

# LMSL Project, B.C.

Technical Review Summary



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# **Executive Summary**

#### Geochemistry of the Lucky Mike Project, contextualized by geology and geophysics:

On a large scale, Lucky Mike is well placed. It appears to reside in a structural corridor which also hosts a cluster of porphyry deposits to the south, Axe and Primer. The abundance of nearby skarn (hosted by Ashcroft) and polymetallic (hosted by Nicola) showings in the immediate area bodes well for hydrothermal activity and metallogeny. Abundant surface geochemistry is somewhat complicated by a large variety of analysis types employed over many years, but results generally agree that the TMI magnetic anomaly, most likely representing an intrusive complex, drives the majority of anomalism, which is also structurally guided by a prominent N-S striking feature bordering a wedge of Ashcroft carbonate sediments.

Historic drill testing would appear to have confirmed the presence of a hydrothermal porphyry Cu (+) Mo (+/-) Au system but narrowly missed the core, and presumably better mineralized portion.

Acquisition of further data, geochemical and geophysical, southward from the current area of coverage, and integration with historic data is recommended.

#### Conceptually:

The geochemistry reviewed would suggest that a hydrothermal cell(s) were originated from the underlying batholith noted in TMI imagery, mineralizing upper levels with base metals and silver, followed by continued development of a molybdenum shell.

The fundamental question to be answered from the economic perspective is whether the hydrothermal activity was focused above a highly fractionated cupola of the batholith and related porphyry stocks, and properly lidded in the sense that metals could be concentrated into a focused central area of higher grades, or if the smoke seen in the area is the product of a broad, open system, related to the simple cooling and devolatilization of the underlying batholith. Either possibility remains open, although the presence of stockwork veining and breccias in drill-core supports the favorable, lidded hypothesis.

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# Metallogeny and Architecture

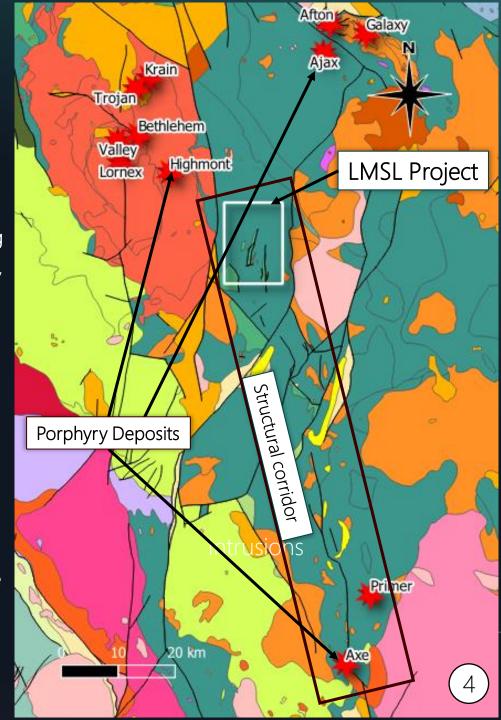
BC Minfile Showings at Left:

Numerous showings, predominantly of magmatichydrothermal affinity, including two porphyry copper prospects (Rey Lake and Lucky Mike area).

The area directly south of Lucky Mike proper contains polymetallic showings hosted in Nikola volcanics, and Pb-Zn skarns hosted by Ashcroft sediments.

USGS Porphyry Deposits at Right:

Large scale lineaments are traceable from the Axe and Primer areas and appear to be on-strike (approximately) with the Lucky Mike area, suggesting an important architectural element for metallogeny in the area (black rectangle, at right).



