differences → looks like base metal source		
6990	2.4	M0	Weird black with kely rim		In vial, don't microprobe
6991	2.5	M0	Weird BLK, kimberlite or base metal, (acid?) These BLK are seriously brittle, they regularly break when picking with tweezers. There are many of these weird BLK, considerably more than any other sample, including all of Lorrain, etc. And they are relatively heavy or they are seriously abundant, Barr B is the most abundant by far.		
6992	2.5	M0	Weird BLK		In vial
	0.84-1.3	M1, M2, Mag tray	No KIMs		
	1.3-3.0	M0	No KIMs		
6993	~2.0	M0	Galena?		In vial, microprobe

Sample # Barr C/D (was combined into one from 2 near locations)		
		
Photo 6917 – 0.4mm, DC	Photo 6926 – 0.5mm, Yellow grain	Photo 6928 – 0.6mm, GP
		
Photo 6929 – 0.6mm, GP	Photo 6930 – 0.5mm, G-red	Photo 6931 – 0.8mm, GP
		
Photo 6932 – 1.4mm, Gold	Photo 6933 – 0.8mm, G-pink	Photo 6934 – 1.0mm, GO

Sample # Barr C/D (was combined into one from 2 near locations)

Pic #	**Size (mm)**	**Magnetic Susceptibility (M0, M1, M2, M3)**	**Description**	**Notes**	**Other**
6915	~0.25	M0	DC with tubular-like BLK inclusions, it's as if the inclusions were molten.	Interesting photo, Very Important, I've seen this before in Lorrain	

			- 2 x G-pink		
6917	0.4		Very nice DC		
6918-6923			Weird BLK		
6926	0.5		Yellow		
	~0.25	M1	Lots of BLKs, quite a few greens & garnets (not shiny), & lots of colourless/transparent		
6928	0.6	M0	GP, somewhat cloudy		
6929	0.6	M1	Nice GP		
	0.25-0.42	M1	Lots of BLK, greens, lots of lesser garnets		
6930	0.5	M2	G-red		
6931	0.8	M0	GP, sharp edges, some kely		
6932	1.4	M0	Gold		
6933	0.8	M1	G-pink		
6934	1.0	M2	GO		

Sample # Barr E


Photo 6904 – 0.4mm, GP


Photo 6905 – 0.7mm, GP

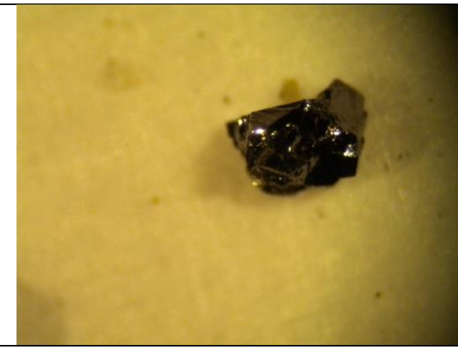


Photo 6906 – 0.7mm, E.F.


Photo 7208 – 1.2mm, E.F.

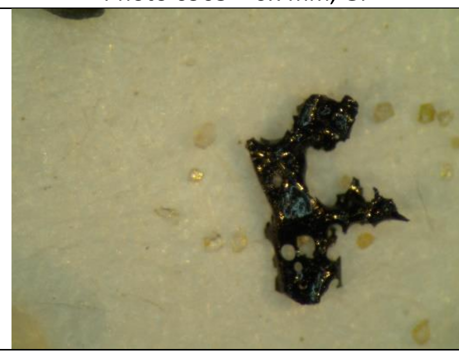


Photo 7209 – 1.1mm, E.F.


Photo 7210 – 2.0mm, E.F.


Photo 7212 – 2.2mm, E.F.


Photo 7216 – 1.8mm, One of a lesser # of poorly formed E.F.

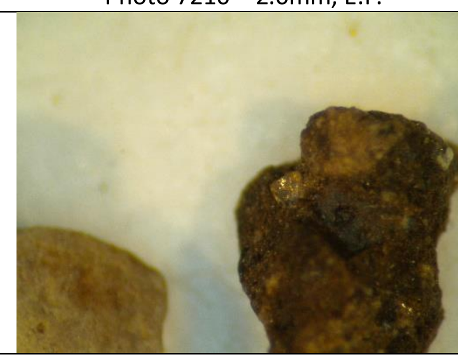
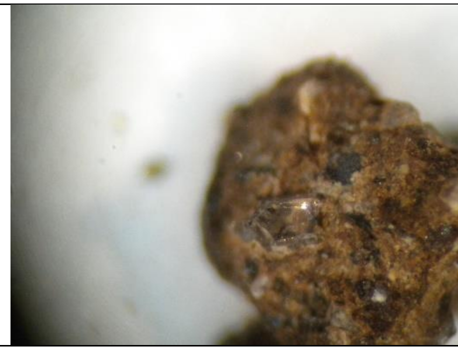


Photo 7219 – 1.8mm, Shiny rock in poorly formed E.F.

		
Photo 7222 – 1.8mm, similar to Photo 7219	Photo 7224 – 1.7mm, similar to Photo 7219	Photo 7225 – 1.2mm, similar to Photo 7219
		
Photo 7230 – 0.8mm, Metallic with quartz		

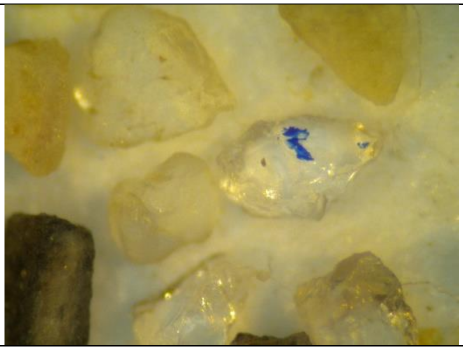
Sample # Barr E

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
	0.25-0.42	M1/M2	Very few M1, M2		
		M0	A few GO, some possible DC		
6903	0.6		Very nice GP		
6904	0.4		GP		
	0.25-0.42	M1	Some GO & pink, not as nice/pretty		
		M2	Some GO & pinkish, BLKs, some interesting sulphides		
	0.42-0.84	M1	No KIMs, maybe BLKs, sulphides, especially strange bluish ones		
		M2	Sulphides, BLK – chromite/magnetite		
	0.84-3.0		Very little of interest		
			Very nice DC (last picking)	Barr E was picked for KIMs and then painstakingly slowly picked for	

				weathered quartz with small Au particles on all sizes = more time	
6905	0.7	M0	GP		
6906	0.7		BLK crystal		
6908 6909	1.3		Pristine Au grain, quartz attached		
6910	~0.9		Au in weathered grain		
6911 6912	~2.0		Black rock with mica & crystals		
6914		Mag tray = M2+	Magnetite clumped and in a line	Interesting, I was checking Mag tray for Barr E and found (as I have before) that the magnetic grains were stuck together in clumps, and can therefore be ruled out as chromites, etc. Magnetite grains were magnetised in rock or by mag tray? Don't pick mag tray, it does its job with BLKs.	
7208	1.2	M0	Weird BLK (too delicate to pick up – broke)	Continued with 'rejects' (not as well etched, i.e. oxalic acid, not muriatic). Many grains are partially or completely coated in (probable) kimberlite	
7209	1.1	M0	Weird BLK (too delicate to pick up – broke)		
7210 7211	2.0	M0	Weird BLK, picked, still has partial (possible) kelyphitic rim/kimberlite		
7212	2.2	M0	Weird BLK		
7213	1.3- 1.8	M0	Partially coated weird BLKs, muriatic etching may remove this as much weaker oxalic acid had been used on this and a few other samples		
7214		M0	What appears to be carbonised/silica wood, partially coated weird BLKs		
7215		M0	Weird BLK		
		M0	Larger proportion of M1 than most other till samples		
		M1	Large proportion of completely coated grains (in Spring I plan to re-etch in muriatic acid/tumbler)		
7216	1.8	M1	A heavily 'carbonised' grain (wood?), coated on one side (with visually similar to Kimberlite), this does appear to have been cooked and coated all in a short time.		
7217	1.7	M1	This grain looks very much kimberlitic, with BLK, ilmenite, or weird BLK		In Barr E, continued M0
			No KIMs in rejects (hurrah!) But other good stuff.		

7218 7219	1.8		Kimberlite-like grain, the bright yellow is lighting refracting/bouncing through a bluish or yellowish transparent grain.		In vial in scales
7220	~1.0-2.0		Both grains look like kimberlite, e.g. Kon Kimberlite Gillies Limit is ~blackish/dark, Lorrain is yellow/orange (when dry, blue/green when rock or wet). This is 2 grains from same till sample. Note, blue grain in lower left of dark grain.		**In one vial**
7221 7222	1.8		Darker grain resembling kimberlite, quite a bit less common than the brown/orange grains. If it is kimberlite then it's from a different phase of one pipe, or a separate pipe.		
7223 7224	1.7		Similar to grain in 7221/7222.		
7225	1.2		Brown/orange grain	****	
7226 7227	1.2	M1	Brown/orange 'cemented' grain with small grains of mica & elongated blue/green kyanite crystals, and elongated red narrow crystals		
7228		M1	Most 'cemented' grains are brown or black in colour in the magnetic fraction, quite a few are a brighter orange in colour, indicating the presence of Fe		
7229	2.1	M1	Weird BLK		
7230	0.8	M0	Metallic with quartz		

Sample # Barr F					
Pic #	**Size (mm)**	**Magnetic Susceptibility (M0, M1, M2, M3)**	**Description**	**Notes**	**Other**
	0.25-0.42	Inert	Very little good - 1 x RP-GP Bunch of so-so DC?		
		Shake-off	- 1 x GO - 2 x G-pink O - 1 x Pink - 1 x Cube Black (red?), frosty - 1 x Chromite Some ilmenites?		
		Stick	BLKs, Chromite, and & Ilmenite Several pink & ~ a dozen GO (not picked), crustal		
	0.42-0.84	Inert	No KIMs		
		Shake-off	No KIMs - 1 x Blue kyanite crystal Some orange crustal G		
		Stick	- 1 x Orange G 1 x Pink G, crustal		
	0.84-1.3		No KIMs 1 x Weird BLK grain		In vial

Sample # Barr H		
		
Photo 7272 – 0.5mm, DC	Photo 7273 - ~0.5mm, Blue on quartz? (inside rock not outside)	Photo 7274 – 0.9mm, Brecciated grain, kimberlitic
		
Photo 7275 – 0.7mm, Sulphide? Metallic?	Photo 7276 – 0.5mm, DC	Photo 7277 – 0.7mm, DC

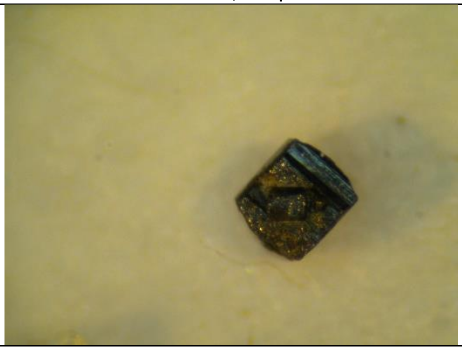
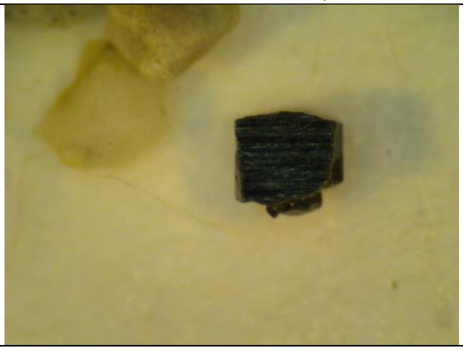

	

Photo 7278 – 0.4mm, Front of Photo 7279	Photo 7279 – 0.4mm, Back of Photo 7278, See notes	Photo 7280 – 1.0mm, ? Intermix of G-red & GO? See notes


Photo 7281 – DC, see notes

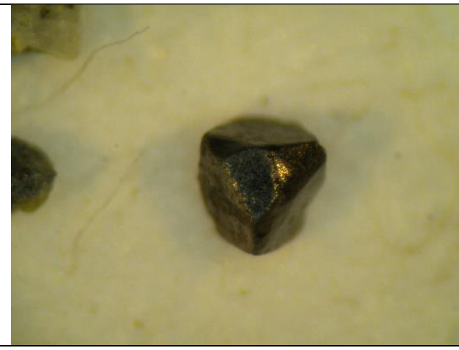


Photo 7282 – 0.5mm, Unknown grain?

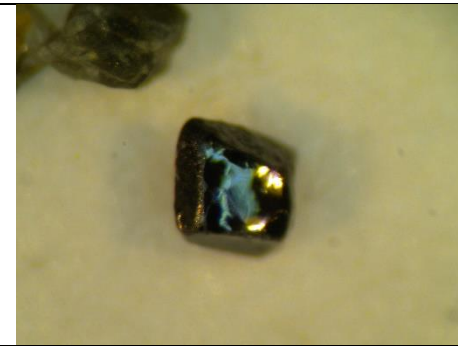


Photo 7283 – 0.5mm, See notes

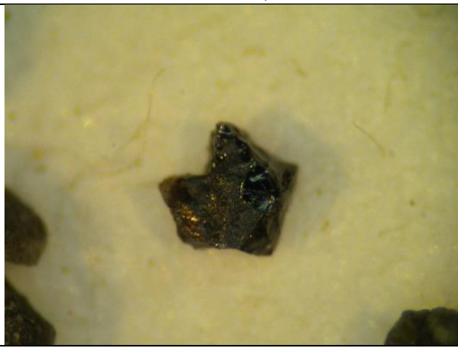


Photo 7284 – 0.4mm, Ilmenite?

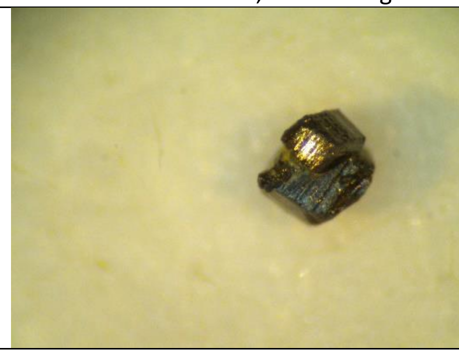


Photo 7285 - ~0.4mm, See notes


Photo 7286 – 1.3mm, See notes


Photo 7289 – 2.7mm, E.F

Sample # Barr H

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
7272	0.5	M0	DC		
		M0	Rusty looking sulphide		
7273	~0.5	M0	Blue on quartz?		

7274	0.9	M0	GP, brecciated with kelyphite rim, somewhat unusual colour		In vial, microprobe
7275	0.7	M0	Sulphide? Metallic?		
7276	0.5	M0	DC		
7277	0.7	M0	Nice DC		
	0.5	M0	Nice DC		
7278 7279	0.4	M0	Cubic grain?, black/deep red-black?, striations		
7280	1.0	M1	Brecciated GO		
		M1	Magnetic pink garnet, therefore crustal, + GO-crusted		
7281		M1	Nice DC but mag, therefore not a good KIM		
		M1	Brown round FeO but mag		
7282	0.5	M1	***? Grain,		In mag vial
7283	0.5	M1	Fractured ilmenite (partially frosted), shiny black (other colours lighting effect)		
7284	0.4		Ilmenite?		
	0.25-0.5		Quite a large number percentage of Mag in 0.25-0.5mm, more than M0		
		M1	Another round brown frosted FeO, & one more (one of the FeO is M1, the rest are mag)		
	~2.0	M1	One poorly formed flat weird BLK		
7285	~0.4	M1	Another cubic, rusty, frosted grain. (see Photo 7278/7279 for similar grain)		
7286	1.3		Looks like partially 'cooled' artificial citrine from an amethyst/smoky quartz. Evidence of 500°C heat for several hours. 1st grain I've seen like this.		
7287	~2.0		Weird BLK	Very few colourless/transparent grains These weird BLKs are all very large grains; the 4.0mm is, I think, the biggest I've found, no smaller in Barr H. Therefore, very proximal, less transport? Plus, they are less well-developed, i.e. more plain & 'ordinary' than many of the other Barr samples.	
7288	~2.0		Weird BLK with considerable matrix		
7289	2.7		Weird BLK		
7290	4.0		Weird BLK		
	0.25-0.5	M0	There were very few potential KIM garnets In M0.		
		M1	- 33 x Mag pink to orange - 1 x Deep orange		

			All of these are magnetic and crustal. Most were not as ‘pretty’ as actual KIMs.		

Sample # Barr X

Photo 6879 - ~0.5mm, DC

Photo 6880 – 0.4mm, See notes

Sample # Barr X

Pic #	Size (mm)	Magnetic Susceptibility (M0,M1,M2,M3)	Description	Notes	Other
6774	1.4				
6879	~0.5	M0	Brilliant green DC, lots and lots of DC left on plate		
6880-6883	0.4	M0	Red cube, right ocular (6883), left ocular (6884), appears to be transparent		Microprobe
6894	0.25- 0.42		Left to right – M0, M1, M2, gets darker/blacker		
6896	~2.0	M0	Weird black grain, frosted (now in 3 pieces)		
6898	~2.0	M0	Black grain coated, 1st time I've seen this in Barr samples M0		
6899	~1.3	M0	Cemented black grain		
	0.5	M0	GP, nice, medium P		
	0.25-0.42	M0	GO		
		M0	Pink garnet		
		M1	Lots of BLK (?), & greens (?) left on plate		
		M2	Lots of BLK grains Picked a few & some colourless with black speck (magnetite) inclusions Some greens, & bluish crystals		
	0.42-0.60-0.84	M0, M1, M2	Approximately nil. Not great.		
		M0	- 1 x GP - 1 x GO		

Sample # Barr X (continued from earlier picking. This sample was 2nd GC Tray & unetched in acid)

Photo 7291 - ~3.1mm, E.F.

