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ASSESSMENT WORK REPORT

CLAIM L 4282172

Block 24, Gillies Limit

Larder Lake Mining Division

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

Report prepared and submitted by Tony Bishop

November 27, 2017

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ASSESSMENT REPORT FOR CLAIM 4282172, GILLIES LIMIT, LARDER LAKE MINING DIVISION

Prepared by Brian A. (Tony) Bishop, submitted November 27, 2017

INTRO:

Hereby submitted by Brian Anthony (Tony) Bishop [Client No. 108621, 100% holder on record], on November 27, 2017, an assessment report for Claim no. L 4282172 (recorded on November 27, 2015). The claim contains fifteen units, situated in Block 24, Gillies Limit**,** Larder Lake mining division [see Appendix 3: Map 1, page 30]. This report includes details of work done to date, including a reconnaissance survey and prospecting and preliminary geochemical surveys based on till sampling and analysis, with recommendations for further assessment. Electron Microprobe or SEM Analysis has been completed on selected grains (34) by Geoscience Lab (Sudbury), and a ~10 kg sample was also sent to Overburden Drilling Management (Nepean) for processing. An aerial drone survey was also undertaken. Appendices include lab results, as well as detailed methodologies for field work and till sample processing (including results of processing efficiency test and flowchart for concentrating), maps, field notes and maps of traverses, and relevant photographs. A video clip of the drone fly-over is also included on the DVD submitted with this report.

PURPOSE:

The purpose of staking Claim L 4282172 and the goal of the assessment work done to date and included in this report is to look for evidence and test the hypothesis that the claim may contain the top of 1-3 kimberlite pipes manifested in the post-glacial topography by round dark circular impressions in Ice Chisel and Darwin Lakes, and by the circular nature of the lakes themselves. As Shigley et al (2016) state, in reference to the Diavik Mine, "Because kimberlites weather and decompose faster than much older surrounding rocks, pipes often occur in topographical depressions beneath lakes…most [pipes] are buried beneath bodies of water".

On claim 4282172, there are two lakes: Ice Chisel Lake (measures 222m NS x 272m EW = 4.74 hectares) and Darwin Lake, approximately 300m to the NE, which visually is 'peanut' shaped with two distinct dark circular areas in aerial views. These measure ~367m NS x 276m EW = 7.96 hectares, and 275m NS x 199m EW = 4.3 hectares. Pipes found in Canada measure from 50-1500m in diameter, but generally from 50-500m.

Work completed to date includes an on-foot observational examination of the claim, a research component, carefully determined and mapped out soil sampling plans, screening, concentrating, sorting and examining potential kimberlite indicator minerals (KIMs) in collected soil samples, microphotography, and recording these and other findings. Lab analysis and aerial photography were also undertaken.

ACCESS:

Access to Claim no. 4282172 can be made from the town of Cobalt.

Cobalt is reached from Highway 11 via Highway 11B. Claim no. 4282172 is situated approximately 8.5 km south-southwest of the town of Cobalt. From Cobalt, Coleman Road can be taken to Hound Chute Road (Silverfield) passes through the west side of 4282172 from north to south ~230 m west of Ice Chisel and 430 m west of Darwin Lake. Highway 11 (Trans Canada) is 1.8 km to the west. Cobalt is 8.5 km north. Latchford is 9.5 km west. North Bay and Toronto are 110 km and 400 km south respectively [see Appendix 3: Map 2, page 31].

PREVIOUS WORK and significance to Claim 4282172:

Diagram A [page 5] shows the results of samples (between 6-20kg in weight) taken by various companies over the last ~2 decades in and around claim 4282172, all within 2 km of Ice Chisel and Darwin Lakes. Bishop samples are also shown, which are typically from 1-4kg in weight.

Immediately down-ice of these two lakes I have taken many till samples and a few creek samples. All return above background to very high KIM counts. Samples taken ~100m west returned no garnets or other KIMs, as checked by Doug Robinson (PEng) and myself separately.

A sample from down-ice of Ice Chisel Lake was sent to ODM as a check of my own results. ODM reported 30 Cr-pyropes, and other significant KIM grains were recovered [see Results, page 12].

Immediately down-ice of this sample, 32 Cr-pyropes were recovered, including a G-10 garnet, as reported in OGS OFR 6088 (2002). A short distance to the southwest of that sample, 35 Cr-pyropes were recovered in another sample by Cabo Co 3566 (2010). A short distance south of that, 10 Cr-pyropes were recovered (OGS OFR 6088).

These results, all in close proximity and down-ice of Darwin and Ice Chisel Lake (claim 4282172), are the best of large scale sampling programs (nearly 100 samples) initiated by others across two townships from the north part of Gillies Limit to the south part of Lorrain, most of which were duds.

Included on Diagram A [page 5] are other samples taken in close proximity and off-ice direction to the west, north, and east of 4282172, which returned a few very low KIM counts with most having no Cr-pyropes.

As well, this sample area is more than 15 km south of and ~ 30 to 60 metres higher in elevation than the known kimberlite pipes in the New Liskeard area, making it possible but unlikely that the KIMs are from any known pipe, and importantly, these two lakes are located between the high KIM counts (to the south) and the aforementioned pipes (to the north). The lakes would have acted as a sediment and heavy mineral trap (barrier) to the deposition of KIMs to the south of and close to these lakes, unless they originate in the lakes. This principle is demonstrated by Cabo's sample on the north side of Schumann Lake having 9 Cr-pyropes, and three samples taken on the south side having none, as would be expected when the lake acts as a heavy mineral trap.

These results, taken together, fairly conclusively point to one or both Ice Chisel and Darwin Lakes being the source of the high KIM counts in close proximity down-ice, especially when so many off-ice samples surrounding these lakes have low to no KIM counts.

RELATED KIMBERLITE DYKE:

Approximately 1km south of claim 4282172, Alan Kon found a kimberlite dyke in 2012. When tested, it contained abundant mica and olivine crystals up to 2mm (Guindon et al, Report of Activities, 2012).

This is interesting in that it has been reported that kimberlite dykes are commonly found in the vicinity of pipes, which is what I hope to prove is under Ice Chisel and/or Darwin Lakes.

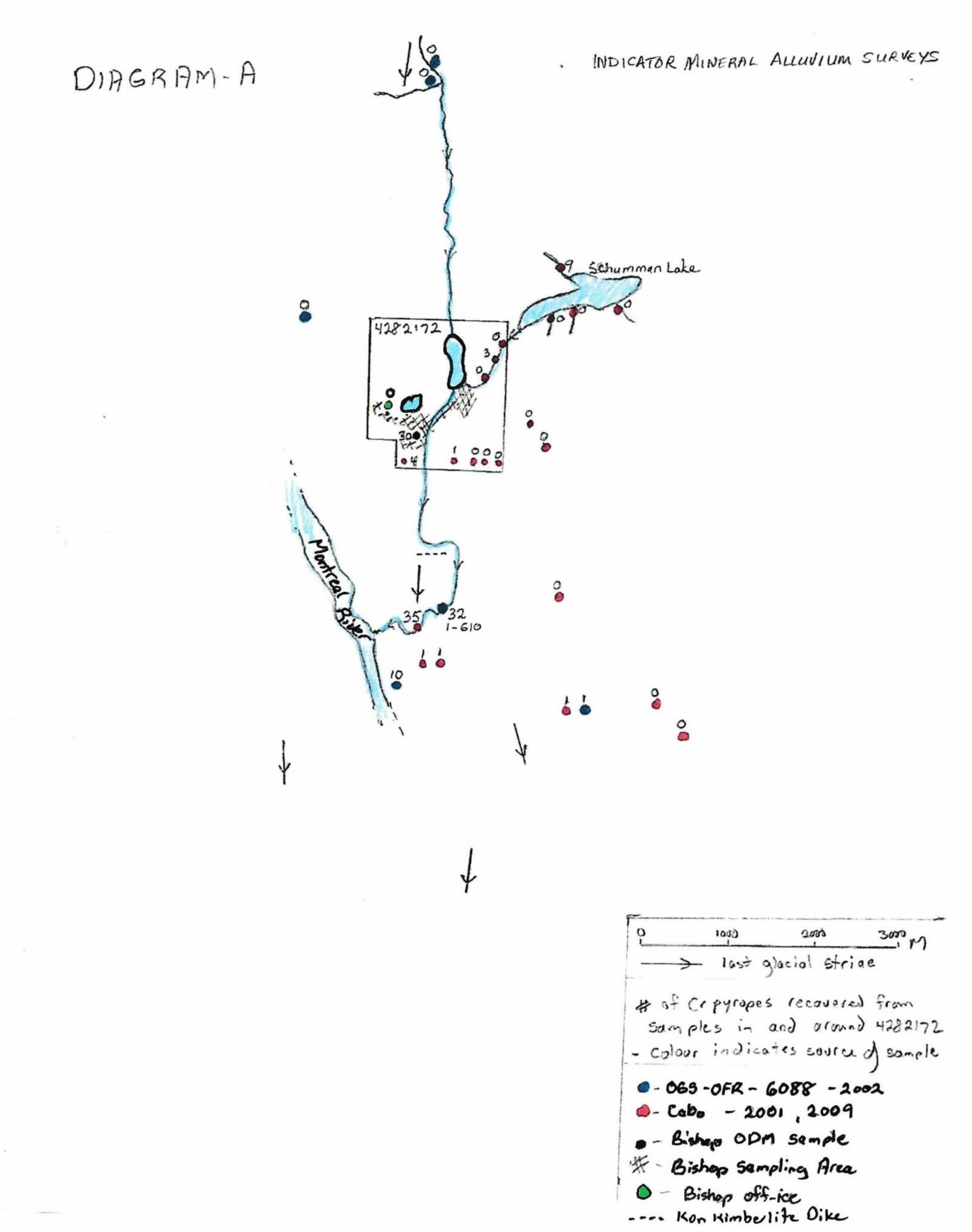


Diagram A – Indicator Mineral Alluvium Surveys

GEOLOGY:

Claim 4282172 is underlain by sedimentary rocks of the Gowganda Formation sandwiched by diabase contacts (which is similar to the geology in Lac de Gras) at the east and west boundaries of the claim. As shown on the Geological Compilation Map [Appendix 3: Map 3, page 32], to the east is the Cross Lake Fault and to the west the Montreal River Fault. A north-south trending fault runs through to the centre of Darwin Lake and many cross faults are close to this claim to the west, east, and south. The claim itself, especially in the vicinity of Ice Chisel Lake, is largely sand/gravel covered.

FIELDWORK:

Taking many smaller till samples from various locations down-ice was deemed appropriate to mitigate the extreme nugget effect caused by KIMs potentially being restricted to thin stratigraphic horizons in the till.

Twenty-four till samples were collected on three traverses [see Appendix 4, page 39]. General prospecting and site examination was undertaken on each traverse, and an aerial survey was also conducted during Traverse #4 [see Photos 1-2, page 6].

Photo 1 – Drone flight, Traverse #4

Photo 2 – Drone operators, Traverse #4

TRAVERSES: **Please refer to Appendix 4 for Traverses for detailed narratives, maps, and coordinates/field notes.**

METHODOLOGIES: **Please refer to Appendix 5 for Methodologies for Fieldwork and Till Processing**

RESULTS:

Geoscience Lab Results from Sudbury:

Of the thirty-four grains from this claim that were analysed at Geoscience Lab in Sudbury, ten were G9s. Spessartine, Almandine, Titanite, Andradite, Staurolite, Fe-Oxide, Quartz, Silicate, and a G1 were also identified.

Lab Findings – CRT-17-0279-01 & CRT-17-0107-04	Sample Label	Features	Dimensions	Target # / Claim #
G9	S-G29	Purple	0.5 x 0.8mm	T-2 Ice Chisel 4282172
G9	S-G30	Purple	0.5 x 0.8mm	T-2 Ice Chisel 4282172
G9	S-G36	Purple	0.8 x 1.4mm	T-2 Ice Chisel 4282172
G9	S-G37	Purple	0.7 x 1.2mm	T-2 Ice Chisel 4282172
G9	S-G38	Purple	0.7 x 1.0mm	T-2 Ice Chisel 4282172
G9	S-G40	Purple	0.8 x 1.2mm	T-2 Ice Chisel 4282172
G9	S-G41	Purple	0.7 x 1.0mm	T-2 Ice Chisel 4282172
G9	S-G42	Purple	0.4 x 1.0mm	T-2 Ice Chisel 4282172
G1	S-G45	Orange	1.0 x 2.0mm	T-2 Ice Chisel 4282172
Spessartine	S-G39	Red/Purple	0.5 x 0.8mm	T-2 Ice Chisel 4282172
Spessartine	S-G43	Mixed Orange	0.5 x 1.0mm	T-2 Ice Chisel 4282172
Almandine	S-G32	Purple with inclusions	0.5 x 0.5mm	T-2 Ice Chisel 4282172
Almandine	S-G33	Pink-Purple	0.4 x 0.6mm	T-2 Ice Chisel 4282172
Titanite	S-G28	Yellow/Brown?	0.3 x 0.8mm	T-2 Ice Chisel 4282172
Titanite	S-G31	Brown/Orange/Red?	0.4 x 0.5mm	T-2 Ice Chisel 4282172
Titanite	S-G35	Purple?	0.5 x 1.0mm	T-2 Ice Chisel 4282172
Andradite	S-G34	Purple	0.4 x 0.6mm	T-2 Ice Chisel 4282172
Staurolite	S-G44	Brownish Red/Yellow	1.3 x 1.7mm	T-2 Ice Chisel 4282172
Fe-Oxide	S-G46	Clear and Deep Reddish Purple	0.7 x 1.3mm	T-2 Ice Chisel 4282172
G9	S-G47	Pink-Purple	0.2 x 0.25mm	T-3/4 Darwin 4282172
G9	S-G48	Purple	0.25 x 0.5mm	T-3/4 Darwin 4282172

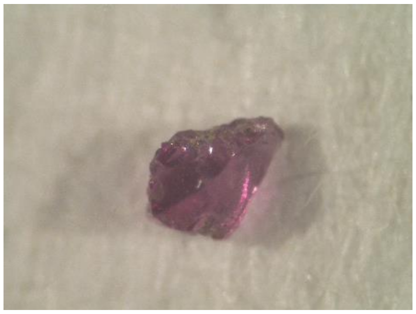

S-G29 – G9 (Ice Chisel)


S-G30 – G9 (Ice Chisel)


S-G36 – G9 (Ice Chisel)

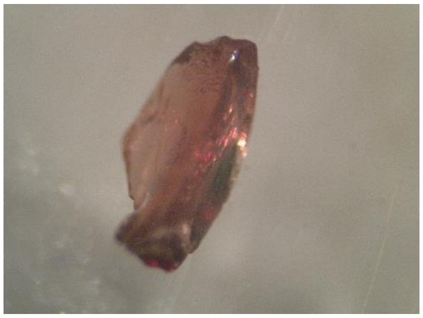

S-G37 – G9 (Ice Chisel)

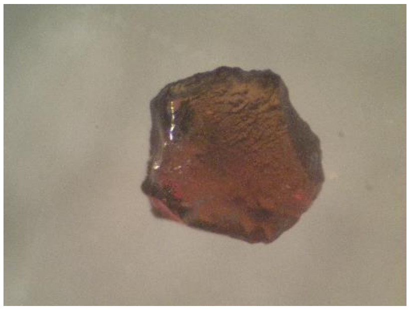

S-G38 – G9 (Ice Chisel)

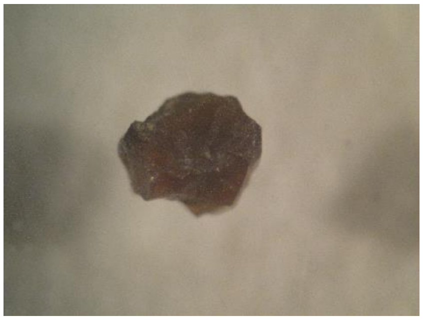

S-G40 – G9 (Ice Chisel)

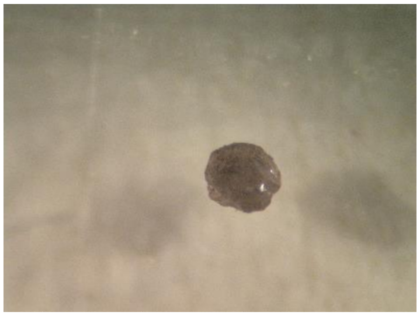

S-G41 – G9 (Ice Chisel)

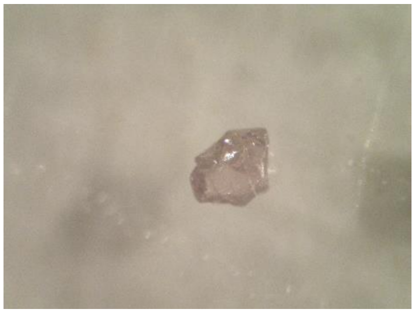

S-G42 – G9 (Ice Chisel)


S-G45 – G1 (Ice Chisel)

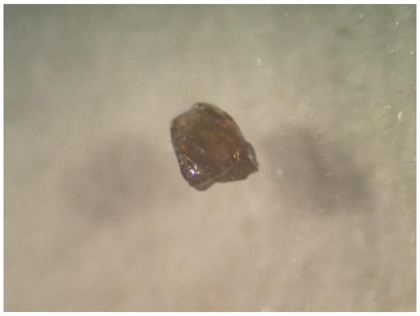

S-G39 – Spessartine (Ice Chisel)


S-G43 – Spessartine (Ice Chisel)


S-G32 – Almandine (Ice Chisel)


S-G33 – Almandine (Ice Chisel)


S-G28 – Titanite (Ice Chisel)


S-G31 – Titanite (Ice Chisel)

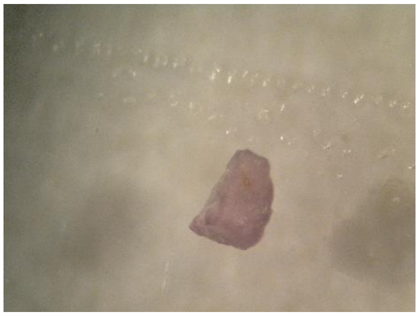

S-G35 – Titanite (Ice Chisel)


S-G34 – Andradite (Ice Chisel)


S-G44 - Staurolite (Ice Chisel)


S-G46 – Fe-Oxide (Ice Chisel)


S-G47 – G9 (Darwin)


S-G48 – G9 (Darwin)

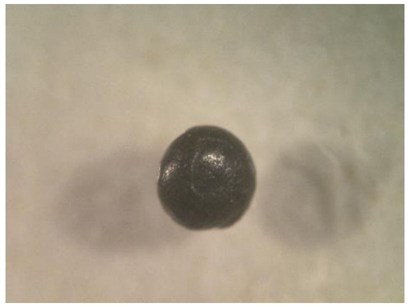
Lab Findings – CRT-17-0107-03	Sample Label	Features	Dimensions	Target # / Claim #
Quartz + organics?	S-D18	Transparent and opaque grey	0.5 x 0.9mm	T-2 Ice Chisel 4282172
Quartz	S-D19	Yellow	0.25 x 0.5mm	T-2 Ice Chisel 4282172
Silicate (epidote?)	S-D20	Yellow	0.5 x 0.9mm	T-2 Ice Chisel 4282172
Quartz?	S-D21	Yellow	0.25 x 0.4mm	T-2 Ice Chisel 4282172
Quartz + Fe-Oxide or Fe-Carbonate?	S-D22	Yellow	0.25 x 0.5mm	T-2 Ice Chisel 4282172
Fe-Oxide	S-D23	Round dark ball	0.5 x 0.9mm	T-2 Ice Chisel 4282172
Organic Material	S-D24	F-Yellow frosted rounded – fluorescent bright white longwave, very dim SB, no shortwave	0.2 x 0.5mm	T-2 Ice Chisel 4282172
Mainly halite + Al, Si, K, P, Ca	S-D25	F-(*) roughly frosted, one edge irregular, translucent whitish cube, fluorescent medium bright white-yellowish longwave, very dim SB, no shortwave	0.25 x 0.25mm	T-2 Ice Chisel 4282172
Mixed silicate coated with organic material	S-D26	F- transparent, colourless, fluorescent medium bright whitish, much <SB, almost no shortwave	1.2 x 1.5mm	T-2 Ice Chisel 4282172
Silicate (epidote?)	S-D27	Yellow	0.5 X 0.6mm	T-2 Ice Chisel 4282172
Zircon	S-D29	F-Pink, fluorescent medium orange longwave, medium bright yellow orange shortwave, 0SB	0.5 x 0.7mm	T-3/4 Darwin 4282172
Quartz	S-D30	Transparent, colourless, with black inclusions	0.5 x 0.05mm	T-3/4 Darwin 4282172

S-D19 – Quartz (Ice Chisel)

S-D20 – Silicate (epidote?) (Ice Chisel)

S-D21 – Quartz? (Ice Chisel)


S-D22 - Quartz + Fe-Oxide or Fe-Carbonate? (Ice Chisel)


S-D23 – Fe-Oxide (Ice Chisel)


S-D24 – Organic Material (Ice Chisel)


S-D27 – Silicate (epidote?) (Darwin)

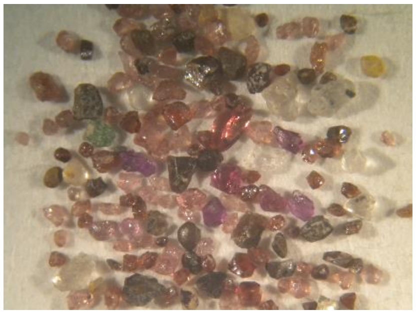

S-D29 – Zircon (Darwin)

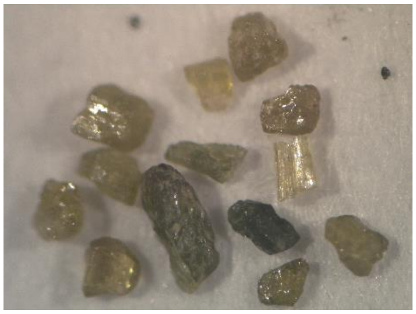
ODM Results:

In the sample (~12kg) sent to ODM, 48 gold grains were recovered, including 1 pristine grain; this is a very high number of gold grains and will be investigated further. As well, 217 KIMs were found, importantly 30 Cr-pyropes (G9/G10) were recovered [see Diagram A, page 5].

