



Alteration beyond sight: the McPhillamys project in hyperspectral 3D

4 May 2021

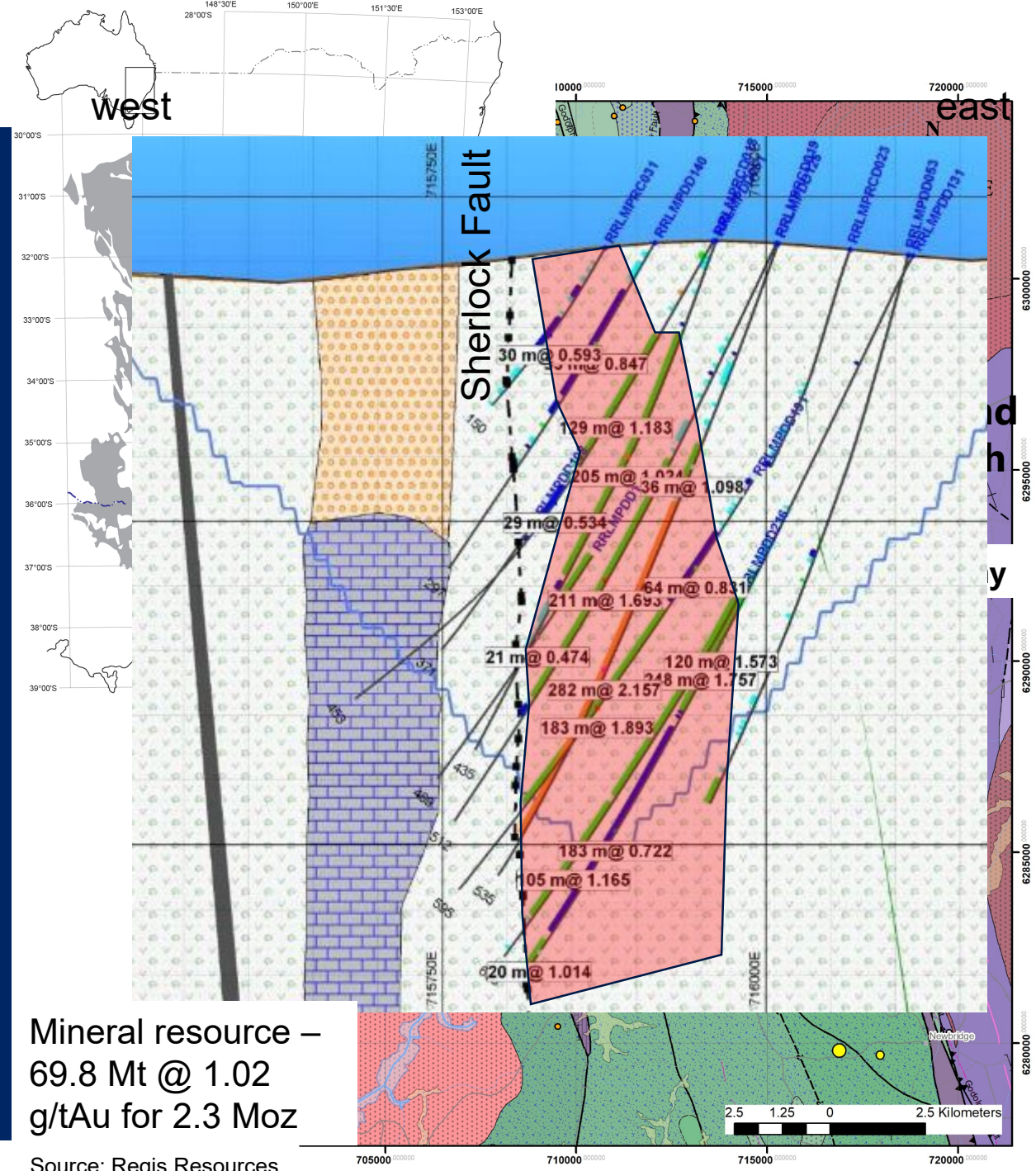
Acknowledgements

- The GSNSW HyLogging System is funded as part of the Federal government and CSIRO-funded NCRIS AuScope National Virtual Core Library Project. HyLogger, TSG and TSA are trademarks of CSIRO. Core transportation, as well as partial cost recovery of HyLogging was funded by the NCRIS AuScope National Virtual Core Library Project.
- Regis Resources Ltd graciously organised and supplied core from McPhillamys for HyLogging.