Photo 7292 – 3.6mm, E.F.

Photo 7293 – See notes

Photo 7294 – 4.5mm, E.F.

Sample # Barr X (continued from earlier picking. This sample was 2nd GC Tray & unetched in acid)

Pic #	Size (mm)	Magnetic Susceptibility (M0, M1, M2, M3)	Description	Notes	Other
7291	~3.1		Weird BLK coated		
7292	3.6		Weird BLK, this is an unetched/p/c etch grain before the coating/kimberlite was removed by muriatic acid (concentrated). It appears to be a fine filagree that grew or was encased in the matrix. This would appear to be a grain that formed in deep-seated mantle or 'grew' in an ascending volcanic eruption. So, the black exposed on this small top portion of the grain is where the grain was 'hit' or abraded off when digging the till sample, or during sluicing (gold cubed/screening, etc.). So, several possibilities:	Best seen through binocular microscope in 3D. 2D photo doesn't supply quite enough detail.	In vial

			- The grain grew in or was encased in matrix during eruption from some depth. - Then, if pre-glacial, it was gently transported or not at all. - Or it formed in some other way and was somehow coated with a calciferous, grainy material - These grains are mostly way too delicate for that to happen, they may break trying to gently pick them with high-end medical tweezers with carbon fibre tips. - So, the most likely seems to be they were spread in an explosive-type eruption, already encased in matrix. Coincidentally, I also found similar grains (basically identical, see my other reports) in Lorrain Twp. And in both Lorrain and Barr Twp they were/are primarily encrusted with KIMs/DIMs.		
7293		M0	Looks like DC 'coating' a darker grain; not etched		
7294	4.5		Weird BLK, not etched		
7295-7299	2.0-4.0		Unetched, coated/in matrix grains in this size fraction from sluice → screening → GoldCube, every till sample from Barr had the majority of grains coated in a cemented (in appearance) coating. Heavy grain KIM picking was not possible, necessitating extra time-consuming steps in preparation for further concentrating and microscope picking of select grains of interest.	Photo 7298 best	
7300-7302			Typical pre-acid grains. All KIMs were similarly coated/encased in all samples. Some obviously crustal grains were uncoated.		
			Re: weird BLKs during etching of their coating in a tumbler – These grains could easily fracture into 'many' smaller ones. This is probably why this Barr X sample has only larger of these grains and might actually be more representative of the typical size of them. However, other smaller of these grains have been found almost entirely coated from other sites.		

Appendix 5: Methodology

[Note: Some of this methodology write-up was last used in the Bishop Grassy Lake report (Bishop, B.A. (2018b)). Much of it has been updated to reflect the changes I've made in the last few years working on the Bishop Barr Claims.]

Methodologies for Field Work and Till Sample Processing

PREFACE:

Diamond exploration is unlike that for any other mineral resource. Search areas are 'limited' to ancient 'cratons' (such as the 'Canadian Shield') which in themselves are vast areas. Geological maps are, in a general sense, of little to no use, as economic kimberlite pipes, relatively small circular to semi-circular, vertical volcanoes, when found may have no direct correlation to local rock types, although locating faults and contacts between different rock types, such as granite/diabase, can be very useful once a kimberlite field has been located by geophysics or till sampling.

Locating a pipe is largely a matter of detective work. Typically, mag maps have been utilized in the search for magnetic 'bulls-eyes' which are then, as funds permit, drilled to see if it is kimberlite or some other magnetic target. **However, in Canada so far most of the production pipes have little to no magnetic signature**. As well, EM surveys often don't work for the same reason, as is also true of gravity surveys (i.e. no detectible mag, EM, or gravity anomaly). [Bishop, B.A. (2018b) Appendix 3]

Soil sampling, either in till or streams, is the simplest and most common method of looking for kimberlites. In fact, though, the search is not directly for diamonds but for kimberlite indicator minerals (KIMs), which include certain garnets, chrome diopsides, ilmenites, chromites, zircons and others.

Stream sediment surveys are for larger scale drainage basins to initially locate KIMs. Till sampling should be then utilized to best zero in on a pipe's location.

These grains must be separated by utilizing their slightly greater specific gravity (SG) compared to most other minerals in the 'soil' samples. However, these grains are generally only 0.25mm to 2.0mm in diameter. This, and the very slightest difference in SG, make it very difficult to concentrate and recognize and pick KIMs from. Basically, commercial-grade microscopes, tweezers, and concentrators must be acquired at great initial cost with trained operators.

As a result, most exploration companies utilize a dedicated lab at a cost of $500 and up per sample for concentrating, visual identification and estimate of KIM grain numbers. For example, 2 till samples sent for identification from my Grassy Lake Target to ODM (Overburden Drilling Management) (Bishop, B.A. (2018b), p 113) in 2017 cost $969.31 +shipping. I requested the leftover non-picked portion (the lab only picks a portion of the cons, see below) and found a number of KIMs and other interesting grains (see Bishop, B.A. (2018b) p 8-9: Photos 1-15, Photo 16 - ODM-picks, Photos 18-44 – picked by Tony Bishop separate till samples). Further to show how difficult it is picking KIMs one could read Geological Survey of Canada Open File 87726 (Smith, I.R. (2020), p 12-13), where 4 till samples sent by the GSC to ODM and then graded by GSC. The picking results were considered 'poor' in 2 control 'spiked' samples.

Usually, ODM is considered an excellent company but I suspect during COVID-19 experienced pickers might have been hard to come by.

ODM Lab-Processing Weights, Processed Splits

Grain Size:	0.25-0.5mm	0.5-1.0mm	1.0-2.0mm
Wt (grams):	18.0	4.7	2.3

So, as you can see, only 25 grams (less than 1 oz) of the concentrates were actually picked. The result was then 'normalised' (i.e. the entire sample is not picked, but one is to assume similar numbers of KIMs would be in the rest of the larger sample of concentrates). In the concentrates from Barr Twp I pick all the concentrates (part/full-time over two winters, but I get all the KIMs in a till sample).

Old-fashioned gold panning for KIMs as one would with gold grains is next to impossible: gold has a specific gravity (SG) of ~20 and therefore is roughly 7 times heavier than the other soil and rocks in a sample. KIMs have an SG 3.3 to 4.3, only very slightly (i.e. <1.4 times) more than most other grains in a field sample. (Common non-KIMs have an SG of ~2.6 to 2.9). As well, size matters. Even experienced individuals can have trouble with separating gold grains the size of KIMs from till or stream gravels, and one basically cannot pan gold this size out of 'black sands', i.e. magnetite. Magnetite (SG of 5.2) is commonly found in kimberlites and hence is also found with KIMs, further complicating concentration of a sample, as magnetite is actually heavier.

Specific Gravities (SG)			
	Gold	-	19.3
	Magnetite	-	5.2
(KIM)	Zircon	-	4.6-4.8
(KIM)	Ilmenite	-	4.3
(KIM)	Garnet	-	3.5-4.3
(KIM)	Pyrope	-	3.56
(KIM)	Diamond	-	3.52
(KIM)	Cr. Diopside	-	3.3
(KIM)	Olivine	-	3.3
	Mica	-	2.9
	Dolomite	-	2.85
	Conglomerate	-	2.8
	Gabbro	-	2.8
	Calcite	-	2.7
	Granite	-	2.7
	Quartz	<=	2.65
	Feldspar	-	2.6
	Clay	-	2.2

With the right equipment however, an individual with some background, specifically in placer-type deposits, can concentrate and pick KIMs from till samples.

To further complicate issues, due to a number of glaciations in Canada in different directions, samples must be taken from tens of metres to several kilometres down-ice (usually along the last glacial direction) of the potential kimberlite source. This requires the bulk of meaningful sampling to be done off claim, sometimes a long way off claim, which then cannot be applied for assessment work to maintain that claim in good standing. Direct sampling of a kimberlite target is only accomplished by bulk sampling with a large diamond drilling program, or if near surface, directly with heavy machinery (both very costly and permit-intensive).

These initial obstacles can only be overcome by a lone prospector with determination, knowledge, the use of a collection of specialized and costly equipment, and lots of time (and patience). Even for established commercial labs the bulk of the time and cost comes down to an individual meticulously picking KIMs with a pair of tweezers while viewing the concentrates from a sample under a microscope. This lengthy time-consuming process is such that if large numbers of indicators are encountered, only a portion of the sample is picked for KIMs in a lab and then averaged (i.e. 'guesstimated') to the full sample, possibly risking losing the few/any all-important G10s and other similar grains in the remaining portion.

After concentrating the individual till samples, picking KIMs is done under a variable power binocular microscope with multiple lighting arrangements. I try to pick all KIMs, unless, as in some cases, they are in the thousands, then numbers are estimated. This of course takes many hours to days (sometimes weeks) of work, especially when photographing and entering the photos into the computer correctly labelled, along with many hours of research identifying unusual/uncommon grains.

Also, to maximize local topography in the field, my knowledgeable samplers or I can make on the spot decisions in the field to sample near but not on my pre-planned coordinates (e.g., an upended tree root nearby etc.), and GPS coordinates are accepted by field workers as possibly being ± 10-50 metres off on any given day.

The up-ice samples are processed separately and considered separately. This initial sampling program was performed to obtain a yes/no probability of my target hypothesis. Additional sampling program(s) help further delineate these preliminary results.

Included in picking pyrope garnets are red, pink, and purple colours. Typically, Cr pyrope (by definition) garnets, in most literature, are considered to be red (colour comes from enhanced chromium and/or iron content) or purple depending on the article; however, McLean et al (2007) shows that the colours in the Canadian Diavik Mine A154-S kimberlite pipe garnets, in order of Chromium content which is important for diamond exploration, are as follows:

- "Orange xenocrysts have <1 wt.% Cr_2O_3, and are inferred to have eclogitic derivation
- There is a general increase in Cr content from orange → red → pink → purple. A similar trend may be seen in the data of Hawthorne et al. (1979) for garnets from the Dokolwayo kimberlite and Hlane paleoalluvial deposits in Swaziland
- Red grains increase in Cr from light → dark red
- Purple xenocrysts are more likely than pink or red to be harzburgitic (G10 or G10D), but colour alone cannot be used as a definitive test"

Pink garnets, however, are not commonly mentioned in diamond exploration literature. In samples from Canadian kimberlites, the Cr content of the pink-purple garnets seem to exceed that of the darker purple garnets when tested at the lab in Sudbury (verbal communication, Dave Crabtree, Geoscience Lab), (McLean et al, 2007), (Grütter et al, 2004); therefore, I am including pink garnets in pyrope garnet counts. This is, of course, subject to change as I continue to sample and have picked garnet grains analysed.

From reading a great number of articles it seems that there is no definitive rule concerning kimberlite minerals, colours of G10s can vary, some diamond pipes have no G10s at all and many other differences also occur. The differences are so numerous and interesting that a future paper or book could be compiled. A certain part of these findings will be presented in this report when applicable to certain claims.

In targeting and evaluating potential kimberlite pipes it is important also to note an article on 'Following kimberlite indicator minerals to source' in GSC OF-7374, "**The corollary for exploration at Chidliak is that any source of high garnet counts in sediment samples is considered worthy of pursuit, regardless of garnet compositions**" (Pell et al, 2013, p 51). With that in mind, if I attempt to normalize my results vs. sample size as compared to say, the 10-20kg samples of the

OGS-OF report 6088 (see p 13 & 17), taking into account my samples were unscreened (until processed in the sluice and/or GoldCube®), the number of KIMs I picked could be averaged up a considerable amount in quantity.

Of course, while till sampling a large part of the day/traverse is spent investigating boulders by removing moss, etc. and in this case specifically looking for kimberlite or other interesting rocks with mineralization. Because this target and sampling area is in and down-ice of a large expanse of diabase and argillite, nearly all boulders. As stated earlier, oversize from the sluice is bagged and viewed as time permits. No attempt will be made to identify every possible cobble if it is well worn and unrelated to kimberlite prospecting.

So I'm sampling unconsolidated till, down-ice a potential kimberlite(s) and taking comparatively small samples.

METHODOLOGY FOR PROCESSING TILL SAMPLES: Please also see Sluice Efficiency Test Results Chart [p 174] and Cost Breakdown Chart for Concentrating KIMs, Micro-picking, & Microphotography [p 175]

EQUIPMENT:

1) GOLDFINDER CUSTOM MADE SLUICE *(since modified by the author for the efficient processing ~10 to 100+ lb soil samples, for initial kimberlite indicators / heavy mineral concentration)***:**

The Goldfinder sluice (see Equipment photo 1) is manufactured with aircraft grade aluminum in 3 sections, with sturdy fast connecting latches. It is 14' long, 14" wide, and has height adjustments at front and back of the top section, and front and back of the fully assembled sluice. From the manufacturer, it excels at saving very fine flour as well as coarser gold. The ability to save 90%+ of flour gold in any sluice is exceedingly rare [The Goldfinder sluice was tested extensively in the 1970s by designer and developer Wayne Loewen on the Saskatchewan River as well as in-house tests with known gold grains counted before and after running through the sluice]. **This particular sluice was rented from me by the then Resident Geologist Gerhard Meyer and District Geologist Gary Grabowski, both of the Kirkland Lake MRO, for testing for gold in eskers on the shores of Abitibi Lake**. I determined that with certain beneficial modifications from stock it could also be very good at saving kimberlite indicator minerals (KIMs) from larger till samples.

Saving gold by gravity methods is comparatively easy as gold is about 7x heavier than indicator minerals or diamonds. To use the sluice to obtain a primary concentrate of KIMs, I removed the Hungarian riffles and the solid-backed 'miner's moss' carpet. I used a thicker, slightly more open-weave miner's moss in the 3 lower sections, and in the top 1st section a specific 4 mesh nylon classifying screen. This was cut to fit in the top of the sluice and overlaps the original grizzly bars to reduce the size of the feed material being concentrated prior to the miners' moss sections, and to spill the +4mm feed off the end of the top section which spills into a bucket and saved to visually check for kimberlites or other minerals of interest. A flat lying diamond pattern stainless-steel expanded metal sheet overlays the miner's moss in the next 3 sections on the lower part of the sluice. This holds the carpet flat to the bottom of the sluice. Finally, during 'clean-up', a large stainless-steel pan is placed at the end of the sluice to catch the concentrates as the carpets are removed thus ensuring no losses occur. Finally, the carpets must be very thoroughly washed with pressurised water to ensure no cross-contamination in the next till sample occurs. A heavy duty ¾ HP submersible sump pump with a large flow rate replaced the 6 ½ HP Honda high pressure pump for a more correct water flow for the lighter material being run and is quieter and less costly to run. This gave a 1" depth of water running above the top of the miner's moss. The sluice was run at a less steep angle than for gold to further enhance saving potential KIMs, with the first top section of the sluice adjusted to an angle with a drop of ½" over 36". The larger bottom section drops 3" every 5'. Great care must be exercised to level the sluice in the 14" width to provide an even water flow across its surface.

The 1st step before sluicing is to dump the till sample in a 5 gallon (20l) bucket, cover the sample with water, and with an industrial ½" slow-speed drill & large dry-wall mixer (paddle) vigorously stir the sample. This breaks down clay, clumps of earth, and thoroughly removes solid rocks/grains from organic matter. A hose is then ran into the 5 gallon pail (at the bottom)), this floats light organic matter and silt (mud)-sized particles out of the pail. The 'clean' material is then dumped through a 24" diameter heavy duty screen with 1cm spacing to remove rocks >1cm (which are visually checked for anything of interest and are then discarded). The <1cm result is then sluiced, the nylon classifier in the top section of the sluice further reduces the feed to <4mm.

The modified sluice considerably reduced the original volume of material, but importantly the modified wrap around spray bar [see Equipment Photo 6 on p 177] helps blast apart any remaining clay and other clumped material very quickly and the water flow then also quickly removes very fine silt, humus, and plant matter as well as +4mm rocks (previously, I would spend 1 – 2 hrs or more trying to break this clay and such by hand with various utensils and water spray, and afterwards would have to screen out the humus and then pan and classify with various screens). Efficiently saving the 4mm and smaller grains from clay/till strictly by hand methods is nearly impossible.

To test efficiency after the initial trial run using this equipment, I cleaned and kept separate the 4 carpet sections and the overflow of the sluice, which after further processing resulted in 25 separate samples of various meshes, and then checked the results under the microscope for indicators to determine if any losses were incurred and where. With this information, I was then able to make further modifications and retest to compare efficiencies which I continue to do and modify as needed. No detectable loss of indicators was observed.

The sluice concentrates further screened to <1.0mm are ran through the GoldCube® in separate runs of 0.25-0.5mm, 0.5-1.0mm, and 1.0-2.0mm for each sample, and the trays are cleaned (i.e. washed for concentrates). The rejects are saved and are again ran through the GoldCube®. The new rejects are discarded. Concentrates from the 1st and 2nd run are then blended and reran through the GoldCube®. The 1st tray is then cleaned and saved separately, as are the 2nd and 3rd trays. These are then saved separately. These will all be dried in a convection oven and demagnetized, and these, if individually too large to directly pick for KIMs, are carefully panned to a manageable size and then dried & stored in separate containers. Although time consuming, this results in a very efficient and consistent method of concentrating till for KIMs and other heavy minerals.

Interestingly, many professional labs still list panning as the final concentration technique. This preliminary work was all necessary to determine the efficiency of sluicing till samples for KIMs and other heavy minerals with this particular sluice. Surprisingly, the first top section with no miner's moss had an interesting number of potential KIMs as well as a 1.5mm purple garnet in my sluice efficiency test. The next carpet had very many indicators, the next a sizable number of indicators, the final carpet and overflow had no KIMs or magnetite etc. that would typically comprise a heavy concentration [see Sluice Efficiency Test Results on p 174].