MICROSCOPE PHOTOS OF KIMs:

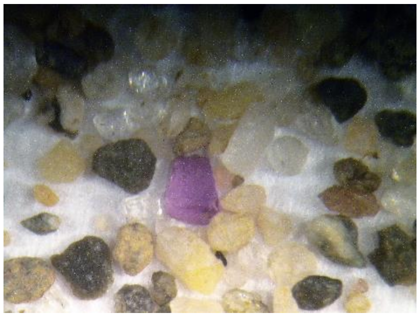

Ice Chisel Lake - From 1 TBSP concentrates

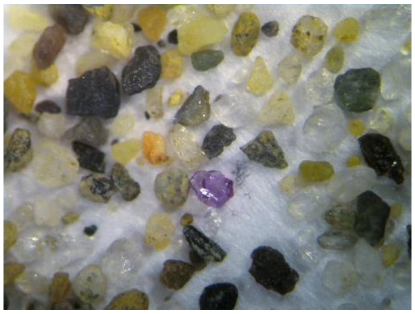

Ice Chisel Lake - KIMs picked - 0.5-2.0mm


Ice Chisel Lake - Green-yellow stones

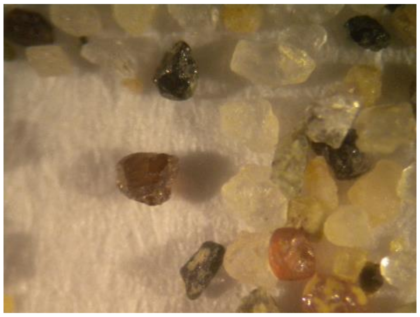

Ice Chisel Lake - Cr diopside


Ice Chisel Lake - Brown crystal – titanite? - 0.8mm

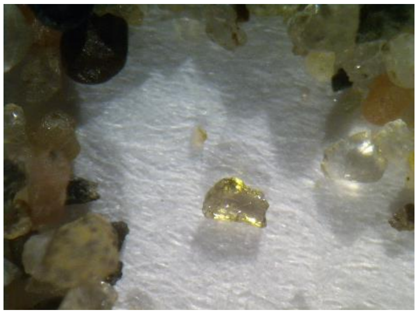

Ice Chisel Lake - Cr pyrope - 0.8mm


Ice Chisel Lake - Cr pyrope - 0.5mm

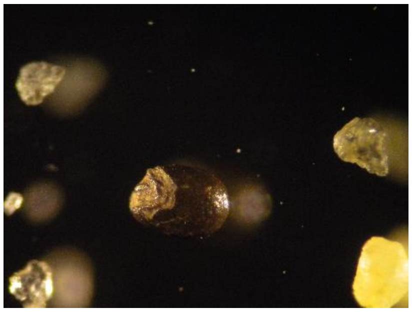

Ice Chisel Lake - Pink garnets - 0.5mm

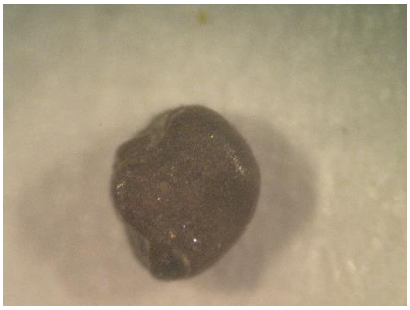

Ice Chisel Lake - Titanite? - 0.5mm


Ice Chisel Lake - Pink-purple garnet - 0.4mm


Ice Chisel Lake - Cr diopside - 0.5mm


Ice Chisel Lake – Yellow grain (titanite?) – 0.4mm


Ice Chisel Lake - Probable FeO Iron (II) - 1.0mm


Ice Chisel Lake - Probable FeO iron (II)


Ice Chisel Lake - Probable FeO iron (II)

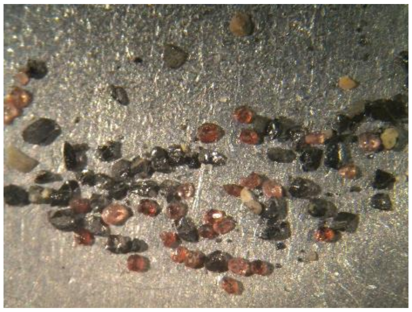

Stone - ~5.0mm


Stone - ~5.0mm

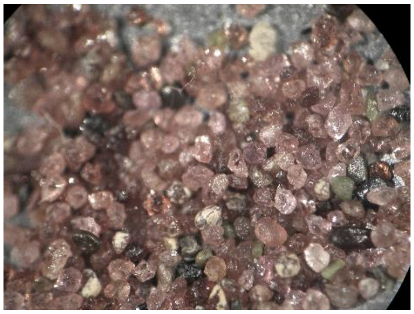

Stone - ~5.0mm

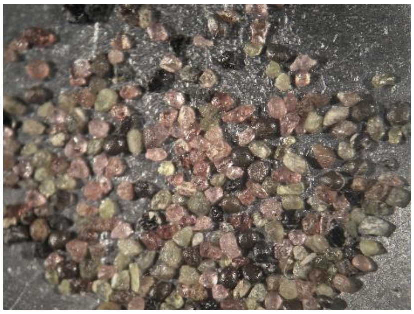
ICE CHISEL LAKE KIMs – MAGNETIC SUSCEPTIBILITY COMPARATIVE:

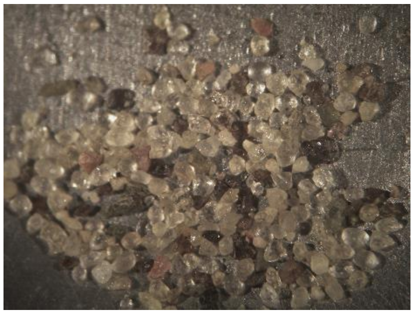
One sample of picked KIMs (with red/purple garnets and euhedral chromites etc. previously removed) was tested with a small but powerful neodymium magnet, and separated based on magnetic susceptibility. Interesting grains are in the very weakly and non-magnetic fractions. At this small grain size, the iron content must be very low to zero and therefore the garnets are not crustal (or are grossular or uvarovite – both rare and green). Further testing/microprobes are recommended to further clarify results. Magnetic susceptibility testing is a very important tool to assist the underfunded grassroots prospector in discerning which grains to send for EMP analysis, and going forward I will begin utilizing this for future lab submissions.


Very magnetic


Moderately magnetic


Weakly magnetic


Picked up touching magnet;
Very weakly magnetic


Non-magnetic

CONCLUSIONS:

Many kimberlitic grains were observed (in the dozens to many hundreds) in samples taken on claim 4282172, especially immediately south of Ice Chisel Lake. Darwin Lake also returned above background results, but was harder to sample. My results were later checked by resampling near and in a similar fashion to be sent to ODM for processing. They too found way above background levels of KIMs [see Results: ODM, page 12]. Two off-ice samples to the west of Ice Chisel Lake produced no KIMs (garnets in particular) as concentrated separately by Doug Robinson (PEng) and myself [see Appendix 4: Traverse 1, page 40]. Results as well can be seen on the Indicator Mineral Alluvium Surveys diagram (Diagram A, page 5), where numerous samples were taken by various companies and Ontario Geological Surveys, to the north, west, southeast, east, northeast, and south of claim 4282172.
Only a small number of potential KIMs were sent to Sudbury for micro-probing from each of individual 9 kimberlite targets by me (a total of 56 pink-purple to purple garnets). Cr pyropes (8 from Ice Chisel Lake and 2 from Darwin Lake) were G9s. S-G33 was unusual being a nearly colourless pink-purple grain which visually should be nearly pure pyrope but tested as an almandine. A number of grains I couldn't identify in the concentrates were also sent for analysis and came back as titanite, spessartine, almandine, andradite, staurolite, Fe Oxide, epidote, quartz, and zircon. So as you can see, not only were potential KIMs sent to be tested, but also other unidentified grains (some grains just because they fluoresced) that were not necessarily considered kimberlite indicators by me. Then, even though determined to be non-kimberlitic by Sudbury, with countless hours of research comparing many research/science articles [see References, page 92], I found that many of these grains are occasionally to often found in kimberlites. For instance, 'crustal' minerals, such as staurolite and spessartine, have been found as inclusions in diamonds (Daniels et al (1996)).
Several brilliant yellow grains were tested quartz, and therefore are citrine, a very rare mineral (almost all 'citrine' is heat-treated smoky quartz or amethyst), as far as I can research not found in Canada, and epidote, which is seldom found as yellow (usually yellow-green to green). Another grain that fluoresces yellow is a pink-purple colour zircon, an unusual colour for zircon, and has a rounded, slightly frosted appearance. Very many small watermelon to round shaped frosted zircons, which is diagnostic for kimberlitic zircons, another commonly found KIM, are also in the concentrates.
Dark opaque red-brown to brown to black round grains with a shiny-frosted appearance are also found. These tested as FeO – iron oxide [see Results: photo S-D23, page 12]. This is very interesting, as iron exists as Fe(I) (ferrous iron, rust, very magnetic), Fe(II) (non-magnetic), and Fe(III) (hematite, non-magnetic). 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 dendridites 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 found where diamonds might form. Unless they undergo super-cooling in a very short time, they turn into Fe(I) – magnetic iron.
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 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 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 Fe^{2x} as compared to Fe^{3x} 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 solid solution of iron with an alloying element. Basically, from 914°C to 1394°C, Fe(I) alpha iron → Fe(II) gamma phase (or the face contact cubic/diamond cubic). 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 B, page 16].

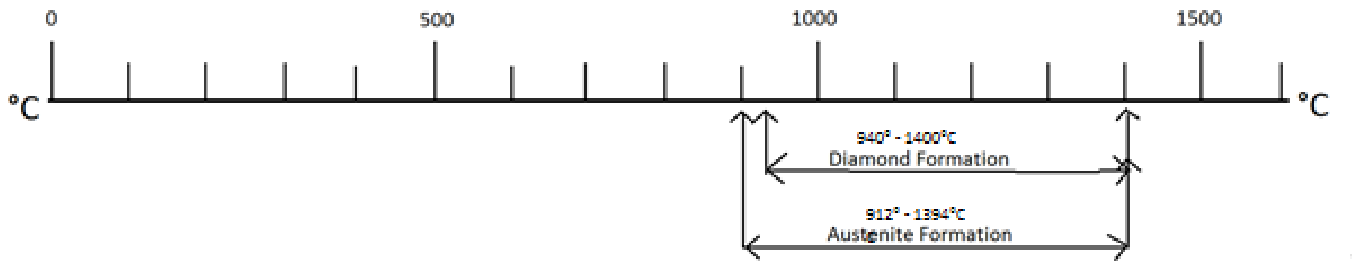


Diagram B: Diamond and Austenite Formation

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, they 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+} rations 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).

[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.)

ON GLACIATION AND DETERMINING SOURCE OF KIMS:

If only the large-scale Ice Flow Movement map [see Appendix 3: Map 5, page 34] is referred to then it would lead to the conclusion of a northwest – southeast glacial flow when tracing KIMs back to their source, in the whole area of the map.

However, locally I plotted 88 recent glacial striae on a map that takes in an area from the New Liskeard/Haileybury kimberlites to the north and the Bishop Claims to the south. These were utilised to create the Detailed Ice Flow Movement map [see Appendix 3: Map 6, page 35]. Next, utilising Cobalt 31M5 Map, Google Earth, and the Ministry of Natural Resources and Forestry, I shaded in the height of land (i.e. hills) above the 30^{+}M and 60^{+}M as compared to the New Liskeard kimberlites.

As you can see the glacial flow from the striae indicates flowing around the hills the glaciers encountered. On a smaller scale, this is very nicely shown on the 'Nip Hill' in Cobalt, which on the west side, the deep striae are basically to the southwest, and on the hilltop – to the south and on the east side are oriented somewhat to the southeast.

So utilising this map, for claim 4282172 there is a very slim possibility for transport from the distance to the known kimberlites. As well, 4282172 is ~60m uphill from the New Liskeard kimberlites which makes transport from 14km to the north unlikely. Therefore it is very probable the KIMs found here are from close by (proximal).

[See Appendix 3: Map 6, page 35]

"Basal sliding occurs only where a glacier is at pressure melting point at its base. Most of the fast ice flow associated with ice streams comes about because of basal sliding. Wet glacier ice on a smooth surface is slippery. The sliding at the ice-bed interface is controlled by freezing to the bed, bed roughness, the quantity of water at the bed, and the amount of rock debris in the basal glacier ice.

"Glacier beds are rough [i.e. bedrock], not smooth. Bumps in the surface of the glacier bed cause melting on the upstream side, and re-freezing on the downstream side. This is called regelation, and it occurs because pressures mount up from behind obstacles to ice flow. Ice melts under pressure, and this lubricates the bed of the glacier.

"Meltwater at the ice-bed interface reduces the adhesion of the glacier to its bed, making it more slippery and enhancing sliding. If a glacier is flowing over a rock bed, a water film may enhance sliding and submerge minor obstacles, making the bed smoother." (Davies, B. (2017))

So as you can see from the Local Glacial Flow Direction map [Appendix 3: Map 6, page 35] when the glacier encounters a hill, pressure builds up and the ice will flow much like water in a creek flows around a boulder. This of course forces material in the creek to flow with it. As such, any heavy materials in the water/ice flow will be forced around the obstacle, not over it. So ignoring this effect when interpreting a regional or local sampling program will cause misinterpretation of results.

To further complicate KIM emplacement, local to the Cobalt area one must also take into account the final stages of glaciation melt which formed Lake Ojibway (see reference (Roy, M. et al (2015). p14-23) for more information). Basically, 8400 years ago there was a staggeringly huge lake in and around north of the Cobalt area, that rose to 272-299 metres above sea level. Coincidentally, the Bishop Claims are between 300-394m above sea level [see Diagram C, page 18]. However, the kimberlites in the New Liskeard area are 30-60m below that (230-270m above sea level), so water movement and wave action would have spread out and diluted heavy mineral concentrates disrupting a classic till KIM emplacement profile. Further, when the 'dam' finally broke when the water level was 250m above sea level, the massive water flow locally followed the Montreal River and Lake Timiskaming/Ottawa River systems, further disrupting KIM emplacement.

From Haileybury Map 5024, claim 4282172 (and to a lesser extent 4282402, Hound Chute Lake) is the only claim in the Bishop Claims group to be effected by glaciofluvial deposits. However, the high numbers of garnets found [see Diagram A, page 5] south of the lakes fits this possibility.

> "Short transport (distance) is expected in an esker because esker streams are thought to be short lived and overloaded with sediment, transport peaks at ±0.9 miles [~1.5km] in a bell curve for distance/heavy mineral concentration." (Lee (1965). p 7)

So, the point of all this is that it is unlikely the possibility of the high numbers of KIMs I'm finding on Claim 4282172 and the rest of the Bishop Claims could have originated from the known kimberlites in the New Liskeard area.

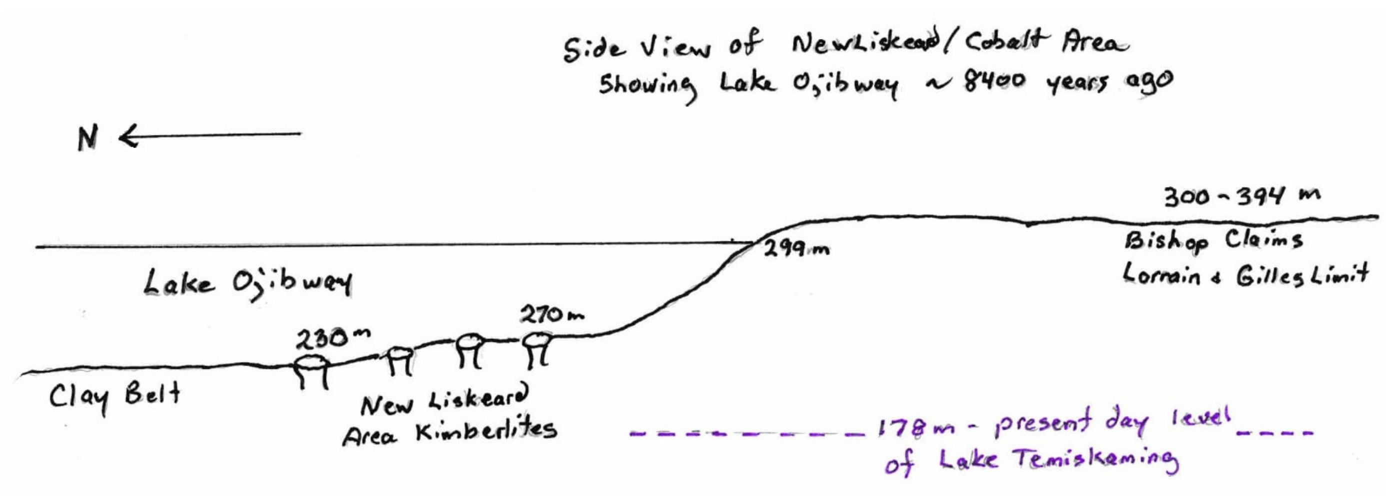


Diagram C – Side view of New Liskeard/Cobalt Area, showing Lake Ojibway ~8400 years ago

What makes the results (high use of KIMs) that I'm finding in my concentrates interesting is that they are, with very few exceptions (namely 4282172, and 4282175 alluvium make up a small percentage of the total samples) in all the other claims taken, <1m deep in till. Most samples weigh from 1-3kg unscreened, as compared to the 10-30kg screened to <5mm samples recommended in OGS-OFR and other reports. This effect makes my typical samples 10-20x smaller when screened to <5mm.

Of five OGS-OFR reports, namely 6060-2001, 6043-2001, 6088-2002, 6119-2004, and 6124-2005, only 6060 took till samples, 400 of them which produced 13 pyrope garnet grains (G9s), recovered from 12 of the 400 samples. 1 in $33^1/_3$, or 3 in every 100 samples produced a Cr pyrope.

As such, the other reports relied always exclusively on alluvium (creek) samples, or less so esker or beach deposits. A creek can concentrate heavy minerals 100-1000x+ over unconsolidated till which is why the KIM count increased considerably in the next four OGS-OFR reports. For example, 6043 took 256 alluvium and 2 till; 6088 – 254 alluvium, 14 glaciofluvial, 1 beach, and 8 till; 6119 – 175 alluvium, 6 glaciofluvial, and 2 till; 6124 – 317 alluvium, 22 glaciofluvial, 2 beach, and 6 till. Grand total: 876 pre-concentrated alluvium, etc. samples and 18 till results in 1371(69) and 45(610) or 12 Cr pyropes in every 19 samples. This is 21x higher results than till samples alone.
In contrast to 6060 till results, ODM recovered 30 Cr pyropes in a 12kg sample, which reflects on my sampling and concentration results for KIMs. Separately, OGS-OFR 6088 and Cabo found 32 and 35 Cr pyropes just down-ice of 4282172 in two individual samples.

An interesting read is GSC-Open File 7111-2014. This report's basic premise is

> "indicator minerals break down (comminute) during transport 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 (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, and were not tested due to problems related to equipment and test parameters.

The results were surprising as they contradict many previous assumptions (other previous test experiments used **non-kimberlitic** industrial garnets), particularly related to garnet durability. Garnets lost mass and broke into small 'pieces' way faster than the 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 should always decrease downflow in dispersal trains due to some combination of comminution, dilution, and/or selective sorting." (Cummings et al. (2014))

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

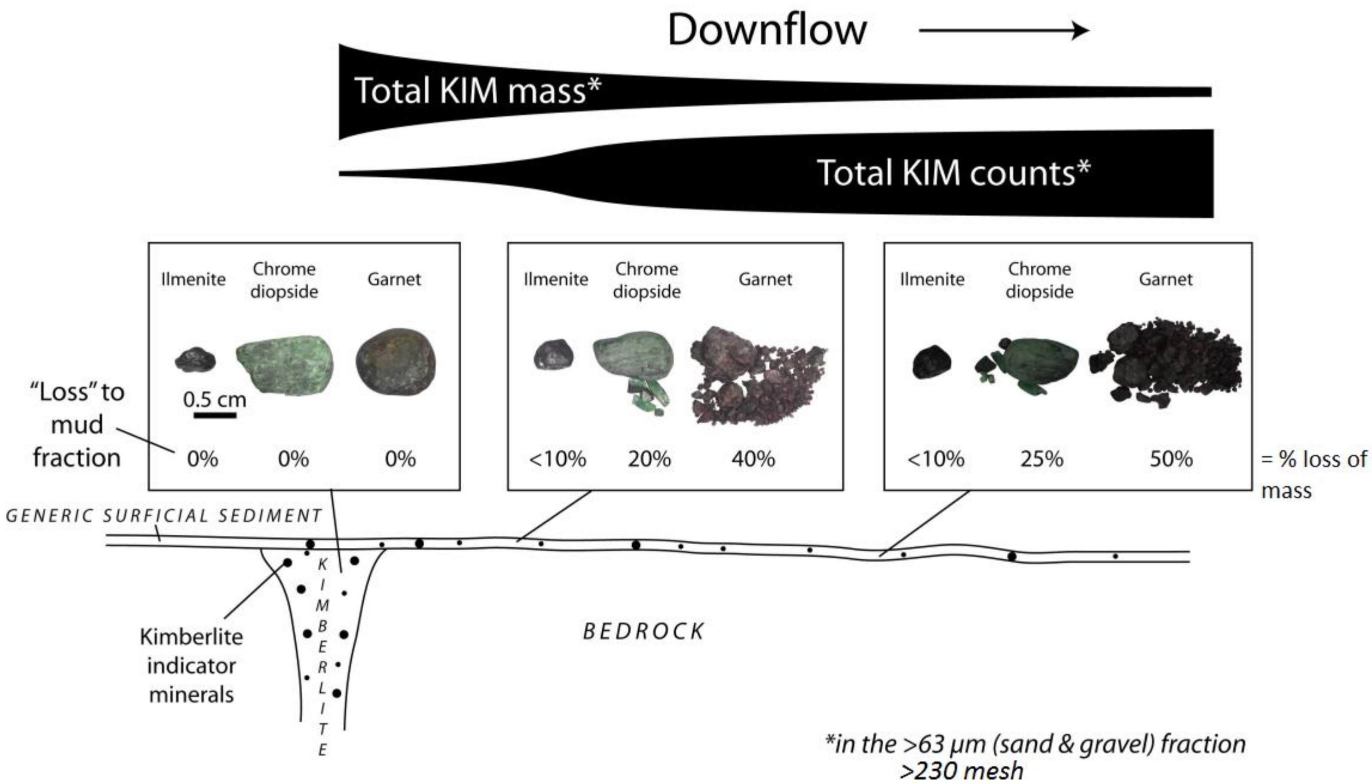


Figure 1: Farther downflow, total KIM counts would decrease, assuming continued comminution (in addition to selective sorting and/or dilution). (Cummings et al. (2014))

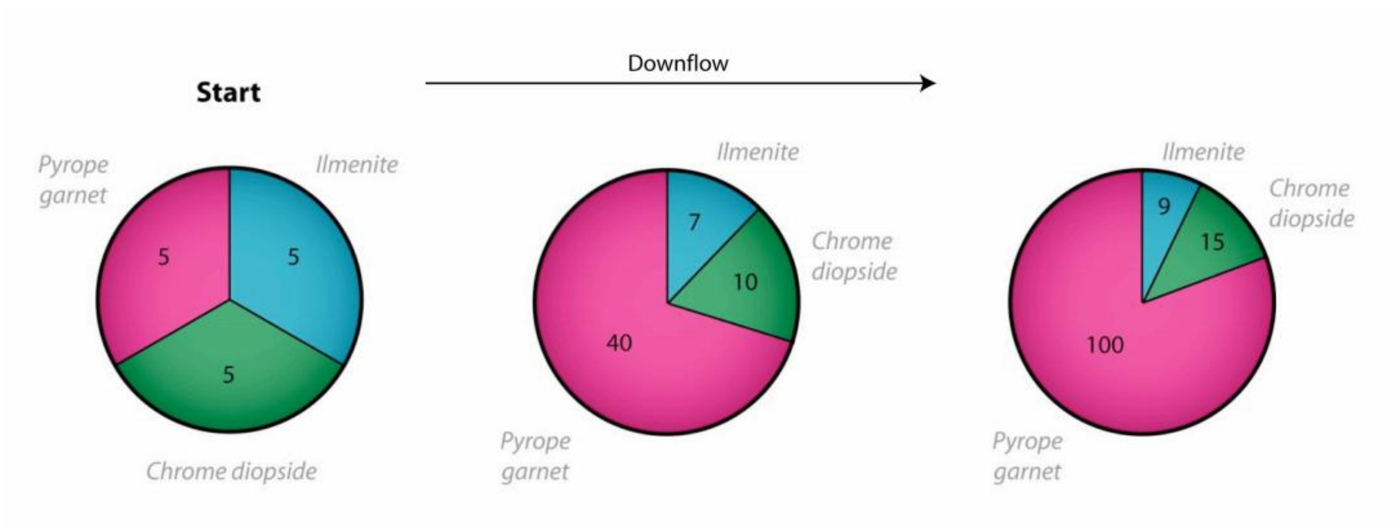


Figure 2: Downflow evolution of indicator mineral assemblages … in which rapid break down of larger pyrope garnets produces abundant sand-sized grains. … Numbers refer to grain counts. (Cummings et al. (2014))

So for interest's sake and interpretation of sampling results for KIMs, I produced the following charts. For simplicity in calculations, I assumed rounded grains. These charts show the relative masses/volume of various sizes of KIM grains and the numbers of smaller grains required to equal the mass of each successive larger size.