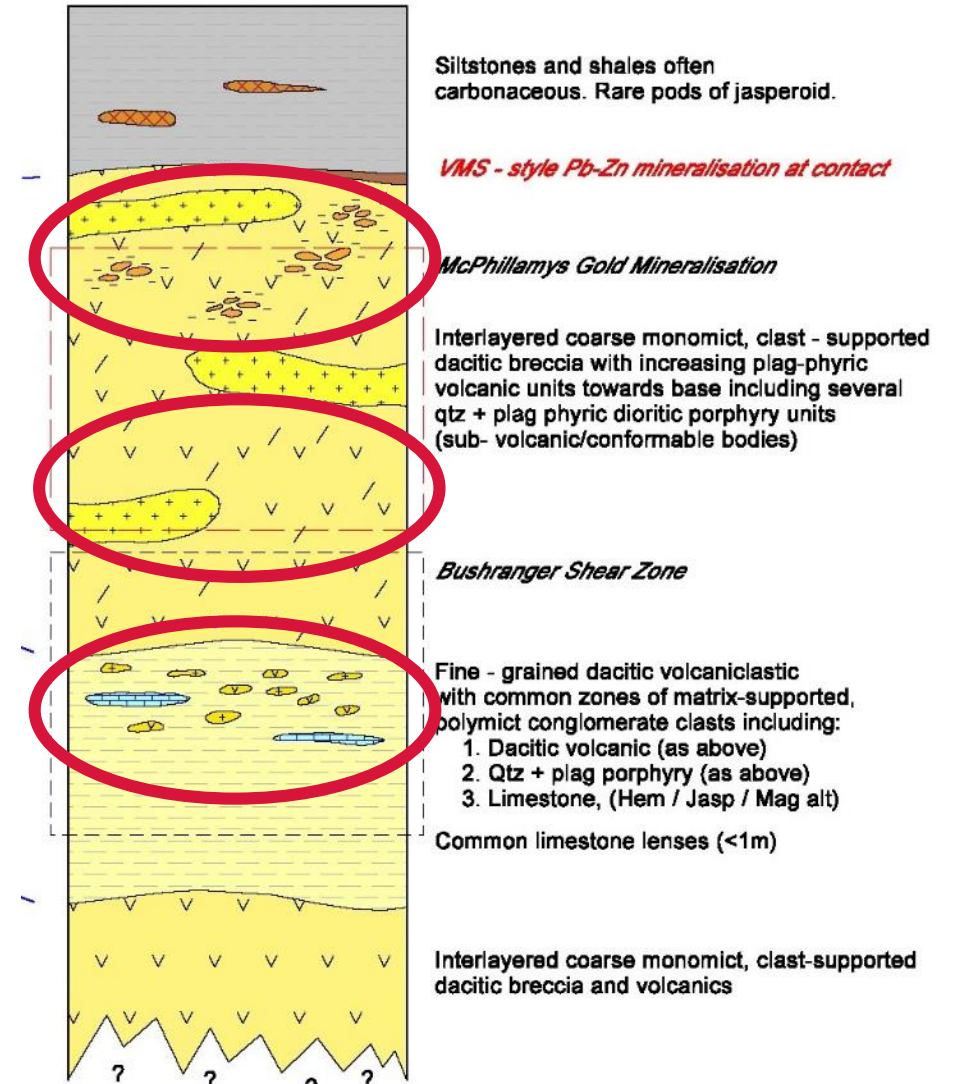
McPhillamys

- Southern end of the Molong Volcanic Belt (8 km NE Blayney)
- Eastern side of the Godolphin Fault
- Hosted in volcanoclastics of the Late Silurian Anson Formation (Mumbil Shelf)
- Mineralisation aligned within a N-NE-oriented dextral shear zone bound in the footwall by the Sherlock Fault
- Highest grade mineralisation occurs within sheared coarse-grained volcanoclastics





Dacitic to andesitic volcanoclastic host to mineralisation



Source:Deurden (2008)

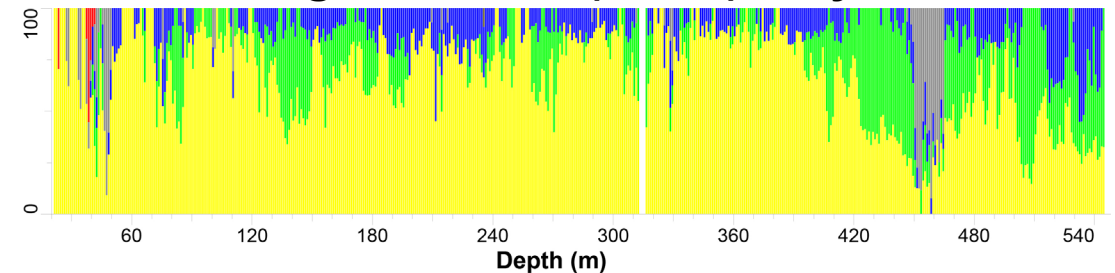
Alteration mapping

- 2018–2021 GSNSW HyLogged 11 holes drilled through the mineralisation and immediate stratigraphy at McPhillamys.
- Spectroscopically determined alteration mineralogy beyond the visible spectrum (SWIR and TIR).
- Focus on petrographic and hyperspectral characteristics of:
 - 1 hole in the south
 - 2 holes through the middle
 - 1 hole in the north.