2) GOLDCUBE®:

The GoldCube® is a 'new' and excellent concentrator built for gold, but after much testing I've discovered it works very well for kimberlite indicators minerals and is uncomplicated and easy to use. After numerous tests (much the same as for the sluice), I determined it is very efficient for reconcentrating the sluice concentrates to a much smaller concentrate without losing KIMs and other 'heavy' minerals, after wet screening the samples to 1.0-2.0mm and <1.0mm which are ran through the concentrator individually. It has a very high recovery rate for <1.0mm heavy minerals and for removing virtually all the silt sized grains, and it's easy to clean after use. This piece of equipment has become indispensable and very efficient.

With many more trials and testing since the original description above, I've discovered the GoldCube works best with grains in the 0.25-0.5mm range, and similarly with the 0.5-1.0mm fraction. The 1.0mm and up are too coarse to rely on separating by S.G. in the GoldCube as efficiently. That having been said, if there is too large a sample of 1.0-2.0mm to pick under the microscope, I carefully pan this size, keeping a close eye on the results until a manageable size of sample is reached. Very important is that the GoldCube is very user-friendly if used as directed by the manufacturers. Very good for beginners or professionals. For KIMs (vs. gold), however, the till sample must be pre-concentrated and screened to size.

3) TYLER PORTABLE SIEVE SHAKER:

The Tyler sieve shaker (Equipment Photo 19, p 178) is available for larger samples. However, for my individual, typically smaller samples, screening is done by hand with standard sieve screens and larger diamond screens, wet or dry depending.

4) MANSKER JIG:

I also acquired and compared the efficiency of using a Mansker Jig for concentrating till samples, as some labs and explorationists use this device extensively for this purpose. I purchased one Coleparmer 8" HHSS #40 sieve for KIMs, and one Coleparmer 8" HHSS #100 sieve for lamprophyre indicators. Based on my findings I have determined a preference for my sluicing and Goldcube® methodology, as this appears to be superior to the Mansker Jig in concentrating KIMs, more so when considering a several thousand US dollar price tag. Basically, I couldn't get a good concentrate using this device.

5) CAMEL SPIRAL CONCENTRATOR:

A Camel Spiral Concentrator, which is used by some commercial labs, was also tested for KIM concentrates and I found it to be the worst of the lot – essentially useless**. Although it is quite useful for heavy metals such as placer gold**. However, even for gold it is much, much slower and less efficient than the GoldCube.

6) HIGH-SPEED CENTRIFUGE:

I acquired and tested a high-speed centrifuge to separate the final concentrate into specific gravity layers. The centrifuge only seems to work to an extent on the finest fraction of concentrates. It's now in permanent storage.

7) OTHER:

I considered the use of Polytungstate for heavy liquid separation, but after acquiring several litres and the equipment required to use it, I then realised after concentrating and picking till sample concentrates at the Bishop-Nipissing Diamond Claims and then at the Bishop-Barr Diamond Claims that some very important grains/minerals for diamond exploration, and finding and establishing the location and 'quality' of kimberlite pipes as to depth sampled and fugacity, temperature, and rate of ascent, would be lost if heavy liquid separation was used.

This, however, has one immutable side effect in creating a larger, more time-consuming concentrate to be picked for KIMs under a microscope. These grains are elaborated on elsewhere in this report.

8) MAGNETIC SUSCEPTIBILITY SEPARATION

After final concentrating, I've developed a method of separation of grains by various N-52 magnets (described elsewhere in this report). Each till sample concentrate is generally separated into 3 size fractions (0.25-0.5mm, 0.5-1.0mm, 1.0-2.0mm) in the industry. However, due to availability of easy-to-use screens, I now use 0.25mm, 0.42mm, 0.6mm, and 0.84mm screens. This gives me <0.25mm (which is necessary for lamproite indicates, e.g., Argyle Diamond Mine in Australia), 0.25-0.42mm, 0.6-0.84mm, and 0.84-3.0mm. Grains under a microscope all of a similar size is much easier to visually pick at a higher rate, so having these ratios actually speed up picking versus when grains of varying sizes are mixed together. Mixing larger and smaller grains really mess up focus and cause more eyestrain and mental fatigue.

Each of the concentrates from these 4 fractions are separately sprinkled evenly onto a white paper plate then, using an N-52 magnet (I prefer the 2.3mm diameter, see Equipment Photo 24, p 178), I remove the magnetic fractions in 3 steps. This leaves 4 fractions:

- M3 – hold magnet ~1/4" or so above grains, grains will 'jump' up to magnet; ferromagnetic
- M0 – no reaction; diamagnetic
- M1 – pick up but with a gentle shake falls off magnet; weakly paramagnetic

- M2 – sticks to magnet; strongly paramagnetic

This is done individually for the 4 size fractions. However, with much experience I now store but do not view M3. I consider M0 the most important for KIMs and other grains of interest. An M0 KIM so far always microprobes as the best KIMs/DIMs. M1 is also for garnets, chrome diopsides, ilmenites, and chromites, iimportant KIMs, and certain other grains of interest. M2 is possibly a KIM but of far lesser importance. I cover the end of the magnet with a small plastic bag to facilitate removal of the magnetic grains.

9) MICROSCOPE KIM PICKING

This leaves 3 x 4 = 12 individual samples to microscopic view and pick. If the grains are M1 or M2, they can each take from 20 minutes to 40 minutes. M0, depending on the sample, can take ~40 minutes to a full day to view and pick under the microscope.

Notes are taken for each grain, including: measuring the grain, recording the sample number, magnetic susceptibility, surface features (undamaged, frosted (sub-kelyphitic rim), white coating (kelyphitic rim – partial or nearly full)), colour and shades of colour (see Appendix 6: Grassy Lake Excerpts, Diagram B, Diavik grain colour chart, p 185), kimberlitic classification of grain, tentative ID of the grain, photo number, and other comments.

An interesting problem is how to measure grains in the 0.25-3.0mm range. Thanks to Doug Robinson, PEng, the solution is at hand. Mechanical pencils can be purchased with the 'lead' – graphite – being of a certain diameter. When a desired grain is being viewed under a microscope, the pencil lead can be placed slightly above the grain, and the size difference or similarity instantly compared. I have these pencils in mm widths of 0.5mm, 0.7mm, 0.9mm, 1.3mm, and 1.8mm. If the grain is wider than any of these, they can be viewed in combination to get a very close estimate of size.

10) MICROPHOTOGRAPHY:

An extra but very important (and time consuming) step is to photograph many of the large/important/unusual potential KIMs or other heavy mineral through the microscope ocular by arranging the grain for best viewing and using appropriate lighting, then recording the type, size, colour, etc. of each grain, and storing and labelling the images with shortform pertinent information on the computer for later viewing or to aid when consulting with geologists and other experts in the field of mineralogy, especially as related to diamond exploration of which a number of interesting grains are represented in this report. Many photographs were taken for this claim of concentrates/various grains have been taken and stored. As well, when dealing with grains that are from 0.25 to <3.0mm in size, one simply cannot easily find a certain one in picked KIMs and show it to individuals to ascertain their potential importance, and once sent to a lab for microprobe analysis, important physical characteristics such as kelyphitic rims and physical wear are lost. Photographing all KIMs picked (or many representative grains if too numerous) also helps estimate total numbers in the sample.

11) LIGHTING:

Another useful tool for picking kimberlitic Cr Pyropes was discovered in my research.

> "Pyrope grains larger than 0.5mm and have a higher Cr content (Cr203) showed a metameric colour change from purplish in incandescent light to grey, blue-grey, or blue in daylight type fluorescent light (Springfield and Manslar, 1985) which is useful qualitative and for picking garnets with higher Cr content." (Carter Hearn Jr. (2004), p 481)

> "[A] color change garnet is an especially rare and valuable … garnet" (GemSelect (2018))

> "[A] color change garnet is one of the most rare, interesting, and unique of all gemstones." (AJS Gems)

"Cr pyropes are picked at ODM by switching light sources (LED and Fluorescent) to find colour change garnets which are from this and other sources indication of kimberlitic chrome pyrope garnets" (personal communication)

Over the last several years, I've tried many (several dozen) types and colours of bulbs and a number of lamp configurations. The latest and so far best is a pair of desk-sized gooseneck LED lamps (Jansjö LED Lamp from Ikea) which gives a true colour image under the microscope and in a microphotography image, and a variable intensity ring light (AmScope – 144 Bright White LED Ring Light) that mounts directly onto the lower part of the microscope and provides a very white (daylight) illumination.

After finding a Cr Pyrope (pink → purple), I can switch from one light to the other separately.

The results are dramatic with a colour change from lilac-purple to grey/blue.

Sluice Efficiency Test Results

Overflow Chart: collected in stainless steel pan after exiting sluice			
Dry weight from sluice = 3160 grams			
	Screened dry weight (grams)	**Magnetic portion (grams)**	**After panning dry weight (grams)**
-4+10 mesh =	1469		24
-10+20 mesh =	290	3	25
-20+28 mesh =	141	2	19
-28+35 mesh =	171	2	23
-35 mesh =	1058	x	
Total =	**3129**		
Sluice Top: expanded metal over classifying screen – no carpet			
Dry weight from sluice = 940 grams			
	Screened dry weight (grams)	**Magnetic portion (grams)**	**After panning dry weight (grams)**
-4+10 mesh =	241	15	24
-10+20 mesh =	128	6	25
-20+28 mesh =	66	3	19
-28+35 mesh =	80	3	23
-35 mesh =	419	x	
Total =	**934**		
Sluice 1: classifying screen over miner's moss			
Dry weight from sluice = 2860 grams			
	Screened dry weight (grams)	**Magnetic portion (grams)**	**After panning dry weight (grams)**
-4+10 mesh =	136	6	26
-10+20 mesh =	495	20	18
-20+28 mesh =	258	6	19
-28+35 mesh =	336	7	17
-35 mesh =	1610	x	
Total =	**2835**		
Sluice 2: classifying screen over miner's moss			
Dry weight from sluice = 3020 grams			
	Screened dry weight (grams)	**Magnetic portion (grams)**	**After panning dry weight (grams)**
-4+10 mesh =	29	1	22
-10+20 mesh =	269	8	18
-20+28 mesh =	248	6	20
-28+35 mesh =	359	7	17
-35 mesh =	2106	x	
Total =	**3011**		
Sluice 3: classifying screen over miner's moss			
Dry weight from sluice = 2550 grams			
	Screened dry weight (grams)	**Magnetic portion (grams)**	**After panning dry weight (grams)**
-4+10 mesh =	220	10	15
-10+20 mesh =	441	13	17
-20+28 mesh =	198	5	16
-28+35 mesh =	210	4	16
-35 mesh =	1425	x	
Total =	**2494**		
(note: slight differences in sluice and screen weights could be accounted for by moisture differences and loss during screeni ng, tumbling, and container transfers, but are statistically inconsequential)			

Cost Breakdown

Concentrating & Processing till samples			
Step	**Time/Rate per sample**	**# of Samples**	**Processing Till Sample for KIMs and other minerals of interest**
1	5 minutes	29	- Weigh each till sample and record weight, colour, and other details. - Store safely
2	20 minutes	29	- Use ½" drill and paddle to pulverise mud/clay, etc. in 5 gallon bucket approximately half full of water - Pour off residue, organics, etc. - Course screen remainder to ~1/4"
3	1.5 hours	29	- Sluice sample automatically screens to ~4mm - +4mm into overflow bucket - Visually check +4mm then discard - Place a large, stainless-steel pan at discharge and bottom of sluice - Disassemble screens, miner's moss, etc. - Flush concentrates into steel pan - Carefully wash miner's moss, etc. into steel pan - Reassemble sluice for next sample - Flush contents of large pan into a smaller stainless-steel pan - Flush into smaller plastic tub
4	5 minutes	29	- Weigh sluice cons
5	0.5 hour	29	- Sluice concentrate screened to 5 sizes (<0.25mm, 0.25-0.5mm, 0.5-1.0mm, 1.0-2.0mm, +2.0mm) - Store the <0.25mm & +2.0mm
6	0.5 hours x2 = 1 hour	29	- GoldCube the 0.25-0.5mm fraction - Disassemble and carefully rinse the 3 sections of the GoldCube into stainless-steel pan and store this for now - Repeat with 0.5-1.0mm fraction
7	15 minutes x2 = 0.5 hour	29	- Transfer GoldCube cons into aluminum pans, to convection oven
8	0.5 hour	29	- Pan 1.0-2.0mm sluice cons and place panned cons into aluminum pan to convection oven - Carefully label and store these dried concentrates until next step(s) - As mentioned elsewhere, this is a lengthy, unusual, and necessary continuation of the process due to the cemented, sandy coating on approximately all grains from Barr Claims
9	0.5 hour	29	- The 3 sizes of concentrates must be visually checked under a microscope to determine level/thickness of coating
10	1 hour each (x3) = 3 hours	28	- Each size is tumbled with concentrated muriatic acid for 10 minutes to 40 minutes to remove coating - Rinse in fresh water several times, baking soda rinse, then another fresh water rinse
11	10 minutes each (x4)= 40 minutes	28	- Weigh each fraction of Tumbler/Acid concentrates (4 size fractions)
12	1 hour	28	- Pan etched concentrates (0.25-0.42mm, 0.42-0.6mm) if required - Put fractions into separate aluminum pans into convection oven to dry - Store safely
= 580 minutes (x28 samples) + 300 minutes (x1 sample) = 16,540 minutes/60 minutes			= 275.67 hours 275.67 hours x $70/hour = **$19,296.90**

Micro-picking				
13	20 minutes	Total	- So, to make micro-picking more accurate and easier, I'd rescreened the panned cons to <0.25mm, 0.25-0.42mm, 0.42-0.6mm, 0.6-0.84mm, & >0.84mm. The <0.25mm is not used but is stored (for lamproite research). Store separately and label.	
14	20 minutes	Total	- For each of 4 sizes before viewing, use an N-52 magnet to separate each size into M0, M1, M2, & M3 (see Results Breakdown: N-52 Magnets used for picking, p 12). M3 is not necessary to view.	
15	~4 hours	29	- For the much larger and more important M0, on a plate under the microscope I view and pick in separate stages (otherwise it's really easy to mess up). ○ 1. One viewing/picking for bright/pretty grains, mainly purple, orange, red, pink garnets, as well as bright yellow, etc. grains, including green Cr Diopside ○ 2. Chromites and ilmenites, black grains, etc. ○ 3. Au, Ag, sulphides, other	0.25-0.42mm
16	~1 hour	29	- M1 can be generally picked for all grains at once	
17	20 minutes	29	- M2 can be generally picked for all grains at once	
18	2 hours	29	- M0	0.42-0.6mm
19	1 hour	29	- M1	
20	15 minutes	29	- M2	
21	1 hour	29	- M0	0.6-0.84mm
22	0.5 hour	29	- M1	
23	10 minutes	29	- M2	
24	0.5 hour	29	- M0	>0.84mm
25	15 minutes	29	- M1	
26	5 minutes	29	- M2	
= 665 minutes (x29 samples) + 40 minutes (total) = 19,325 minutes / 60 minutes			= 322.08 hours 322.08 hours x $70/hour = **$22,545.60**	
Microphotography				
$20 per photo X 281 photos in report **(Duplicates and non-microphotographs were not counted in this total)**			- At each stage on important/unusual grains will be carefully photographed (through the microscope). With till sample number, grain will be measured, visual characteristics listed, i.e. sub-kely rim ('f' frosted), brecciated, fractured, colour, kelyphite rim, etc. The grain photographed will be recorded in a dedicated book. The grain is then picked and put in a separate vial with the description, photo number, and till sample number for reference or microprobing - Many more common KIMs are recorded in a log sheet - Store each grain in vials separated by magnetic susceptibility, i.e. 4 vials with info on cons	
			$20 x 281 photos = **$5,620**	
TOTAL			**= $ 47,462.50**	

Equipment Photos


1 – Early Spring work station. GoldCube is on the right


2 - 1/2" drill with mixer


3 - 1/4" screen


4 – Graeme Bishop, sluicing a till sample


5 - Sluice


6 – Automatically classifies to 5mm


7 – The rubber has a rough surface to slow down and sort grains by size & weight


8 – The carpet is 'miner's moss'. Washing the carpet


9 – Washing the carpet


10 – Sluice concentrate screened to 4 sizes before GoldCube

11 – 3 fractions of sluiced cons (0.25-0.5mm, 0.5-1.0mm, 1.0-2.0mm)

12 – Note the different colour of till

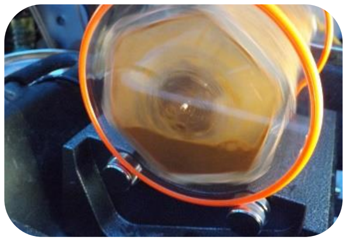

13 – Gold-panning concentrates from the 'GoldCube'


14 – Finish gold-panning


15 – Wash panned cons in aluminum pan for drying


16 – Drying the panned cons – 3 size fractions for each sample

17 – Acrylic tumblers with muriatic acid & different size fractions from the GoldCube. These are variable speed & timers



18 – Note hole drilled in centre to allow gases from the acid to be released.

19. Tyler motorized portable sieve shaker

20 – Part of working area

21 – Storage of picked KIMs

22 – Various rare-earth (N-52) magnets, largest of which is 3” diameter (600lb lift)

23 – Pencils of varying lead thickness for measuring grains under the microscope

24 – Determining magnetic susceptibility

25 – Releasing the grains from the magnet into one of 4 categories

26 – Leftovers from KIM picking

27 – Screens of various sizes

28 – Carbon fibre brush to dissipate electrostatic charge

29 – Individual grains picked and stored for their importance or to be sent for microprobing

- Photo 10 – Sluice concentrate screened to 4 sizes before GoldCube. Only the 0.25-0.5mm and 0.5-1.0mm is GoldCubed. The 1.0-2.0mm is carefully panned. The 2.0mm+ is stored in case there are a number of 1.0-2.0mm KIMs and I want to check for larger.