# Lornex Regional Trend Geology + Mineral Occurrences Developed Prospect Past Producer Prospect Showing

# Metallogeny and Architecture

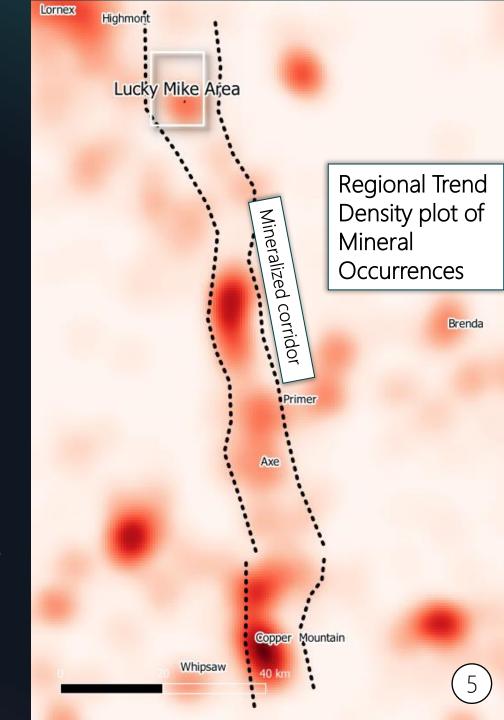
Regional Minfile showing at Left:

There is a clear concentration of past producers, prospects, and showings along this structural corridor (left).

Mineral Showings heat-mapped at right:

The mineralised structural corridor can be extended for at least 130 km along strike by combining density of showings with structural mapping from the BCGS to include the producing Copper Mountain mine.

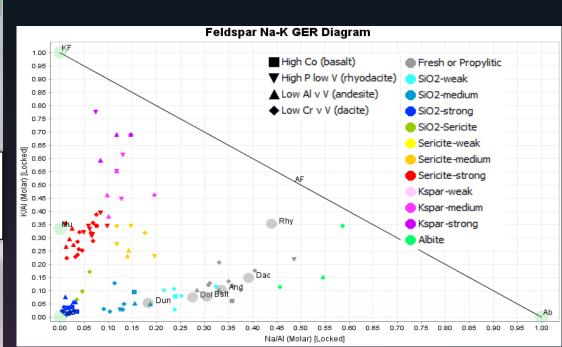
\*Data from BC Minfiles.

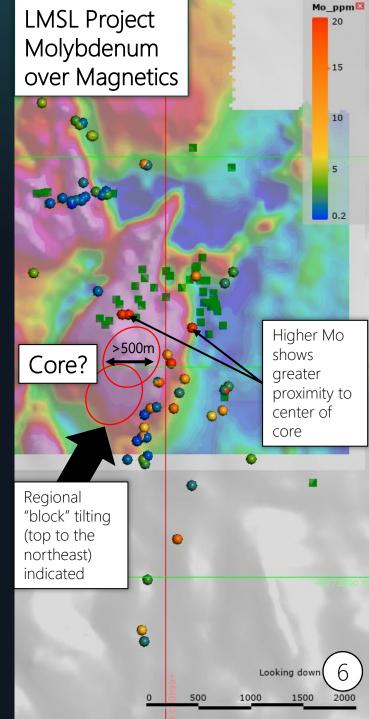


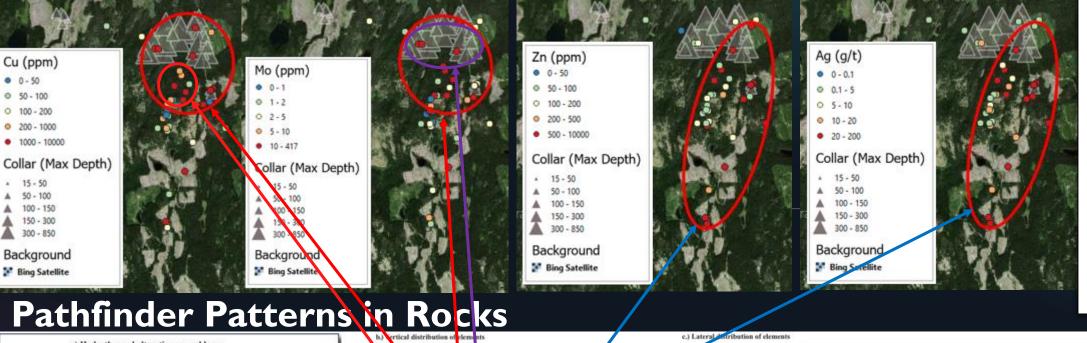
#### Alteration\_GER 🖾 LMSL Project Albite Alteration over Fresh or Propylitic Kspar-medium Magnetics Kspar-strong Sericite-medium Sericite-strong SiO2-medium SiO2-Sericite SiO2-strong SiO2-weak Drilling in high level leached and silicious dominated Core? alteration Regional "block" tilting (top to the Chalcopyrite northeast) associated with indicated magnetite noted in drillina 1000 1500