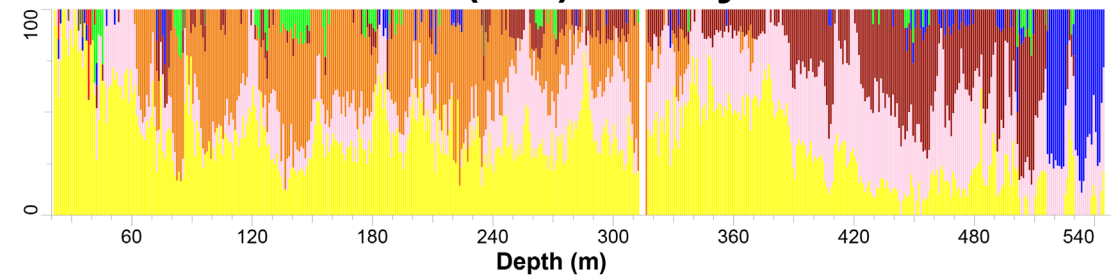


Reading hyperspectral data

Short Wavelength Infrared (SWIR) – Hydrous silicates



Thermal Infrared (TIR) – Anhydrous silicates



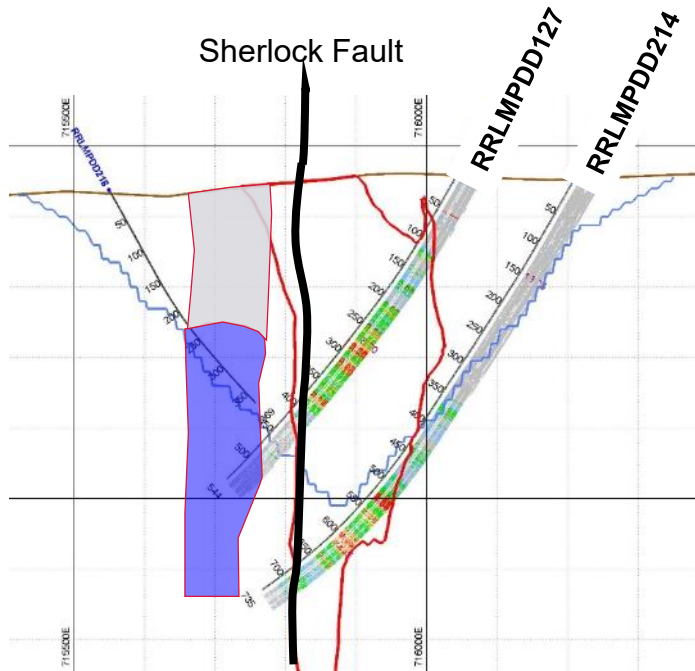
Colours = Minerals detected

White mica	Quartz
Chlorite	K-feldspar
Carbonate	Plagioclase

Y-axis ~ Mineral abundance

Spectroscopic mapping – alteration distribution & scale

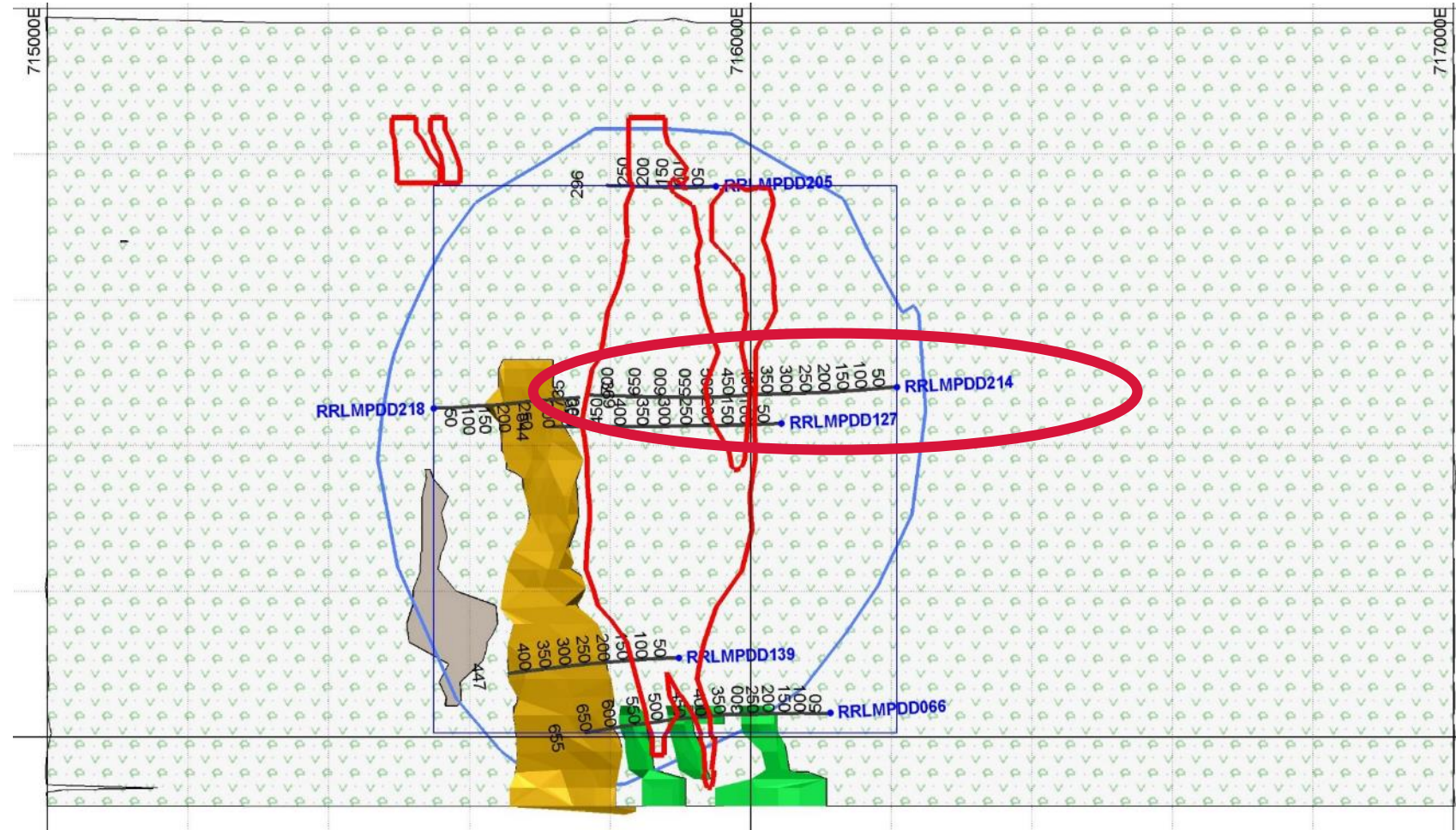
Focus on 2 holes through the middle of McPhillamys orebody



Cross-section facing north

West

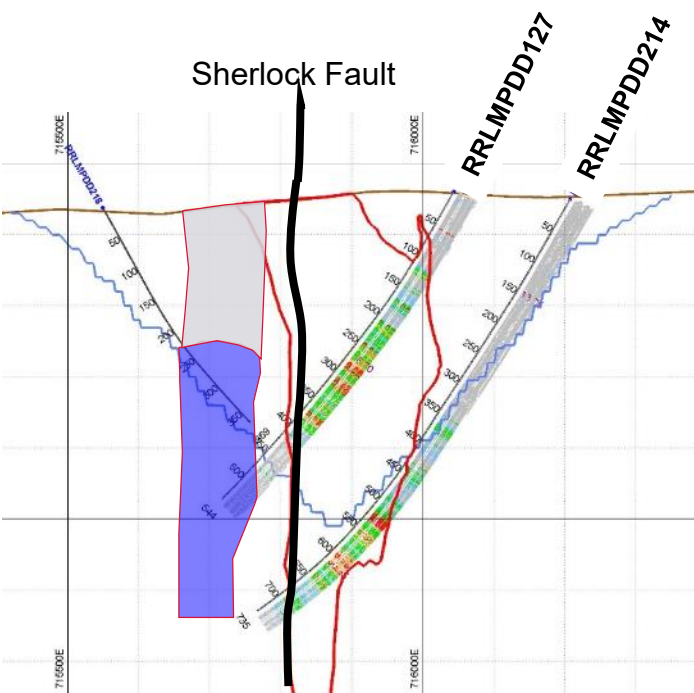
East



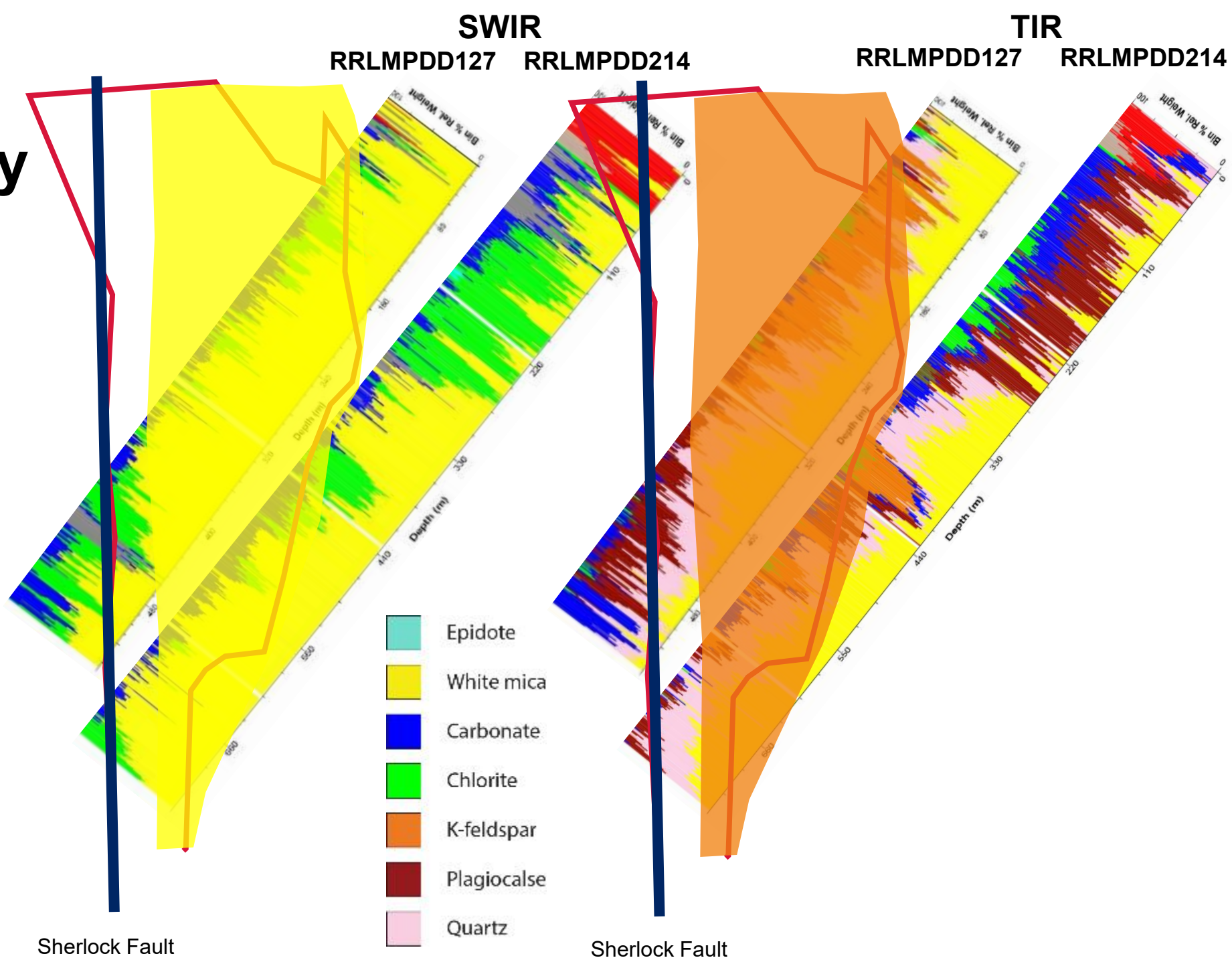
Plan view of McPhillamys orebody (red outline)