- Photo 18 – Note hole drilled in centre to allow gases from the acid to be released. The level of cons and acid must be safely below this, sometimes necessitating multiple runs for each fraction of grains. The mixture was then washed in clean water with a next to last bath in baking soda and water, and lastly in clear water. The newly revealed cons were then rescreened and panned to the various size fractions. This was then put in aluminum pans and into the convection oven to dry. This was then stored for eventual KIM picking under a compound, low-power microscope.

- Photo 22 – Various magnets used to separate grains according to their (approximate, but very useful and important) magnetic susceptibility. They are all rare-earth (N-52) magnets, the largest is 3" diameter (600lb lift) – great care must be taken using this. A 1.5" magnet was assembled from ABS plumbing parts, it works great removing black sands when gold panning. The most useful is the 'eyebolt black magnet'.

- Photo 24 – On a plate of concentrates I hold the magnet ~0.25-0.5" above the plate. The magnetite and other ferrous minerals will 'jump' up to the magnet, which I call M3, this is generally of no use in exploration. Then I touch the magnet gently to the grains. The move to the aluminum pan marked M1 and give the magnet a gentle shake. The grains that fall of are weakly paramagnetic. The grains that stick are strongly paramagnetic and are dropped into the M2 pan by lifting the magnet up from the plastic bag.

- Photo 25 – The grains left in the plate are non-magnetic (diamagnetic) M0. KIMs/DIMs in the M0 category are by far the most important for diamond exploration and determining the possibility of a kimberlite having diamonds, and if they were preserved in transport to the surface. In some cases, M1 grains are also very important if they should be M3 but are actually M0 or M1.

- Photo 27 – There are no set rules, but 0.25mm, 0.5mm, 1.0mm, and 2.0mm screens are fairly standard but oddly hard to find. Affordable gold panning screens can be bought. These are perfect lab (or hobbyist gold panning) screens which will give <0.25mm, 0.25-0.42mm, 0.42-0.6mm, 0.6-0.84mm, and >0.84mm fractions. So, I tried to pick various sizes, once under a microscope and it is very non-productive. So, even though it is much more time consuming, I pick each individual fraction separately. As well, most/all other commercial labs only pick a small ~30g of cons and estimates the potential numbers of indicators in the actual cons. Now, this might be good in theory but with the importance of a few grains and the enormous cost of diamond exploration I pick all the grains in a concentrate. This takes enormous dedication and time, it's a good time to be snowed in over long winters.
  That being said, on my first attempt at finding kimberlites, a number of surface massive area and volume totally unique kimberlites have been discovered on my Lorrain claims near Cobalt.
  I'm certain that Barr Twp will match this is quality but with more traditional kimberlite pipes.

- Photo 28 – An unexpected, but important tool in KIM picking. A large part of diamond/kimberlite exploration is picking literally microscopic 0.25-0.5mm grains. At this size, static charges (and perhaps Vanderwaal) cause a lot of trouble. Put these grains on a plate and try to pick them up with tweezers, often they will be repelled, or several grains will be attracted to the tweezers and will not let go afterwards when you try to spread out the grains and then dump the plate they will stick to the plate, the funnel, etc. If you use a nylon brush, for example, the grains will electrostatically stick to it in great numbers.
  This is a makeup brush (from the dollar store). Interestingly, I discovered the bristles are carbon fibre which dissipates/conducts the electrostatic charge – absolutely necessary piece of equipment.

- Photo 16 – Drying the panned cons. 3 size fractions for each sample for storing. Note, normally this would be ready for magnetic separation and microscopic picking of KIMs, however often after sluicing and GoldCubing several samples I checked with a magnifying glass and noticed that 'all' the grins had a heavy coat of a round, sandy composition, which made the final concentrating very problematic and viewing and picking the KIMs impossible. That's when I tried oxalic acid which did not work, then after much thought and research ordered the acrylic tumblers and muriatic acid – which I researched – the acid will not harm KIMs, but it is somewhat dangerous to use. This added considerable time to process each sample.

Equipment List

Preferred Equipment is starred* for diamond/kimberlite exploration

- Mansker Jig
- Camel Spiral Concentrator
- Custom designed proprietary tube/spiral concentrator for fine to very fine material
- Diamond sieves
- Tyler – 8 sieve Motorized Portable Sieve Shaker
- *Various test sieves from -4 to -100 mesh
- *12V and 120V and motorized water pumps for concentrators as needed
- Garrett Au Pans: 15” super sluice, 10”
- *Keene’s Engineering Au Pans: 14”, 12”, 10”
- *Heavy duty 18” x 16” rubber panning tub
- Goldcube® fine Au/heavy mineral concentrator
- Goldspears (2 of) with extra 4’ extensions for precious metal and magnetite soil testing, wet & dry
- Scintrex-Scintillation Counter Model BGS-1S
- Rock saws: 10”, 18”, 24”, 36”
- Various metal/mineral detectors: MineLab Pro-find Pinpointer, Garrett’s BFO, ADS VLF 5khz, AT-Gold 15 khz, ATX multi-frequency pulse
- *Goldfinder 14’ aircraft aluminum collapsible sluice with ¾ hp 120V submersible pump, 6 ½ hp Honda pump, dredging (3”) capability, custom designed Hungarian and expanded metal riffles, -4 mesh classifying screen
- *Digiweigh digital scale, readability 0.1 gram
- *Mettler PM30, 0-60lb, 0.1g scales
- *Fujifilm Finepix SL, Nikon Coolpix digital cameras, custom microscope adapter for Coolpix
- Canon EOS Rebel SLR, with commercial microscope adapter
- Zeiss OPMI-1 stereo 4-25x microscope with thru the lens variable halogen lighting, 6’ articulating boom stand
- Zeiss Jena 4-25x compound microscope with separate oculars to 80x
- Bristal 40-1000x microscope
- Nikon SMZ 2B continuously variable 8-50x microscope with adjustable boom stand
- *Nikon SMZ 745T microscope
- *Turnstile microscope viewing platform
- *Diamond Selector II
- Superbright 2000SW and Superbright II LW370 portable ultraviolet lights /battery/120V
- *Inova multi-wavelength LW UV LED flashlight
- *Jansjö LED gooseneck microscope lamps
- *AmScope 144 bright-white variable intensity ring light
- Clay-Adams high speed centrifuge
- 2” Neodymium magnet in waterproof ABS shell
- *Various N-52 magnets
- Weaker 4” x 6” flat magnet cut to fit Au pans
- *Various shovels, auger, containers, compasses, GPS, maps, etc. as needed for soil/rock sampling
- Electronic pH tester and pH strips
- *Toyota Tacoma 4x4

This list is regularly updated and modified.

Appendix 6: Grassy Lake Excerpts

Pertinent excerpts taken from the Bishop Grassy Lake Report (Bishop, B.A. (2018b)) which also relate to the Bishop-Barr Claims.

ASSESSMENT WORK REPORT

for CELL CLAIMS 277042, 277041, 131127, & 329881

arising from LEGACY CLAIMS 4282444, 4282707, & 4286187

Lorrain Township

Larder Lake Mining Division

Claim Holder - Brian Anthony (Tony) Bishop client #108621

Photo A: Unpicked till sample concentrates – 0.25-0.5mm

Report prepared and submitted by Tony Bishop

June 18, 2018

On FeO & Austenite

Also found down-ice of [a number of my targets] are round, frosted grains with a brownish to black glassy surface, first described in Report 4282172 [see Bishop, 2017c, p12, Photo S-D23, & p15]. These grains vary from totally inert magnetically and then others vary in response to a magnet. Some of these [magnetically] inert grains microprobed as FeO which (with much research) can only be Fe(II) or austenite.

This is very interesting, as iron exists as Fe(I) (ferrous iron, rust, very magnetic), Fe(II) (non-magnetic), and Fe(III) (hematite, weakly magnetic – paramagnetic). These spheroids tested non-magnetic by me and are described as Fe(II) in various science journals and are exceedingly rare. Basically, they are found in meteorites and in impact ejecta in nature, they can also be found as the 'sparks' that fly off when plasma arc welding, and that is pretty much it. Similar grains are mentioned in some volcanos, but are Fe(I) – magnetite, as dendrites in a glassy matrix. It is estimated that as much as 9% of the mantle is composed of Fe(II) but normally only exists in the upper mantle at the pressure/temperature coincidentally found where diamonds might form. Unless they undergo cooling in a very short time in a reducing environment, they turn into Fe(I) – magnetic iron. Austenite is only stable above 910°C in bulk metal form. Recent theories suggest that in an ascending kimberlite a pressurised 'froth'/foam of CO2 precedes the 'solid' constituent. This acts as a 'super-cooling' wave, much like a freezer in your house, while the kimberlite ascends that has been theorised might actually flash-freeze the kimberlite when it reaches the surface. This helps to explain why diamonds don't always oxidise (burn) when ascending to the surface. It seems it might also preserve these Fe(II) spherules (as well as the non-magnetic garnets I'm finding). As such, I propose that if these non-magnetic spherules of iron oxide are found in with KIMs, it might show that if diamonds are also present in the kimberlite then the conditions might be favourable for their preservation as well. It is already known that a higher ratio of Fe2+ as compared to Fe3+ is necessary for higher diamond (preservation) content. Iron (II) oxide has been found as inclusions in diamonds and its presence indicates a highly reducing environment. However, I cannot find reference to Fe(II) spheroids in the published results of sampling programs by other diamond producing companies. Fe(II) apparently is an allotrope of iron (gamma phase iron) called Austenite, a metallic non-magnetic iron, or a man-made solid solution of iron with an alloying element (see Austenite, n.d.). Basically, from 914°C to 1394°C, Fe(I) alpha iron turns into Fe(II) gamma iron, so I compared the pressure-temperature diamond formation range with that for austenite (940°-1400°C) and found an interesting possible relationship between diamond and Fe(II) formation [see Diagram A below].

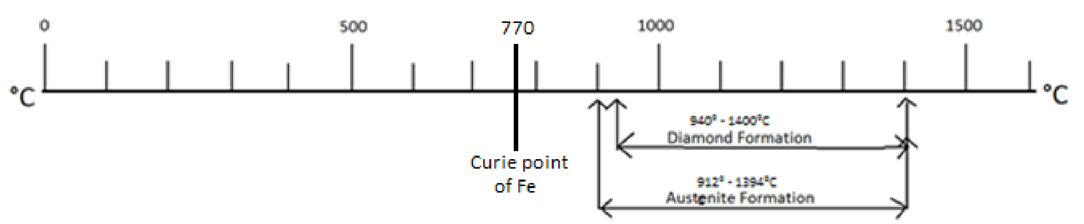


Diagram A: Diamond and Austenite Formation

By adding certain alloying elements such as manganese and nickel and cooling in a reducing environment (nitrogen), a more stable austenitic iron that doesn't form in nature is made – 'stainless steel'.

Visually similar spherules are quite common in volcanic ejecta and major impacts by asteroids, etc. (like the one that killed the dinosaurs), from fly ash, from various industrial processes, automotive exhaust, etc., but they are all Fe(I) magnetite (ferromagnetic) and less commonly silicon nodules (with no iron – non-magnetic), sometimes which have dendritic magnetite throughout the matrix (therefore magnetic).

So, if these spherules are found in concentrates with (other) KIMs and are diamagnetic (inert) and test as FeO, it would appear to be an indicator of originating in a kimberlite that sampled the diamond formation part of the mantle and was preserved in a strongly reducing environment as the kimberlite ascended, perfect for diamond preservation as well.

So, diamond and Fe(II) both form in the same pressure/temperature area of the mantle. To be preserved, they both require rapid cooling in a reducing environment. If cooled too slowly in an oxidising environment, diamond turns to carbon and diamagnetic Fe(II) turns to ferromagnetic Fe(I) ferric iron or paramagnetic Fe(III).

This concept, perhaps, can be expanded to included non-magnetic garnets, ilmenites, and perhaps other grains, such as chromite.

I've been finding non-magnetic garnets in my cons.

ON FE(II) GARNETS:

As shown in various articles, diamonds with inclusions have been tested in which the original structure/chemistry of the inclusion was maintained under the original pressure conditions inside the diamond (Tschauner et al (2018)). The same could be said, and in fact is documented in garnets (Kiseeva, et al, 2018), so might Fe(II), austenite, a non-magnetic form of iron, be maintained inside a garnet [see Bishop, B.A. (2018b), page 25, and also Bishop, 2017c, p 15/16].

Briefly, there is Fe(I) – very magnetic (ferromagnetic), the iron we use extensively; Fe(III) – weakly magnetic (paramagnetic), hematite; and Fe(II) – (diamagnetic), austenite, totally inert which only (in nature) exists in the mantle at high pressure/temperature and sometimes in meteorites. The importance for this report is that all garnets are accepted in scientific journals as being greater or lesser magnetic. However, I'm finding (totally) inert (diamagnetic) garnets which at first glance should be impossible.

This is especially evident when utilising a very powerful N-52^+ neodymium magnet and the very small grains 0.25-2.0mm of KIM size, where all types of garnets will pick up. Larger mass gem size stones might or might not do so (see 'Magnetism in Gemstones' Feral (2011)).

> "For Gem identification a pick up response to a strong neodymium magnet separates garnet from all other natural transparent gemstones" (Feral (2011))

This is utilised by mineral testing labs using various strengths of magnetic fields (ODM and others use a variable electromagnet and different amperages) to remove the ferro, para, and diamagnetic fractions of concentrates. The strongest magnetic fields are not used to separate KIMs as all garnets (crustal and kimberlitic) would be removed.

[09/04/2022 Note: the terms 'Fe(I), Fe(II), & Fe(III) are actually quite confusing as the original austenite article used those shortforms for the different structures/configurations of these types of iron at the atomic level. Later, I realised that it's another way of writing the valence states (i.e. Fe^{2x} = Fe(II), Fe^{3x} = Fe(III)). I also realised there is no Fe^{1x}, i.e. only Fe^{2x} & Fe^{3x}, these can have different structures, as a result some of my earlier writing is somewhat in error but the general content and results are correct.]

In many 1000s of samples tested by microprobe in OGS and other reports, non-kimberlitic (crustal garnets) vary approximately between 20-40% FeO, others eclogitic and Cr poor megacrysts can be from 10-20%, G9/G10 garnets vary from 5-10% FeO.

However, a while back ago I tested a small group of concentrates picked from KIMs from Little Grassy Lake with a very powerful, small neodymium magnet, and **discovered a few inert (diamagnetic) garnets** [see Bishop, B.A. (2018b) Photo 33, p11] **which when microprobed had normal iron levels (two of three G11s are diamagnetic)**. This mystery led me to a type of iron called austenite [see Bishop, B.A. (2018b) p25].

Then recently, with this information in mind as reported in my previous Work Assessment Report on Legacy claim 4282142 [see Bishop 2018, p11], I rechecked the concentrates and picked KIMs from the Trench samples to test for the magnetic susceptibility of the garnets. Many of the orange garnets were non-magnetic.

I then recalled another report that was very useful for a different reason. In several years of extensive research and from conversations with a prominent lab, it appears that **most companies and labs** involved in the quest for **KIMs pick eclogitic garnets based on an orange colour; the deeper, brighter (pretty) garnets were at the top of the picking list**. However, I had found an article titled 'Garnet xenocrysts from the Diavik mine, NWT, Canada: Composition, color, and paragenesis' (McLean, Banas, et al. (2007), p 1136, 1138, 1139), which in part I've included below. As can be clearly seen, the basically ugly Lo (light orange), MLo (medium light orange), and MDo (medium dark orange) & Do (dark orange) garnets (at least at the Diavik Mine) encompasses the majority of G3 and G4s which have (recently?) become of great interest in diamond exploration.

In addition, this article drew attention to the importance of pink garnets, which I'm finding in very high numbers in my heavy concentrates along with KIMs. No company or lab reports pink garnets that I've found in three years of research, except for this article. From the charts made on Diavik garnets (they only tested a few pinks), the pink garnets seem to be far more likely than other colours to be G10s. Only purple garnets are more likely to be G10s.