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 maximise returns – this chart explains why.

However, looking for 1.0-2.0mm and 2.0-3.0mm grains becomes much more important (especially Cr pyrope) as one or two of this size indicates a proximal source, even (especially) if many small grains are also encountered.

So larger grains should be given more value than many smaller grains.

RECOMMENDATIONS FOR FUTURE WORK:

High numbers of Cr pyrope and other KIMs were found immediately down-ice of 4282172, including a G10. Low to zero Cr pyropes and other KIMs were recovered in off-ice directions. This, combined with the distance to known pipes, makes it prudent to continue treating the lakes Ice Chisel and/or Darwin as hosting kimberlites and to continue working to prove so.

This is made more interesting in that in the breadth of two townships, Gillies Limit and Lorrain, in a line ~15km long trending southwest-northeast, are 12 targets being considered as potential kimberlites, and the easternmost target intersects a northwest-southeast line paralleling the Cross Lake Fault ~6km long that comprises another 7 targets also being considered as potential kimberlites, all are near major faults and many have cross faults running through or near to them. These comprise the 'Bishop Claims'. Kimberlites are commonly found in 'clusters'.

One of The Majors verbally stated that they had not looked at this area and that the published and in-house mag flyovers at 200m spacing could easily have missed them, as typically diamondiferous pipes in Canada are between 60-200m wide, and although I did try to explain that having a weak to no mag signature in some Canadian kimberlites consistently correlates to higher diamond content so no recognisable mag signature might be a good thing [see Appendix 2, page 25], the senior representative, however, insisted on the importance of a 'solid' mag signature as important to the company (which is true in some areas but not on my claims).

These targets comprise nearly perfectly round to half-round – when faulted, lakes of the same size range as the diamond mines and other kimberlites found in the Lac de Gras area where virtually all kimberlites are found beneath round lakes, as are all my targets. Attawapiskat, having been covered by the post-glacial Tyrell Sea, however, has a pretty much flat, featureless surface, but with pipes having approximately the same size as Lac de Gras.

As Appendix 2 [page 25] demonstrates, if my targets are diamondiferous kimberlite pipes, then utilising geophysics will cost lots but provide little in the way of useful diagnostic results. Basically, productive pipes in Canada often/usually have no demonstrable mag, EM, or gravity anomalies.

Therefore, I will continue to sample till and report the results. I will continue to look for kimberlite boulders, which although difficult in overgrown, rough terrain, is strong evidence for proximity to a close up-ice pipe. Three samples of kimberlite have been found on my other claims along with one other possible sample. Continued sampling and prospecting is also planned.

An excellent advantage of the 'Bishop Claims' is location. They are all on high/dry ground. Driveable roads are within a kilometre, year-round roads (including the Trans Canada Hwy 11) are less than 10km distant. Cobalt, one of the most important mining communities in Canada, is nearby with its railway system and infrastructure. There is no developed private land adjoining any claim, it's mostly undeveloped Crown land in all directions.

EXPENSES of Assessment Work Claim L 4282172 to November 27, 2017

Work Type	Units of work	Cost per unit of work	Total Cost
Field survey/prospecting/supervision – 3 traverses	Tony Bishop: 3 days	$500 per day	$1,500
Field assistants for 3 traverses	Graeme Bishop: 3 days; Patrick Harrington: 1 day	$285 per day	$1,140
Consulting Geologist – processing 1 till sample (see Traverse 1), consultation re analysis/interpretation	Douglas Robinson, PEng: 1 day	$850 per day	$850
Aerial fly-over: Technical on-site consultation (Traverse 4)	David Crouch, PEng: ½ day	$850 per day	$425
Aerial fly-over: operator, use of drone equipment, file storage	Grant Morgan: 1 site contract	$500 per site contract	$500
Till sample processing, HMC, separating into multiple size fractions, sorting, microscope picking, interpretation of KIMs and logging results, microphotography of select grains & KIMs picked, computer storage of micro-photos, storage of picked grains & concentrates picked	Tony Bishop: 10 samples (does not include ODM split kept)	$500 per sample	$5,000
ODM sample preparation [see page 57]	Tony Bishop: ½ day	$500/day	$250
ODM concentrating kept portion (5 of 10 samples) - HMC only	Tony Bishop: ½ day	$500/day	$250
Selection & mounting of grains for EMP and SEM analysis	Tony Bishop: ½ day	$500 per day	$250
Sampling plans, report preparation, map compilations, interpretations, consultations	Tony Bishop: 6 days	$500 per day	$3,000
GeoLab EMP & SEM invoice 12021117006	EMP 21 grains	$16.27 per grain (inc HST)	$342
	SEM 13 grains of 35	Prorated 13/35 x $336.18 (inc HST)	$125
ODM Laboratory Services Sample DC-ICL-TZ-72 invoice 917052	Sample Processing	$546	$546
Fe(II) - Austenite consultation	David Crouch, PEng: ½ day	$850 per day	$425
Clerical support for reports & technical computer support	Chloë Bishop	$1,000	$1,000
Field work supplies: sampling tub, flagging tape, tape to seal sampling bags	Can Tire (28), Paul's New & Used (38), Can Tire (6)	$72	$72
Transportation based on OPA OEC rate	3 return trips to claim 248 km x 3 = 744 km; travel from 4282189 to 4282172 return (Aug 25/17) = 70km	$0.50 per km x 814 km	$407
Office supplies – notebooks/pencils, computer paper/printer ink	Dollarama (7), Northern Lights (56)	$63	$63
Shipping to ODM in Nepean	Purolator Aug 18/17	$69	$69
TOTAL VALUE OF ASSESSMENT WORK			**$16,214**

History of Development in the Cobalt Area

Before 1900, when the surveyors for the right-of-way of the Temiskaming and North Ontario (T.&N.O.) Railway worked north from North Bay past Long Lake Station [Cobalt, ON] up to Cochrane, there was limited activity in what is now Lorrain Township. Logging expeditions entered Lake Temiskaming after coming up the Ottawa River from Montreal as early as the late 1700s and some mid-to-late 1800s colonization of Lake Temiskaming on the Quebec shore. A farming community was settled in the 1880s on a bay a bit south and east of the Bishop claims in Lorrain Township, in addition to a mission of oblate Fathers, and the posts of the Northwest Company and Hudson Bay Trading Companies not far away on Lake Temiskaming. Charles Farr founded Haileybury in the late 1880s and petitioned the government for railway access to facilitate colonization of the area. A colonization road did exist which reached the southernmost part of Lake Temiskaming on the Ontario side, but was never widely used.

The first government infrastructure nearest the claim was the building of the T. & N.O. railway which passed to the west, reaching Cobalt, Ontario in 1903-1904, where a silver and cobalt-nickel arsenide deposit was discovered. The mining boom which followed the discovery of silver at Cobalt often dominated the geological interest in the area for many decades, and although prospectors and geologists closely explored the terrain all around Cobalt (leading to the settling of Silver Centre south of these claims in 1907-08), most of the exploration was guided by the search for more silver and cobalt-nickel arsenide deposits.

In the 1980s, there was renewed interest in the geology of the area, this time in search of diamond-bearing kimberlite pipes, stimulated in part by the discovery of an 800-carat yellow diamond by a settler “somewhere in the Cobalt area” in 1904 (which was sent out and cut into a number of stones by Tiffany’s of New York, and some are still to this day retained and treasured by great-granddaughters), but became overshadowed by the vastly rich silver discoveries of the day. Soil sampling and geophysics by companies like Cabo, Tres-Or Resources Ltd., and others in addition to exploration by the Ontario Geological Survey, uncovered many kimberlite pipes/dykes, some diamondiferous, which helped to outline the existence of a Lake Temiskaming Kimberlite Field on the Lake Temiskaming structural zone, which appears to have intruded the Canadian Shield in this region approximately 148 million years before present. Deep sonar has also revealed circular features beneath the water of Lake Temiskaming itself which are inferred to be kimberlite pipes.

As well, a number of diamondiferous lamprophyres have been discovered near Cobalt, including one just NW of Latour Lake in the south part of Lorrain Twp, and another on the “Nip” Hill in Cobalt, as well as others.

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 Lac de Gras kimberlite pipes, including producing mines, and advances in geo-chemical and structural geology analysis. This is not true of the Attawapiskat area where all but one kimberlite pipe exhibits high positive mags. This is due to having a magnetically quiet Paleozoic carbonite bedrock. As well, numerous kimberlite samples have secondary magnetite that creates a larger mag than just the kimberlite pipe itself would have.

However, the geology of Lac de Gras is largely granite cut by diabase dykes, the same scenario as in Lorrain and Gillies Limit, which explains why looking for magnetic anomalies will likely result in failure to detect kimberlite pipes. The kimberlites nearby to the north in the New Liskeard/Haileybury area were, however, found by their mag signatures, but as is shown on the Geological Compilation map [see Appendix 3: Map 3, page 32], all these known pipes are in sedimentary (or metasedimentary – Peddie Pipe), a bedrock similar to Attawapiskat.

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." Page 9
- "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)

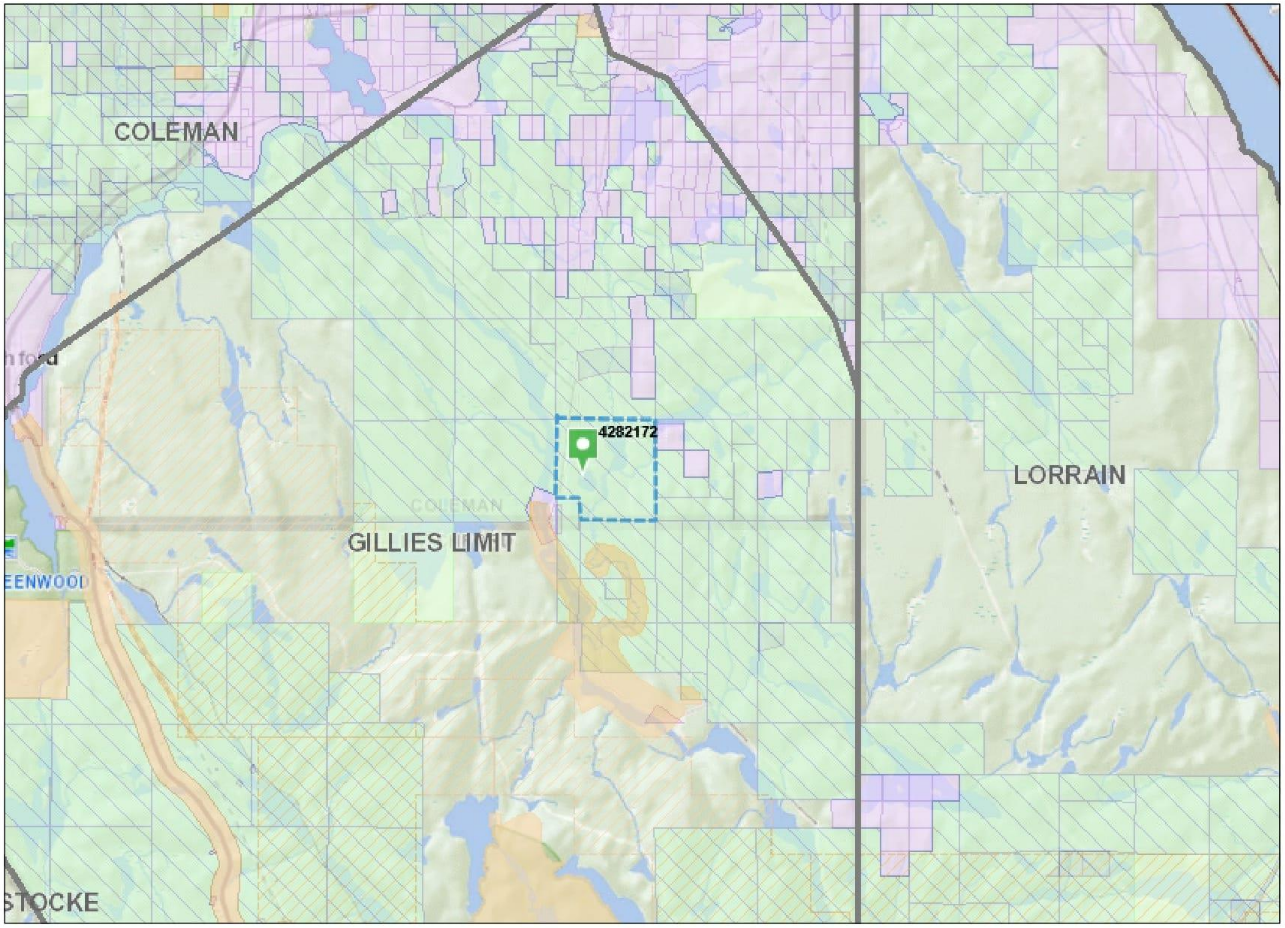
Map Appendix Overview

Ontario

MINISTRY OF NORTHERN DEVELOPMENT AND MINES
CLAIMaps

4282172 LOCATION

Notes:
Ice Chisel Lake & Darwin Lake



Legend

Administration Boundaries
- Mining Divisions
- Resident Geologist District
- Townships and Areas
- UTM Grid
- Geographic Lot Fabric
- Other Federal Land

Mineral Tenure Grid
- OMTG Tenure Grid

Alienations
- Withdrawal
- Notice

Unpatented Claim
- Active
- Reconciled
- Pending

Disposition
- Disposition

Disposition Symbols
- Camp
- Disposition Unknown/Pending
- Freehold Patent Mining Rights Only
- Freehold Patent Surface Rights Only
- Freehold Patent Surface and Mining Rights
- Land Use Permit
- Leasehold Patent Mining Rights Only
- Leasehold Patent Surface Rights Only
- Leasehold Patent Surface and Mining Rights
- License of Occupation Mining Use Only
- License of Occupation Surface Use Only
- License of Occupation Surface and Mining Rights
- License of Occupation Uses Not Specified
- Order in Council
- Tower
- WPLA

Geology Layers
- AMIS Sites
- AMIS Features
- Drill Holes
- Mineral Occurrences

0 4.79 km

Projection: Web Mercator

N

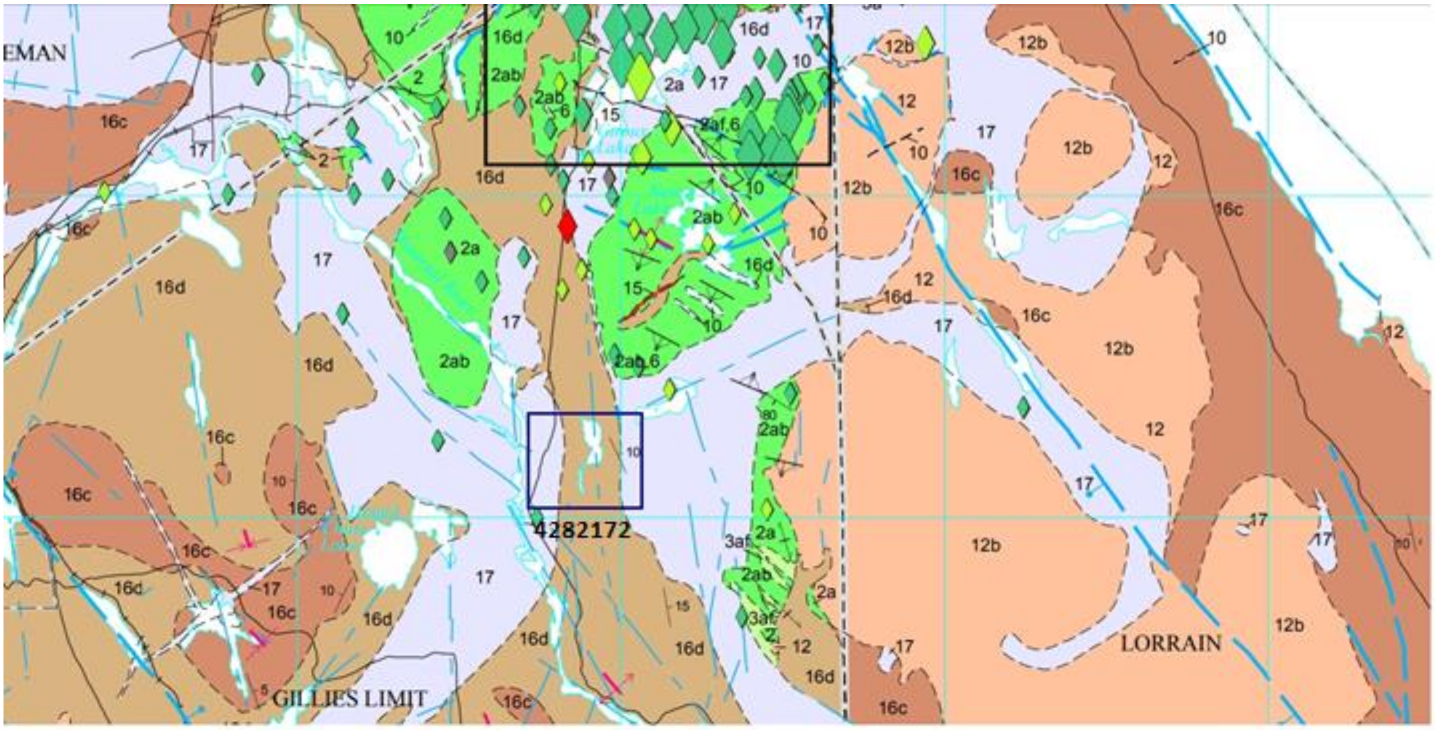
The Ontario Ministry of Northern Development and Mines shall not be liable in any way for the use of, or reliance upon, this map or any information on this map. This map should not be used for: navigation, a plan of survey, routes, nor locations.

Imagery Copyright Notices: Ontario Ministry of Natural Resources and Forestry; NASA Landsat Program; First Base Solutions Inc.; Aéro-Photo (1961) Inc.; DigitalGlobe Inc.; U.S. Geological Survey.