Source: Regis Resources

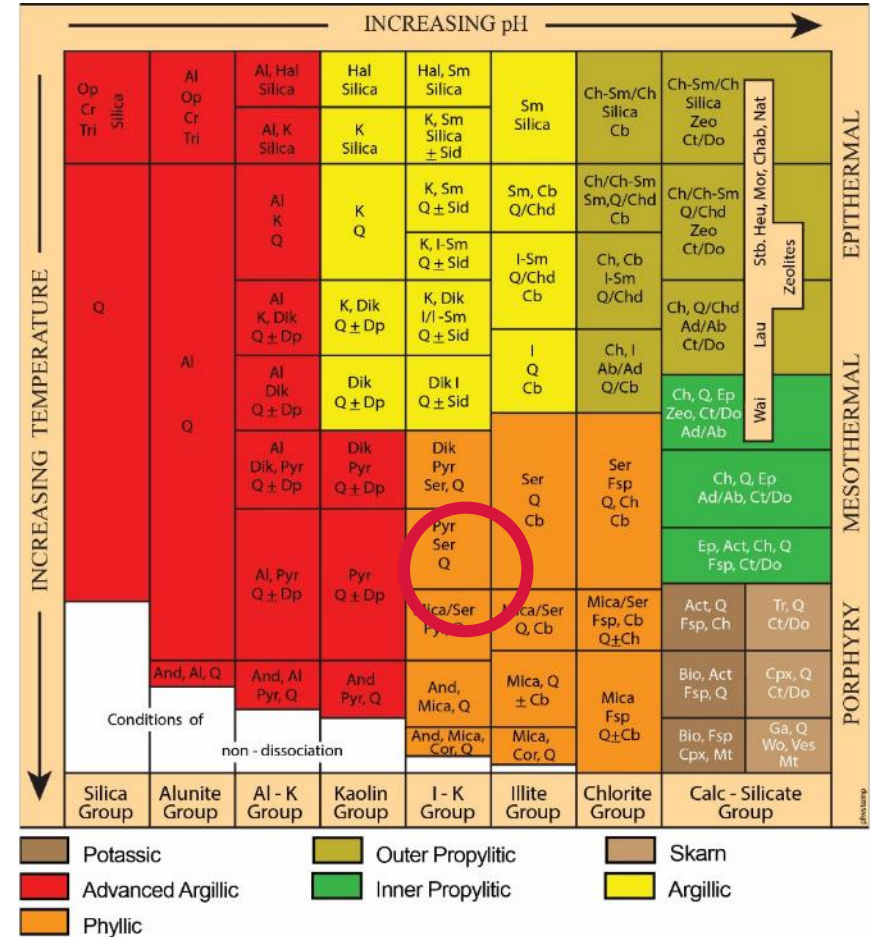
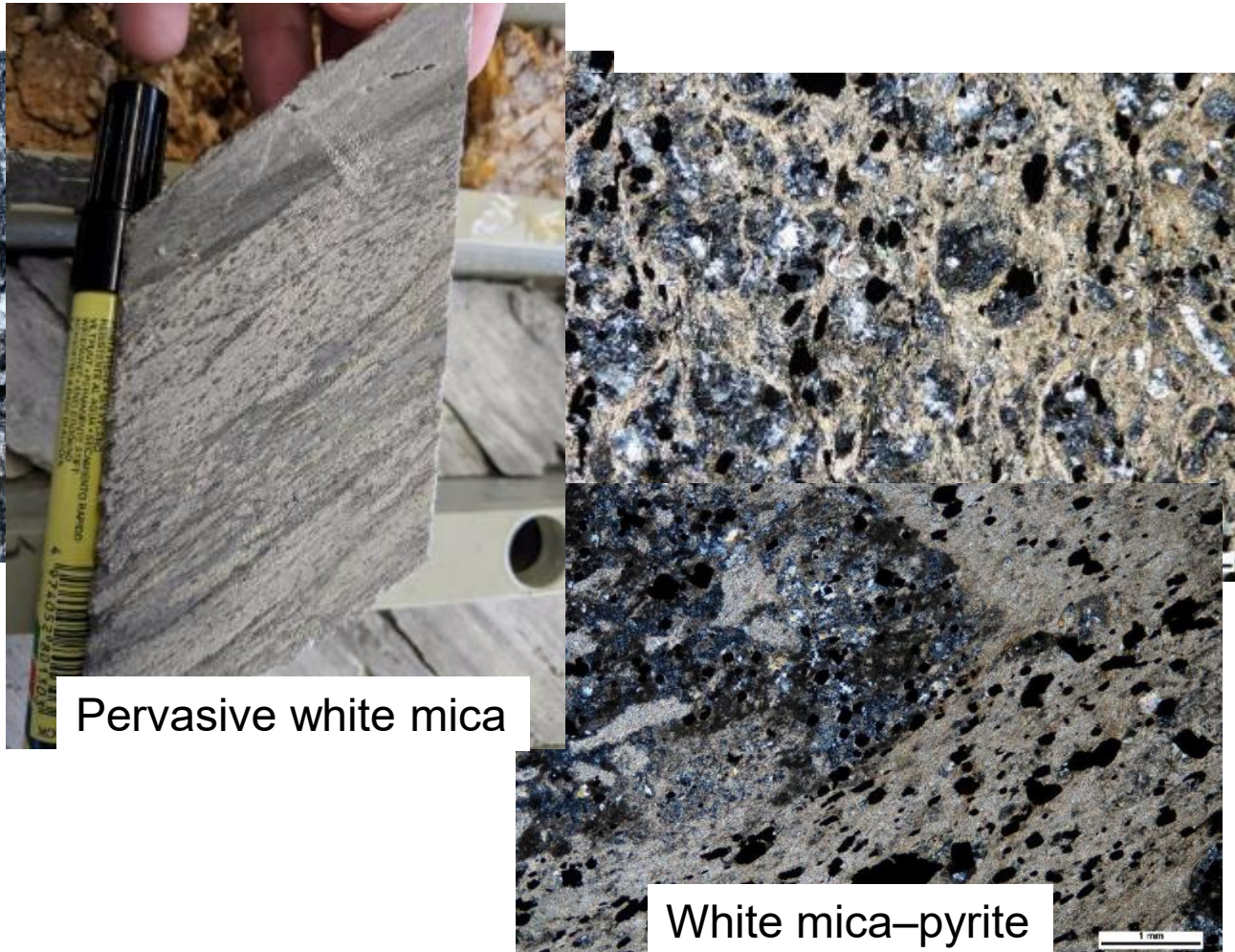
Alteration – central orebody