# Alteration Patterns in Rock Geochemistry

- Green squares show historic collar locations for reference. TMI raster as background.
- Leached or siliceous compositions are predominant in the area of historic drilling, and more sericitic chemistry becomes increasingly common to the south. Shows previous drilling was in high level, and not targeting core.
- Area on and around the TMI anomaly is broadly anomalous in Mo values possibly indicating proximity to core of porphyry system.
- Several target areas remain untested with favorable geology and geochemistry, including area immediately to the south of the previous drilling.
- Alteration geochemistry indicates regional block tilting of geology with top to the northeast which is consistent with regional geology and could explain why drilling to depth in high level alteration missed the core of the system.







Regional "block" tilting (top to the northeast) along with strong structural controls explains elongated and horizontal distribution of originally vertical geochemical zonation and footprint.

Shallow sericitic

0.2 - 10

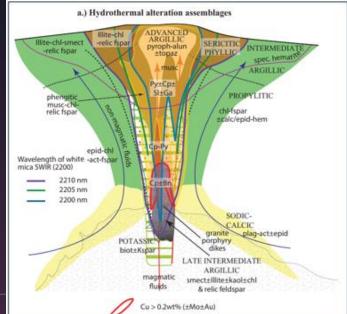
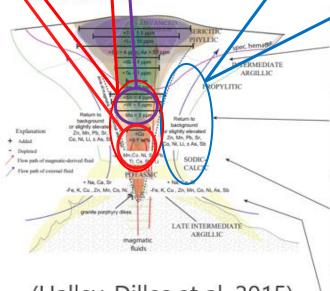
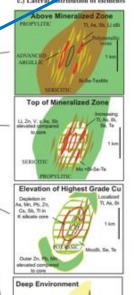


FIGURE 1. a.) Vertical cross section of a typical porphyry Cu deposit showing distribution of hydrothermal alteration and sulfide minerals. Also shown are generalized contours of the 2,200-nm peak measured in SWIR instruments



(Halley, Dilles et al. 2015)

FIGURE 1. (Cont.) b.) Vertical variations in trace elements in a porphyry Cu system. c.) Schematic changes in hydrothermal alteration assemblages and trace elements through a porphyry Cu system viewed as a series of map views through a vertical system



CALCIC

Na, Ca, and Sr enrichment

Average crust abundance<sup>1</sup> Potassic Metal Deep sericitic >200-ore Mo 0.5-ore 2-20 0.5 - 50.5 - 10Sn 2.5 2-30 bkgd bkgd 2-20 1,400 <bkgd 1,000-5,000 400-1,000 Zn <bkgd 200-1,000 10-100 200-1.000 10-1002 50 0.08 0.5 - 31-50 1-102 bkad-30 Ni <bkgd Co 10 bkgd-20 0.05 5-20 0.001 0.1 0.05 0.06 1-10 <bkgd 10-50 50-1.000 <bkgd 1-3 3-100

TABLE 1. Typical Pathfinder Elemental Ranges (ppm)

0.36

0.08

Background concentration (bkgd) varies by rock unit; this is the average crustal abundance (Ni and Co = average upper crust; Taylor and McLennan, 1985); alteration zones are potassic from ore zone, deep sericitic above ore zone, and shallow sericitic and associated advanced argillic near