Map 2

Cobalt
11B
Gillies
Kerr Lake
Gillies Depot
Trans-Canada Hwy
567
4282172
3.48 km
© 2017 Google
Image © 2017 DigitalGlobe
Google Earth
Tour Guide
Imagery Date: 7/23/2011 17 T 600890.00 m E 5244453.44 m N elev 336 m eye alt 16.23 km

Appendix 3



Scale 1:100 000

2000 m 0 2 4 km

Claim #428 2172

LEGEND[abcd]

PRECAMBRIAN

PROTEROZOIC

NIPISSING

17	**Mafic Intrusive Rocks:** diabase, granophyre

HURONIAN SUPERGROUP

16	**Sedimentary Rocks**
	16a Bar River Formation[e] 16b Gordon Lake Formation[e] 16c Lorrain Formation
	16d Gowganda Formation
	16f Mississagi Formation

ARCHEAN

NEOARCHEAN

12	**Felsic to Intermediate Intrusive Suite** 12a Tonalite, granodiorite, trondhjemite 12b Granite, quartz monzodiorite, quartz diorite 12c Schistose textured

INTRUSIVE CONTACT

8	**Timiskaming-Type Clastic Metasedimentary Rocks** 8a Arenite 8b Wacke 8c Conglomerate 8d Mudstone, siltstone 8e Schistose textured

UNCONFORMITY

6	**Clastic Metasedimentary Rocks** 6a Arenite 6b Wacke 6c Conglomerate 6d Mudstone, siltstone 6f Schistose textured
2	**Mafic (to Intermediate) Metavolcanic Rocks/Intrusions** 2a Massive flows 2b Pillowed flows

Map Portion courtesy of

Ontario

Ontario Geological Survey

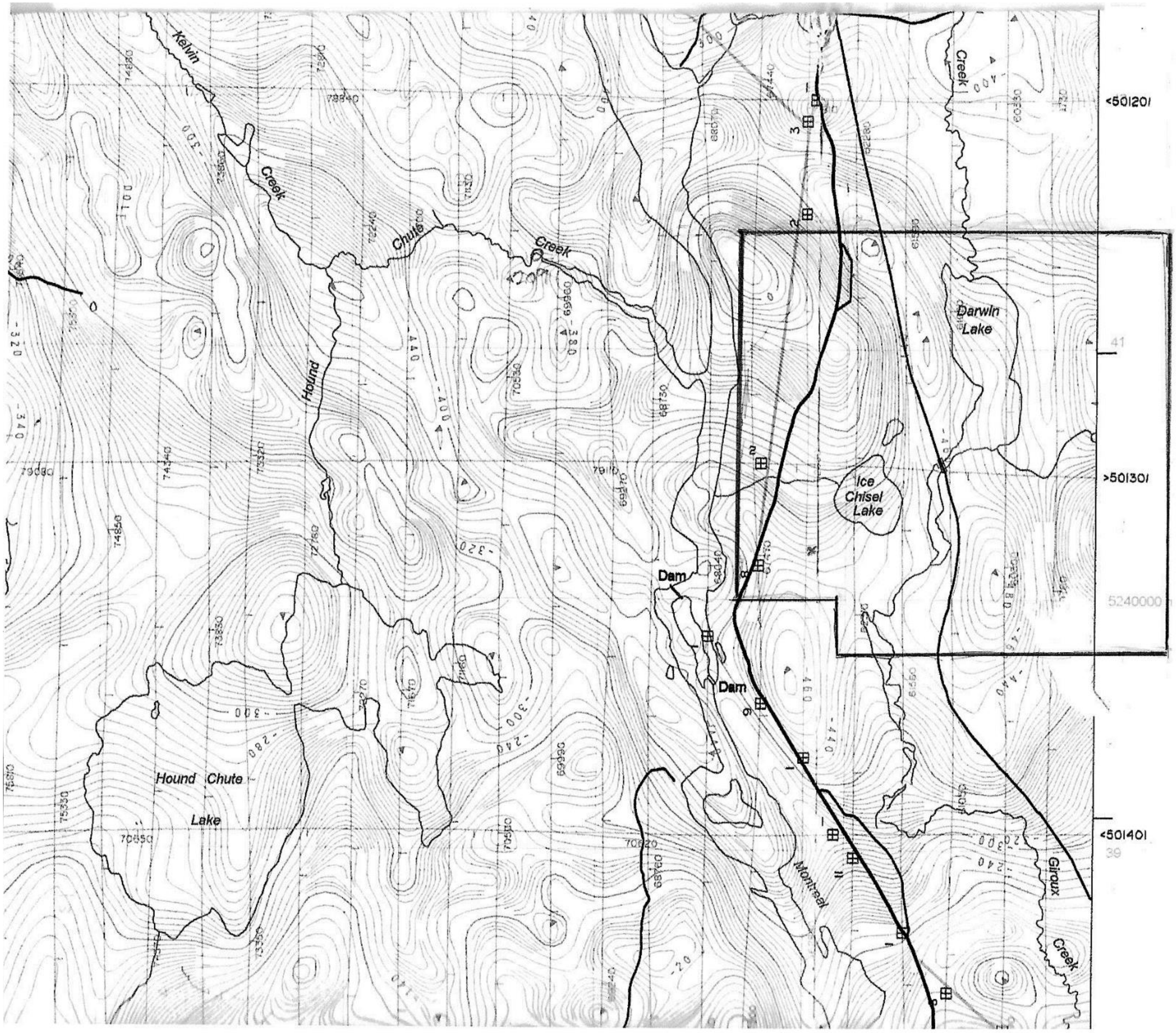
MAP P.3581

PRECAMBRIAN GEOLOGY

GEOLOGICAL COMPILATION OF THE COBALT–TEMAGAMI AREA, ABITIBI GREENSTONE BELT

Map 3

Appendix 3



Scale 1:20 000

500 m 0 0.5 1 km

Map Portion courtesy of

Ontario

Ontario Geological Survey

MAP 82 066

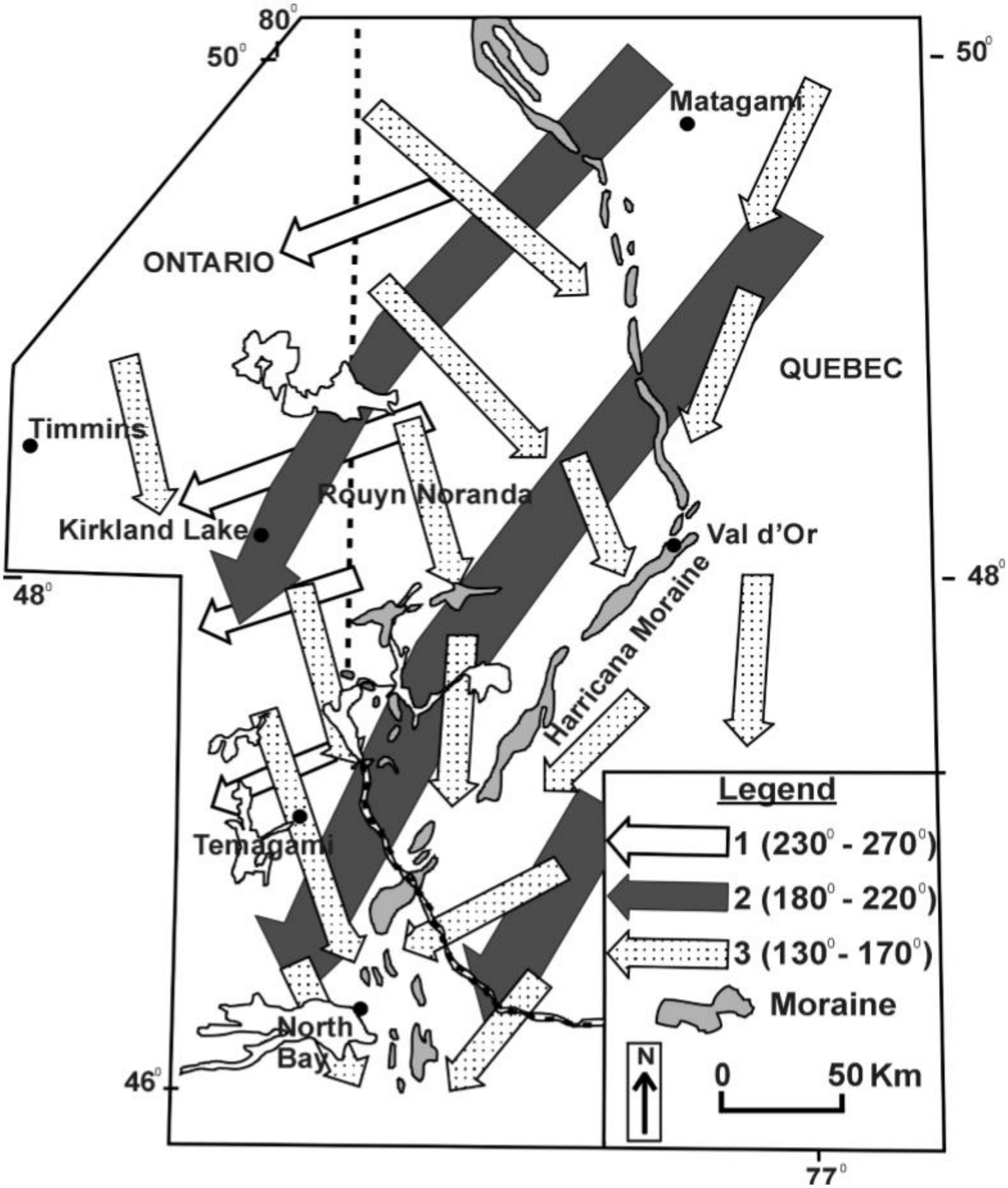
AIRBORNE MAGNETIC AND
ELECTROMAGNETIC SURVEYS

TEMAGAMI AREA

N

Claim #4282172

Map 4

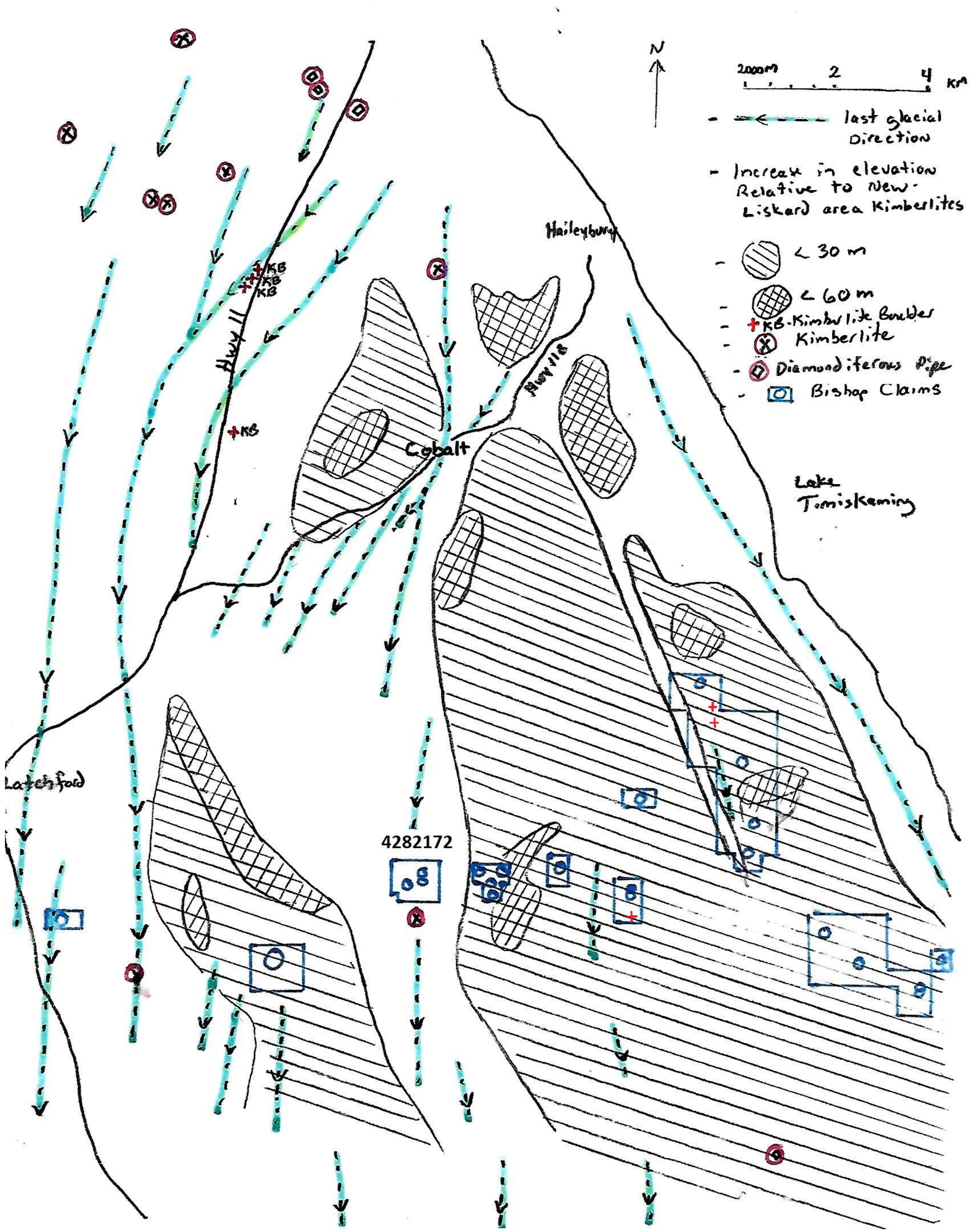


Ice flow movement in the Abitibi-Temiskaming area. The oldest ice flow event is the number 1 movement, the youngest the number 3 movement (after Veillette 1986).

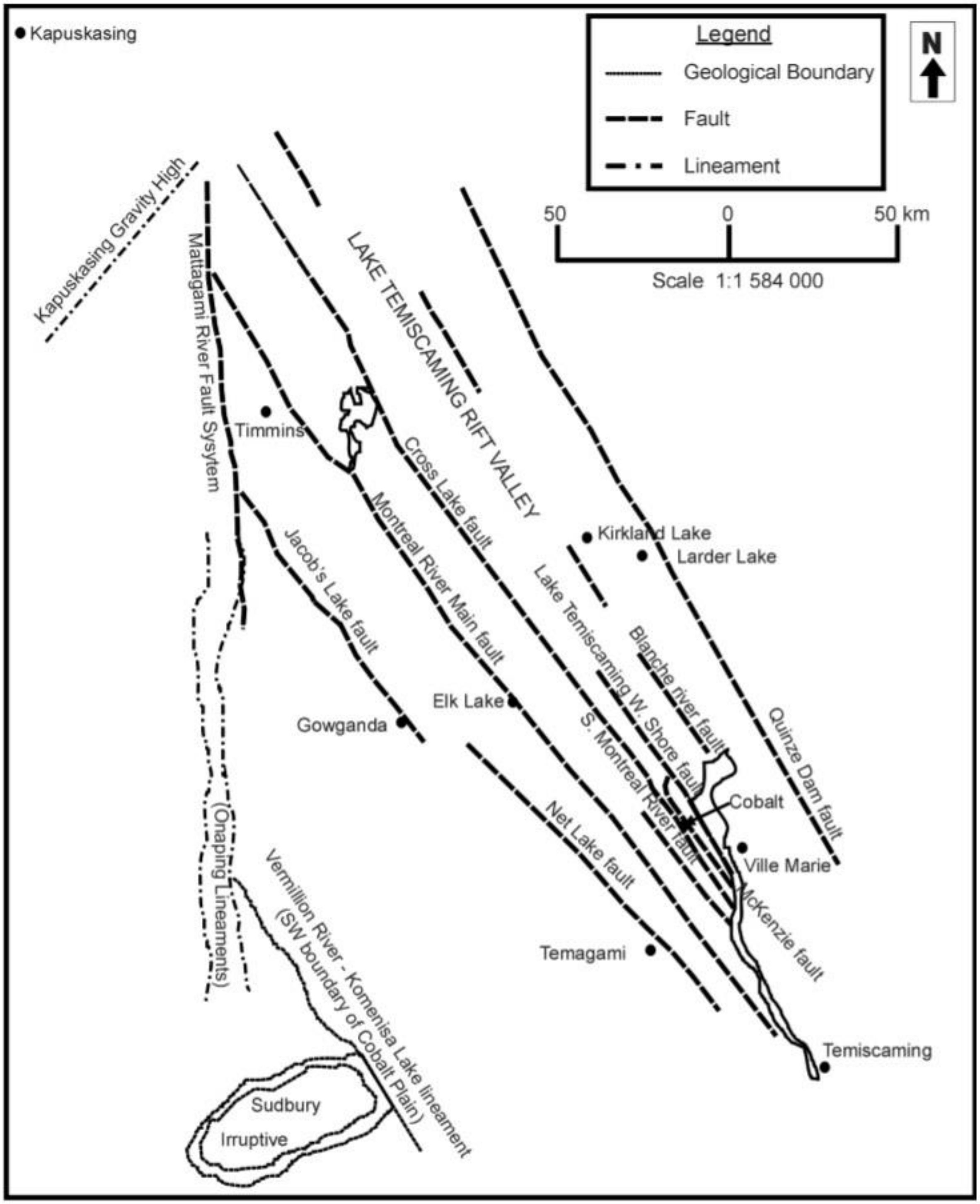
Used courtesy of
Ontario Geological Survey
Open File Report 6088

Map 5

Appendix 3



Map 6

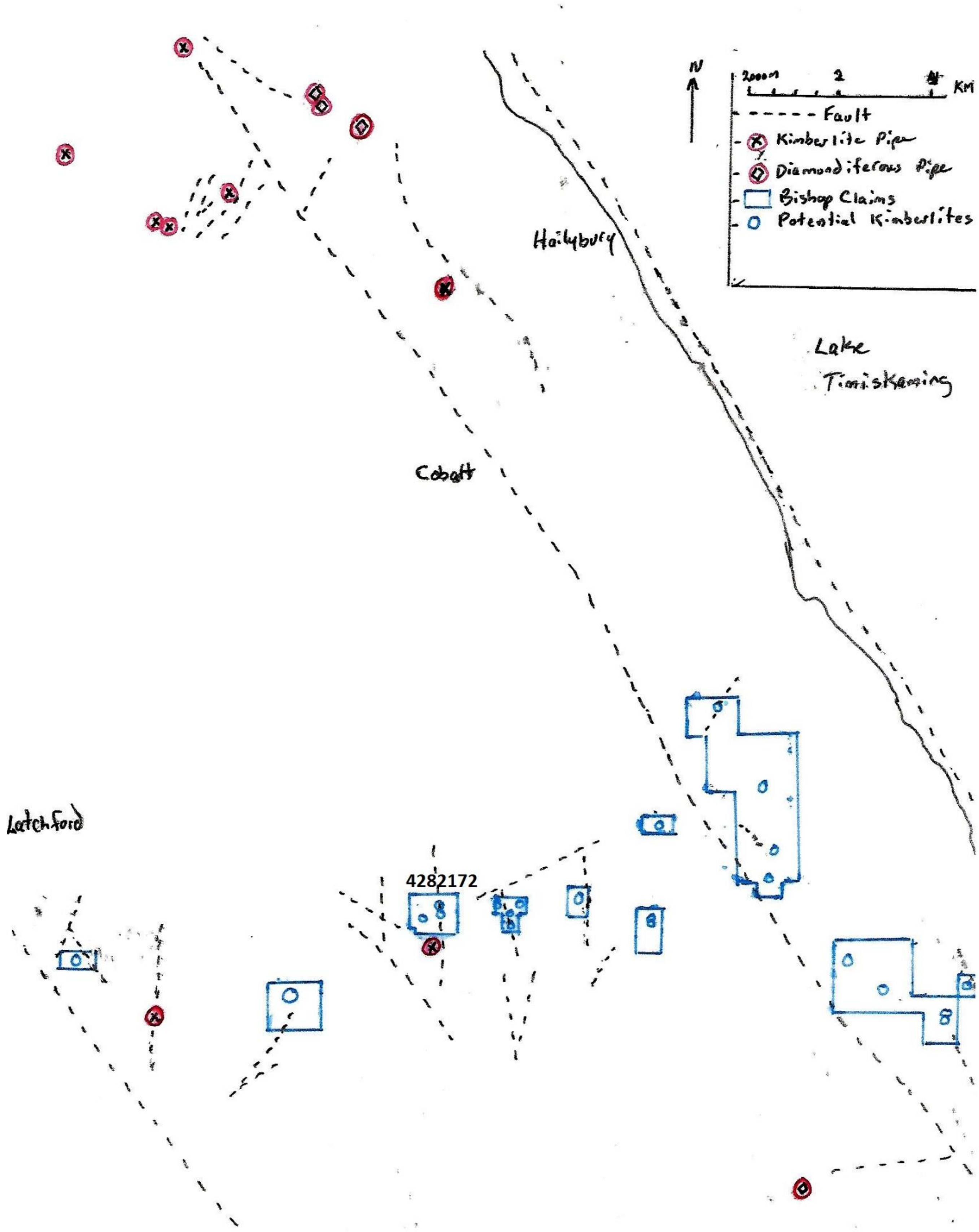


The Lake Temiskaming Rift Valley (also known as the Lake Temiskaming Structural Zone) (after Lovell and Caine 1970).

Used courtesy of
Ontario Geological Survey
Open File Report 6088

Map 7

Appendix 3



Map 8

Appendix 3

Down-ice

N

Map 9

N

Down-ice

Map 10

Traverses Appendix Overview

TRAVERSE 1: June 6, 2016 – Fieldwork, Map, & Field Notes

TRAVERSE 2: June 26, 2016 – Fieldwork, Map, & Field Notes

TRAVERSE 3: August 4, 2017 – Fieldwork, Map, & Field Notes

TRAVERSE 4: August 25, 2017 – Fieldwork, Map & Field Notes

FIELDWORK: Please refer to Appendix 6 for Methodologies for Field Work and Till Sample Processing

L 4282172 – Ice Chisel Lake/Darwin Lake

Traverse 1: fieldwork June 6, 2016 Brian A. (Tony) Bishop, Graeme Bishop

Graeme and I left early to prospect the claim 4282172.

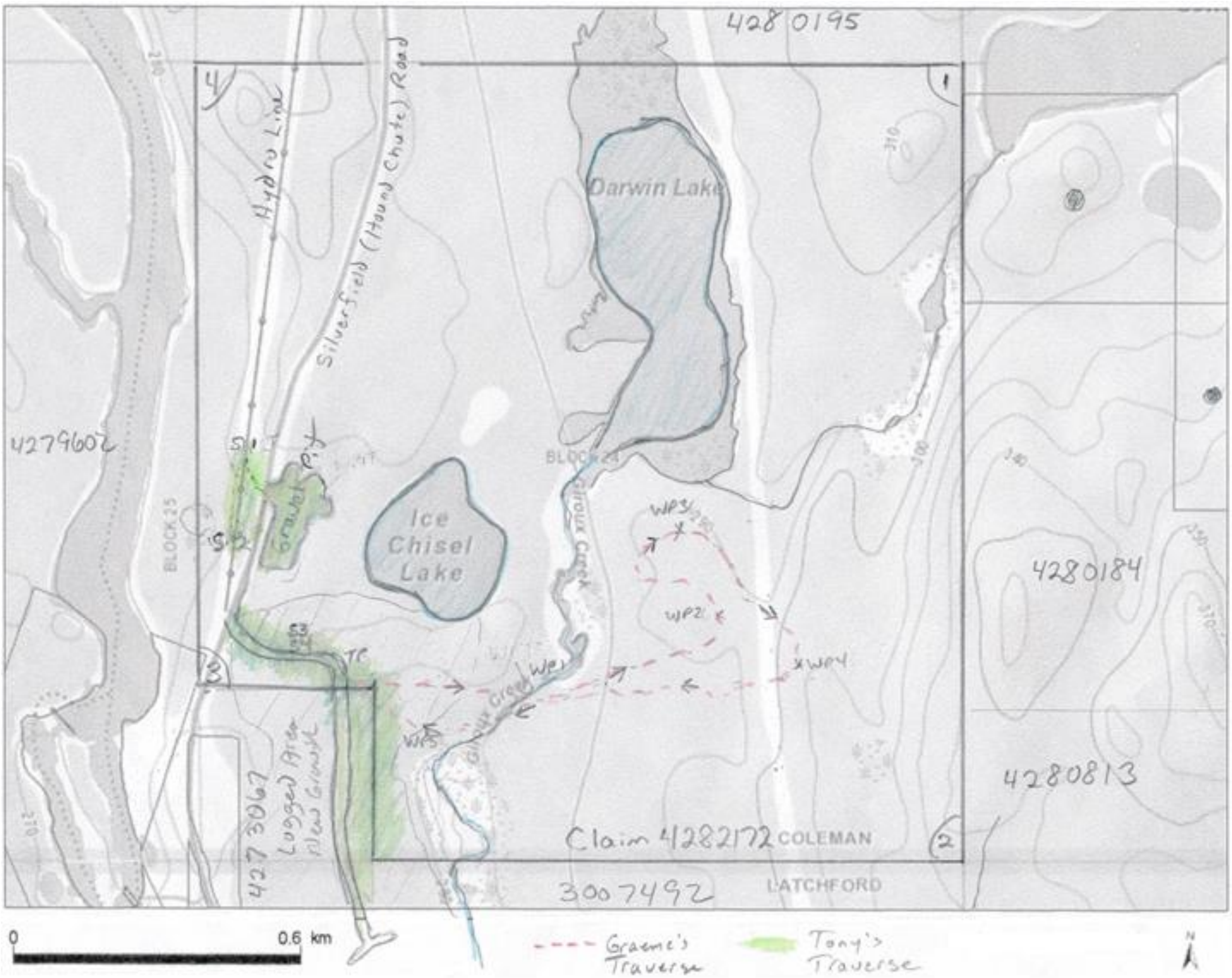
As preplanned from a detailed viewing of various maps, Graeme (being the younger) left the truck to prospect down-ice of Darwin Lake on the southwest corner of the claim, mainly on the lookout for kimberlite or other mineralized boulders/outcrops. The going was fairly difficult from the ~10-year-old growth from previous logging. Boulders were scraped of moss, and a few chip samples were taken off various rocks for later viewing. Particular attention was given to upturned tree roots where clean cobbles/rocks were easily viewed.