Facing north

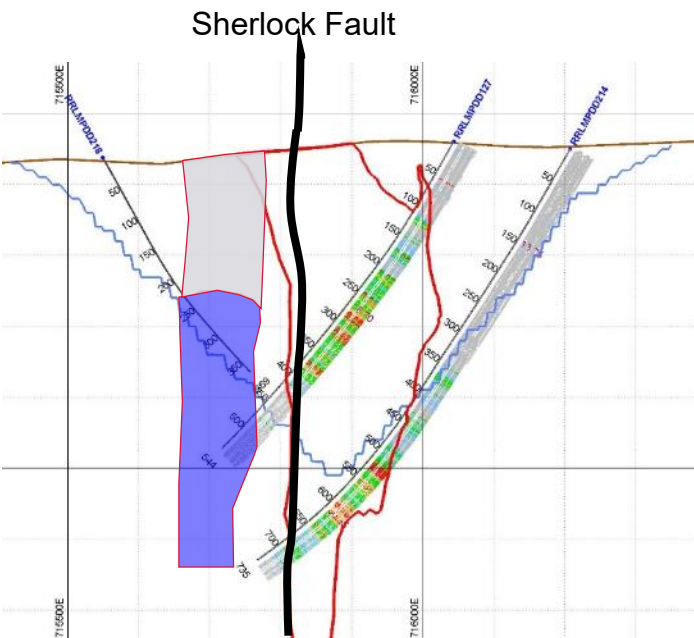


Alteration – stage 2 central orebody – white mica–pyrite

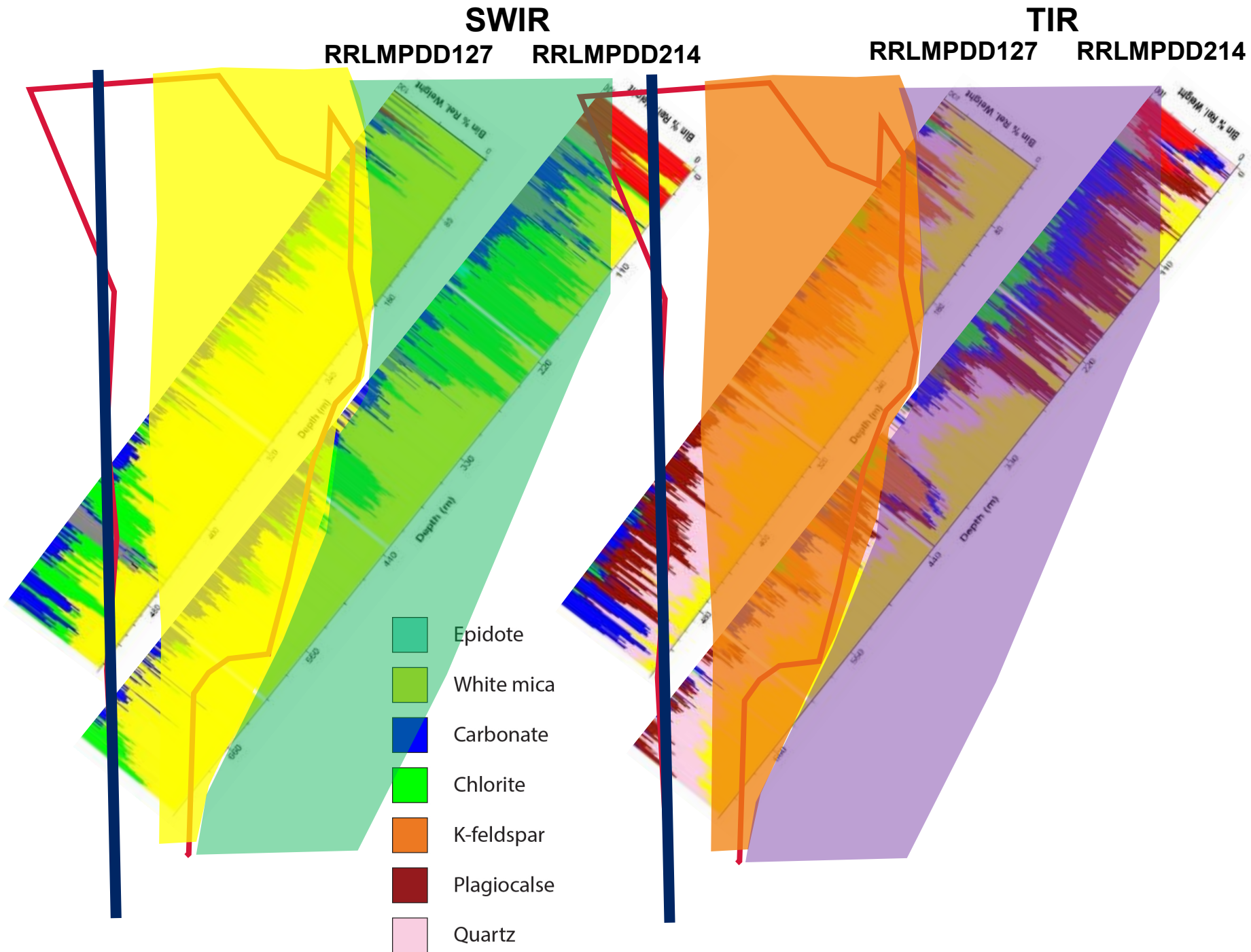


Source: Corbett and Leach (1998)