<bkgd

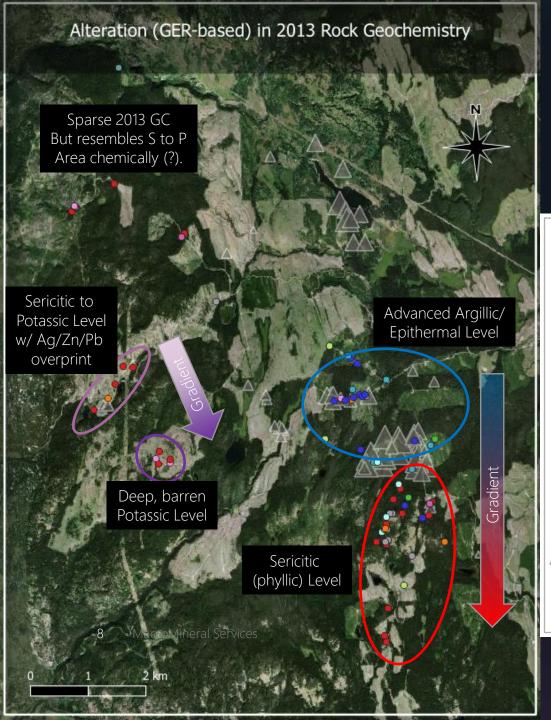
0.2

0.05

<bkgd

0.05

<sup>2</sup>Alunite is commonly enriched in Pb, Ag, Ba, and Sr in advanced argillic alteration



## **Alteration vs Pathfinders**

#### Alteration (GER)

- Fresh or Propylitic
- SiO2-weak
- SiO2-medium
- SiO2-strong
- SiO2-Sericite
- Sericite-medium
- Sericite-strong
- Kspar-medium
- Kspar-strong
- Albite

#### Collar (Max Depth)

15 - 50

▲ 50 - 100

▲ 100 - 150

**150 - 300** 

300 - 850

#### Background

🛂 Bing Satellite

Based on the compiled rock Geochem viewed via pathfinders and contextualized by GER alteration classification we can propose the broad strokes of a hydrothermal system model.

Western side (purples): Cu, Mo, and sericitic alteration suggest transition from phyllic toward a potassic assemblage. To the southeast samples have a stronger potassic signature but less metal, suggesting a deep, barren level in the porphyry model. Ag, Zn, and Pb overprints the area (a later event perhaps, base metal distal veins from a distinct, later center?).

Eastern (Lucky Mike Area) side (blue to red): very siliceous, altered rock in the north, resembles advanced argillic, transitions southward into an area with phyllic characteristics. Looks as though previous operators were strongly focused on the transition zone (looking for epithermal Au?). Again, this area contains abundant Ag, Zn, and Pb, suggesting overprinting and long-lived system. The most prospective area remains immediately to the south of the previous work. Strong structural influence creating elongated anomalism.