Meanwhile, I prospected on and near the logging road south of Ice Chisel Lake (ICL). On some maps, a creek is shown flowing from ICL to the west into the Montreal River. The creek was not found, but a gravel pit accessed from Hound Chute Road was prospected for kimberlite boulders. To the west, a dirt road to the hydro line exposed another area of sand/gravel which was also viewed. Two samples were taken on the hydro line (S1 & S2) for later concentrating and viewing as off-ice samples. Two additional samples (S3 & 34) were taken off-ice on the logging road several feet apart, one each for Doug Robinson (PEng) and myself, to run separately and match results.

Appendix 4

L 4282172 – Ice Chisel Lake/Darwin Lake

Traverse 1: map   June 6, 2016   Brian A. (Tony) Bishop, Graeme Bishop



Traverse 1: Map

Appendix 4

L 4282172 – Ice Chisel Lake/Darwin Lake

Traverse 1: field notes June 6, 2016 Brian A. (Tony) Bishop, Graeme Bishop

Sample #	Coordinates 17T UTM	Elevation (feet)	Activity/Description
S1	0598688_E 5240692_N	904’	Off-ice to Quarry west of Hound Chute Road on power line cut in gully 20-30’ deep x 300’ across. Approximately 9km to Peterson Lake; Sand/gravel till
S2	0598764_E 5240719_N	942’	Off-ice sample on power line cut; Sandy/gravel till
S3	0598747_E 5240389_N	954’	Samples S3 & S4 were taken ~2’ apart for Doug and Tony to run separately and match results; Off-ice, 3’ deep hole; Sandy/gravel till
S4	0598747_E 5240389_N	954’	Samples S3 & S4 were taken ~2’ apart for Doug and Tony to run separately and match results; Off-ice, 3’ deep hole; Sandy/gravel till

Location #	Coordinates 17T UTM
Truck Park (TP)	0598932_E / 5240399_N
WP1	0599322_E / 5240347_N
WP2	0599656_E / 5240521_N
WP3	0599598_E / 5240690_N
WP4	0599879_E / 5240405_N
WP5	0599071_E / 5240213_N

Location #	Coordinates 17T UTM
Corner post #1	0600180_E / 5241600_N
Corner post #2	0600200_E / 5240017_N
Corner post #3	0598600_E / 5240400_N
Corner post #4	0598610_E / 5241606_N

L 4282172 – Ice Chisel Lake/Darwin Lake

Traverse 2: fieldwork June 26, 2016 Brian A. (Tony) Bishop, Graeme Bishop, Patrick Harrington

A sampling program was initiated by reviewing various sources such as Google Earth and topographic and geological maps to best select till sample sites based on glacier ice movement directions, topography etc., as well as utilizing information gained on the first traverse. After driving down from Kirkland Lake we parked at UTM17 059888_E and 5240383_N GPS co-ordinates.

As pre-planned, Patrick Harrington walked to the east with a sample map down-ice of Darwin Lake. Graeme sampled below Ice Chisel Lake and separately in the creek flowing out of Darwin. I did some general prospecting and looked for exposed boulders on the surface looking for kimberlite float below Ice Chisel Lake. (As of writing this report, kimberlite boulders have been found on two other claims/targets with a possible third waiting for positive ID.) The apparent lack of outcrops and thick new growth made prospecting difficult.

When the samplers Graeme and Patrick returned at day's end, I catalogued and carefully stored the till and creek samples for transport and later processing. A total of 7 till and 3 creek samples were taken.

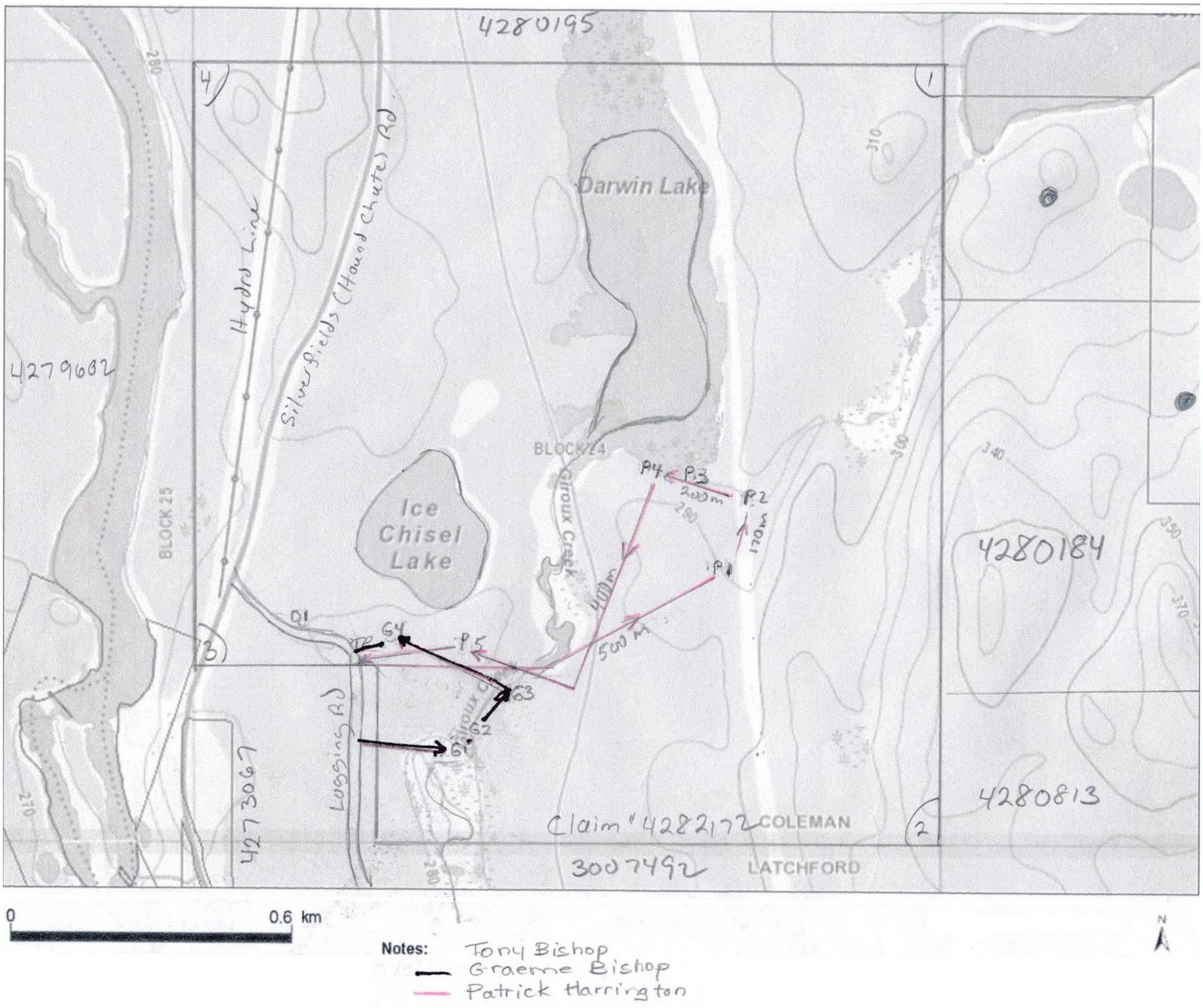
As is prudent, till samples by Patrick and Graeme were taken under overturned tree roots when near map co-ordinates or near any similar advantageous feature in the field. The stream samples took advantage of inner curves, sand bars, and behind boulders.

The size of the samples varied from 1-4kg and most were not screened in the field (except for the creek samples) due to the difficulty of screening fine material from moist or clay till. Larger rocks/branches etc. were removed by hand while sampling. The samplers visually checked for kimberlite and mineralized cobbles while removing detritus.

Appendix 4

L 4282172 – Ice Chisel Lake/Darwin Lake

Traverse 2: map June 26, 2016 Brian A. (Tony) Bishop, Graeme Bishop, Patrick Harrington



Traverse 2: Map

Appendix 4

L 4282172 – Ice Chisel Lake/Darwin Lake

Traverse 2: field notes June 26, 2016 Brian A. (Tony) Bishop, Graeme Bishop, Patrick Harrington

Sample #	Coordinates 17T UTM	Elevation (metres)	Activity/Description
P1	0599773_E 5240547_N	303	Boulder/gravel/sand
P2	0599799_E 5240714_N	297	Sandy/gravel
P3	0599719_E 5240747_N	290	Damp sandy/gravel
P4	0599604_E 5240754_N	289	Wet humus/sandy mix
P5	0599185_E 5240374_N	291	Sandy/gravel till
G1	0599209_E 5240182_N	283	Creek sample
G2	0599219_E 5240200_N	283	Creek sample
G3	0599315_E 5240336_N	283	Creek sample
G4	0599045_E 5240392_N	292	Sandy/gravel till
O1	0598846_E 5240400_N	293	Off-ice sample; Sand/gravel till

Location #	Coordinates 17T UTM
Truck Park (TP)	0598888_E / 5240383_N

Location #	Coordinates 17T UTM
Corner post #1	0600180_E / 5241600_N
Corner post #2	0600200_E / 5240017_N
Corner post #3	0598600_E / 5240400_N
Corner post #4	0598610_E / 5241606_N

Appendix 4

L 4282172 – Ice Chisel Lake/Darwin Lake

Traverse 3: fieldwork   August 4, 2017   ODM Collection   Brian A. (Tony) Bishop, Graeme Bishop

Due to excellent results in previous sampling, I decided to resample down-ice of Ice Chisel Lake in a similar manner as Traverse 2. The purpose was to take a number of samples from nearby the previous locations, and send them to Overburden Drilling Management (ODM). A total of 7 till samples and 3 creek samples were taken over two traverses. Time was also spent prospecting along the way.

As is best for local sampling [see Diagrams D & E, pages 53-54], I washed each sample to remove silt and screened to -6 mesh. Each sample was then partially dried over several days to a damp consistency in order to be able to create a homogenous concentrate when mixed. Then ~± 1.0 kg was removed from each sample to create close to ideal 10kg (it was actually 12.7kg damp) total weight, 9.3kg till (~73% weight) and 3.4kg alluvium (~27% weight). I then put this total into an industrial tumbler for ½ hour. This mixture was bagged and carefully packaged to send to ODM. An identical split was kept by me to concentrate as a comparison. The leftover was stored. My split-half has been concentrated but still requires KIM picking and sorting under the microscope. Findings will be included in a subsequent report.

Appendix 4

L 4282172 – Ice Chisel Lake/Darwin Lake

Traverse 3: map August 4, 2017 ODM Collection Brian A. (Tony) Bishop, Graeme Bishop

Traverse 3: Map

L 4282172 – Ice Chisel Lake/Darwin Lake

Traverse 3: field notes August 4, 2017 ODM Collection Brian A. (Tony) Bishop, Graeme Bishop

Sample #	Coordinates 17T UTM	Elevation (metres)	Field Weight (KG)	ODM Split Weight (KG)	Activity/Description
TR1	0598969_E 5240534_N	290	4.0	1.6	~Dry/damp – tree root
TR2	0599013_E 5240496_N	290	2.1	0.6	~Dry/damp – tree root, blow down
T1	0599006_E 5240470_N	290	3.7	1.2	~Dry/damp – mostly sandy
T2	0599088_E 5240419_N	291	3.3	1.0	~Dry/damp – sand/gravel
T3	0599189_E 5240416_N	292	3.0	1.4	~Dry/damp, sandy till
T4	0599000_E 5240255_N	289	4.0	1.4	Sandy/cobbles
T5	0599143_E 5240268_N	292	5.2	2.1	Sandy/cobbles
C1	0599299_E 5240331_N	284	6.9kg wet	1.2	Creek sample
C2	0599210_E 5240242_N	283	5.2 kg wet	1.0	Creek sample
C3	0599203_E 5240219_N	283	5.3 kg wet	1.2	Creek sample

Location #	Coordinates 17T UTM
Truck Park (TP)	0598902_E / 5240340_N

Location #	Coordinates 17T UTM
Corner post #1	0600180_E / 5241600_N
Corner post #2	0600200_E / 5240017_N
Corner post #3	0598600_E / 5240400_N
Corner post #4	0598610_E / 5241606_N

L 4282172 – Ice Chisel Lake/Darwin Lake

Traverse 4: fieldwork August 25, 2017 Brian A. (Tony) Bishop, David Crouch (PEng), Grant Morgan

Aerial Fly-over:

Upon hearing of mining companies contracting an operator/owner of a camera-mounted drone to obtain an aerial view of their property in the Cobalt area at minimal cost (relative to a helicopter rental), I located an engineer, David Crouch, and owner/operator, Grant Morgan, who have experience with the technology and drone photography, who travelled from Kirkland Lake to Cobalt where I met them so they could follow me to the first drone site at Cedar Pond (4282189). I left Cedar Pond after the aerial survey concluded on that claim, and drove to 4282172 to direct David and Grant to the second drone site before returning to my work on 4282189. Time was spent programming the flight path into the drone, and the flight was monitored in real-time. The resulting footage also enables individual 'frames' to be viewed to better delineate topography, outcrops, vegetation, etc. on the computer.

The footage can be seen on the digital copy of this report [see Appendix 15, page 90].

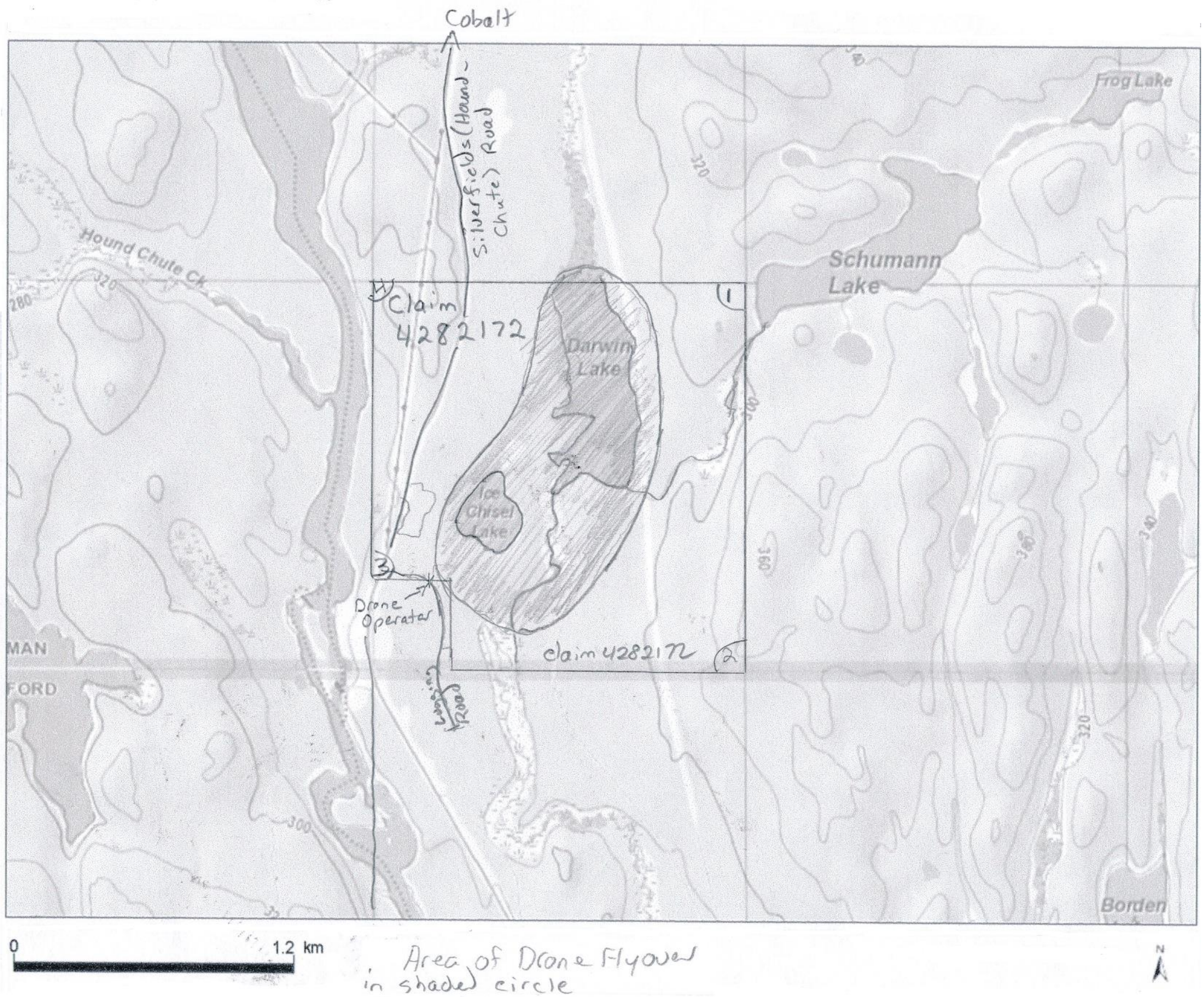
This achieved an unprecedented view of the suspected kimberlite pipes that are Ice Chisel and Darwin Lakes. The resulting hi-def video provided a view of the shoreline to look for rock outcrops/boulders, and access that would have been nearly inaccessible by foot, and can be closely viewed whenever necessary. I can see lots of potential for planning work.

In the future I might try to book flyovers before/after heavy leaf growth (i.e. early spring/late fall) to better recognise outcrops and other topographic features

Appendix 4

L 4282172 – Ice Chisel Lake/Darwin Lake

Traverse 4: map/field notes August 25, 2017 Brian A. (Tony) Bishop, David Crouch (PEng), Grant Morgan



Traverse 4: Map

Location #	Coordinates 17T UTM
Drone Operator	0598873_E / 5240344_N

Location #	Coordinates 17T UTM
Corner post #1	0600180_E / 5241600_N
Corner post #2	0600200_E / 5240017_N
Corner post #3	0598600_E / 5240400_N
Corner post #4	0598610_E / 5241606_N

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 many of the productive 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). [See 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 [see Specific Gravities chart below], 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.

Specific Gravities			
	Gold	-	19.3
(KIM)	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

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.

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.

With the right equipment however, an individual with some background 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. 'guestimated') to the full sample, possibly risking losing the few/any all-important G10s and other similar grains in the remaining portion.

As such, this Appendix is rather lengthy and details largely the method of processing till and stream samples by the author and achieving meaningful results.

METHODOLOGY/OVERVIEW OF FIELD WORK & TILL SAMPLE COLLECTION:

Standard 38cm x 28cm sample bags are used for collecting till samples. Small shovels are used to dig a 1' to 3' deep hole below the humus line and the bags filled ½ to ⅔ full, taped shut, and labelled. When possible, the sample is screened through a 4 mesh screen (typically just creek samples), or if not, then larger rocks and roots are removed by hand. If a sample site is very near to the transport vehicle I just remove larger cobbles and take a larger sample to be screened later, before concentrating. In between samples the equipment is cleaned as well as possible to avoid cross-contamination. GPS coordinates are taken at each sample site and then recorded if not matching the prechosen map coordinates.

The base of logging roads is basically composed of till collected immediately adjacent to the road as it is constructed. This makes for a very useful till sampling location, namely the area beside the road where the heavy machinery dug down from several to 10+ feet deep. This creates the possibility to collect from a number of horizons at various locations without mechanized equipment, thereby increasing the possibility of finding KIMs.

Whereas most approaches initially involves a regional sampling survey and then trace up-ice to the possible target, I start with identifying a potential target based on structural, glacial, landscape features, and publicly available OGS reports. I then take multiple samples to determine the likelihood of my target hypothesis, down-ice and off-ice for comparison.

My intent is basically to determine kimberlite pipe/or not a kimberlite pipe, based on a visual identification and number of KIMs picked from my till sample concentrates, and EMP analysis of an affordable minimal # of grains selected and sent for lab analysis. Interestingly, a number of exploration companies as well as ODM in Nepean have stated (within the last 5 years) that visually picked KIM grains and total number of KIMs are their criteria for continued interest in an area rather than analysis of grains. ODM said recently in an email that most companies have been adopting this approach. (From personal research it also appears that many of the most successful companies at finding new discoveries of diamondiferous kimberlite pipes now are looking for non- to low-mag and EM targets utilizing gravity surveys, which do not always produce usable results, and finally results in till sampling for KIMs as the primary prospecting tool), especially in a region with known kimberlites and certain geological backgrounds.

In their sampling programs, OGS Open File Reports on Alluvium Sampling Surveys recommend creek samples for a far more pre-concentrated material for heavy minerals including KIMs (not for some distance down-ice/water flow of a lake due to its being a heavy mineral trap), and so recommend to “maximise the distance between the sample site and the lake”, so I then thought that this is not true if the lake (heavy trap) is the source of KIMs. Large distances between sample spacing and large 10-30kg samples however, are more applicable to doing regional surveys while hunting for a ‘target’, i.e. in this case a kimberlite pipe. Also, creeks are rarely conveniently placed directly down-ice of a pipe-sized target (in Canada typically 50-200m in diameter) and they concentrate material from a large area, so when sampled can strongly skew results to high numbers of KIMs compared to till samples. In my case, where the lake itself is a potential kimberlite pipe, I take many (5-20) small 1-3 kg unscreened till samples, relatively closely spaced, from between ±50 to 1000 metres down-ice of the target, and generally combine the results into one larger sample, creating a more representative sampling of post-glacial conditions for emplacing KIMs into till.

As you can see, due to the lake being a heavy mineral trap for material up-ice/water flow, all the samples I take from ‘close’ proximity down-ice/water flow can in all probability be attributed to that lake (or in theory, a hidden pipe in very close proximity down-ice of the lake). So, any of these samples below a proposed pipe can individually or collectively statistically be attributed to this discrete target. Taking many smaller till samples from various locations down-ice was deemed appropriate to mitigate the extreme nugget effect caused by KIMs potentially being restricted to thin stratigraphic horizons in the till.