Alteration – hanging wall

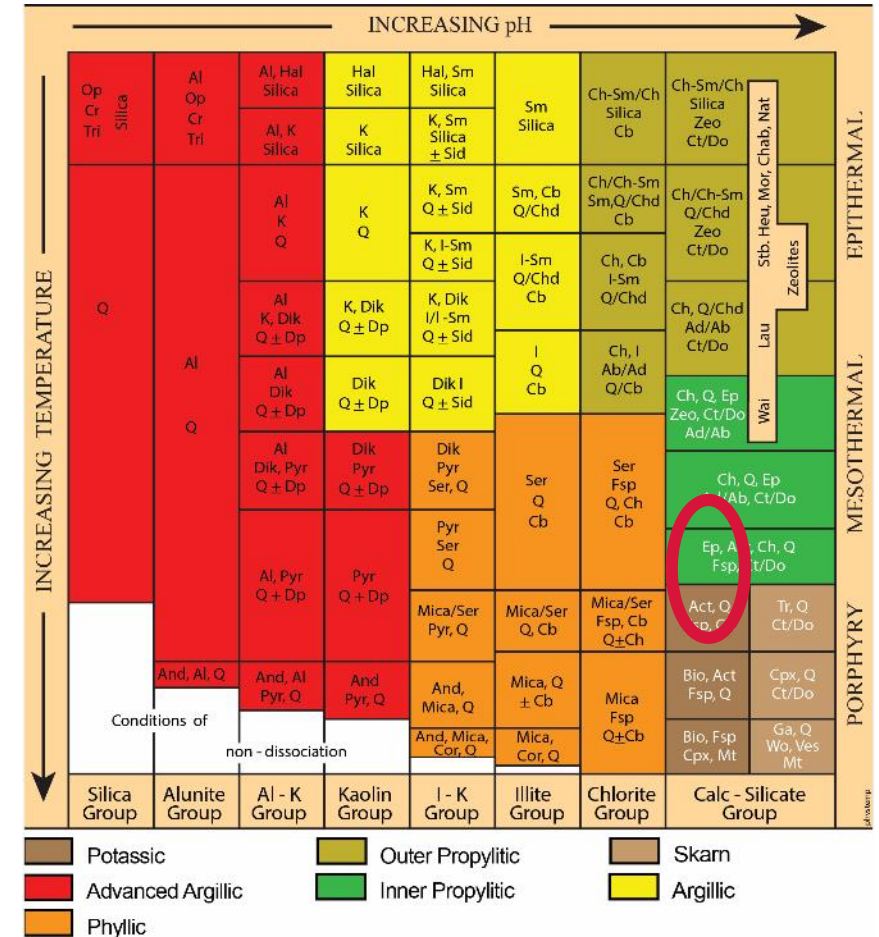


Facing north



Alteration – hanging wall

(epidote–albite–biotite (chlorite)–actinolite)



Source: Corbett and Leach (1998)

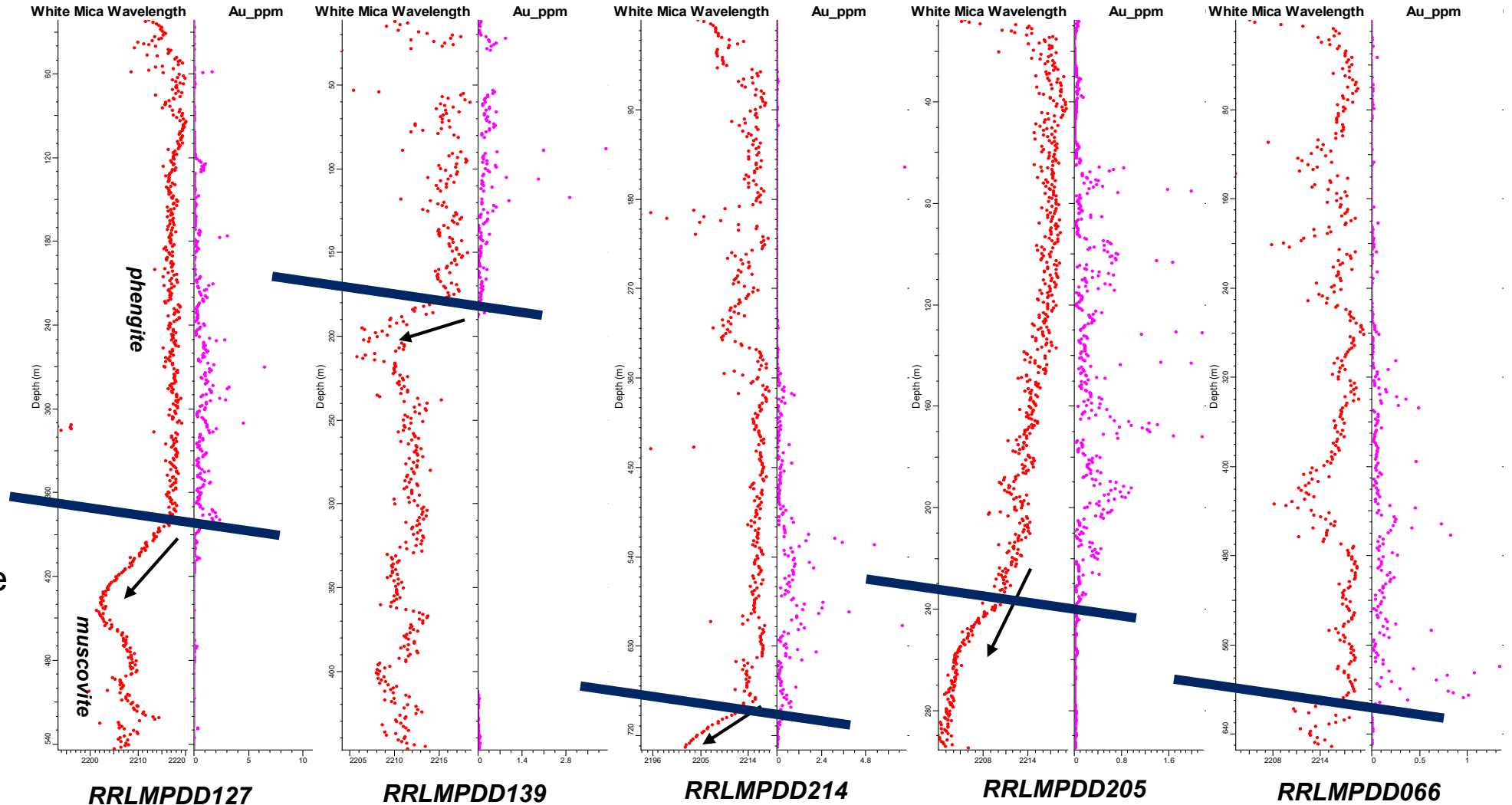
HyLogger™ white mica chemistry – Sherlock