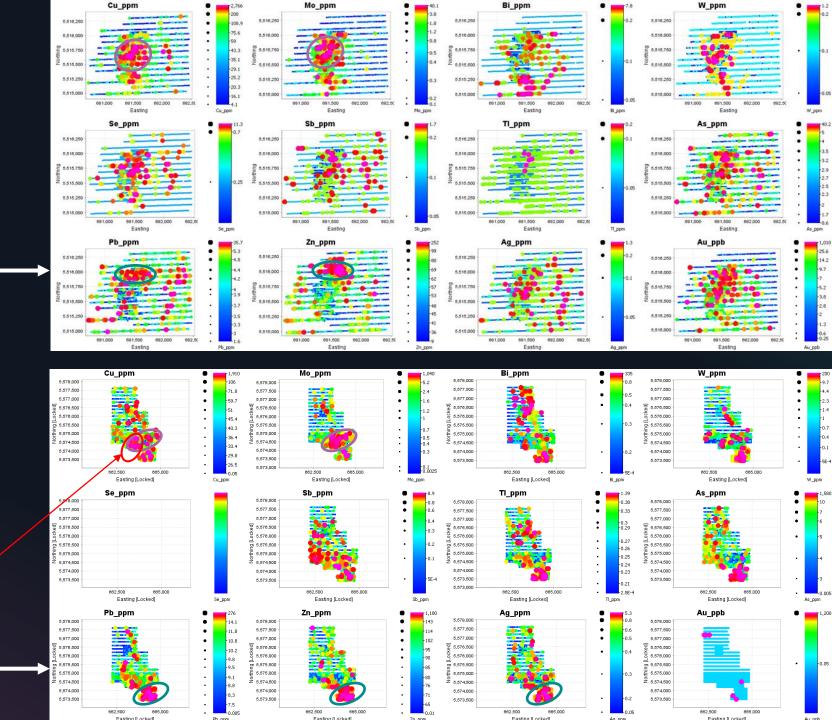
# 2013 Soil Survey vs Primer Soils (Kodiak Copper discovery) Comparison

Premier Soil Grid

- Similar scales of anomalism (Lucky mike area shows larger anomalies – reference grid 500m wide for Premier vs 1000m wide for Lucky Mike).
- Some interesting parallel results in the sense that Primer shows a central Cu-Mo anomaly with a base metal anomaly to the north and the drilling area of LM shows a Cu-Mo anomaly with a base metal anomaly to the southeast.
- Base metal and silver tenor is much higher in Lucky Mike, perhaps to be expected in a skarn scenario (higher reactivity in carbonate units)
- o Note that the Lucky Mike Cu and Mo anomalies are

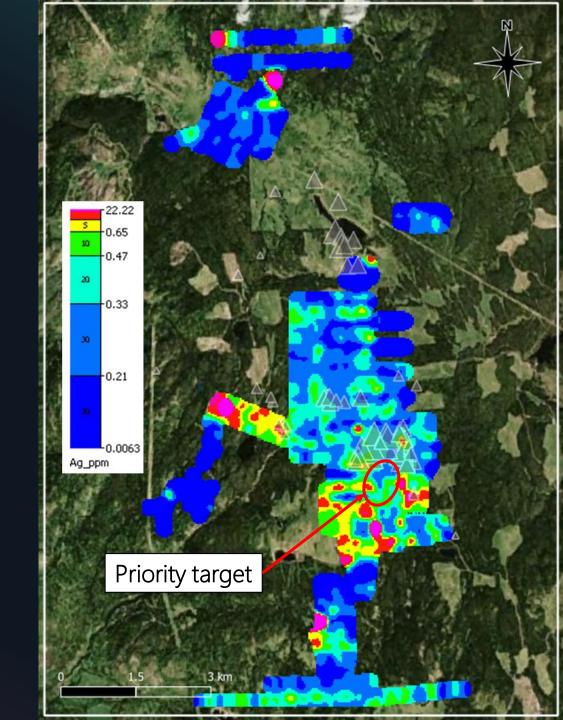
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Lucky Mike Area Soil Grid