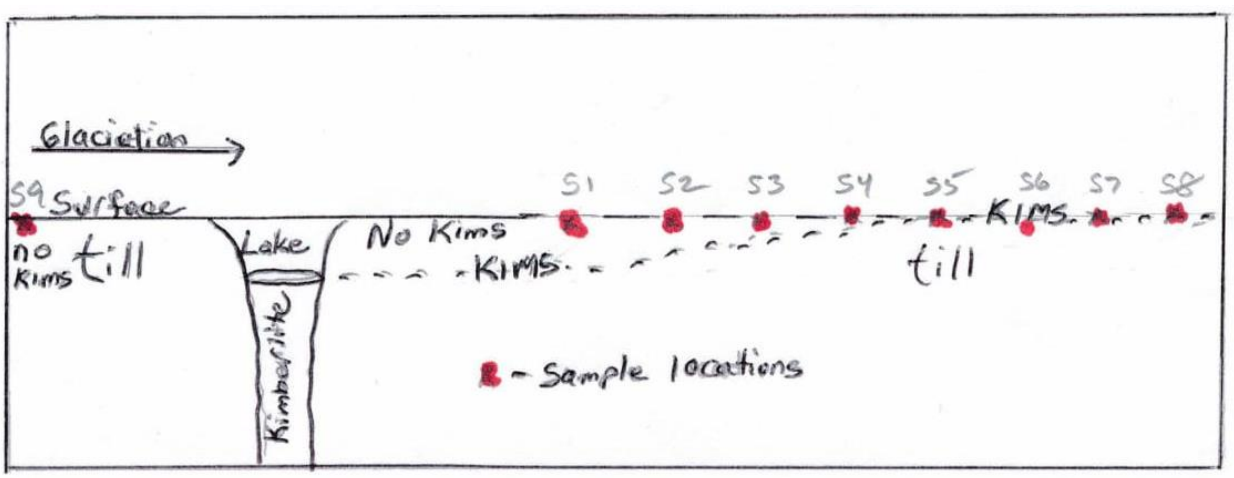


Diagram D – Side View – Till Sampling Program

- If only S1 and/or S2 and/or S3 and/or S4 in till were sampled, one would find no KIMs and conclude no kimberlite up-ice
- If any one of S5, S6, S7, or S8 were sampled one might get favourable results for KIMs
- If the S1 ↔ S8 results, after concentrating and picking KIMs, are combined to a single larger sample result the chance of finding KIMs increases dramatically even though only ‘one’ or more samples contained KIMs initially. This is demonstrably more efficient and accurate at predicting proximity to a kimberlite pipe than only one larger sample would do
- Up-ice, S9 is a check and should statistically contain little to no KIMs

- Further sampling can then help verify/delineate the source of the KIMs

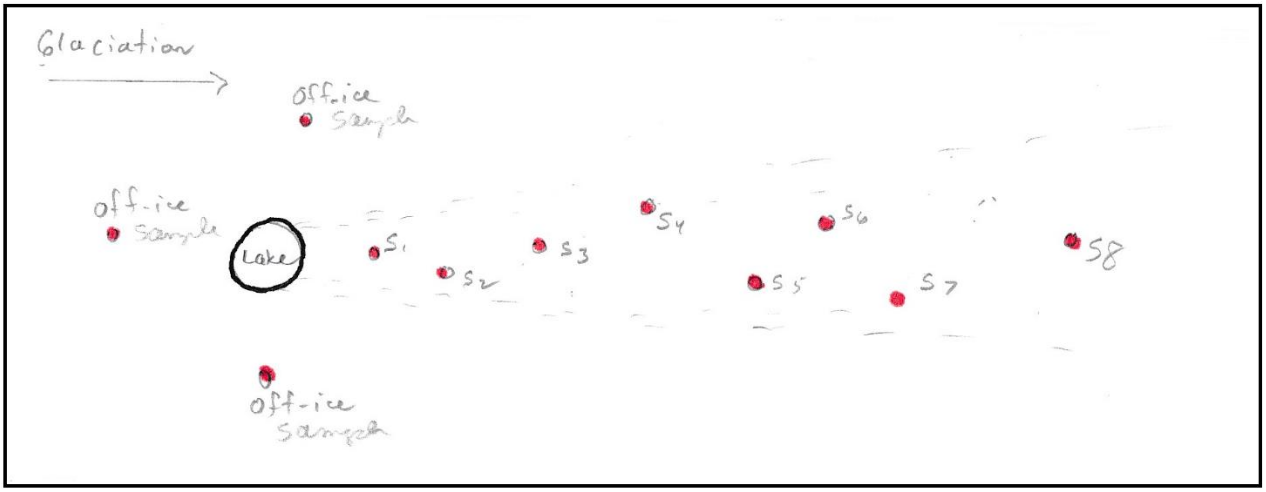


Diagram E – Top View – Till Sampling Program

- Same as Diagram D, with off-ice samples containing little-to-no KIMs if lake is a kimberlite pipe

My blended till samples increases finding one or more that are confined to the appropriate KIM emplacement zone: I concentrate off-ice samples individually/separately. When KIM counts in off-ice samples drop to very few to zero, it adds to the probability of a favourable target location.

After concentrating, 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 (sometime weeks) of work, especially when photographing and entering the photos into the computer correctly labelled.

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 overturned 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), (Grutter et al, 2004); therefore, I am including pink garnets in pyrope garnet counts.

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 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.

So… I'm sampling unconsolidated till, down-ice of a heavy mineral trap (lake) and taking comparatively small samples and getting high to very high in KIM anomalous results, which in classic teachings should result in poor→ no results. Unless of course the heavy mineral trap (lake) is the source of the heavy minerals.

METHODOLOGY FOR PROCESSING TILL SAMPLES: **Please also see Sluice Efficiency Test Results Chart [Appendix 7] and Flow Sheet for Concentrating and Retrieving KIMs from Till and Stream Samples [Appendix 8]**

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, and overlying the miner's moss, 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 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. 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 modified sluice considerably reduced the original volume of material, but most importantly the modified wrap around spray bar [see Equipment photo in Appendix 10] blasts apart 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 1mm 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.

The sluice concentrates <1.0mm are ran through the GoldCube® 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 rejects are then saved separately. These will all be dried and demagnetized and screened into a number of different mesh fractions, and these, if individually too large to directly pick for KIMs, are carefully panned to a manageable size. 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 in Appendix 7].

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 smaller sized 1-4kg till/creek samples, 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.

3) TYLER PORTABLE SIEVE SHAKER:

The Tyler sieve shaker (Equipment photo 2) is utilized for larger samples. For individual small samples, screening is done by hand with standard sieve screens and larger diamond screens.

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.

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.

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. For now I will continue to use a high quality pan for final concentrating.

7) OTHER:

I considered the use of Polytungstate for heavy liquid separation but at $2500 US for 500 ml and special licensing and equipment requirements to use this product I quickly nixed that idea.

8) MAGNETS:

After purchase, a powerful neodymium magnet (1 ½" diameter x 1" deep) was encased in an ABS pipe (with a dowel to prevent movement) and capped (glued) at both ends. This provides an excellent method of removing magnetite from concentrates while (mostly) leaving behind lesser magnetic grains. For other grains [see Results: Ice Chisel Lake KIMs – Magnetic Susceptibility Comparative, page 14], a smaller but very powerful neodymium magnet is used to further separate grains, such as crusted garnets, etc.

9) MICROSCOPE:

After these steps the indicators are then visually picked out (or a number estimated, and/or photographed under the microscope if too many to pick out or count) from each fraction under a Nikon SMZ-2B 8-50x binocular microscope with the help of Pelco (ceramic or carbon-fibre tipped) medical grade tweezers, and colour correct LED lamps for top, left and right, and below lighting. LW and SW ultraviolet lamps are also used in conjunction with the microscope to further identify various mineral grains. I have also been researching and experimenting with the use of switching between incandescent, fluorescent, and LED light, as some/many kimberlite garnets are also rare colour-change garnets.

10) PHOTOGRAPIC RECORDING:

An extra but very important (and time consuming) step is to photograph many of the large/important/unusual potential KIM or other heavy mineral through the microscope ocular, recording the type, size, colour, etc. of each grain, and storing and labelling the images 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.

PREPARATION OF FIELD SAMPLES FOR SHIPPING TO LAB (ODM):

Individual samples are washed to remove silt-sized particles and are wet screened to <4mm. These are then partially dried over several days until they are of slightly damp consistency. Each sample is thoroughly mixed and split into two 'identical' fractions of the same weight, bringing the ODM sample weight to their recommended 10kg size. One fraction (half of each of the four samples) is retained for concentration by me as a comparison check. The second fraction containing half of each of the four samples is put in a large tumbler and blended for one hour. For shipping, the blended till is placed in a clear garbage bag and then sealed in a white 'feed' bag which is then labelled for shipping to Overburden Drilling Management (ODM) for concentrating and KIM picking.

Sluice Efficiency Test Results

Appendix 6

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**		

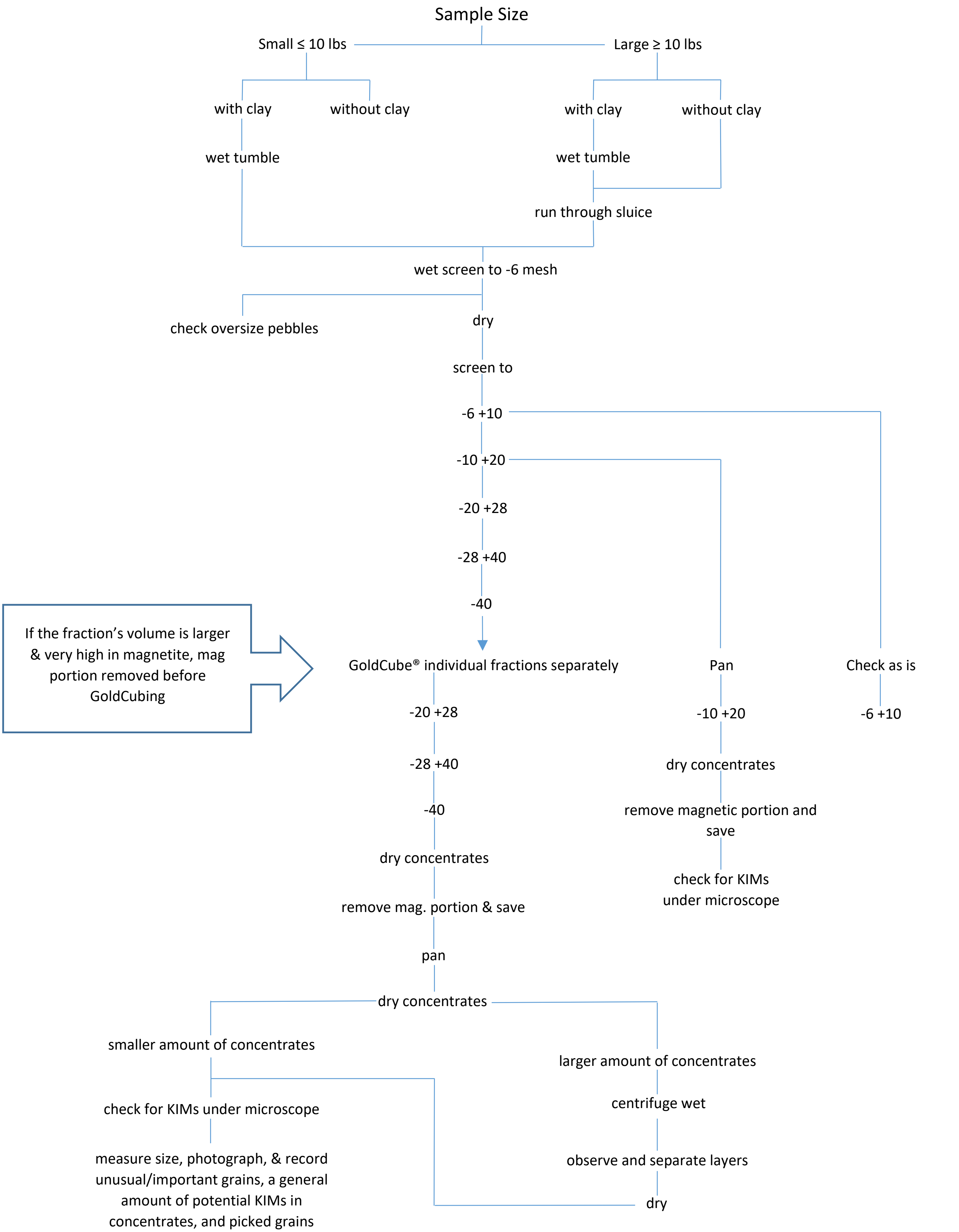
Sluice 2: classifying screen over miner's moss			
Dry weight from sluice = 3020 grams			
	Screened dry weight (grams)	**Magnetic portion (grams)**	**After panning dry weight (grams)**
-4+10 mesh =	29	1	22
-10+20 mesh =	269	8	18
-20+28 mesh =	248	6	20
-28+35 mesh =	359	7	17
-35 mesh =	2106	x	
Total =	**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 screening, tumbling, and container transfers, but are statistically inconsequential)

Appendix 7

Flow Sheet for Concentrating and Retrieving KIMs from Till & Stream Samples



Appendix 8

Equipment List

- 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
- Individually switched, colour correct directed LED, incandescent, and fluorescent lighting
- 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
- Clay-Adams high speed centrifuge
- 2” Neodymium magnet in waterproof ABS shell
- 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
- 8’ Boler, 14’ Boler trailers/portable camps

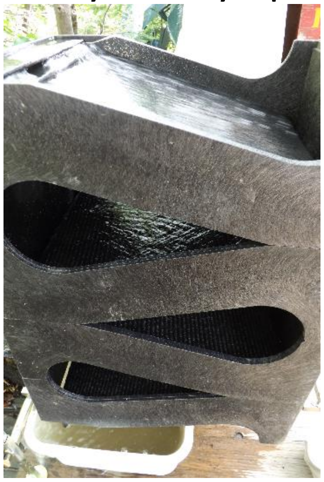
Equipment Photos

Appendix 9

1 - Goldfinder Sluice

1a - Panned and dried concentrates from sluice efficiency test ready to pick for KIMs under microscope

2 -Tyler motorized portable sieve shaker



3 - Goldcube®

4 - Variable speed industrial tumbler

5 - Microscopes

6 - 2-inch neodymium magnet

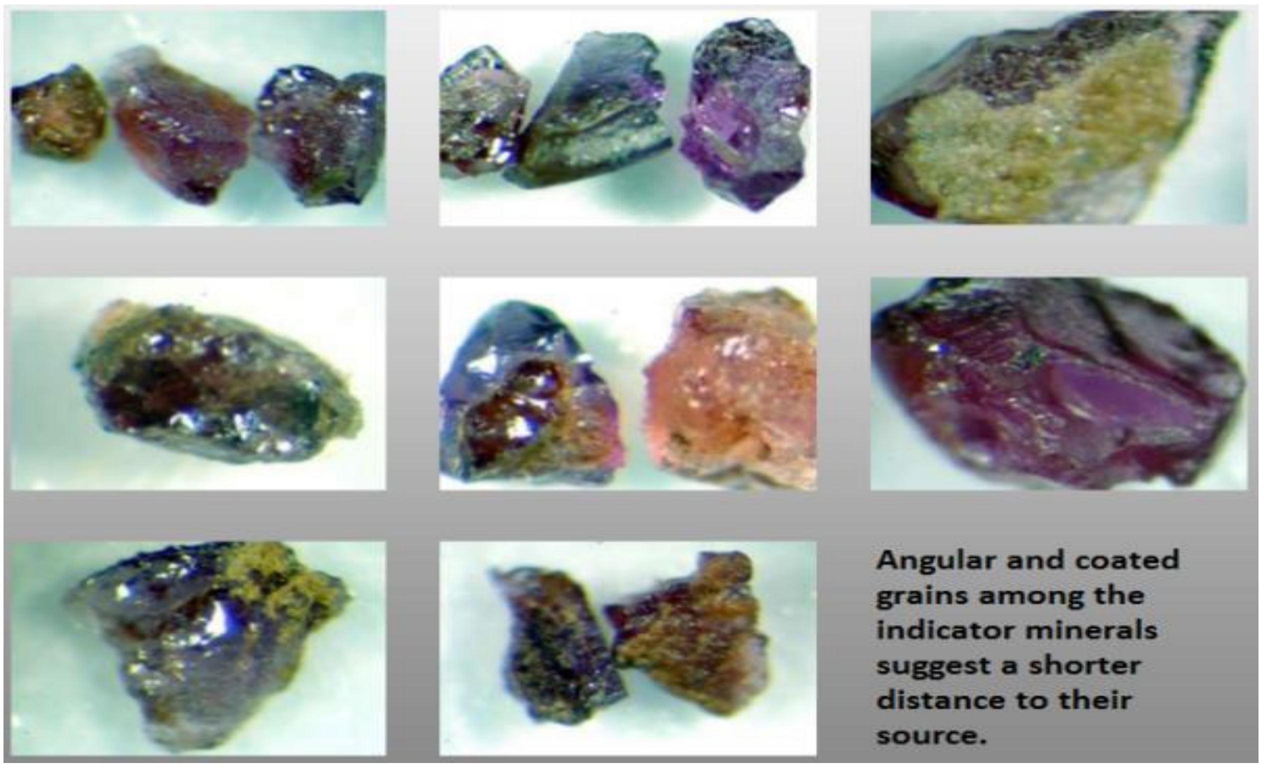
7 - Portable camp near claim

Appendix 10

Reference Photos

“Angular and coated grains among the indicator minerals suggest a shorter distance to their source” (“Arctic Star Presentation”, 2016, p 13)

Arctic Star and North Arrow Announce Drilling at Redemption Diamond Project



“Studies of the indicator minerals from the South Coppermine train, some of which are imaged to the right, show very angular habits, some with soft alteration rims, (kelphyite for pyrope and lucoxene for ilmenite), all evidence for close proximity to source. Mineral grains lose their coats and become rounded as they travel down ice in the glacier. The angular/coated grains were most abundant at the head of the South Coppermine train. One grain with kimberlite attached was also noted." (“Arctic Star Presentation”, 2016, p 13)

Appendix 11

Geoscience Labs – Certificates of Analysis

Ontario

CERTIFICATE OF ANALYSIS

GEO LABS

GEOSCIENCE LABORATORIES

Geoscience Laboratories (Geo Labs)
933 Ramsey Lake Road, Bldg A4
Sudbury, ON P3E 6B5
Phone: (705) 670-5637
Toll Free: 1-866-436-5227

Issued To:	Mr. T. Bishop 440 Grenfell Rd Swastika, ON P0K 1T0 Canada
Phone:	705-642-3937
Fax:	
Email:	bishop.ts@gmail.com
Client No:	1599

Certificate No:	CRT-17-0107-03
Certificate Date:	06/09/2017
Project Number:	
Geo Labs Job No:	17-0107
Submission Date:	06/06/2017
Delivery Via:	Email
QC Requested:	Y

Method Code reported with this certificate: SEM-101

Method Code	Description	QTY	Test Status
EMP-100	Microprobe Analysis / Grain	1	Completed
SEM-101	SEM: Rental With Operator	1	Completed

Please refer to the Geo Labs Job No. 17-0107 if you have any questions.

CERTIFIED BY :

Date: Sept 8 2017

Page 1 of 1

John Beals, GeoServices Senior Manager

Appendix 11

Ontario

CERTIFICATE OF ANALYSIS

GEO LABS

GEOSCIENCE LABORATORIES

Geoscience Laboratories (Geo Labs)
933 Ramsey Lake Road, Bldg A4
Sudbury, ON P3E 6B5
Phone: (705) 670-5637
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Swastika, ON P0K 1T0 Canada

Phone: 705-642-3937
Fax:
Email: bishop.ts@gmail.com
Client No: 1599

Certificate No: CRT-17-0107-04
Certificate Date: 22/09/2017
Project Number:

Geo Labs Job No: 17-0107
Submission Date: 06/06/2017

Delivery Via: Email
QC Requested: Y

Method Code reported with this certificate: EMP-100

Method Code	Description	QTY	Test Status
EMP-100	Microprobe Analysis / Grain	1	Completed
SEM-101	SEM: Rental With Operator	1	Completed

REVISED
DATE: Sep 22/2017
RE Certificate # CRT-17-0107-02

Please refer to the Geo Labs Job No. 17-0107 if you have any questions.

CERTIFIED BY :

John Beals, GeoServices Senior Manager

Date: Sept 22 2017

Page 1 of 1

Except by special permission, reproduction of these results must include any qualifying remarks made by this Ministry with reference to any sample. Results are for samples as received.

Appendix 11

CERTIFICATE OF ANALYSIS

GEO LABS

GEOSCIENCE LABORATORIES

Ontario

Geoscience Laboratories (Geo Labs)
933 Ramsey Lake Road, Bldg A4
Sudbury, ON P3E 6B5
Phone: (705) 670-5637
Toll Free: 1-866-436-5227

Issued To:	Mr. T. Bishop 440 Grenfell Rd, RR#2 Swastika, ON P0K 1T0 Canada
Phone:	705-642-3937
Fax:	
Email:	bishop.ts@gmail.com
Client No:	1599

Certificate No:	CRT-17-0279-01
Certificate Date:	02/10/2017
Project Number:	
Geo Labs Job No:	17-0279
Submission Date:	09/14/2017
Delivery Via:	Email
QC Requested:	Y

Method Code reported with this certificate: EMP-100

Method Code	Description	QTY	Test Status
EMP-100	Microprobe Analysis / Grain	1	Completed

Please refer to the Geo Labs Job No. 17-0279 if you have any questions.

CERTIFIED BY :

John Beals, GeoServices Senior Manager

Date: Oct 2 2017

Page 1 of 1

Client	**Tony Bishop**
Mineral	**Garnet**
Sample	**Various**
Job #	**17-0107**
Analyst	**D. Crabtree**
Analyst Approved	**September 20th 2017**

GEOSCIENCE LABORATORIES REPORT
ELECTRON MICROPROBE ANALYSIS
Data reviewed by Dave Crabtree

Sample Label	SiO2	TiO2	Al2O3	V2O3	Cr2O3	MgO	CaO	MnO	FeO^t	Na2O	K2O	Total
Cr-Pyrope Garnet Analyses												
G10 Harzburgite Garnet (Grutter Classification)												
S-G74	41.683	0.010	20.756	0.023	4.499	22.088	3.284	0.410	7.065	0.016	0.000	99.834
S-G83	42.142	0.017	21.101	0.019	4.059	21.869	4.078	0.413	6.779	0.017	0.000	100.494
S-G91	40.929	0.026	19.480	0.029	5.713	20.867	3.765	0.377	8.595	0.018	0.000	99.799
G9 Lherzolite Garnet (Grutter Classification)												
S-G1	41.928	0.016	21.103	0.026	4.033	20.266	5.397	0.400	7.324	0.012	0.003	100.508
S-G5	41.536	0.069	20.875	0.021	4.178	20.355	4.939	0.497	7.630	0.027	0.000	100.127
S-G6	41.726	0.027	22.573	0.013	1.678	20.498	4.551	0.438	8.892	0.017	0.000	100.413
S-G10	42.109	0.002	21.274	0.013	3.680	21.500	4.587	0.377	6.724	0.013	0.003	100.282
S-G11	40.175	0.230	18.840	0.026	5.538	17.109	5.951	0.478	11.335	0.035	0.000	99.717
S-G15	41.776	0.201	21.270	0.029	3.128	20.819	4.698	0.404	7.977	0.041	0.000	100.343
S-G16	41.404	0.018	19.656	0.028	5.856	20.577	4.915	0.473	7.274	0.019	0.000	100.220
S-G24	41.729	0.023	20.961	0.015	3.940	20.956	4.978	0.423	7.441	0.019	0.000	100.485
S-G25	41.460	0.000	20.893	0.019	3.984	20.437	5.489	0.476	7.215	0.005	0.001	99.979
S-G29	41.719	0.007	21.406	0.017	3.476	21.136	4.402	0.479	7.215	0.014	0.000	99.871
S-G30	41.503	0.017	20.215	0.019	5.003	20.494	5.446	0.434	7.096	0.016	0.002	100.245
S-G36	41.606	0.018	20.361	0.020	5.000	20.641	4.962	0.470	7.182	0.025	0.000	100.285
S-G37	41.793	0.322	20.707	0.039	3.442	21.317	5.098	0.287	6.903	0.030	0.002	99.940
S-G38	41.417	0.010	19.838	0.032	5.016	18.963	5.786	0.489	8.566	0.010	0.001	100.128
S-G40	41.701	0.193	19.902	0.033	5.028	20.928	4.995	0.356	7.049	0.043	0.000	100.228
S-G41	41.636	0.228	20.473	0.024	3.980	21.250	4.802	0.392	7.312	0.046	0.000	100.143
S-G42	41.890	0.105	20.707	0.028	4.167	20.214	5.370	0.399	7.368	0.018	0.000	100.266
S-G47	41.392	0.199	19.758	0.034	5.005	19.983	5.281	0.436	8.052	0.044	0.000	100.184

All concentrations are reported as wt%.