Fault

Sherlock Fault

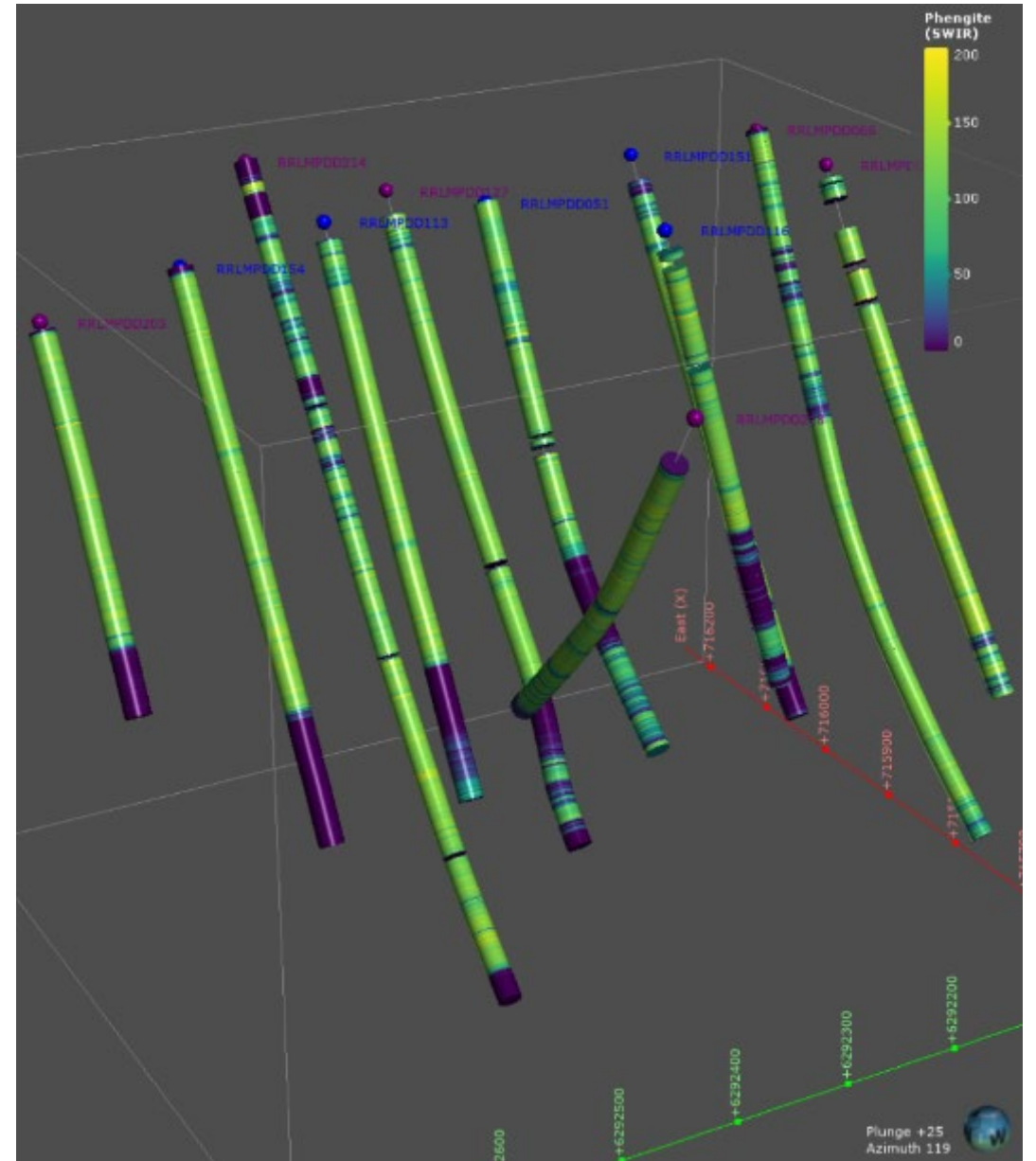
Tschermak substitution
($Al_{vi}Al_{iv} \leftrightarrow [MgFe]_{vi}Si_{iv}$).

Phengite to muscovite
=
Knife edge drop in Au



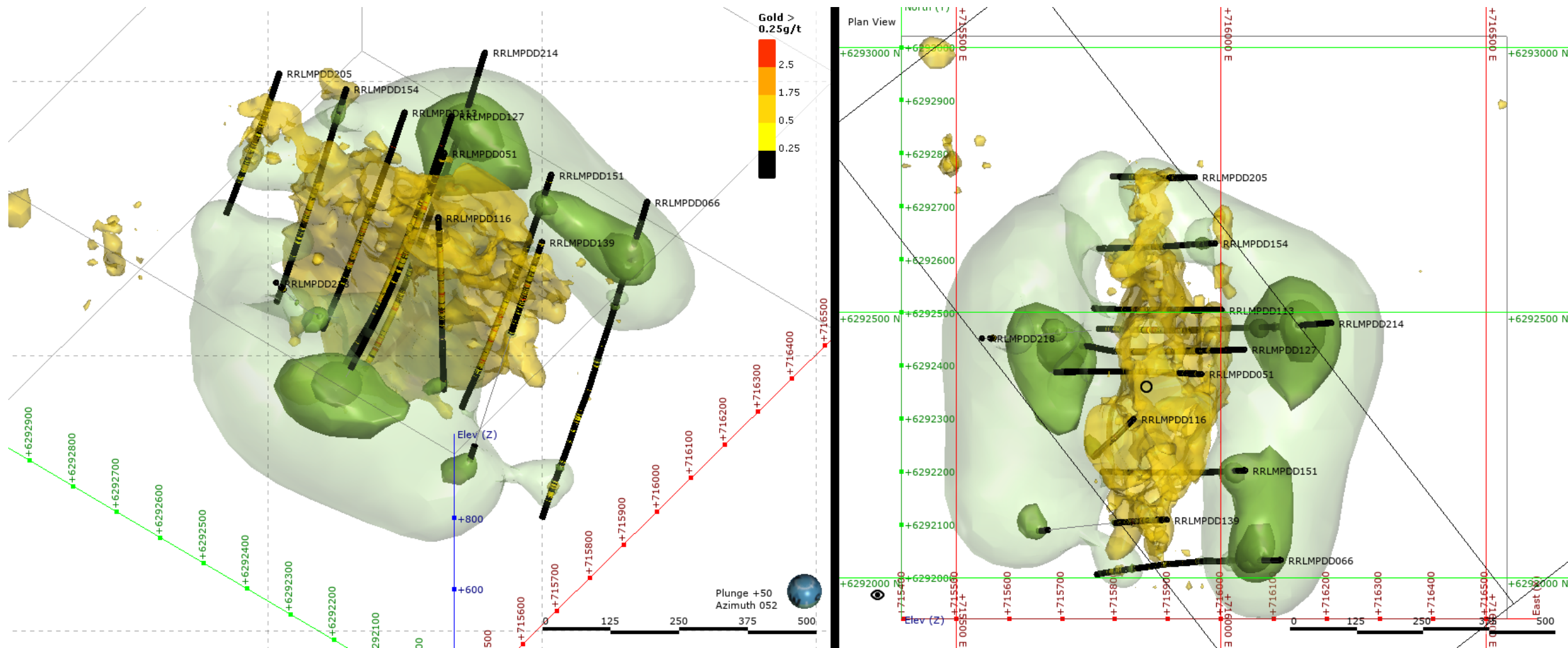
McPhillamys in 3D

- Leapfrog Geo implicit modelling
- Spherical interpolant, no trends applied
- Data composited to 10 m intervals.
- Abundance models (analogous to grade) are produced for higher levels of abundance
- Gold has been modelled but is based on low grade occurrence – not a resource model