Magnetic Susceptibility Index for Gemstones (Kirk Feral (2010))			
Gemstone	**Response Range**	**SI X 10 (-6) Range**	**Cause of Colour**
Garnet Group **Almandine Garnet**	Picks Up	1926-3094	Iron
Andradite Garnet Demantoid Garnet	Picks Up	2253-2752	Iron, Chromium
Brown Andradite & Topazolite	Picks Up	2559-2907	Charge Transfer Involving Iron
Melanite (black) Garnet	Picks Up	1866 SI	Charge Transfer Involving Iron
Grossular Garnet Hessonite (pale to dark yellow/orange)	Moderate to Strong	91-345	Charge Transfer Involving Iron
Hydrogrossular (green, pink)	Weak to Strong	74-339	Iron, Chromium., Manganese
Green Grossular (including Tsavorite & Merelani)	Weak to Strong	20-309	Vanadium, Chromium, Iron
Pyrope Garnet Standard Pyrope Garnet	Picks Up	1163-1971	Iron, Chromium, Vanadium
Chrome Pyrope	Drags to Pick Up	454-999	Chromium, Iron
Spessartine Garnet Spessartine Garnet	Picks Up	4301-4728	Manganese, some Iron
Uvarovite Garnet	Picks Up	998 SI	Chromium Vanadium

Diagram B (McLean, Banas, et al. (2007), p 1136), [Diavik]

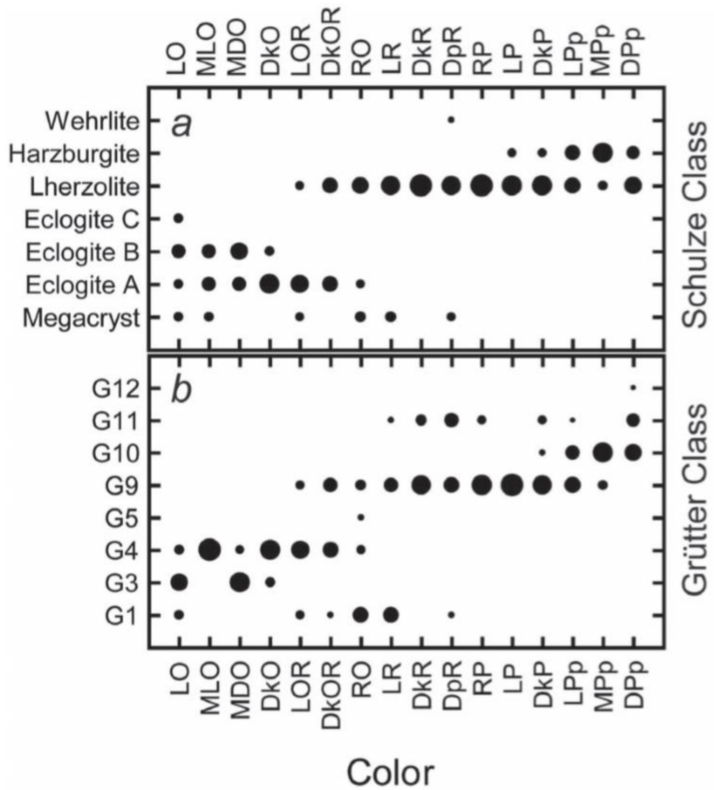


FIG. 4. Correlation diagrams showing garnet classes represented by each color group. Note that most colors are comprised of several types of garnet. (a) Classification scheme of Schulze (2003). (b) Classification scheme of Grütter *et al.* (2004). Grütter classes represented at Diavik are: G1: low-Cr megacrysts, G3: eclogitic (high-Ca), G4: eclogitic (low-Ca), pyroxenitic or websteritic, G5: pyroxenitic, G9: lherzolitic, G10: harzburgitic, G11: high-Ti peridotitic, G12: wehrlitic.

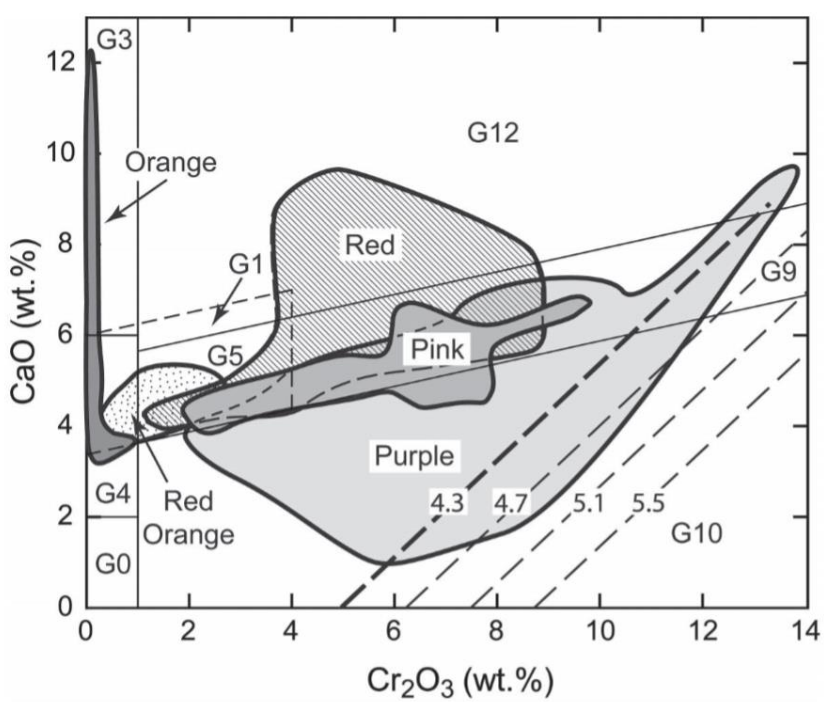


FIG. 5. CaO–Cr_2O_3 diagram, showing the compositional ranges of garnet xenocrysts of different color. For clarity, the classes were consolidated into Orange (LO, MLO, MDO, DkO), Red Orange (LOR, DkOR, RO), Red (LR, DkR, DpR), Pink (LP, DkP), and Purple (LPp, MPp, DPp). Solid lines and fields after Grütter *et al.* (2004). Dashed lines are isobars from the Cr–Ca barometer of Grütter *et al.* (2006). Numbers on isobars are pressure in GPa; the 4.3 GPa isobar is emphasized because it represents the graphite–diamond transition along a 38 mW/m^2 geotherm.

Diagrams C & D (McLean, Banas, et al. (2007) p 1138, 1139)

ON ILMENITES:

Presently, most companies will not consider a diamond prospect/pipe unless the 'chemistry' of the indicators are a certain value. Specifically the chemistry for ilmenite, **although they are not a kimberlite (mantle) mineral**, are 'picked up' from the country rock by the ascending kimberlite volcano.

Many properties are made or ignored based on this premise. I recently encountered this when a major I spoke with wanted to see the ilmenite chemistry (expensive to test for 15 individual targets at the prospecting level) and from the company's past history, the results are treated as gospel for pipe/diamond content.

However, as quoted below showing various viewpoints on this, perhaps they should reconsider their long ago entrenched beliefs.

"… the importance of ilmenite composition during the evaluation of a pipe for diamond content may be related to diamond preservation (McCallum and Waldman 1991). … the magma may be subjected to later near-surface oxidizing environments. Such oxidation may show up as high Fe^3/Fe^{2+} ratios … in ilmenite. In such cases, it has been suggested that … diamonds in the host magma may be substantially resorbed to produce graphite, CO_2, or CO.

"Survival of diamond at elevated temperatures … is linked to low oxygen fugacity; elevated oxygen levels favor resorption. Ferrimagnetic ilmenite high in Cr_2O_3 is found in some diamond-poor kimberlites, and these ilmenites characteristically show exsolution texture.

"In contrast, homogenous ilmenites are found in kimberlites that are interpreted to have risen comparatively rapidly. … typically results in later ilmenites that have lower MgO and Cr_2O_3 contents.

"It has been reported that ilmenite in equilibrium with diamond contains almost no Fe^{3+}

"High Cr_2O_3 and MgO components in ilmenite relate to low oxygen fugacity. This association has led to the use of Cr_2O_3/MgO plots to evaluate ilmenite trends for diamond preservation.

"Gurney (1989) and Gurney, Helmstadt, and Moore (1993) report that 'ilmenites with low Fe^{3+}/Fe^{2+} ratios are associated with higher diamond content than those with more Fe^{3+}, whereas **diamonds are not associated with ilmenites of high Fe^{3+} content at all.**'

"**However, this association is not supported by all observations.** As pointed out by Schulze et al. (1995) and Coopersmith and Schulz (1996), on the basis of ilmenite geochemistry, an exploration geologist would be forced to conclude that finding diamonds in the Mir, Frank Smith, DeBeers, Monastery, and Kelsey Lake mines would be unlikely because these kimberlites all have ilmenites with high hematite [Fe(III)] component. Yet, unresorbed diamonds and relatively high ore grades are found in kimberlites at Mir (200 carats/100 tonnes), Frank Smith (known for its sharp-edged octahedrons), DeBeers (90 carats/100 tonnes), and Monastery (50 carats/100 tonnes). Low diamond grades are reported at the Kelsey Lake mine, but the diamonds are excellent and include many spectacular gem-quality octahedrons with little evidence of resorption. The ilmenite geochemistry of Kelsey Lake shows as much as 38% hematite component (Schulze et al. 1995; Coopersmith and Schulze 1996) which would lead to a prediction, based on ilmenite geochemistry, that these kimberlites would be devoid of diamond. However, diamond production at the mine includes a large percentage of high-quality gemstones with octahedral habit indicating that diamond preservation was favorable.

> "In all probability, many picroilmenite nodules did not coexist with the magma at the time they were incorporated in to the kimberlite. Therefore, … their oxidation state would have little bearing on the diamond resorption potential (Schulze et al. 1995; Coopersmith and Schulze 1996)"
> (Erlich and Hausel, 2002).

I'm also investigating the value of using a neodymium magnet to differentiate between 'crustal' ilmenite ($FeTiO_3$) and 'kimberlitic' magnesian ilmenite – geikielite ($MgTiO_3$); however, there is a 'third' ilmenite: pyrophanite ($MnTi0_3$).

To determine oxygen fugacity as previously stated, an Fe(III) to Fe(II) ratio should be able to be determined with a similar neodymium magnet test that I'm using for garnets. More results will be forthcoming.

> **[G10s]** "Some diamondiferous pipes, such as the Argyle, contain few (if any) G10 garnets, whereas some barren pipes such as Zero and Buljah, Western Australia, contain abundant G10 garnets."
> (Erlich & Hausel (2002). p 330-331.) [*Bishop, B.A. (2018b). p*11]

Advances in Diamond Exploration in Canada: Understanding the Importance of Non-Magnetic Signatures and Geo-Chemical and Structural Geology

There seems to be a general misconception concerning the necessity of having a "magnetic bullseye" as being the primary method of locating kimberlite pipes and indeed, during the 1980s-1990s, a necessity. The following articles will help dispel that outdated belief, given more recent research and outcomes from Canadian-producing mines, including advances in geo-chemical and structural geology analysis:

From Energie et Ressources naturelles Quebec*, Exploration Methods,* accessed online at: https://www.mern.gouv.qc.ca/english/mines/industry/diamond/diamond-methods.jsp:

- "Anomalies may be negative or positive and locally very close together (Sage, 1996; Saint-Pierre, 1999). **A few diamondiferous lamproite and kimberlite intrusions do not create magnetic anomalies** (Atkinson, 1989; Brummer *et al*., 1992; Fipke *et al.*, 1995)."

- **"Geophysical Surveys:** Kimberlites often form swarms that are generally associated with large, deep fractures (or faults) and with the intersection of major weakness zones in the earth's crust**….** In exploration programs for diamond-bearing kimberlite pipes between 100 m and 1,000 m in diameter world-wide (average of 300 m), the optimal flight line spacing in aeromagnetic surveys is believed to be 100 m, but a line spacing of 200-250 m is considered sufficient [for much of the world, however diamond pipes in Canada tend to be only ~50m to 200m in diameter, i.e., Lac de Gras and Attawapiskat]….In general, the cost of airborne surveys increases exponentially as the line spacing narrows. Magnetic or electromagnetic surveys spaced at 100 m are very expensive. The investment for this type of exploration can quickly become exorbitant. It is therefore important to use other techniques to target locations for conducting these surveys. The most commonly used technique consists of identifying indicator minerals in the heavy fraction of glacial deposits.

- **"Indicator Minerals:** For both kimberlites and lamproites, the "indicator minerals" must present a very specific chemical composition that reflects the prevailing pressure, temperature, and oxidation-reduction conditions for the formation or preservation of diamonds. It is therefore very important to chemically analyze as many "indicator minerals" as possible in order to ensure that a number of grains possess the right chemical composition. This unavoidably results in high costs for analyzing and interpreting results.

- **"Tracer minerals:** This is the most common method used in diamond exploration, especially in the early stages of exploration well before the considerably expensive geophysical methods are used. This method consists of looking in secondary environments (soil, streams, rivers, etc.) for minerals characteristically associated with diamond-bearing kimberlites and retracing them back to their source…. In northern regions, glaciers have eroded kimberlite rocks, dispersing the minerals that compose these rocks over large distances, either in tills or eskers….Studying glacial movement provides information on the directions and distances that glaciers traveled and makes it possible to go back to the source of the dispersal. A number of sampling campaigns based on relatively tight grids will be needed depending on progress made in the work. These sampling campaigns will take place over a number of years. They will also be difficult to carry out and very expensive."

From Geophysical Survey Methods in Diamond Exploration
Posted by: Maiko Sell in Exploration Geophysics, Exploration Methods. Accessed online at https://www.geologyforinvestors.com/geophysical-survey-methods-diamond-exploration/ :

- "Gravity surveys can be time consuming and expensive. When choosing to do a gravity survey at the exploration level, one is generally expecting to find kimberlites that have no discernible magnetic or electromagnetic response."

From http://www.pdac.ca/docs/default-source/publications---papers-presentations---conventions/jaques.pdf?sfvrsn=4

- "These companies reported **the discovery of 4 new non-magnetic** satellite **pipes** surrounding Aries kimberlite pipe using the Falcon airborne gravity gradiometer. **Subsequent microdiamond sampling indicated that all were diamondiferous** including the most recently discovered Niobe pipe." From page 20 of presentation at PDAC conference

From http://www.adamera.com/i/pdf/ppt/Amaruk-Project-Presentation.pdf page 9:

- "**In Lac de Gras all economic kimberlites are** strong EM conductors **with weak magnetic signatures**."
- "Many of the >200 kimberlites discovered on the Slave Craton are magnetic discoveries, often tested with only one diamond drill hole. **Non-magnetic kimberlites are often *more diamondiferous*** than magnetic kimberlites, and these kimberlitic phases would be missed if only magnetic anomalies were tested."

From http://www.metalexventures.com/html/attawapiskat.html on **magnetics not evident on most productive pipes in Attawapiskat**

From http://resourceclips.com/tag/add_ca/ Arctic Star/Margaret Lake Diamonds form JV, follow Kennady's approach to NWT kimberlites, **by Greg Klein | November 15, 2016**

- "De Beers considered Kelvin and Faraday low grade, based on their lack of prominent magnetic anomalies, according to the **Arctic/Margaret** JV. **Mountain Province** then spun out **Kennady** to explore the pipes. That company "applied ground geophysics, **gravity and Ohm mapper EM, which revealed** extensions to these **kimberlites that were not revealed in the magnetics**," the Diagras partners stated. "Subsequent drilling and bulk sampling has shown that these **non-magnetic phases of the kimberlites have superior diamond grades** to the magnetic phases and significantly increase the tonnage potential." Looking at some nearby deposits, the JV states that **certain kimberlites at the Rio Tinto NYSE:RIO/Dominion Diamond TSX:DDC Diavik mine and the high-grade portions of Peregrine Diamonds' (TSX:PGD)** majority-held **DO-27 kimberlite "are non-magnetic, proof that a magnetic-only approach in the Lac de Gras field could miss significant diamondiferous kimberlite bodies**."

From **http://www.grizzlydiscoveries.com/index.php/investor-relations/news/91-grizzly-provides-update-for-diamond-exploration-in-northern-alberta**

- "The potential for discovery of additional diamondiferous kimberlites within Grizzly's Buffalo Head Hills properties is considered high, based upon the favourable regional geological setting and the positive results of exploration conducted to date, including the identification of numerous priority geophysical targets. Grizzly's past work has shown that **the focus should be on kimberlites with a weak magnetic signature** with or without an accompanying electromagnetic, gravity and/or seismic signature, **which have tended to yield better diamond counts** in the Buffalo Head Hills kimberlite field."

From Kennedy, C.M. (2008). The Physical Properties of the Lac de Gras Kimberlites and Host Rocks with Correlations to Geophysical Signatures at Diavik Diamond Mines, NWT: http://research.library.mun.ca/10786/1/Kennedy_Carla.pdf

- "To date, the majority of kimberlites discovered using magnetic surveys have been negative magnetic anomalies. These small, circular, negative anomalies are easy to pick out in the comparatively positive magnetic background. It is **assumed that there are still many kimberlites that have not yet been discovered due to their neutral** or positive **magnetic responses**" (Kennedy, 2008, p 5).

- "In the Diavik area, **diabase dykes have large positive magnetic signatures making pipes located close to these dykes difficult to detect**. There is also the issue of remanent magnetization obscuring magnetic signatures" (Kennedy, 2008, p 149).

From: http://www.arcticstar.ca/s/NewsReleases.asp?ReportID=684168&_Title=Arctic-Announces-new-100-owned-Property-in-the-heart-of-the-Lac-de-Gras-dia... November 18, 2014

Arctic Announces new 100% owned Property in the heart of the Lac de Gras diamond field:

- "Twenty years of diamond exploration on the Slave Craton has proven that kimberlites can be small with complex shapes (dykes, sills, and multi-phase pipes) with complex geophysical signatures. …Many of the >200 kimberlites discovered on the Slave Craton are magnetic discoveries…**Non-magnetic kimberlites are often more diamondiferous than magnetic kimberlites, and…would be missed if only magnetic anomalies were tested.** The Kennady Diamonds Property (TSXv-KDI) is a recent examples of exploration **success** that resulted **from exploring for non-magnetic kimberlite**. Close-spaced airborne gravity, ground gravity, and ground EM techniques discovered high diamond grade kimberlites…. On the adjacent Ekati property, 6 new kimberlites were discovered by a modern heli-borne gravity survey. **One kimberlite… is significantly diamondiferous. …The Diavik mine itself consists of non-magnetic kimberlite**, detected by electromagnetic (EM) surveys. …**These new discoveries represented separate, usually volcanic pyroclastic events which were always more diamondiferous than their magnetic partners. We also found diamondiferous kimberlites with no magnetic and EM signature using gravity techniques**."

From Kjarsgaard, B. A. (2007). Kimberlite Pipe Models: Significance for Exploration. In B. Milkereit. *Proceedings of Exploration 07: Fifth Decennial International Conference on Mineral Exploration.* (pp. 667-677). Retrieved from http://www.dmec.ca/ex07-dvd/E07/pdfs/46.pdf

- "The physical and geochemical signatures of the host rocks are widely variable in terms of their magnetic response, electrical resistivity, density and elemental distributions. **Hence a variety of kimberlite** – host rock **responses are possible** i.e. positive anomaly, negative anomaly, **or no anomaly**" (Kjarsgaard, B.A., 2007, p 674).