Sample Label	SiO2	TiO2	Al2O3	V2O3	Cr2O3	MgO	CaO	MnO	FeO^t	Na2O	K2O	Total
S-G48	41.823	0.131	21.166	0.029	3.545	20.549	4.863	0.460	8.058	0.022	0.002	100.648
S-G49	41.206	0.034	19.937	0.024	5.113	20.139	5.461	0.439	7.403	0.017	0.000	99.773
S-G50	41.392	0.004	20.500	0.031	4.361	20.182	5.593	0.423	7.696	0.006	0.000	100.188
S-G51	41.411	0.045	21.135	0.012	3.717	20.487	4.885	0.513	7.675	0.026	0.001	99.907
S-G52	41.938	0.145	21.202	0.037	3.486	20.141	4.947	0.409	8.014	0.027	0.000	100.346
S-G64	41.903	0.040	20.716	0.026	4.495	20.754	5.220	0.402	7.244	0.016	0.000	100.816
S-G65	41.437	0.197	19.624	0.038	5.553	20.689	5.265	0.396	7.063	0.037	0.000	100.299
S-G66	41.859	0.087	21.601	0.021	3.016	20.770	4.634	0.403	7.960	0.022	0.002	100.375
S-G67	41.066	0.320	18.159	0.025	7.077	20.068	5.831	0.379	6.983	0.040	0.000	99.948
S-G68	41.768	0.043	21.777	0.031	2.836	20.080	5.030	0.393	8.451	0.017	0.000	100.426
S-G69	41.530	0.173	19.667	0.033	5.482	20.247	5.293	0.425	7.422	0.044	0.000	100.316
S-G70	41.382	0.097	19.462	0.020	5.673	20.360	5.528	0.443	7.222	0.031	0.003	100.221
S-G71	41.412	0.066	20.628	0.022	4.183	19.342	5.800	0.581	8.397	0.016	0.000	100.447
S-G72	41.289	0.102	19.620	0.029	5.599	20.507	5.391	0.442	7.134	0.029	0.000	100.142
S-G75	41.079	0.002	19.948	0.024	5.155	19.497	6.385	0.481	7.247	0.009	0.001	99.828
S-G77	41.383	0.005	19.975	0.031	5.052	20.504	5.488	0.422	7.331	0.015	0.000	100.206
S-G80	41.298	0.090	19.228	0.043	5.653	20.267	5.683	0.364	7.399	0.023	0.000	100.048
S-G81	41.550	0.094	20.943	0.025	3.855	19.930	4.953	0.465	8.400	0.024	0.000	100.239
S-G84	41.347	0.000	20.916	0.020	3.747	20.100	5.208	0.506	8.039	0.013	0.000	99.896
S-G90	40.920	0.047	19.879	0.019	5.116	19.037	5.711	0.573	8.330	0.026	0.001	99.659
S-G93	41.128	0.084	18.771	0.040	6.828	20.239	5.396	0.450	7.128	0.010	0.000	100.074
S-G94	40.699	0.208	19.110	0.031	5.984	20.344	5.144	0.430	7.529	0.047	0.000	99.526
S-G96	41.056	0.202	18.569	0.034	6.389	20.215	5.720	0.376	7.221	0.028	0.000	99.810
G11 Hi-Ti Peridotitic Garnet (Grutter Classification)												
S-G17	41.268	0.807	18.398	0.054	5.169	19.570	6.396	0.303	8.064	0.032	0.000	100.061
S-G22	41.330	1.014	17.583	0.046	6.727	20.524	6.135	0.273	6.696	0.060	0.000	100.388
S-G92	41.535	0.658	19.707	0.040	4.495	21.091	5.267	0.303	7.206	0.061	0.000	100.363
G1 Low-Cr Megacryst Garnet (Grutter Classification)												
S-G45	41.804	0.468	21.449	0.034	1.818	20.562	4.605	0.323	8.880	0.048	0.003	99.994
S-G8	42.153	0.694	22.048	0.039	1.223	21.071	4.604	0.324	8.513	0.067	0.001	100.737

Sample Label	SiO2	TiO2	Al2O3	V2O3	Cr2O3	MgO	CaO	MnO	FeO^t	Na2O	K2O	Total
G12 Wherlitic Garnet (Grutter Classification)												
S-G89	39.707	0.054	20.229	0.041	3.341	14.980	6.444	0.697	14.028	0.006	0.000	99.527
S-G95	40.189	0.042	17.663	0.062	7.221	16.088	7.901	0.652	10.165	0.003	0.001	99.987

All concentrations are reported as wt%.

Sample Label	SiO_2	TiO_2	Al_2O_3	V_2O_3	Cr_2O_3	MgO	CaO	MnO	FeO^t	Na_2O	K_2O	Total

Crustal Garnet Analysis

Typical Spessertine Garnet Analysis

Sample Label	SiO_2	TiO_2	Al_2O_3	V_2O_3	Cr_2O_3	MgO	CaO	MnO	FeO^t	Na_2O	K_2O	Total
S-G39	36.838	0.105	20.363	0.006	0.001	1.813	5.502	8.620	26.595	0.008	0.000	99.851

Other Grains: Non Kimberlite Indicator Minerals (Not analysed)

S-G7	almandine
S-G9	almandine
S-G12	almandine
S-G18	almandine
S-G26	almandine
S-G27	almandine
S-G32	almandine
S-G33	almandine
S-G57	almandine
S-G73	andradite
S-G34	andradite
S-G46	fe-oxide
S-G55	fe-oxide
S-G76	K-Feldspar
S-G87	Mg-Si-Fe alt oli?
S-G20	peraluminous silicate
S-G44	peraluminous silicate
S-G78	peraluminous silicate
S-G79	peraluminous silicate
S-G82	peraluminous silicate
S-G60	quartz
S-G4	spessertine
S-G2	spessertine
S-G13	spessertine
S-G14	spessertine
S-G23	spessertine

All concentrations are reported as wt%.

Sample Label	SiO2	TiO2	Al2O3	V2O3	Cr2O3	MgO	CaO	MnO	FeO^t	Na2O	K2O	Total
S-G43	spessertine											
S-G58	spessertine											
S-G61	spessertine											
S-G85	spessertine											
S-G86	spessertine											
S-G3	titanite											
S-G19	titanite											
S-G21	titanite											
S-G28	titanite											
S-G31	titanite											
S-G35	titanite											
S-G53	titanite											
S-G54	titanite											
S-G56	titanite											
S-G59	titanite											
S-G62	titanite											
S-G88	titanite											
S-G63	zircon											

changes made to labels:

S-G2 (17-0107-P02-001) originally labelled as S-G12

SG-34 andradite was originally lebelled as epidote

Job # was originally listed as 17-0170

QUALITY CONTROL

Analytical Conditions: **Majors - 20kV & 20nA. Trace 20kV & 200nA.**
Routine: **WDS acquisition.**
Correction Procedure: **PAP**

Sample Label	SiO_2	TiO_2	Al_2O_3	V_2O_3	Cr_2O_3	MgO	CaO	MnO	FeO^t	Na_2O	K_2O	Total
diopAST	55.030	0.077	0.063	0.028	0.000	18.738	25.829	0.053	0.051	0.006	0.002	99.877
diopAST	55.217	0.070	0.087	0.021	0.002	18.652	25.878	0.042	0.040	0.014	0.000	100.023
garKNZ	41.020	0.432	23.063	0.025	0.087	19.207	5.190	0.298	10.265	0.019	0.000	99.606
garKNZ	41.227	0.438	23.174	0.025	0.105	19.029	5.160	0.321	10.261	0.019	0.000	99.759
garKNZ	41.144	0.434	23.062	0.027	0.097	19.106	5.180	0.316	10.227	0.025	0.000	99.618
garKNZ	41.192	0.438	23.008	0.024	0.091	19.215	5.150	0.313	10.257	0.023	0.000	99.711
garKNZ	41.080	0.434	23.066	0.026	0.097	19.224	5.177	0.312	10.274	0.019	0.000	99.709
garKNZ	41.176	0.423	22.941	0.018	0.086	19.043	5.194	0.311	10.337	0.025	0.000	99.554
garKNZ	41.375	0.438	23.263	0.016	0.102	19.222	5.245	0.305	10.276	0.017	0.000	100.259
garKNZ	41.597	0.428	23.136	0.023	0.091	18.940	5.219	0.318	10.343	0.020	0.000	100.115
garRV3	42.185	0.027	19.804	0.034	5.678	23.233	2.505	0.333	6.319	0.007	0.000	100.125
garRV3	41.952	0.028	19.836	0.031	5.697	23.169	2.513	0.330	6.318	0.008	0.002	99.884
garRV3	42.070	0.023	19.934	0.033	5.727	23.338	2.529	0.323	6.260	0.007	0.000	100.244
garRV3	42.030	0.022	19.932	0.033	5.675	23.323	2.505	0.326	6.391	0.008	0.002	100.247
garRV3	42.032	0.028	19.960	0.033	5.652	23.219	2.460	0.326	6.396	0.009	0.000	100.115
garRV3	42.146	0.028	19.752	0.037	5.674	23.251	2.493	0.320	6.389	0.007	0.003	100.100
garRV3	42.068	0.021	19.913	0.026	5.678	23.246	2.472	0.334	6.324	0.007	0.002	100.091
garRV3	41.974	0.031	19.990	0.037	5.648	23.266	2.461	0.327	6.330	0.013	0.000	100.077
Standard	garKNZ	garKNZ	garKNZ	garKNZ	garRV3	garKNZ	garKNZ	garKNZ	garKNZ	garKNZ	garKNZ	
Average wt%	41.226	0.433	23.089	0.023	5.679	19.123	5.189	0.312	10.280	0.021	L.O.D.	
Expected wt% *	41.441	0.440	23.166	n.d.	5.770	18.887	5.098	0.313	10.441	n.d.	n.d.	
Accuracy % rel.	-0.52	-1.63	-0.33		-1.58	1.25	1.78	-0.52	-1.54			
Mode	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	
Signal	Si Ka	Ti Ka	Al Ka	V Ka	Cr Ka	Mg Ka	Ca Ka	Mn Ka	Fe Ka	Na Ka	K Ka	
XTAL	TAP1	PET2	TAP1	LLiF3	LLiF3	TAP1	PET2	LiF4	LiF4	TAP1	LPET5	

Sample Label	SiO2	TiO2	Al2O3	V2O3	Cr2O3	MgO	CaO	MnO	FeO^t	Na2O	K2O	Total
Count time (seconds)	15	20	15	20	45	15	45	20	45	20	20	
Beam Current (nA)	20	200	20	200	20	20	20	200	20	200	200	
L.O.D. (estimate)	0.027	0.006	0.023	0.006	0.012	0.023	0.012	0.008	0.018	0.006	0.003	
L.O.Q. (estimate)	0.090	0.020	0.077	0.021	0.040	0.078	0.041	0.028	0.060	0.021	0.011	

* Expected Values are from long term in-house charcterization of mineral standards.

QC notes

1) None of the reported values for these mineral standards are certified:" accuracy" is therefore based on available chemical data.
2) n.d. not determined for the specified mineral standard.
3) n.a. not applicable
4) LOD = Limit of Detection defined here as 3 x standard deviation of the total accumulated background counts.
   The L.O.D. reported here represents the minimum value in this report where the peak - background signal exceeds 3 x standard deviation of the background signal.
5) L.O.Q. = Limit of quantification (3.3 x L.O.D), precision ~ 10-30%.
6) Reported count times are for both peak and background measurements.
7) FeO^t - total Iron expressed as FeO

GEO LABS
GEOSCIENCE LABORATORIES

Ontario

Q.C. NOTE TO ACCOMPANY ANALYTICAL RESULTS

Client : Bishop

Job # : 17-0107

Test : EMP-100

Sample # : see below

Date : September 21, 2017

Please Note:

Labelling errors discovered in the report for job 17-0107 by the EMP-100 test method have been corrected. Please see the attached revised report. If you would like additional work please contact Kayla Kalmo at (705) 670-5632 or email kayla.kalmo@ontario.ca.

Sincerely,

Jennifer Hargreaves,
Quality Assurance Coordinator

Client	**Tony Bishop**	**GEOSCIENCE LABORATORIES REPORT**	
Mineral	**Various**	**ELECTRON MICROPROBE ANALYSIS**	
Sample	**Various**	Data reviewed by Dave Crabtree	
Job #	**17-0279**		
Analyst	**D. Crabtree**		
Analyst Approved	**September 28th 2017**		

Note that low totals in some of the analyses are the result of hydration in the mineral structure, or in the case of andradite are due to the presence of Fe^{3+}

Sample Label	SiO2	TiO2	Al2O3	Cr2O3	MgO	CaO	MnO	FeO	ZnO	Na2O	K2O	F	Cl	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Total
Titanite (Rare Earth Elements and Halogens included)																					
S-G53	29.830	36.360	1.145	0.024	0.000	27.398	0.050	1.690	0.003	0.026	0.000	0.307	0.000	0.143	0.311	0.845	0.120	0.513	0.040	0.104	98.909
S-G56	29.772	35.814	1.147	0.020	0.014	26.999	0.037	1.851	0.009	0.032	0.007	0.484	0.000	0.156	0.342	0.865	0.139	0.519	0.071	0.092	98.370
S-G59	30.263	37.306	1.460	0.013	0.007	27.952	0.098	1.186	0.000	0.000	0.000	0.265	0.000	0.097	0.032	0.279	0.045	0.227	0.000	0.045	99.275
S-G62	29.802	37.337	1.044	0.096	0.018	27.392	0.050	1.153	0.000	0.014	0.000	0.335	0.007	0.200	0.117	0.439	0.078	0.325	0.077	0.092	98.576
S-G19	29.419	35.727	1.117	0.018	0.027	26.646	0.070	2.041	0.000	0.090	0.010	0.471	0.001	0.207	0.363	0.937	0.180	0.671	0.108	0.211	98.314
S-G21	29.681	35.867	1.023	0.030	0.015	26.796	0.085	1.801	0.000	0.026	0.001	0.361	0.009	0.164	0.334	0.897	0.137	0.516	0.092	0.123	97.958
S-G28	30.285	36.374	1.205	0.027	0.000	27.776	0.048	1.456	0.000	0.002	0.007	0.335	0.009	0.104	0.127	0.470	0.070	0.331	0.080	0.084	98.790
S-G31	29.853	37.179	1.019	0.042	0.000	27.330	0.060	1.173	0.003	0.028	0.012	0.200	0.002	0.143	0.172	0.751	0.100	0.486	0.065	0.146	98.764
S-G88	29.299	35.937	0.478	0.040	0.012	25.091	0.104	2.047	0.007	0.181	0.004	0.111	0.000	0.380	0.543	1.823	0.281	1.194	0.209	0.223	97.964
S-G3	29.529	35.406	0.901	0.054	0.018	26.497	0.072	2.440	0.000	0.096	0.000	0.448	0.000	0.200	0.407	1.113	0.157	0.627	0.087	0.206	98.258
S-G35	29.673	36.179	1.284	0.032	0.000	26.710	0.055	1.322	0.006	0.022	0.000	0.313	0.007	0.240	0.119	0.742	0.169	0.807	0.201	0.161	98.042
S-G54	29.982	36.496	1.565	0.000	0.002	27.507	0.070	1.524	0.024	0.001	0.000	0.339	0.005	0.288	0.024	0.307	0.086	0.402	0.073	0.115	98.810
Almandine																					
S-G57	37.463	0.029	21.448	0.009	4.703	1.075	1.488	34.373	0.000	0.000	0.004	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100.592
S-G33	38.233	0.002	22.049	0.059	8.309	1.060	0.579	30.437	0.002	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100.730
S-G18	37.454	0.013	21.730	0.000	7.361	0.899	1.268	30.772	0.000	0.000	0.001	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.498
S-G32	37.403	0.099	21.211	0.040	3.545	1.641	3.045	33.609	0.000	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100.593
S-G12	37.263	0.020	21.325	0.048	7.015	0.679	1.764	30.373	0.003	0.000	0.006	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	98.496
S-G7	36.983	0.026	21.340	0.024	3.955	1.445	5.286	31.175	0.000	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100.234
S-G9a	37.144	0.134	20.782	0.014	2.581	4.170	0.318	34.531	0.006	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.680
S-G26	37.386	0.003	21.393	0.016	4.404	1.098	4.417	32.203	0.000	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100.920
S-G27	37.334	0.000	21.476	0.003	4.559	1.502	4.076	31.301	0.000	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100.251
Andradite																					
S-G73	36.118	0.648	6.572	0.024	0.087	32.441	0.886	20.648	0.015	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	97.439
S-G34	37.161	0.138	10.456	0.000	0.000	31.077	0.088	19.728	0.000	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	98.648
Spessertine																					
S-G39	37.043	0.109	20.390	0.001	2.038	5.760	8.385	26.561	0.000	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100.287
S-G4	35.863	0.077	20.404	0.000	0.761	0.936	13.878	27.914	0.021	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.854
S-G13	35.716	0.069	20.075	0.001	0.367	0.486	25.392	17.323	0.059	0.006	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.494
S-G14	35.409	0.108	19.825	0.000	0.823	1.248	19.794	21.264	0.000	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	98.471
S-G23	35.927	0.208	19.988	0.000	0.971	0.660	19.327	21.998	0.013	0.034	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.126
S-G58	35.346	0.191	19.925	0.001	0.503	0.220	28.457	14.303	0.024	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	98.970
S-G61	35.773	0.026	20.863	0.002	0.884	0.616	25.809	15.635	0.015	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.623
S-G2	35.661	0.200	20.016	0.000	0.771	0.565	23.078	19.098	0.012	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.401
S-G85	35.731	0.102	19.994	0.000	0.291	0.718	21.550	21.495	0.048	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.929
S-G86	36.042	0.111	19.948	0.000	0.362	0.894	25.171	17.574	0.043	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100.145
S-G43	35.640	0.035	20.224	0.009	0.893	1.030	17.628	23.617	0.011	0.028	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.115

All concentrations are reported as wt%.

Sample Label	SiO2	TiO2	Al2O3	Cr2O3	MgO	CaO	MnO	FeO	ZnO	Na2O	K2O	F	Cl	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Total
Stauralite																					
S-G78	27.283	0.607	54.209	0.048	1.847	0.000	0.330	13.122	0.191	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	97.637
S-G20	27.446	0.604	53.586	0.102	1.886	0.000	0.271	13.308	1.038	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	98.241
S-G82	27.022	0.549	54.851	0.062	1.796	0.014	0.271	13.600	0.231	0.000	0.009	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	98.405
S-G44	27.124	0.523	54.921	0.039	2.485	0.011	0.322	13.187	0.147	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	98.759
S-G79	27.619	0.657	53.688	0.064	1.920	0.001	0.371	13.717	0.326	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	98.363
Quartz																					
S-G9b	100.919	0.010	0.000	0.000	0.008	0.010	0.001	0.365	0.000	0.000	0.006	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	101.319
S-G60	100.238	0.000	0.139	0.003	0.005	0.000	0.000	0.102	0.005	0.000	0.054	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100.546
Feldspar																					
S-G76	64.499	0.000	18.427	0.009	0.000	0.000	0.000	0.040	0.000	0.672	15.877	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.524
Aletered silicate (serpentine?)																					
S-G87	41.519	0.028	1.785	0.000	36.743	0.183	0.062	6.234	0.034	0.014	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	86.602

All concentrations are reported as wt%.

Sample Label	SiO2	TiO2	Al2O3	Cr2O3	MgO	CaO	MnO	FeO	ZnO	Na2O	K2O	F	Cl	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Total

QUALITY CONTROL

Analytical Conditions: Majors - 20kV & 20nA. REE run at 20kV & 100nA.
Routine: WDS acquisition.
Correction Procedure: PAP

Sample Label	SiO2	TiO2	Al2O3	Cr2O3	MgO	CaO	MnO	FeO	ZnO	Na2O	K2O	F	Cl	Y2O3	La2O3	Ce2O3	Pr2O3	Nd2O3	Sm2O3	Gd2O3	Total
albFF	68.069	0.000	19.744	0.000	0.000	0.088	0.015	0.000	0.000	11.685	0.101	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.702
albFF	67.901	0.000	19.744	0.003	0.000	0.092	0.000	0.002	0.000	11.803	0.080	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.625
diopAST	55.144	0.059	0.075	0.001	18.573	25.949	0.039	0.041	0.006	0.015	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.902
diopAST	55.469	0.066	0.055	0.009	18.653	26.167	0.035	0.060	0.000	0.009	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100.523
garKNZ	41.341	0.415	23.376	0.098	19.032	5.261	0.311	10.352	0.007	0.000	0.002	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100.195
garKNZ	41.523	0.423	23.090	0.101	18.989	5.165	0.285	10.183	0.000	0.000	0.003	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.762
garRV3	42.095	0.049	19.920	5.742	23.316	2.485	0.340	6.268	0.006	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	100.221
garRV3	41.695	0.016	19.976	5.592	23.391	2.477	0.365	6.356	0.000	0.006	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.874
kyaSTD	36.382	0.022	63.223	0.099	0.008	0.000	0.006	0.115	0.015	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.870
kyaSTD	36.311	0.001	63.215	0.082	0.000	0.000	0.000	0.146	0.000	0.000	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.755
Or-1	63.963	0.000	18.534	0.000	0.016	0.012	0.007	0.005	0.000	1.084	15.195	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	98.816
pyxBRN	50.308	0.483	7.493	0.922	17.264	17.248	0.129	4.701	0.009	0.843	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	99.400
pyxBRN	50.001	0.479	7.469	0.898	17.218	17.139	0.123	4.661	0.000	0.851	0.000	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	98.839
Standard	garKNZ	garKNZ	garKNZ	garRV3	garKNZ	garKNZ	garKNZ	garKNZ	n.a	albFF	Or-1	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	
Average wt%	41.432	0.419	23.233	5.667	19.011	5.213	0.298	10.268	n.a	11.744	15.195	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	
Expected wt% *	41.441	0.440	23.166	5.770	18.887	5.098	0.313	10.441	n.a	11.820	15.120	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	
Accuracy % rel.	-0.02	-4.84	0.29	-1.79	0.65	2.25	-4.91	-1.66		-0.64	0.50										
Mode	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	WDS	
Signal	Si Ka	Ti Ka	Al Ka	Cr Ka	Mg Ka	Ca Ka	Mn Ka	Fe Ka	Zn Ka	Na Ka	K Ka	F Ka	Cl Ka	Y La	La La	Ce La	Pr Lb	Nd La	Sm La	Gd La	
XTAL	TAP1	LLIF3	TAP1	LLIF3	TAP1	LPET5	LIF4	LIF4	LLIF3	LTAP2	LPET5	LTAP2	LPET5	LPET5	LLiF3	LLiF3	LLiF3	LiF4	LiF4	LiF4	
Count time (seconds)	15	15	15	15	15	10	25	20	15	15	15	30	20	30	10	10	10	10	10	10	
Beam Current (nA)	20	20	20	20	20	20	20	20	20	20	20	20	20	100	100	100	100	100	100	100	
L.O.D. (estimate)	0.025	0.029	0.021	0.024	0.023	0.018	0.028	0.030	0.033	0.018	0.012	0.053	0.009	0.025	0.036	0.039	0.052	0.052	0.048	0.046	
L.O.Q. (estimate)	0.085	0.096	0.071	0.078	0.076	0.060	0.093	0.100	0.110	0.060	0.040	0.176	0.032	0.082	0.120	0.129	0.172	0.173	0.159	0.154	

* Expected Values are from long term in-house charcterization of mineral standards.