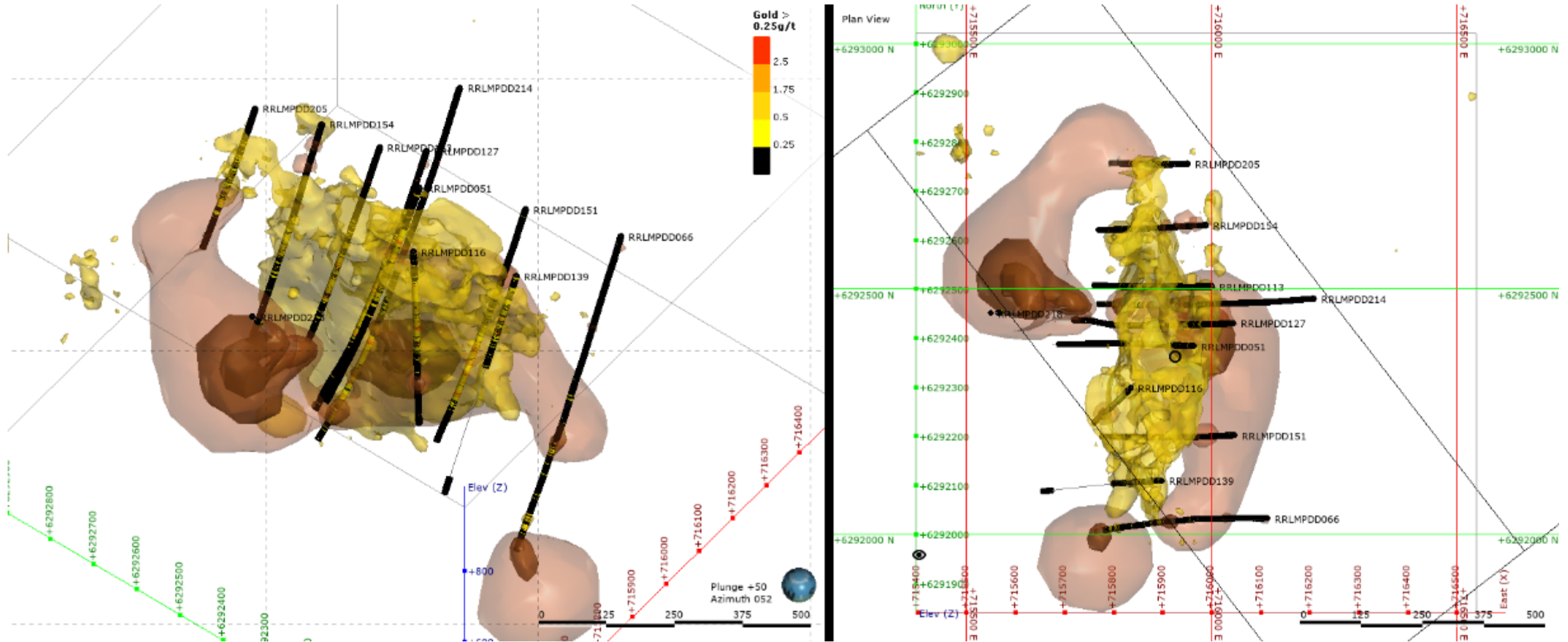
Alteration stage 2 – Fe-rich chlorite

Fe-chlorite = strong negative correlation with Au mineralisation



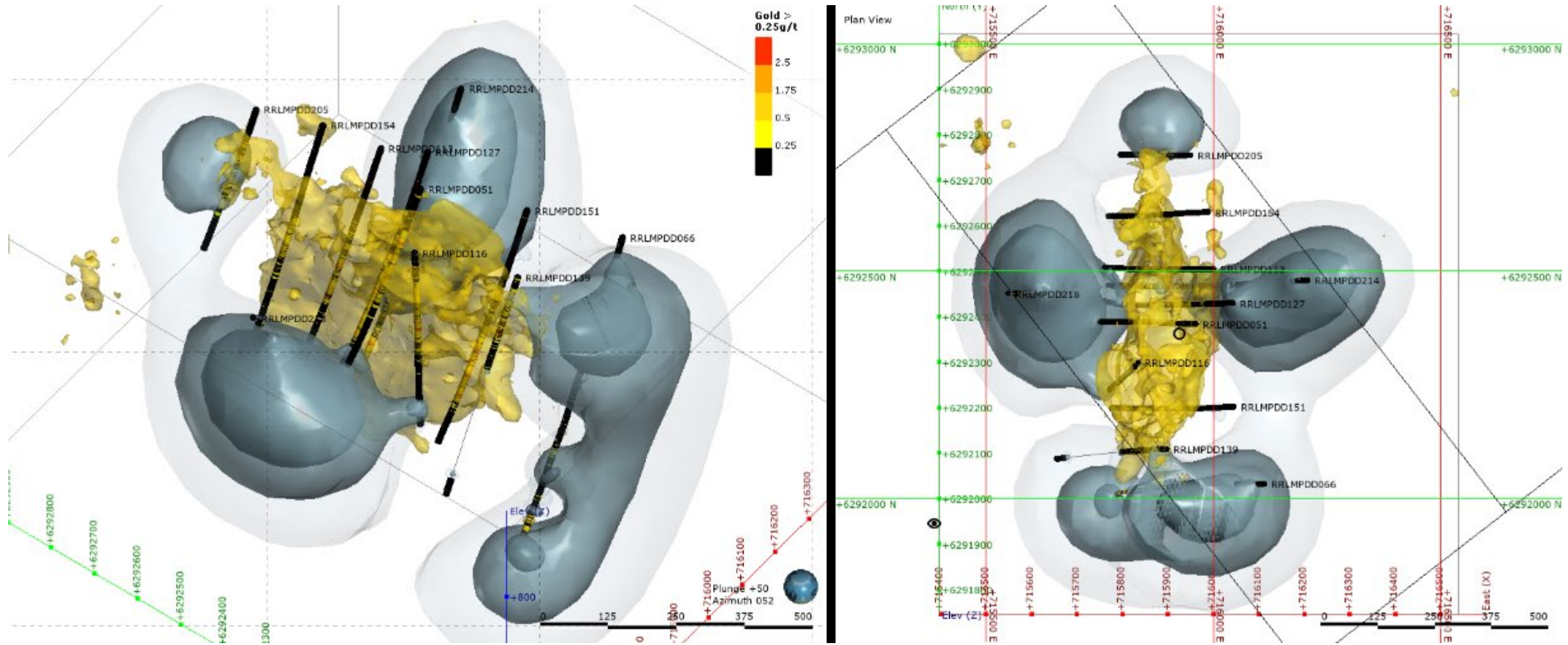
Alteration stage 2 – ankerite

Can be present in mineralised zone, but no direct correlation



Alteration stage 2 – calcite

Strong negative correlation with Au mineralisation



Conclusions: alteration beyond sight

Stage 1 alteration

- Potassic core
 - K-feldspar ± biotite
 - central orebody only
- Propylitic-style flanks
 - albite ± biotite ± epidote ± actinolite
- Gold between potassic and propylitic
- Footwall to orebody and Sherlock Fault
 - outer propylitic-style unknown relationship to orebody

Stage 2 alteration

- Phyllic alteration
 - phengite = Au, muscovite ≠ Au
 - Mg-chlorite = Au, Fe-chlorite ≠ Au
 - ankerite ± Au, calcite ≠ Au
- Strong positive and negative correlations with gold
- Transgresses Stage 1 alteration
- Footwall to orebody and Sherlock Fault
 - knife edge change in white mica and chlorite chemistry across the fault
 - post-alteration faulting



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