From Shigley, J.E., Shor, R., Padua, P., Breeding, Shirey, S.B., Ashbury, D. (2016). Mining Diamonds in the Canadian Arctic: The Diavik Mine. Gems & Gemology, Summer 2016, Vol. 52, No. 2. Retrieved from https://www.gia.edu/gems-gemology/summer-2016-diamonds-canadian-arctic-diavik-mine

- "Because kimberlites weather and decompose faster than much older surrounding rocks, **the pipes often occur in topographic depressions beneath lakes**. …The pipes are capped by several meters of glacial till, a thin layer of lacustrine sediments, and 15–20 meters of lake water. … With the retreat of the glaciers, the pipe locations often became depressions in the land surface, which filled with water to become lakes. The lakes at pipe locations are generally deeper than those formed by just glacial action." (Shigley et al, 2016).

From Kono, M (Ed) (2010): Geomagnetism: Treatise on Geophysics. Elsevier, May 11, 2010. *Science* pp205. Retrieved from https://books.google.ca/books?id=_YDNCgAAQBAJ&pg=PA205&lpg=PA205#v=onepage&q&f=false

- "**Kimberlite pipes are often found in geographically localized groups, frequently under lakes** because of differential erosion, and the remanence directions within those groups is often similar**. Kimberlite pipes are often associated with diabase dikes**, and are also commonly intruded along pre-existing zones of weakness regional faults, geological contacts." (Kono (Ed), 2010, p 205)

From Kjarsgaard, B. A. (2007). Kimberlite Pipe Models: Significance for Exploration. In B. Milkereit. *Proceedings of Exploration 07: Fifth Decennial International Conference on Mineral Exploration.* (pp. 667-677). Retrieved from http://www.dmec.ca/ex07-dvd/E07/pdfs/46.pdf

- "Known, economically viable kimberlites range in size from thin (1 - 4 m) dykes or sills, to small pipes of ~75 m in diameter to very large pipes with sizes of ~1.5 km diameter. Just about any type of rock can host kimberlite bodies. …Kimberlites in the Lac de Gras field tend to be small (50-200m diameter) steep sided bodies…" (Kjarsgaard, B.A., 2007, p 674).

From Power, M., Hildes, D. (2007). *Geophysical strategies for kimberlite exploration in northern Canada*. Paper 89 in "Proceedings of Exploration 07: Fifth Decennial International Conference on Mineral Exploration" edited by B. Milkereit, pp1025-1031. Retrieved from https://www.911metallurgist.com/blog/wp-content/uploads/2015/10/Geophysical-strategies-for-kimberlite-exploration-in-northern-Canada.pdf

- "**Kimberlite intrusions tend to occur in clusters or fields**, with the large-scale distribution possibly controlled by deep seated structural features and local emplacement **controlled by shallow zones of weakness such as faults or the margins of diabase dykes**" (Power & Hildes, 2007, p 1025).

From Erlich, E.I., Hausel, W.D. (2002). *Diamond Deposits: Origin, Exploration, and History of Discovery*. Society for Mining, Metallurgy, and Exploration, Inc. (SME). Littleton, CO, USA

- "**Gravity.** The high relative density of kimberlite and lamproite should make these rocks detectable by gravity and seismic surveys. However, most diamondiferous intrusives are small and weathered, and gravity and seismics are generally not sensitive or practical enough to use in the search for kimberlite or lamproite. For example, Hausel, McCallum, Woodzick (1979) noted that **diamondiferous kimberlite intruded in granite** in the Wyoming craton **showed no detectable density differences with the host granite**." (Erlich & Hausel, 2002, p 313)

From Daniels, L.R.M., Tshireletso A. Dira, T.A., Kufandikamwe, O. (2017). The magnitude of termites to the future of kimberlite exploration in Botswana. 11th International Kimberlite Conference Extended Abstract No. 11IKC-4555, 2017

- "**The future of new kimberlite discoveries, mainly poorly magnetic to non-magnetic, is once again dependent on soil sampling for kimberlite indicator minerals**." (Daniels et al, 2017)

Appendix 7: Excerpt of Kimberlite Diamond Table by Gary Grabowski (2013)

#	PIPE NAME	TOWNSHIP	YEAR FOUND	DISCOVERED BY / PRESENT OWNER	ROCKTYPE	AGE	MDI NUMBER	DIAMONDS RECOVERED				DIAMONDS
								Macro	Micro	Total	Sample Size	
1	95-1	Lundy	1995	Sudbury Contact Mines Ltd.	Heterolithic volcaniclastic diatreme breccia		MDI31M05SW00016	0	0	0	313 kg	No
2	95-2 (aka 95-3)	Lundy	1995	Sudbury Contact Mines Ltd.	Pelletal-textured volcaniclastic diatreme breccia		MDI31M05SW00017	126	408	534 67.35 carats	3650 kg 652 tonne	Yes
3	96-1	Lundy	1996	Sudbury Contact Mines Ltd.			MDI31M05SW00018	0	26	26	62 kg	Yes
4	A-1	Arnold	1987	LAC Minerals Ltd. / Kirkland Lake Minerals Inc.	Lithic tuffaceous breccia with minor pelletal tuffisitic breccia	159.0 ±0.4	MDI32D05SW00019					No
5	A-4 (Alfie Creek 1) (North)	Arnold	1983	Monopros Ltd. / Kirkland Lake Minerals Ltd.	Lithic tuffisitic breccia	156.2 ±1.0	MDI32D04NW00012	2 1	 5 4	2 5 5	47 t 103.8 kg 147 kg	Yes
6	A-4 (Alfie Creek 2) (South)	Arnold	1983	Monopros Ltd. / Kirkland Lake Minerals Ltd.	Lithic tuffisitic breccia		MDI32D04NW00011	0	0	0	52.3 kg	No
7	AM-47 (Nelson Lake)	Arnold, Morrisette	1983	Monopros Ltd. / Kirkland Lake Minerals Ltd.	Hypabyssal kimberlite breccia	154.7 ±0.4	MDI32D04NW00031					No
8	B-30 (Nikila Lake)	Bisley	1983	Monopros Ltd. / Crown (OLL Park)	Lithic tuffisitic breccia with minor pelletal tuffisitic breccia	155.9 ±2.0	MDI32D05SW00005			3	?	Yes
9	Bucke	Bucke	1983	Monopros Ltd. / Novawest Resources Inc.	Lithic tuffisitic breccia	155.4 ±0.2	MDI31M05NE00104			3	?	Yes

10	Buzz #1	Guibord	1987	Homestake Mineral Dev.	Fine to coarse breccia with pelletal-textured matrix	152.6 ±2.2	MDI42A05NE00075					No
11	Buzz #2	Guibord	1989	Homestake Mineral Dev.	Fine to coarse breccia		MDI42A05NE00076			1	7.5 lb	Yes
12	Buzz #3	Guibord	1989	Homestake Mineral Dev.	Fine to coarse breccia with pelletal-textured matrix		MDI42A05NE00077					No
13	C-14	Clifford	1987	LAC Minerals Ltd. / Martin Harrington	Tuffaceous kimberlite breccia, coarse tuffaceous breccia, hypabyssal kimberlite and tuffaceous kimberlite	155.6 ±0.6	MDI32D05SW00006			8 7	15.04 T 135 t	Yes
14	Diamond Lake 1 (North)	McVittie	1990	Sudbury Contact Mines Ltd. / Skead Holdings Inc.	Fine to coarse breccia with pelletal-textured matrix	152.6 ±2.2	MDI32D04SE00019		14	14	0.5 T	Yes
15	Diamond Lake 2 (South)	McVittie	1992	Sudbury Contact Mines Ltd. / Skead Holdings Inc.	Fine to coarse breccia with pelletal-textured matrix		MDI32D04SW00397					No
16	Glinker	Firstbrook	1996	Consolidated Pine Channel Gold Corp. / Glinker	Hypabyssal kimberlite with crustal xenoliths	134.0 ±2.0	MDI31M12NW00007					No
17	Gravel	Bucke	199?	Falconbridge Ltd. / Gravel	Fine to medium breccia with pelletal-textured matrix	151.8 ±2.2	MDI31M05NW00018			4		Yes
18	Guibord	Guibord	1984	Falconbridge Ltd.	Fine to coarse breccia with pelletal-textured matrix	152.1 ±2.8	MDI42A05NE00074					No
19	Guigues	Guigues (Quebec)	1983	Monopros Ltd. / Tres-Or Resources Ltd.	Hypabyssal kimberlite with crustal xenoliths	142.3 ±6.6		1		1	23 t	Yes

20	McLean	Bucke	1996	Consolidated Pine Channel Gold Corp. / E. McLean	Hypabyssal kimberlite with crustal xenoliths	142.2 ±2.8	MDI3M05NW00019					No
21	Michaud	Michaud	1948	Marchaud Mines Ltd.	Diatreme facies kimberlite		MDI42A05NE00079	0	0	0		No
22	Morrisett e Creek	Morrisette	1984	Monopros Ltd. / Kirkland Lake Minerals Ltd.	?	155.6 ±2.0	MDI32D04NW00010	0	0	0	81.2 kg	No
23	NDN No.1	Nedelec (Quebec)	1994	KWG Resources / Tres-Or Resources Ltd.	Hypabyssal kimberlite with crustal xenoliths		MDI31M12NE00007		22	22	22 kg	Yes
24	NDN No.2	Nedelec (Quebec)	1994	KWG Resources / Tres-Or Resources Ltd.	Hypabyssal kimberlite with crustal xenoliths	125.0 ±1	MDI31M12NE00006		1	1	?	Yes
25	OPAP	Bucke	1994	John Ewanchuk	Tuffaceous kimberlite breccia	138.8 ±2.6	MDI31M05NE00218					No
26	Peddie	Bucke	1996	Consolidated Pine Channel Gold Corp. / Harold Walton	Macrocrystic, phlogopite-bearing calcite-monticellite Group 1 kimberlite of hypabyssal facies	153.6 ±2.4	MDI31M05NE00219					No
27	Seed	Firstbrook	1996	Consolidated Pine Channel Gold Corp. / J. Seed	Globular segregationary to segregationary phlogopite and monticellite-bearing Group 1 kimberlite of the hypabyssal facies	153.7 ±1.8	MDI31M05NE00220					No
28	Tandem-1	Guibord	1997	Tandem Resources Ltd.		164.6 ±3.0			3	3	87.9 kg	Yes (Ruby)

29	Upper Canada	Gauthier	1968	Upper Canada Mines Ltd. / Queenston Mining Inc.	Massive micaceous kimberlite	158.0 ±2.0						No
30	Gossan	Lorrain	2001	Simon Wareing and Murray Simpson / Cabo Mining Inc.	Lamprophyre				3	3	22.2 kg	Yes
31	Cabo	Lorrain	2002	Cabo Mining Inc.	Lamprophyre, heterolithic breccia			4	91	95	9.3 kg	Yes
32	MR-6	Hudson	1996	Sudbury Contact Mines Ltd.	Kimberlite			0	1	1	200 kg	Yes
33	Pacaud	Pacaud	1979	Lac Minerals / Dianor Resources Inc.	Kimberlite							
34	Triple B	Firstbrook	2002	GSC	Kimberlite							
35	KL01	Van Nostrand	2004	Sudbury Contact Mines Ltd.	Kimberlite		MDI41P08NE00018	2	25	27	88 kg	Yes
36	KL22	Klock	2004	Sudbury Contact Mines Ltd.	Kimberlite		MDI41P08NE00019	7	12	19	85 kg	Yes
37	Lapointe	Sharpe	2005	Tres-Or Resources Ltd.	Kimberlite		MDI000000000635	1	30	31	588.5 kg	Yes
38	MR8	Hudson	2005	Sudbury Contact Mines Ltd.	Kimberlite		MDI000000000636					?
39	Woolings	Chamberlain	2005	Discover Abitibi / G. Woolings	Lamprophyre		MDI000000000638		1	1	24 kg	Yes
40	Knutson	McVittie	2005	Discover Abitibi /Globex Mining Enterprises	Lamprophyre		MDI000000000639	1		1	24 kg	Yes
41	Boston Creek	Pacaud	2005	Discover Abitibi /Kirkland Lake Minerals	Lamprophyre		MDI000000000640		1 5	1 5	24 kg 24 kg	Yes
42	Bastarac he	Burt	2005	Discover Abitibi /G. Bastarache	Lamprophyre		MDI42A01SW00016		3	3	24 kg	Yes
43	Nipissing Hill	Coleman	2005	Discover Abitibi /Agnico-Eagle Mines Ltd.	Lamprophyre		MDI31M05NE00072		23	23	24 kg	Yes

44	KRVY	Gillies Limit	2006	Temex Resources Corp.	Kimberlite Breccia		MDI000000000637		5	5	218.95 kg	
45	Kon	Gillies Limit	2012	Al Kon	Hypabyssal Kimberlite		MDI000000001848					No

The Newest Kimberlites

Within the last couple years, 8 very large area flat-lying kimberlite bodies have been found just south of Cobalt area in Northern Ontario. They are together potentially upwards of 200 million tons of ore.

These are totally unique, being relatively shallow thickness coming to surface with a thin layer of till on top, some of which measure ~1km x 2km in width.

They are all part of or near to the Bishop-Nipissing Diamond Claims optioned and now owned by RJK Explorations Ltd. Several years before kimberlite was actually drilled into by RJK, I theorised that due to the deformation/compression of the earth's crust during an ice age due to the weight of a 2-mile-thick ice sheet, that it might cause a deep-seated weakness in the Cross Lake Fault that would allow kimberlite to ascend. After discovery of these huge kimberlite bodies, Peter Hubacheck, PGeo, also concluded they erupted during the last ice age in a flat-lying deposit. This makes them unique and probably the youngest kimberlites on earth, possibly as young as 10,000 years ago. These kimberlites are now thought to have erupted and were emplaced under the ice during the last glacial period which ended ~10,000 years ago.

Research has shown that there is an excellent chance that the 800-carat yellow gemstone diamond 'The Nipissing Diamond' was found on this claim block early in the early 1900s. These kimberlites are diamondiferous and have certain grains found only in subducted material, other KIM chemistries also suggest the kimberlite sampled deep into the mantle possibly bringing to surface large 'super deep' Type IIA diamonds.

So, these kimberlites have no apparent mag signatures but a very well-defined EM definition that delineates their boundaries with excellent results.

Initially, extensive till sampling programs helped establish the potential for multiple sources which was indeed the case. The KIMs/DIMs (kimberlite and diamond indicator minerals) found in these till samples strongly suggest the kimberlite bodies sampled the subducted zone of the mantle – the source of large Type IIA, 'Super Deep Diamonds'.

Partway through drilling/finding the Bishop-Lorrain Kimberlites, a magnetic target in Gillies Limit was drilled and the Kon Kimberlite was discovered. This is a much older, more traditional kimberlite.

Statement of Qualifications: Brian Anthony (Tony) Bishop

I have been prospecting and placer mining part-time for 43+ years in Ontario, British Columbia, and Nova Scotia (which led to writing a book *The Gold Hunter's Guide to Nova Scotia* (Nimbus Publishing, 1988, ISBN 0-920852-93-9) which was used in prospecting courses in Nova Scotia). I have held an Ontario Prospector's License since the 1970s and was issued a Permanent Prospector's License in 2005. I have completed a number of prospecting courses given by the Ministry and have my Prospector's Blasting Permit. I was one of the Directors on the Northern Prospectors Association (NPA) in the early years when Mike Leahy revitalized/resurrected the NPA in Kirkland Lake, and with Mike, initiated the annual gold panning event as part of Kirkland Lake Gold Days.

As well, I sold and used small scale mining and concentrating/processing equipment for over 20 years. This included instructing others in their use. Since then, I have designed, built and used new types of concentrating equipment for heavy minerals/metals.

For over forty years I was a dealer for many of the major metal detector manufacturers at that time. I was also a dealer for Keene's Engineering of California, possibly the best-known manufacturer of small to medium scale prospecting and mineral recovery equipment. I was also (the only) dealer for Goldfinder Custom Sluices built by Wayne Loewan in Alberta. Until recently I was sent new models/types of Garrett metal detectors to test in the field for their prospecting capabilities.

On short term contracts I have performed specialized work for Cobatec, Macassa, Castle Silver Mines Inc., Gold Bullion Development Corp, as well as short stints in Ecuador and Montana.

I was the first (and possibly only) person to use a Garrett Sentry Tracing instrument (used to find underground cables etc.) to look for silver veins (Cobatec, Castle Resources), and underground at Macassa Mine (now Kirkland Lake Gold) to successfully locate 600' and 800' vertical length large bore holes (for paste) that had missed the adit by 14' and 18' respectively.

I have also been hired by two different mining exploration companies to locate samples of gold and silver with metal detectors and grade waste dumps with metal detectors to determine if they could be profitably re-milled.

The last seven years I have devoted to full-time diamond exploration. While interpreting the results of till sampling programs and the KIMs that were found, the primary author has conducted 1,000+ hours of research on the scientific and exploration aspects of Canadian diamond discoveries from many diverse sources on exploration and processing techniques. The Resident Geologist's office (MNDM, Kirkland Lake) has many kimberlite and KIM samples that were compared to the ones found on the Bishop Claims. One present and two former Resident Geologists were regularly consulted, as well as the former District Geologist who is considered the local diamond expert for this area. Other prospectors and geologists are regularly consulted, especially Douglas Robinson, P.Eng Geo, who has overseen and verified much of the results and methodologies of the work.