QC notes

1) None of the reported values for these mineral standards are certified:" accuracy" is therefore based on available chemical data.
2) n.d. not determined for the specified mineral standard.
3) n.a. not applicable
4) LOD = Limit of Detection defined here as 3 x standard deviation of the total accumulated background counts.
The L.O.D. reported here represents the minimum value in this report where the peak - background signal exceeds 3 x standard deviation of the background signal.
5) L.O.Q. = Limit of quantification (3.3 x L.O.D), precision ~ 10-30%.
6) Reported count times are for both peak and background measurements.
7) FeO^t - total Iron expressed as FeO

SEM-101:

GEO LABS
GEOSCIENCE LABORATORIES

Ontario

Mineralogy Report

Client Contact:	Mr. Tony Bishop
GL Job Number:	17-0107
Test Group:	SEM-101
Date:	August 29, 2017

Client Request:

Thirty five grains were submitted for energy dispersive (ED) x-ray analysis with the SEM in order to determine if any of the grains classify as diamond.

The samples were mounted on double-sided carbon tape and analysed non-polished and non-coated. The analysis is therefore only collected at the surface of the grain. This sample preparation technique makes it possible to identify the elements present in the grain, however this approach is not ideal for quantitative analysis. These results are therefore qualitative in nature.

Results:

None of the samples submitted for analysis were positively identified as diamond. See Appendix 1 for table of results.

Table 1. Table of results.

Grain #	ID
S-D1	quartz
S-D2	quartz
S-D3	fe-oxide
S-D4	silicate (almandine?)
S-D5	silicate (epidote?)
S-D6	silicate (epidote?)
S-D7	quartz
S-D8	quartz
S-D9	quartz
S-D10	calcite
S-D11	calcite
S-D12	calcite
S-D13	calcite
S-D14	quartz
S-D15	quartz
S-D16	quartz
S-D17	quartz
S-D18	quartz + organics?
S-D19	quartz
S-D20	silicate (epidote?)
S-D21	quartz?
S-D22	quartz+Fe-oxide or Fe-carbonate?
S-D23	Fe-oxide
S-D24	organic material
S-D25	mainly halite + Al, Si, K, P, Ca
S-D26	mixed silicate coated with organic material
S-D27	silicate (epidote?)
S-D28	organic material
S-D29	zircon
S-D30	quartz
S-D31	silicate (epidote?)
S-D32	quartz
S-D33	silicate (epidote?)
S-D34	silicate (epidote?)
S-D35	quartz

Appendix 13

ODM Lab – Results (see digital file for full version)

E-MAILED 7554

1

xls

pdf

Overburden Drilling Management Limited
Unit 107, 15 Capella Court
Nepean, Ontario, Canada, K2E7X1
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odm@storm.ca www.odm.ca

ODM

Exploring Heavy Minerals

Laboratory Data Report

Client Information

Mr. David Crouch

[redacted]

Email: [redacted]

Attention: Mr. David Crouch

Data-File Information

Date:	Septembe 05, 2017
Project name:	
ODM batch number:	7554
Sample numbers:	DC-ICL-TZ-72
Data file:	201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Number of samples in this report:	1
Number of samples processed to date:	1
Total number of samples in project:	1
Preliminary data:	
Final data:	X
Revised data:	

Sample Processing Specifications

1. Submitted by client: Sand and gravel sample prescreened to -5.0 mm in the field.
2. One 300 g archival split taken.
3. Sample panned for gold, PGMs and fine-grained metallic indicator minerals.
4. The shaking table concentrates refined by heavy liquid separation at S.G. 3.2 to create a heavy mineral concentrate ("HMC").
5. The 0.25-2.0 mm, nonferromagnetic HMC fractions picked for indicator minerals.

Notes

For: Don Holmes, P.Geo.
President

Primary Sample Processing Weights and Descriptions

Client: Mr. David Crouch
File Name: 201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Total Number of Samples in this Report: 1
ODM Batch Number(s): 7554

	Weight (kg wet)					Screening and Shaking Table Sample Descriptions												
						Clasts (+2.0 mm)*					Matrix (-2.0 mm)							
							Percentage				Distribution					Colour		
Sample Number	Bulk Rec'd	Archived Split	Table Split	+2.0 mm Clasts*	Table Feed	Size	V/S	GR	LS	OT	S/U	SD	ST	CY	ORG	SD	CY	Class
DC-ICL-TZ-72	11.8	0.3	11.5	2.8	8.7	G	90	10	Tr	0	S	MC	-	N	N	MOC	NA	SAND + GRAVEL

*Sample prescreened to -5.0 mm in the field.

Gold Grain Summary

Client: Mr. David Crouch
File Name: 201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Total Number of Samples in this Report: 1
ODM Batch Number(s): 7554

	Number of Visible Gold Grains				Nonmag HMC Weight (g)*	Calculated PPB Visible Gold in HMC			
Sample Number	Total	Reshaped	Modified	Pristine		Total	Reshaped	Modified	Pristine
DC-ICL-TZ-72	48	33	14	1	34.8	1649	1468	177	4

* Calculated PPB Au based on assumed nonmagnetic HMC weight equivalent to 1/250th of the table feed.

Detailed Gold Grain Data

Client: Mr. David Crouch
File Name: 201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Total Number of Samples in this Report: 1
ODM Batch Number(s): 7554

Sample Number	Dimensions (µm) Thickness		Width	Length	Number of Visible Gold Grains Reshaped	Modified	Pristine	Total	Nonmag HMC Weight* (g)	Calculated V.G. Assay in HMC (ppb)	Metallic Minerals in Pan Concentrate
DC-ICL-TZ-72	3	C	15	15	2			2		<1	Tr (5 grains) arsenopyrite (25-75 µm).
	5	C	25	25	3	2		5		3	
	8	C	25	50	2	3		5		10	
	10	C	25	75	1	1	1	3		12	
	10	C	50	50	4	2		6		33	
	13	C	50	75	9	2		11		113	
	15	C	50	100	1	2		3		49	
	15	C	75	75	2			2		37	
	18	C	75	100	2			2		57	
	20	C	75	125	2	1		3		121	
	22	C	100	125	3	1		4		241	
	27	C	125	150	1			1		109	
	100	M	200	200	1			1		862	
								48	34.8	1649	

* Calculated PPB Au based on assumed nonmagnetic HMC weight equivalent to 1/250th of the table feed.

Appendix 13

 Overburden Drilling Management Limited 2017-09-06

Laboratory Processing Weights

Client: Mr. David Crouch
File Name: 201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Total Number of Samples in this Report: 1
ODM Batch Number(s): 7554

	Weight of -2.0 mm Table Concentrate (g)												
			0.25 to 2.0 mm Heavy Liquid Separation S.G. 3.20										
					HMC S.G.>3.20								
								Nonferromagnetic HMC					
									Processed Split				
									Total				
Sample Number	Total	-0.25 mm	Total	Lights S.G. <3.2	Total	-0.25 mm (wash)	Mag	Total	%	Weight	0.25 to 0.5 mm	0.5 to 1.0 mm	1.0 to 2.0 mm
DC-ICL-TZ-72	1603.8	921.3	682.5	656.0	26.5	4.4	2.3	19.8	100	19.8	10.8	6.6	2.4

Kimberlite Indicator Mineral Counts

Client: Mr. David Crouch
File Name: 201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Total Number of Samples in this Report: 1
ODM Batch Number(s): 7554

Sample Number	Number of Grains																	
	Selected MMSIMs																	
	1.0 to 2.0 mm						0.5 to 1.0 mm						0.25 to 0.5 mm					
	Low-Cr diopside		Cpy		Gh		Low-Cr diopside		Cpy		Gh		Low-Cr diopside		Cpy		Gh	
	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P
DC-ICL-TZ-72	1	1	0	0	0	0	0	0	0	0	0	0	8	8	0	0	0	0

Sample Number	Number of Grains																							
	KIMs																							
	1.0 to 2.0 mm												0.5 to 1.0 mm											
	GP		GO		DC		IM		CR		FO		GP		GO		DC		IM		CR		FO	
	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P
DC-ICL-TZ-72	1	1	1	1	0	0	1	1	0	0	1	1	8	8	3	3	0	0	29	29	7	7	6	6

Sample Number	Number of Grains													
	KIMs													
	0.25 to 0.5 mm												Total (KIMs)	
	GP		GO		DC		IM		CR		FO			
	T	P	T	P	T	P	T	P	T	P	T	P	T	P
DC-ICL-TZ-72	21	21	13	13	4	4	50	20	60	20	12	12	217	147

T = Total number of grains in sample. Total is estimated if number is greater than number of picked grains.
P = Number of picked grains in sample.

Kimberlite Indicator Mineral Remarks

Client: Mr. David Crouch
File Name: 201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Total Number of Samples in this Report: 1
ODM Batch Number(s): 7554

Sample Number	Remarks
DC-ICL-TZ-72	Almandine-hornblende-goethite/epidote assemblage. SEM checks from 1.0-2.0 mm fraction: 1 GO versus almandine candidate = 1 GO (Cr-poor pyrope); 2 IM versus crustal ilmenite candidates = 1 IM and 1 crustal ilmenite; and 1 FO versus diopside candidate = 1 FO. SEM checks from 0.5-1.0 mm fraction: 5 GO versus almandine candidates = 3 GO (Cr-poor pyrope) and 2 almandine; 7 IM versus crustal ilmenite candidates = 4 IM and 3 crustal ilmenite; 1 CR candidate = 1 CR; and 6 FO versus diopside candidates = 6 FO. SEM checks from 0.25-0.5 mm fraction: 6 GO versus almandine candidates = 5 GO (Cr-poor pyrope) and 1 grossular. Sole IM from 1.0-2.0 mm fraction, 16 IM from 0.5-1.0 mm fraction, and 3 GP and 40% of IM have partial alteration mantles.

Appendix 15

Drone Footage

See digital file for drone footage.

Statement of Qualifications:

I, Brian Anthony (Tony) Bishop p/l #A44063 of Kenogami (RR#2 Swastika, ON), hereby certify as follows concerning my report on Claim L 4282172 in Gillies Limit, Larder Lake Mining Division:

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 0-92085293-9) which was used in prospecting courses in Nova Scotia). I have held an Ontario Prospector's License for 36 years, 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.

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.

The last three years I have devoted to full-time diamond exploration. This has included 1,000+ hours of research from many diverse sources on exploration and processing techniques.

Drawing on this research and my many years of practical experience 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 time/cost constraints. 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:

Brian Anthony (Tony) Bishop

November 27, 2017

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Thank you.

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Exploring Heavy Minerals

Laboratory Data Report

Client Information

Mr. David Crouch
38 Harding Avenue
Kirkland Lake, Ontario
P2N 1B5

Email: dgcrouch@rogers.com

Attention: Mr. David Crouch

Data-File Information

Date:	Septembe 05, 2017
Project name:	
ODM batch number:	7554
Sample numbers:	DC-ICL-TZ-72
Data file:	201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Number of samples in this report:	1
Number of samples processed to date:	1
Total number of samples in project:	1
Preliminary data:	
Final data:	X
Revised data:	

Sample Processing Specifications

1. Submitted by client: Sand and gravel sample prescreened to -5.0 mm in the field.
2. One 300 g archival split taken.
3. Sample panned for gold, PGMs and fine-grained metallic indicator minerals.
4. The shaking table concentrates refined by heavy liquid separation at S.G. 3.2 to create a heavy mineral concentrate ("HMC").
5. The 0.25-2.0 mm, nonferromagnetic HMC fractions picked for indicator minerals.

Notes

Don Holmes, P.Geo.
President

Sample Reception Log

Client: Mr. David Crouch
File Name: 201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Total Number of Samples in this Report: 1
ODM Batch Number(s): 7554

Sample Number	Number of bags per Sample	Security Seal No.	Date Received	Comments
DC-ICL-TZ-72	1	NA	21-Aug-17	

Overburden Drilling Management Limited - Abbreviations Table

Raw Sample Weights and Descriptions Log

Largest Clast Size Present:
- G: Granules
- P: Pebbles
- C: Cobbles

Clast Composition:
- V/S: Volcanics and/or sediments
- GR: Granitics
- LS: Limestone, carbonates
- OT: Other lithologies (refer to footnotes)
- TR: Only trace present
- NA: Not applicable
- OX: Very oxidized, undifferentiated

Matrix Grain Size Distribution:
- S/U: Sorted or unsorted
- SD: Sand (F: Fine; M: Medium; C: Coarse)
- ST: Silt
- CY: Clay
- Y: Fraction present
- +: Fraction more abundant than normal
- -: Fraction less abundant than normal
- N: Fraction not present

Matrix Organics:
- ORG: Y: Organics present in matrix
  - N: Organics absent or negligible in matrix
  - +: Matrix is mainly organic

Matrix Colour:

Primary:

BE:	Beige	GG:	Grey-green
BR:	Brick Red	PP:	Purple
GY:	Grey	PK:	Pink
GB:	Grey-beige	PB:	Pink-beige
GN:	Green	MN:	Maroon

Secondary (soil):
- OC: Ochre
- BN: Brown
- BK: Black

Secondary Colour Modifier:
- L: Light
- M: Medium
- D: Dark

Detailed Gold Grain Log

- VG: Visible gold grains

Thickness:
- M: Actual measured thickness of grain (µm)
- C: Thickness of grain (µm) calculated from measured width and length

Kimberlite Indicator Mineral (KIM) Log

- GP: Purple to red peridotitic garnet (G9/10 Cr-pyrope)
- GO: Orange mantle garnet; includes both eclogitic pyrope-almandine (G3) and Cr-poor megacrystic pyrope (G1/G2) varieties; may include unchecked (by SEM) grains of common crustal garnet (G5) lacking diagnostic inclusions or crystal faces
- DC: Cr-diopside; distinctly emerald green (paler emerald green low-Cr diopside picked separately)
- IM: Mg-ilmenite; may include unchecked (by SEM) grains of common crustal ilmenite lacking diagnostic inclusions or crystal faces
- CR: Chromite
- FO: Forsterite

Metamorphosed/Magmatic Massive Sulphide Indicator Mineral (MMSIM) and Porphyry Cu Indicator Mineral (PCIM) Logs

Adr:	Andradite	Cpx:	Clinopyroxene	Gth:	Goethite	PGM:	Platinum group-bearing mineral	Spi:	Spinel
Ap:	Apatite	Cpy:	Chalcopyrite	Ilm:	Ilmenite			Sps:	Spessartine
Ase:	Anatase	Cr:	Chromite	Ky:	Kyanite	Py:	Pyrite	St:	Staurolite
Aspy:	Arsenopyrite	Fay:	Fayalite	Mz:	Monazite	REM:	Rare earth-bearing mineral	Tm:	Tourmaline
Ax:	Axinite	Gh:	Gahnite	Ol:	Olivine			Ttn:	Titanite
		Gr:	Grossular	Opx:	Orthopyroxene	Sil:	Sillimanite	Zir:	Zircon

Other

- HMC: Heavy mineral concentrate
- UV: Ultra-violet
- EPD: Electric-pulse disaggregation
- PGE: Platinum group element

Gold Grain Summary

Client: Mr. David Crouch
File Name: 201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Total Number of Samples in this Report: 1
ODM Batch Number(s): 7554

	Number of Visible Gold Grains				Nonmag HMC Weight (g)*	Calculated PPB Visible Gold in HMC			
Sample Number	Total	Reshaped	Modified	Pristine		Total	Reshaped	Modified	Pristine
DC-ICL-TZ-72	48	33	14	1	34.8	1649	1468	177	4

* Calculated PPB Au based on assumed nonmagnetic HMC weight equivalent to 1/250th of the table feed.

Detailed Gold Grain Data

Client: Mr. David Crouch
File Name: 201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Total Number of Samples in this Report: 1
ODM Batch Number(s): 7554

Sample Number	Dimensions (µm)				Number of Visible Gold Grains				Nonmag HMC Weight* (g)	Calculated V.G. Assay in HMC (ppb)	Metallic Minerals in Pan Concentrate
	Thickness		Width	Length	Reshaped	Modified	Pristine	Total			
DC-ICL-TZ-72	3	C	15	15	2			2		<1	Tr (5 grains) arsenopyrite (25-75 µm).
	5	C	25	25	3	2		5		3	
	8	C	25	50	2	3		5		10	
	10	C	25	75	1	1	1	3		12	
	10	C	50	50	4	2		6		33	
	13	C	50	75	9	2		11		113	
	15	C	50	100	1	2		3		49	
	15	C	75	75	2			2		37	
	18	C	75	100	2			2		57	
	20	C	75	125	2	1		3		121	
	22	C	100	125	3	1		4		241	
	27	C	125	150	1			1		109	
	100	M	200	200	1			1		862	
								48	34.8	1649	

* Calculated PPB Au based on assumed nonmagnetic HMC weight equivalent to 1/250th of the table feed.

Primary Sample Processing Weights and Descriptions

Client: Mr. David Crouch
File Name: 201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Total Number of Samples in this Report: 1
ODM Batch Number(s): 7554

ODM #	Sample Number	Weight (kg wet) Bulk Rec'd	Archived Split	Table Split	+2.0 mm Clasts*	Table Feed	Clasts (+2.0 mm)* Size	Percentage V/S	GR	LS	OT	Matrix (-2.0 mm) Distribution S/U	SD	ST	CY	ORG	Colour SD	CY	Class
A1	DC-ICL-TZ-72	11.8	0.3	11.5	2.8	8.7	G	90	10	Tr	0	S	MC	-	N	N	MOC	NA	SAND + GRAVEL

*Sample prescreened to -5.0 mm in the field.

Laboratory Processing Weights

Client: Mr. David Crouch
File Name: 201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Total Number of Samples in this Report: 1
ODM Batch Number(s): 7554

	Weight of -2.0 mm Table Concentrate (g)												
			0.25 to 2.0 mm Heavy Liquid Separation S.G. 3.20										
					HMC S.G.>3.20								
								Nonferromagnetic HMC					
									Processed Split				
									Total				
Sample Number	Total	-0.25 mm	Total	Lights S.G. <3.2	Total	-0.25 mm (wash)	Mag	Total	%	Weight	0.25 to 0.5 mm	0.5 to 1.0 mm	1.0 to 2.0 mm
DC-ICL-TZ-72	1603.8	921.3	682.5	656.0	26.5	4.4	2.3	19.8	100	19.8	10.8	6.6	2.4

Kimberlite Indicator Mineral Counts

Client: Mr. David Crouch
File Name: 201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Total Number of Samples in this Report: 1
ODM Batch Number(s): 7554

Sample Number	Number of Grains																																																							
	Selected MMSIMs																		KIMs																																					
	1.0 to 2.0 mm						0.5 to 1.0 mm						0.25 to 0.5 mm						1.0 to 2.0 mm												0.5 to 1.0 mm												0.25 to 0.5 mm												Total (KIMs)	
	Low-Cr diopside		Cpy		Gh		Low-Cr diopside		Cpy		Gh		Low-Cr diopside		Cpy		Gh		GP		GO		DC		IM		CR		FO		GP		GO		DC		IM		CR		FO		GP		GO		DC		IM		CR		FO			
	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P	**T**	P
DC-ICL-TZ-72	1	1	0	0	0	0	0	0	0	0	0	0	8	8	0	0	0	0	**1**	1	**1**	1	0	0	**1**	1	0	0	**1**	1	**8**	8	**3**	3	0	0	**29**	29	**7**	7	**6**	6	**21**	21	**13**	13	**4**	4	**50**	20	**60**	20	**12**	12	**217**	147

T = Total number of grains in sample. Total is estimated if number is greater than number of picked grains.
P = Number of picked grains in sample.

Kimberlite Indicator Mineral Remarks

Client: Mr. David Crouch
File Name: 201747554 - Crouch - KIM - (DC-ICL-TZ-72) - September 2017
Total Number of Samples in this Report: 1
ODM Batch Number(s): 7554

Sample Number	Remarks
DC-ICL-TZ-72	Almandine-hornblende-goethite/epidote assemblage. SEM checks from 1.0-2.0 mm fraction: 1 GO versus almandine candidate = 1 GO (Cr-poor pyrope); 2 IM versus crustal ilmenite candidates = 1 IM and 1 crustal ilmenite; and 1 FO versus diopside candidate = 1 FO. SEM checks from 0.5-1.0 mm fraction: 5 GO versus almandine candidates = 3 GO (Cr-poor pyrope) and 2 almandine; 7 IM versus crustal ilmenite candidates = 4 IM and 3 crustal ilmenite; 1 CR candidate = 1 CR; and 6 FO versus diopside candidates = 6 FO. SEM checks from 0.25-0.5 mm fraction: 6 GO versus almandine candidates = 5 GO (Cr-poor pyrope) and 1 grossular. Sole IM from 1.0-2.0 mm fraction, 16 IM from 0.5-1.0 mm fraction, and 3 GP and 40% of IM have partial alteration mantles.

INPUT ASSEMBLAGE	INPUT REMARKS
Almandine-hornblende-goethite/epidote	SEM checks from 1.0-2.0 mm fraction: 1 GO versus almandine candidate = 1 GO (Cr-poor pyrope); 2 IM versus crustal ilmenite candidates = 1 IM and 1 crustal ilmenite; and 1 FO versus diopside candidate = 1 FO. SEM checks from 0.5-1.0 mm fraction: 5 GO versus almandine candidates = 3 GO (Cr-poor pyrope) and 2 almandine; 7 IM versus crustal ilmenite candidates = 4 IM and 3 crustal ilmenite; 1 CR candidate = 1 CR; and 6 FO versus diopside candidates = 6 FO. SEM checks from 0.25-0.5 mm fraction: 6 GO versus almandine candidates = 5 GO (Cr-poor pyrope) and 1 grossular. Sole IM from 1.0-2.0 mm fraction, 16 IM from 0.5-1.0 mm fraction, and 3 GP and 40% of IM have partial alteration mantles.