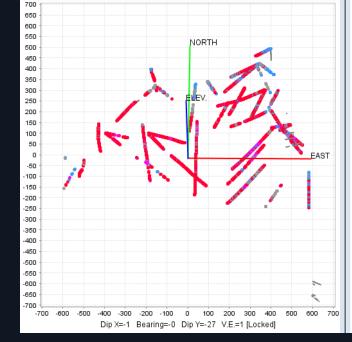


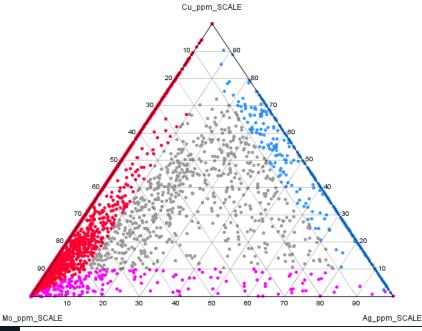
# **Soil Geochemistry**

- Gridded composites from pathfinder elements which appeared to be comparable between surveys at right.
- Note that the main drilled area corresponds well to Mo anomalism. Mo values are extremely high in drillhole assays.
- o Ag and Zn are higher to the south/southeast, which perhaps led to the prior workers constraining the system. Rock geochemistry contradicts this as a distal representation, however (more sericite southward). Likely the increased Ag and Zn values are driven by skarnification effects in the Ashcroft carbonate sediments. In that context the Ag/Zn should not be considered as a constraint.
- Definite NNE grain to anomalism, fits well with structural interpretation derived from magnetics.
- System remains open and untested to south from previous drilling.



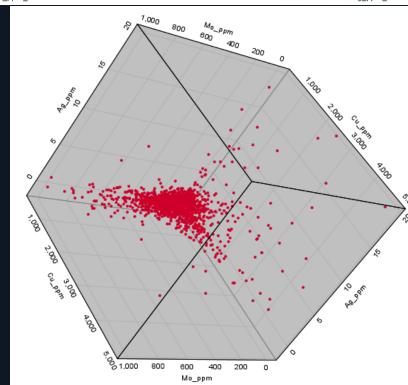
# Drillhole Geochemistry

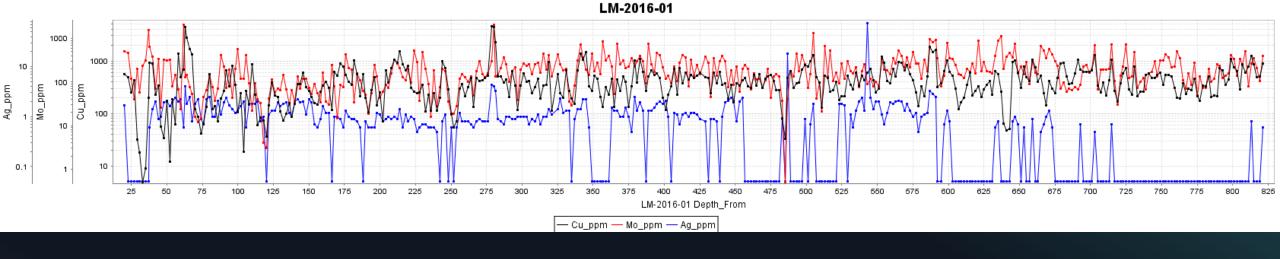




- Using scaled versions of Cu, Ag, and Mo to classify them into metal groupings using a ternary plot.
- Assuming that Cu-Mo relationship is proximal to our source and Ag-related assemblages are higher/more distal.
- Pretty clear that Ag assemblages are higher in the rock column and tend to be located in the NE. Confirms tilting scenario.
- Consistent with looking at the raw elements one by one in the previous slide.
- There are some tremendous Mo values in here. No rhenium was not assayed for, but we can likely assume that it is way above background as well. Mo generally higher on the west side so that may be giving us a vector