My comprehensive assessment reports can be viewed online on the MNDM website. As well as writing (with the help of family) the various assessment reports, I authored a 43-101 compliant report, approved by Douglas Robinson, P.Eng.Geo, for RJK Explorations Ltd. (February 19th, 2019). In the last few years, I've developed new techniques for identifying KIMs and for determining the diamond potential in kimberlite pipes, and some of these are outlined in my latest reports. Since March 22nd, 2019, The Lorrain Twp. Bishop Diamond Claims have had a number of discoveries of massive near surface diamondiferous kimberlite bodies by RJK Explorations Ltd., thereby proving my theory of kimberlitic bodies being present in that exploration area.

Drawing on this research and my many years of practical experience, especially in placer mining techniques, I have assembled a complete till processing lab I feel rivals many commercial ones. Importantly, I sometimes exceed their results by testing a wider range of samples' fraction sizes and as a result have found a number of kimberlite indicator minerals, notably a number of indicators in the 2.0 – 3.0 mm size that are larger than the usual upper cut-off for commercial labs' mesh sizes. Additionally, I pick far more potential KIMs than any lab can reasonably do, given their time/cost constraints. I recently purchased a complete heavy mineral lab formerly operated by True North Mineral Laboratories in Timmins to integrate as another part of my KIM processing equipment.

Redundancy tests are routinely performed to monitor potential losses of the KIMs and I feel my equipment and techniques closely match that of the industry.

Signed:

April 28, 2022

Statement of Qualifications: Graeme S. Bishop

I, Graeme Bishop, have the following experience:

Over the last twenty years, I first instructed gold panning activities at the opening of the Ecocentre in Elk Lake, and occasionally at the annual Toburn mining heritage days. I spent a lot of my childhood prospecting and rockhounding with my family in Temiskaming District. I have read my way through most of the reports of the GSC from its first century and have read most of the OBM annual reports from the first half of the 20th century. Additionally, I have made an academic study of the history of geology. I have worked cutting lines in Bidgood township and the Munro esker area with a P.Eng. geologist. I have moved and split core for a P.Eng. geologist. I worked as a helper with a junior mining company, retrieving core from the drills and tagging core boxes. I have worked on foot and clerically as a security guard at the Macassa mine, including shifts assisting the weekly gold pour in the Macassa mill refinery. I worked underground for several years at the Macassa mine. I quit the mine to return to university to work on a Master's degree, including a significant component of geologically oriented research. Since returning to Temiskaming, I have become involved with the Northern Prospectors Association.

I have spent the last eight years assisting my family in claimstaking and prospecting for diamonds in Temiskaming District. I have collected hundreds of till samples from the field, and briefly, auger sampling for SGH analysis. I have designed scores of work plans for field sampling, and manually created several large Sampling Program maps for later publication. I have project managed the field activities of on-the-ground till sampling for a junior mining company over the summer of 2019, directing the collecting and logging of hundreds of samples. I collaborated with local geologists and produced a graphic sequence outlining the deposition of gold in the Larder Lake-Cadillac fault system for visual display at the Toburn site in Kirkland Lake. I meet regularly with local geologists and the resident geologist to inquire and discuss various topics relevant to diamond prospecting and geology more generally. Collectively, I have spent many months grassroots prospecting and chipping at rocks in the boreal forest. I try to keep up to date on publications relevant to the geology of the area and will continue to broaden my experience in mineral exploration.

Signed, Dated: April 28, 2022

Graeme S. Bishop

References & Resources:

Adamera Minerals: Amaruk Project Presentation. Accessed online at http://www.adamera.com/i/pdf/ppt/Amaruk-Project-Presentation.pdf

Agashev, A.M., Orihashi, Y., Pokhilenko, N.P., Serov, I.V., Tolstov, A.V., Nakai, S. : 2016: Age of Mirny field kimberlites (Siberia) and application of rutile and titanite for U-Pb dating of kimberlite emplacement by LA-ICP-MS; in Geochemical Journal Vol. 50 (2016) No. 5 pp 431-438, pub by Geochemical Society of Japan. Accessed at https://www.jstage.jst.go.jp/article/geochemj/50/5/50_2.0438/_article

AJS Gems (n.d.). Accessed at https://www.ajsgem.com/gemstone-information/color-change-garnet-36.html

AJS Gems (n.d.). Accessed at https://www.ajsgem.com/articles/rare-leuco-garnet.html

Attawapiskat. (2015). Retrieved from http://metalexventures.com/attawapiskat/

Arctic Star Presentation (2014). Arctic Announces new 100% owned Property in the heart of the Lac de Gras diamond field. Accessed online at Arctic Announces new 100% owned Property in the heart of the Lac de Gras diamond field - Arctic Star Exploration

Arctic Star Presentation (2016). Retrieved from: http://www.arcticstar.ca/i/pdf/Presentation-2016-03.pdf page 13 of 22

Austenite (n.d.) accessed at https://en.wikipedia.org/wiki/Austenite

Ayer, J.A., Chartrand, J.E., Grabowski, G.P.D., Josey, S., Rainsford, D. and Trowell, N.F. 2006. Geological compilation of the Cobalt–Temagami area, Abitibi greenstone belt; Ontario Geological Survey, Preliminary Map P.3581, scale 1:100 000.

Bajc, A.F. and Crabtree, D.C. (2001). Results of regional till sampling for kimberlite and base metal indicator minerals, Peterlong Lake-Radisson Lake area, northeastern Ontario; Ontario Geological Survey, Open File Report 6060, 65p.

Baker, C.L., Gao, C. and Perttunen, M. (2010). Quaternary geology of the Cobalt area, northern Ontario; Ontario Geological Survey, Map 2685, scale 1:50 000

Baumgartner, M.C., Gurney, J.J., Moore, R.O., Nowicki, T.E. (2007). Diamonds and associated heavy minerals in kimberlite: a review of key concepts and applications. Developments in Sedimentology, Vol. 58, Chapter 46 pp1235–1267. Accessed online at http://www.msgroup.net/documents/Nowicki-et-al-2007-Diamonds-and-assoc-HMs-in-kimberlite-.pdf

Bishop, B.A. (2016). Paradis Pond Work Assessment Report, Legacy Claim L4273040, Lorrain Township, Larder Lake Mining Division, MNDM, Oct 3, 2016

Bishop, B.A. (2017a). Mozart Lake Work Assessment Report, Legacy Claim L4284088, Gillies Limit, Larder Lake Mining Division, MNDM, Jan 26, 2017

Bishop, B.A. (2017b). Cedar Pond Work Assessment Report, Legacy Claims L4282189 and L4282187, Lorrain Township, Larder Lake Mining Division, MNDM, Nov 2, 2017

Bishop, B.A. (2017c). Ice Chisel and Darwin Lakes Work Assessment Report, Legacy Claim L4282172, Gillies Limit, Larder Lake Mining Division, MNDM, Nov 27, 2017

Bishop, B.A. (2017d). Chopin Lake Work Assessment Report, Legacy Claim L4282175, Gillies Limit, Larder Lake Mining Division, MNDM, Nov 27, 2017

Bishop, B.A. (2017e). Work Assessment Report, Legacy Claim L4282176, Gillies Limit, Larder Lake Mining Division, MNDM, Nov 27, 2017

Bishop, B.A. (2017f). Criostal Lake Work Assessment Report, Legacy Claim L4282146, Lorrain Township, Larder Lake Mining Division, MNDM, Nov 27, 2017

Bishop, B.A. (2017g). Longfellow Lake Work Assessment Report, Legacy Claims L4282174 and L4282408, Lorrain Township, Larder Lake Mining Division, MNDM, Nov 27, 2017

Bishop, B.A. (2017h). Lightning Lake Work Assessment Report, Legacy Claims L4281431 and L4282409, Lorrain Township, Larder Lake Mining Division, MNDM, Nov 27, 2017

Bishop, B.A. (2018a). The Trench Work Assessment Report, Legacy Claim L4282142, Lorrain Township, Larder Lake Mining Division, MNDM, June 6, 2018

Bishop, B.A. (2018a). The Trench Work Assessment Report, Legacy Claim L4282142, Lorrain Township, Larder Lake Mining Division, MNDM, June 6, 2018

Bishop, B.A. (2018b). The Grassy Lake Project Work Assessment Report, Legacy Claims L4282444, L4282707, and L4286187, Lorrain Township, Larder Lake Mining Division, MDNM, June 18, 2018

Bishop, B.A. (2018c). Assessment Work Report for Cell Claims 337054, 241583, 194992, 241582, 230056 arising from Legacy Claim 4282412 (Peanut Lake), Lorrain Township, Larder Lake Mining Division, MNDM, August 17, 2018

Bishop, B.A. (2019). Assessment Work Report for Cell Claims 212123, 128936, 326238, 279661, 230928, 326237, 312714, 326239, 128937, 117276, 145465 arising from Legacy Claim 4282402 (Hound Chute), Gillies Limit, Larder Lake Mining Division, MNDM #1273, March 20, 2019

Bishop, B.A., Robinson, D., P.Eng.Geo. (2019). Technical Report on the Bishop Claims Property, Gillies Limit & Lorrain Townships. 43-101-compliant report for RJK Explorations Ltd., Feb 19, 2019.

Bishop, B.A., Bishop, G., Bishop, C. for RJK Explorations Ltd. (2022) Assessment Work Report for Cell Claims 117274, 278144, 326238, 128936, 212123, 212124, arising from Legacy Claim 4282402 (Hound Chute), Gillies Limit, Larder Lake Mining Division, MNDM, March 16, 2022

Brushett, D. (2014). Prospecting Under Cover: Using Knowledge of Glacial Processes in Mineral Exploration. Notes to accompany CIM Short Course Nov 5, 2014. Geological Survey of Newfoundland and Labrador.

Campbell, J.E., McClenaghan, M.B., McMartin, I., Paulen, R.C., Plouffe, A., Spirito, W.A. (2013). Quality Assurance and Quality Control Measures Applied to Indicator Mineral Studies at the Geological Survey of Canada. *New frontiers for exploration in glaciated terrain*; Geological Survey of Canada, Open File 7374, pp13-19. doi:10.4095/292679

Carter Hearn Jr., B. (2004). The Homestead Kimberlite, Central Montana, USA: Mineralogy, xenocrysts, and upper-mantel xenoliths. In The 8th International Kimberlite Conference, Selected Papers Vol 2: The J. Barry Hawthorne Volume, Editors R.H. Mitchell, H.S. Grǚtter, L.M. Heaman, B.H. Scott Smith, T. Stachel (2004) Elsevier. pp 481

Chakhmouradian A.R., Mitchell, R.H. (2000) Occurrence, Alteration Patterns and Compositional Variation Of Perovskite In Kimberlites; The Canadian Mineralogist August 2000 38 (4) pub by Mineralogical Association of Canada, 2000 Vol 55 (4). Accessed online at: http://canmin.geoscienceworld.org/content/38/4/975

Cisowski, S.M. (1990). The significance of magnetic spheroids and magnesioferrite occurring in K/T boundary sediments, *in* Sharpton, V.L., and Ward, P.D., eds, Global catastrophes in Earth history: An interdisciplinary conference on impacts, volcanism, and mass mortality: Geological Society of America Special Paper 247, 1990.

Clements, B., Grenon, H., Grütter, H., Neilson, S., Pell, J. (2013). Following Kimberlite Indicator Minerals to Source in the Chidliak Kimberlite Province, Nunavut. Geological Survey of Canada, Open File 7374. pp51

Creighton, S., Harvey, S., Read, G. (2011). Diamond Exploration on the Sask Craton: A challenge for current paradigms. Saskatchewan Research Council, 2011. Accessed at http://www.publications.gov.sk.ca/details.cfm?p=82822&cl=4

Crompton, R.R. (1967): Manual of Field Geology; John Wiley and Sons Inc., New York.

Cummings, D.I., Kjarsgaard, B.A., Russell, H.A.J., and Sharpe, D.R., (2014). Comminution of kimberlite indicator minerals in a tumbling mill: Implications for mineral exploration; Geological Survey of Canada, Open File 7111. doi:10.4095/293467 accessed at http://publications.gc.ca/collections/collection_2014/rncan-nrcan/M183-2-7111-eng.pdf

Daniels, L.R.M., Gurney, J.J., Harte, B. (1996). A crustal mineral in a mantle diamond: *Nature* **379**, 153 - 156 (11 January 1996); doi:10.1038/379153a0. Accessed online at http://www.nature.com/nature/journal/v379/n6561/abs/379153a0.html?foxtrotcallback=true

Daniels, L.R.M., Tshireletso A. Dira, T.A., Kufandikamwe, O. (2017). The magnitude of termites to the future of kimberlite exploration in Botswana. 11th International Kimberlite Conference Extended Abstract No. 11IKC-4555, 2017

Das, J.N., Korakoppa, M.M., Fareeduddin;Shivanna, S. Srivastava, J.K. (2013): Tuffisitic Kimberlite from Eastern Dharwar Craton, Undraldoddi Area, Raichur District, Karnataka, India; in DG Pearson et al. (eds) Proceedings of the 10th International Kimberlite Conference, Vol 2, Special Issue of the Journal of the Geological Society of India

de Silva, S.L., Wolff, J.A., and Sharpton, V.L., (1990). Explosive volcanism and associated pressures: Implications for models of endogenically shocked quartz, *in* Sharpton, V.L., and Ward, P.D., eds, Global catastrophes in Earth history: An interdisciplinary conference on impacts, volcanism, and mass mortality: Geological Society of America Special Paper 247, 1990.

DiLabio, R.N.W., Coker, W.B. (Editors) (1989). Drift Prospecting. Geological Survey of Canada, Paper 89-20.

Energie et Ressources naturelles Quebec*, Exploration Methods,* accessed online at: https://www.mern.gouv.qc.ca/english/mines/industry/diamond/diamond-methods.jsp

Erlich, E.I., Hausel, W.D. (2002). *Diamond Deposits: Origin, Exploration, and History of Discovery*. Society for Mining, Metallurgy, and Exploration, Inc. (SME). Littleton, CO, USA

Feral, K. (2011). Color Change Garnet. In Magnetism in Gemstones: An Effective Tool and Method for Gem Identification. Retrieved from https://www.gemstonemagnetism.com/color_change_garnet.html

Feral, K. (2011). Idiochromatic or Allochromatic. In Magnetism in Gemstones: An Effective Tool and Method for Gem Identification. Retrieved from http://www.gemstonemagnetism.com/garnets_pg_3.html

Feral, K. (2011). Varieties of Pyrope Garnet. In Magnetism in Gemstones: An Effective Tool and Method for Gem Identification. Retrieved from http://www.gemstonemagnetism.com/garnets_pg_4.html

Feral, K. (2010). Magnetic Susceptibility Index. In Magnetism in Gemstones: An Effective Tool and Method for Gem Identification. Retrieved from http://www.gemstonemagnetism.com/garnets_pg_2.html

Feral, K. (2009). The Floatation Method - Magnetic Susceptibility Index. In Magnetism in Gemstones: An Effective Tool and Method for Gem Identification. Retrieved from https://www.gemstonemagnetism.com/how_to_pg_2.html

Fugro Airborne Surveys, Terraquest Ltd for Sudbury Contact Mines Ltd, 2002

Gao, C. (2015). Results of regional till sampling in the Detour Lake and Burntbush area, northern Ontario; Ontario Geological Survey, Open File Report 6297, 120p.

Gao, C. (2012). Results of regional till sampling in the Cobalt – New Liskeard – Englehart areas, northern Ontario; Ontario Geological Survey, Open File Report 6259, 87p.

Gao, C. 2010. Quaternary geology of the New Liskeard area, northern Ontario; Ontario Geological Survey, Map 2657, scale 1:50 000.

Gee, J.S., Heaman, LM., Kent, D.V., Kjarsgaard, B.A., Muttoni, G. (2015). Tracking the Late Jurassic apparent (or true) polar shift in UPb-dated kimberlites from cratonic North America (Superior Province of Canada). *Geochemistry Geophysics Geosystems*. 16:983-994. Retrieved from http://scrippsscholars.ucsd.edu/jsgee/content/tracking-late-jurassic-apparent-or-true-polar-shift-u-pb-datedkimberlites-cratonic-north-am

Gem Select (2018). Accessed at https://www.gemselect.com/gem-info/color-change-garnet/color-change-garnet-info.php

Geology and Geosciences. Natural Resources Canada. http://www.nrcan.gc.ca/earth-sciences/geography/atlas-canada/selectedthematic-maps/16876

Google Inc. (2016). Google Earth (Version 7.1.7.2600) [Software]. Available from https://www.google.ca/earth/download/ge/agree.html

Grabowski, G. (2006). 1) Exploration for kimberlite and diamonds in Kirkland Lake-New Liskeard area; 2) Diamonds in Lamprophyre – Kirkland Lake area; 3) Where are the kimberlites in NW Ontario. In 2005-2006 Recommendations for Mineral Exploration – Ontario. Accessed at https://www.mndm.gov.on.ca/sites/default/files/article_files/recommendations_for_exploration_2005_2006.pdf

Grant, W.T. and Owsiacki, L., 1987. An Evaluation of the Lake Timiskaming Paleozoic Outlier for Potentially Exploitable Limestone and Dolostone Deposits. OGS, Open File Report 5661

Grizzly Discoveries: Buffalo Hills Diamond Property, Alberta. Accessed online at **From** http://www.grizzlydiscoveries.com/index.php/investor-relations/news/91-grizzly-provides-update-for-diamond-exploration-in-northern-alberta

Grütter, H. S., Gurney, J. J., Menzies, A. H., Winter, F. (2004, June 17). An updated classification scheme for mantle-derived garnet, for use by diamond explorers. *Lithos 77*, pp.841-857. Retrieved from https://www.pdiam.com/assets/docs/articles/grutter-et-alupdated-garnet-classification-scheme-for-explorers-lithos-2004.pdf

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

Harvey, S.E., Kjarsgaard, B.A., Kelley, L.I. (2001). Kimberlites of Central Saskatchewan: Compilation and Significance of Indicator Mineral Geochemistry with Respect to Diamond Potential. In Summary of Investigations, 2001, Volume 2, Saskatchewan Geological Survey, Sask. Energy Mines, Misc. Rep. 2001-4.2. Accessed at http://publications.gov.sk.ca/documents/310/88680-kjarsgaard.pdf

Hausel, W.D. (2014). *A Guide to Finding Gemstones, Gold Minerals & Rocks*. GemHunter Publications.