## LM-2016-01 Observations

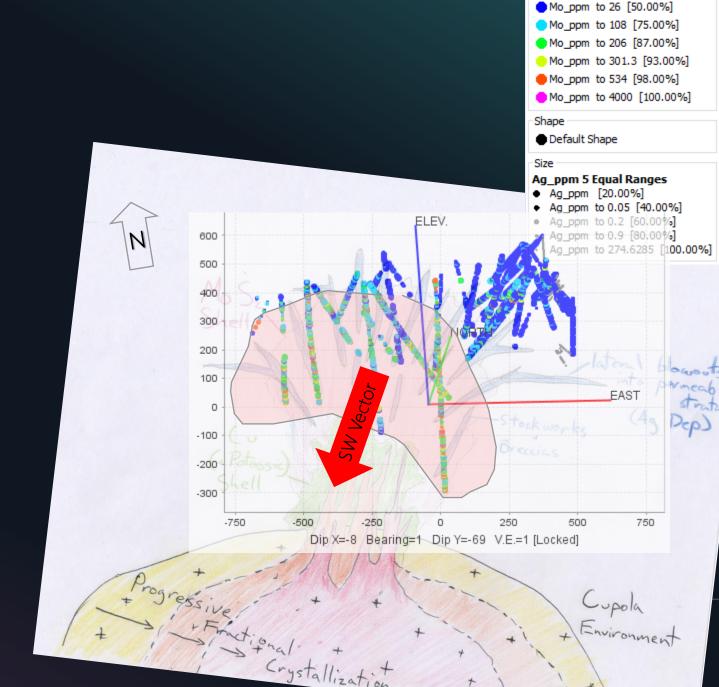
- o Deepest hole in the area, hence the focus on it.
- o Reading through the log for this hole it's evident that the operator did clip a porphyry-type hydrothermal system.
- Based on the erratic zonation patterns it is suggested that they drilled along the margins of the system, clipping mixed alteration zones, and a couple of dykes deeper down. Vertical drillhole so a vertically oriented system can produce that effect.
- Alteration assemblages are mainly chlorite-epidote and/or chlorite-actinolite, with frequent intercepts of stockwork quartz (+/- MoS2) veining and "solution" breccias. There's an observation of sericitic vein halos around 489-499m which is encouraging and suggestive of a phyllic assemblage.
- Numerous observations of potentially potassic alteration at depth but not consistent or well-zoned, again suggesting a drill path beside the principal system.
- Lots of mention of magnetite in association with chalcopyrite... Ajax and Primer both mention magnetite as ore gangue so perhaps this is a common feature between deposits in the region. Copper associated with magnetite reinforces association with high grade core being magnetic which remains untested.

o Molybdenite is observed frequently and is extremely high in assays could represent proximal plum of tilted system.

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## **Drillhole Observations**

- Overlaying the molybdenum values in drilling on the conceptual model makes a compelling case for the centre being nearby, to the SW
- This also fits with Mo anomalism in soils.
- It is suggested that LM-2016-01 grazed our system on the NE side and the holes further to the SW didn't go deep enough.
- o In a very schematic way, we can imagine the surface molybdenum and silver, base metal anomalism at surface explained by the erosional level placed on a system like that at right.
- In LM-2016-01, the erratic alterations and transition away from Mo and into higher copper at depth would be consistent with the same model.

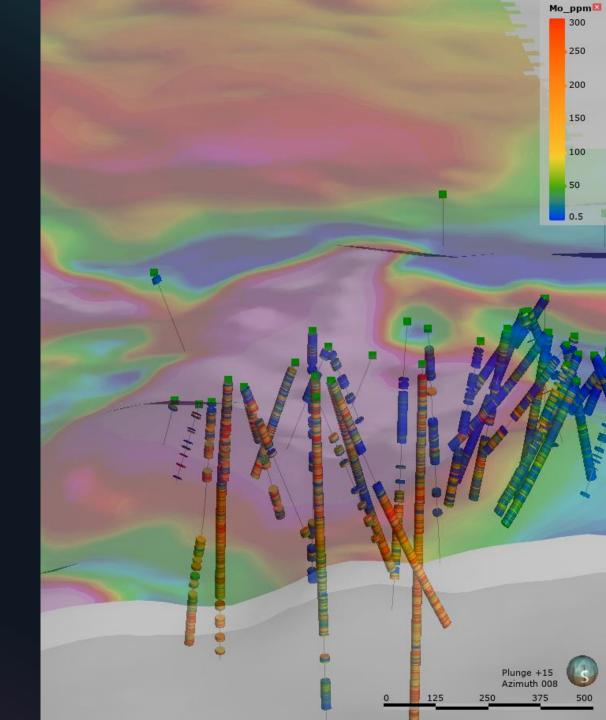


Colour

Mo ppm Progressive Half

# Synthesizing with Mag

- o Correlation with the TMI feature and Mo at surface is excellent.
- Constrained with magnetics, LM-2016-01 still looks like its at the edge of magnetic high and hydrothermal system.
- Copper association observed in drilling and related to magnetite indicate that good potential exists based on the geochemistry in surface samples and drilling.
- Vectors point towards potentially higher-grade mineralization to the southwest.
- Continued work is recommended see additional slides.





## **Conclusions**

Potential for cluster of porphyry centers in area: Geochemical signals throughout the area are consistent with a series of hydrothermal centers at varying levels of exposure at surface, ranging from the lithocap/advanced argillic environment down to a high temperature potassic level.

Located in a NW-trending regional large scale structural corridor which also hosts the Axe and Primer and Copper Mountain porphyry deposits. Presents a favorable metallogenic architecture.

Porphyry-epithermal signatures are present, but unusual in the distinctively high Ag values, which may represent:

1) overprinting events, or 2) reflect high host rock reactivity and skarn formation, and 3) high metal endowed system

In the context of superimposed and genetically related skarn/porphyry systems the patterns observed could be explained adequately. Early base/precious metal-bearing fluids which normally form a more distal halo could be buffered and precipitated much closer to source and be preserved through the continuing porphyry event(s). In other words, carbonate horizons in the Nicola or Ashcroft rocks would capture early base and precious metal fluids as skarns and the evolving system could generate sericite in volcanic facies of the Nicola in proximity to said skarns.

Historic drilling in the main area most likely focused on a very high-level part of a porphyry system within the molybdenite halo and with base and precious metal deposition as skarn and stratigraphic horizons. If a body of economic mineralization exits, it is likely roughly parallel to LM-2016-01 in terms of orientation and not far away (within a couple hundred metres probably to the southwest).

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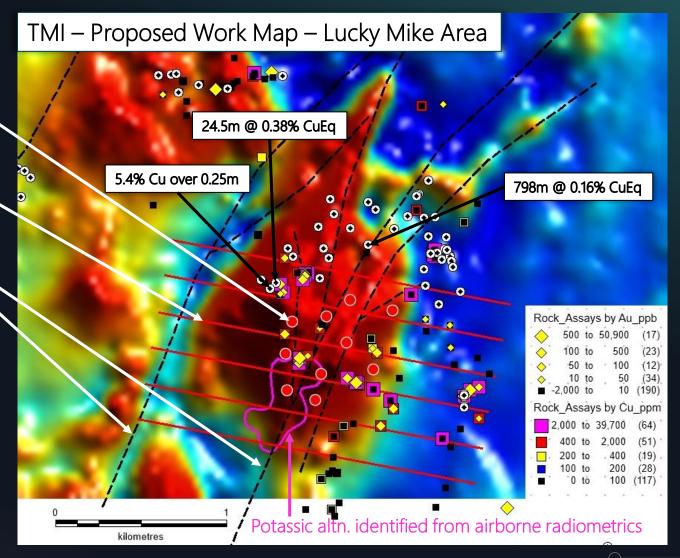
# Implications and Planned 2021-2022 Work

Planned drill holes (red circles)

Planned IP lines (red lines)

Structures (interpreted)

- Step 1 Planned Geophysics:
  - Extend electrical (IP) geophysics coverage to the south to identify underlying porphyry patterns.
- Step 2 Planned Drilling:
  - Planned Drilling follow hydrothermal Mo-rich system southsouthwest towards higher temperature regime following strong structural controls.
  - Angled holes across controlling structures to the southwest of the previously drilled area
  - and look for additional centres southward.
- Step 3 Additional Work:
  - Extend Magnetic survey further south and north in search of additional porphyry centers.



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