Head III, J. W., Wilson, L. (2007, May 3). An integrated model of kimberlite ascent and eruption. *Nature,* 4471

Heaman, L.M., Kjarsgaard, B.A., 2000. Timing of eastern North American kimberlite magmatism: continental extension of the Great Meteor hotspot track? Earth and Planetary Science Letters 178

Heaman, L.M., Kjarsgaard, B.A., Creaser, R.A., (2004). The temporal evolution of North American kimberlites. Lithos. 76. 377-397. 10.1016/j.lithos.2004.03.047.

Horita, J., Polyakov, V.B. (2015) Carbon-bearing iron phases and the carbon isotope composition of the deep Earth. Proc Natl Acad Sci U S A. 2015 Jan 6; 112(1): 31–36. Accessed online at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4291649/

Johns G. W. and Van Steenburgh R. 1984: Firstbrook and Parts of Surrounding Town ships; Ontario Geological Survey Map 2474, Precambrian Geology Series, Scale 1" to ½ mile, Geology 1979

Kaminsky, F. V., Wirth (2011): Iron carbide inclusions in lower-mantle diamond from Juina, Brazil. The Canadian Mineralogist, 49, 2, 555-572. Accessed online at http://gfzpublic.gfz-potsdam.de/pubman/item/escidoc:243553:2/component/escidoc:243552/17067.pdf

Kavanagh, J. L.; Sparks, R. S. J. (2009). "Temperature changes in ascending kimberlite magmas". *Earth and Planetary Science Letters*. Elsevier. **286** (3–4): 404–413. Bibcode:2009E&PSL.286..404K. doi:10.1016/j.epsl.2009.07.011. Accessed at http://www.academia.edu/193612/Temperature_changes_in_ascending_kimberlite_magma

Kennedy, C.M. (2008). The Physical Properties of the Lac de Gras Kimberlites and Host Rocks with Correlations to Geophysical Signatures at Diavik Diamond Mines, NWT: A thesis submitted to the School of Graduate Studies in the partial fulfillment of the requirements for the degree of Masters of Science (Geophysics) Department of Earth Sciences Memorial University of Newfoundland St. John's, Newfoundland. February 3, 2008. Retrieved from http://research.library.mun.ca/10786/1/Kennedy_Carla.pdf

Kenny, G.G., Pasek, M.A. The response of zircon to the extreme pressures and temperatures of a lightning strike. *Sci Rep* **11,** 1560 (2021). https://doi.org/10.1038/s41598-021-81043-8

Kiseeva, E.S., Vasiukov, D.M., Wood B.J., *et al*. (2018). Oxidized iron in garnets from the mantle transition zone. *Nature Geoscience*, published online January 22, 2018; doi: 10.1038/s41561-017-0055-7. Accessed online at https://www.nature.com/articles/s41561-017-0055-7

Kjarsgaard, B.A., McClenaghan, M.B. (2001). Indicator mineral and geochemical methods for diamond exploration in glaciated terrain in Canada. In Drift Exploration in Glaciated Terrain. Geological Society of London, Special Publications, 185, 83-123

Kjarsgaard, B.A. (2007). Kimberlite Pipe Models: Significance for Exploration. In B. Milkereit. *Proceedings of Exploration 07: Fifth Decennial International Conference on Mineral Exploration.* (pp. 667-677). Retrieved from http://www.dmec.ca/ex07dvd/E07/pdfs/46.pdf

Klein, G. (2016). Arctic Star and North Arrow Announce Drilling at Redemption Diamond Project, March 22 2016. Accessed online at www.arcticstar.ca/i/pdf/presentation-2016-03.pdf

Kono, M. (Ed) (2010). Geomagnetism: Treatise on Geophysics. Elsevier, May 11, 2010. *Science* pp205. Retrieved from https://books.google.ca/books?id=_YDNCgAAQBAJ&pg=PA205&lpg=PA205#v=onepage&q&f=false

Kravchinsky, V. (2014). Geomagnetism. *Earth Sciences Series. Encyclopedia of Scientific Dating Methods.* University of Alberta, Edmonton, Canada. Retrieved from 2014-Geomagnetism-Springer.pdf

Lauf, R.J. (2012). *Collector's Guide to the Garnet Group.* Schiffer Earth Science Monographs Volume 12. Schiffer Publishing Ltd, Atglen, PA, USA

Lee, C. (n.d.). Contribution of structural geology. SRK News: Focus on Diamonds, 31, 3. Retrieved from http://www.srk.com/files/File/newsletters/SRKnews31-Diamonds_A4.pdf

Lovell, H.L., Frey, E.D., and Caine, T.W., 1972: Hudson Township, District of Timiskaming; Ontario Div. Mines, Prelim. Map P.786, Geol. Ser., scale l inch to 1/4 mile.

Maiko Sell: Geophysical Survey Methods in Diamond Exploration. In Exploration Geophysics, Exploration Methods. Accessed online at: https://www.geologyforinvestors.com/geophysical-survey-methods-diamond-exploration/

Makvandi, S. (2015). Indicator mineral exploration methodologies for VMS deposits using geochemistry and physical characteristics of magnetite. PhD Thesis, University of Laval, Quebec.

McClenaghan, B., Peuraniemi, V. and Lehtonen, M. (2011). Indicator mineral methods in mineral exploration. Workshop in the 25th International Applied Geochemistry Symposium 2011, 22-26 August 2011 Rovaniemi, Finland. Vuorimiesyhdistys, B92-4, 72 pages.

McClenaghan, M.B. , Kjarsgaard, B.A. (2001). Indicator mineral and geochemical methods for diamond exploration in glaciated terrain in Canada. In Drift Exploration in Glaciated Terrain. Geological Society of London, Special Publications, 185, 83-123

McClenaghan, M.B., Paulen, R.C. (2013). New frontiers for exploration in glaciated terrain; Geological Survey of Canada, Open File 7374, pp85 doi:10.4095/292679

McFarlane, M., Long, C., Coetzee, S.H. (2018) Lightning-induced beads, 'fulguroids', associated with kimberlite eruptions in the Kalahari, Botswana. International Journal of Earth Sciences, August 1, 2018, DOI:10.1007/s00531-018-1618-6 Accessed at https://www.semanticscholar.org/paper/Lightning-induced-beads%2C-%E2%80%98fulguroids%E2%80%99%2C-associated-McFarlane-Long/72f45c8a12252e4252abec7b016def92777f9eab#paper-header

McLean, H., Banas, A., Creighton, S., Whiteford, S., Luth, R.W., Stachel, T., (2007). Garnet Xenocrysts from the Diavik Mine, NWT, Canada: Composition, Color, and Paragenesis. *The Canadian Mineralogist, 45.* pp. 1131-1145

Meyer, G., Cosec, M., Grabowski, G.P.B., Guindon, D.L., Chaloux, E.C. and Stewart, J.M. (2002). Report of Activities 2001, Resident Geologist Program, Kirkland Lake Regional Resident Geologist Report: Kirkland Lake and Sudbury Districts; Ontario Geological Survey, Open File Report 6083, 94p.

Milligan, R.S. (2014) REACTION OF IRON-TITANIUM OXIDE MINERALS WITH KIMBERLITE MAGMA: A CASE STUDY FOR ORAPA KIMBERLITE CLUSTER Submitted in Partial Fulfilment of the Requirements For the Degree of Bachelor of Sciences, Honours Department of Earth Sciences Dalhousie University, Halifax, Nova Scotia March, 2014. Accessed online at http://earthsciences.dal.ca/aboutus/publications/theses/BSc/ES_2014_BSc_Milligan_Rachel_final.pdf

Mining Land Administration System (MLAS) Map Viewer (2018). MNDM. Accessed at https://www.mndm.gov.on.ca/en/mines-and-minerals/applications/mining-lands-administration-system-mlas-map-viewer

Ministry of Natural Resources and Forestry: Make a Topo Map. Accessed online at: http://www.gisapplication.lrc.gov.on.ca/matm/Index.html?site=Make_A_Topographic_Map&viewer=MATM&locale=en-US

Montgomery, J.K., (2003), Report on the 2003 Diamond Drilling on the Timiskaming Property, Larder Lake Mining Division, Northeastern Ontario, of Sudbury Contact Mines Limited, for MPH Consulting Limited, May 30, 2003

Nelson,Jr., H.R.,Siebert, D.J.,Denham, L.R. (2013) Lightning Data - A New Geophysical Data Type* . Search and Discovery Article #41184 (2013) Posted August 26, 2013 *Adapted from extended abstract prepared in conjunction with oral presentation at AAPG Annual Convention and Exhibition, Pittsburgh, Pennsylvania, May 19-22, 2013, AAPG©2013. Accessed at https://www.searchanddiscovery.com/documents/2013/41184nelson/ndx_nelson.pdf

Nestola, F., Jung, H., Taylor, L.A. (2016) Mineral inclusions in diamonds may be synchronous but not syngenetic. In Nature Communications. 24 Jan 2017. DOI: 10.1038/ncomms14168DOI

Nowicki, T.E., Moore, R.O., Gurney, J.J., and Baumgartner, M.C. (2007) Diamonds and associated heavy minerals in kimberlite: a review of key concepts and applications. Developments in Sedimentology, Vol. 58, Chapter 46 pp1235–1267. Accessed online at http://www.msgroup.net/documents/Nowicki-et-al-2007-Diamonds-and-assoc-HMs-in-kimberlite-.pdf

Ontario Geological Survey (2000). Airborne Magnetic and Electromagnetic Survey, Temagami area, Ontario Geological Survey, Map 82 067

Ontario Geological Survey (2000). Airborne Magnetic and Electromagnetic Survey, Temagami area, Ontario Geological Survey, Map 82 066

Owsiacki, Leo 1985: Geology and Mineral Deposits of Lundy Township, Timiskaming District; Ontario Geological Survey. Map P.2733, Geological Series-Preliminary Map, scale 1:15 840 or 1 inch to ¼ mile Geology 1981, 1982.

Paulen, R.C. and McClenaghan, M.B. (ed.), 2013. New frontiers for exploration in glaciated terrain; Geological Survey of Canada, Open File 7374, 85 p. doi:10.4095/292679

Pilchin, A., Eppelbaum, L.V. (2004). On the stability of ferrous and ferric iron oxides and its role in rocks and rock-forming minerals stability. Scientific Israel, 2004, **6**, No. 3-4, 119-136. Accessed at https://www.researchgate.net/publication/240028866

PIVIN M., BERGER, J., and DEMAIFFE, D. (2011). Nature and origin of an exceptional Cr-rich kyanite-bearing clinopyroxenite xenolith from Mbuji-Mayi kimberlite (DRC). Eur. J. Mineral. 2011, 23, 257–268 Published online January 2011

Plouffe, A., Paulen, R.C., Smith, I.R., Kjarsgaard, I.M. (2007). Chemistry of kimberlite indicator minerals and sphalerite derived from glacial sediments of northwest Alberta, Alberta Energy and Utilities Board, Alberta Geological Survey, Special Report 87, Geological Survey of Canada, Open File 5545,

Power, M., Hildes, D. (2007). *Geophysical strategies for kimberlite exploration in northern Canada*. Paper 89 in "Proceedings of Exploration 07: Fifth Decennial International Conference on Mineral Exploration" edited by B. Milkereit, pp1025-1031. Retrieved from https://www.911metallurgist.com/blog/wp-content/uploads/2015/10/Geophysical-strategies-for-kimberlite-exploration-innorthern-Canada.pdf

Quirt, D.H. (2004). Cr-diopside (clinopyroxene) as a kimberlite indicator mineral for diamond exploration in glaciated terrains; in Summary of Investigations 2004, Volume 2, Saskatchewan Geological Survey, Sask. Industry Resources, Misc. Rep. 2004- 4.2, CDROM, Paper A-10, pp14. Retrieved from http://publications.gov.sk.ca/documents/310/88824-cquirt.pdf

Reed, L.E., Witherly, K.E. (2007) 50 Years of Kimberlite Geophysics, A Review; Ore Deposits and Exploration Technology, Paper 47. In Proceedings of Exploration 07: Fifth decennial International Conference on Mineral Exploration edited by B. Milkereit, 2007, p. 679-689. Accessed online at: https://www.911metallurgist.com/blog/wp-content/uploads/2015/10/50-Years-of-Kimberlite-Geophysics-A-Review.pdf

Reid, J. L. (2002). Regional modern alluvium sampling survey of the Mattawa-Cobalt corridor, northeastern Ontario. Ontario Geological Survey, Open File Report 6088. pp. 235

Reid, J.L. (2004). Regional modern alluvium sampling survey of the Cobalt--Elk Lake area, northeastern Ontario; Ontario Geological Survey, Open File Report 6119, 140p

Roy, M., Veillette, J.J., Daubois, V., Menard, M. (2015). Late-stage phases of glacial Lake Ojibway in the central Abitibi region, eastern Canada. In Geomorphology, Vol 248, Nov 2015, pp 14-23. Accessed online at http://www.sciencedirect.com/science/article/pii/S0169555X15300891

Sage, R. P. (2000). Kimberlites of the Lake Timiskaming Structural Zone. Supplement. *Ontario Geological Survey, Open File Report 6018*

Scott Smith, B.H., Nowicki, T.E., Russell, J.K., Webb, K.J., Mitchell, R.H., Hetman, C.M., Harder, M., Skinner, E.M.W., and Robey, Jv. A. (2013). Kimberlite Terminology and Classification. In Proceedings of 10th Annual Kimberlite Conference, Vol 2. Editors D. Graham Pearson, Herman S. Grütter, Jeff W. Harris, Bruce A. Kjarsgaard, Hugh O'Brien, N V Chalapathi Rao, Steven Sparks, 2013.

Shigley, J.E., Shirey, S.B. (2013). Recent Advances in Understanding the Geology of Diamonds: in Gems & Gemology, Winter 2013, Vol. 49, No.4. Accessed at https://www.gia.edu/gems-gemology/WN13-advances-diamond-geology-shirey

Shigley, J.E., Shor, R., Padua, P., Breeding, Shirey, S.B., Ashbury, D. (2016). Mining Diamonds in the Canadian Arctic: The Diavik Mine. Gems & Gemology, Summer 2016, Vol. 52, No. 2. Retrieved from https://www.gia.edu/gems-gemology/summer-2016-diamonds-canadian-arctic-diavik-mine

Smythe, D.J, Schulze, D.J., Brenan, J.M. (2008): Rutile as a Kimberlite Indicator Mineral: Minor and Trace Element Geochemistry; 9th International Kimberlite Conference Extended Abstract No. 9IKC-A-00193, 2008. Accessed at https://ikcabstracts.com/index.php/ikc/article/view/3434/3434

Sobie, P. (2002) Interim Compilation Report on the TIMISKAMING DIAMOND PROJECT, for MPH Consulting Limited 2002. Accessed at https://gq.mines.gouv.qc.ca/documents/examine/GM59385/GM59385.pdf

Stachel, T., Banas, A., Aulbach S., Smit, K.V., Wescott, P., Chinn, I.L., Fisher, D., Kong, J.(2017). The Victor Mine (Superior Craton, Canada) – A new paradigm for exploration in unconventional settings; 11th International Kimberlite Conference Extended Abstract No. 11IKC-4453, 2017.

Stachel, T., Banas, A., Aulbach S., Smit, K.V., Wescott, P., Chinn, I.L., Kong, J. (2018). The Victor Mine (Superior Craton, Canada): Neoproterozoic lherzolitic diamonds from a thermally-modified cratonic root. Received: 15 November 2017 /Accepted: 5 April 2018 # Springer-Verlag GmbH Austria, part of Springer Nature 2018

Tardif, N.P. and Crabtree, D.C. 2000. Kimberlite indicator minerals from till samples in the River Valley–Verner area, northeastern Ontario; Ontario Geological Survey, Open File Report 6040, 61p.

Tschauner, O., Huang, S., Greenberg, E., Prakapenka, V.B., Ma, C., Rossman, G.R., Shen, A.H., Zhang, D., Newville, M., Lanzirotti, A., Tait, K. (2018). Ice-VII inclusions in diamonds: Evidence for aqueous fluid in Earth's deep mantle. In Science 09 Mar 2018: Vol 359, Issue 6380, pp. 1136-1139

van Hees, E., Bousquet, P., Pace, A., Daniels, C.M., Debicki, R.L., Wilson, A.C., Beauchamp, S.A. and Walmsley, J. 2016. Report of Activities 2015, Resident Geologist Program, Timmins Regional Resident Geologist Report: Timmins and Sault Ste. Marie Districts; Ontario Geological Survey, Open File Report 6317, 91p.

Veillette, J.J. (1989). Ice Movements, till sheets and glacial transport in Abitibi-Timiskaming, Quebec, and Ontario: in Drift Prospecting, ed. R.N.W. DiLabio and W.B. Coker; Geological Survey of Canada, Paper 89-20. pp 139-154.

Webb, K.J., Scott Smith, B.H., Paul, J.L., Hetman, C.M. (2004) Geology of the Victor Kimberlite, Attawapiskat, Northern Ontario, Canada: cross-cutting and nested craters. Accessed online at www.kwgresources.com/_resources/McFadyen/v762004Webb-geol_of_Victor_kimberlite_Attawapiskat_Ont.pdf

Yirka, B (2012). New research explains how diamond rich kimberlite makes its way to Earth's surface in Earth / Earth Sciences, January 19, 2012 Accessed online at https://phys.org/print246180331.html