

Supplementary figures 1-11



Figure S1. Plutonic contacts: Field photograph of the sharp contact between the McLeod QMD and LHG in the Luhr Hill area. Hammer placed at contact. No chilled margins or evidence of interaction is apparent. No metasomatic effects are present at the contacts beyond the later, pervasive, mostly sodic-calcic and propylitic hydrothermal alteration.



Figure S2. Igneous banding in Luhr Hill granite: Field photograph from a ~7.5 km palaeo-deep portion of the LHG (Luhr Hill area; Dilles, 1987) showing igneous banding, defined by grain size variations. We interpret this texture to be the product of magmatic differentiation processes post emplacement of the granitic melts into the upper crust.

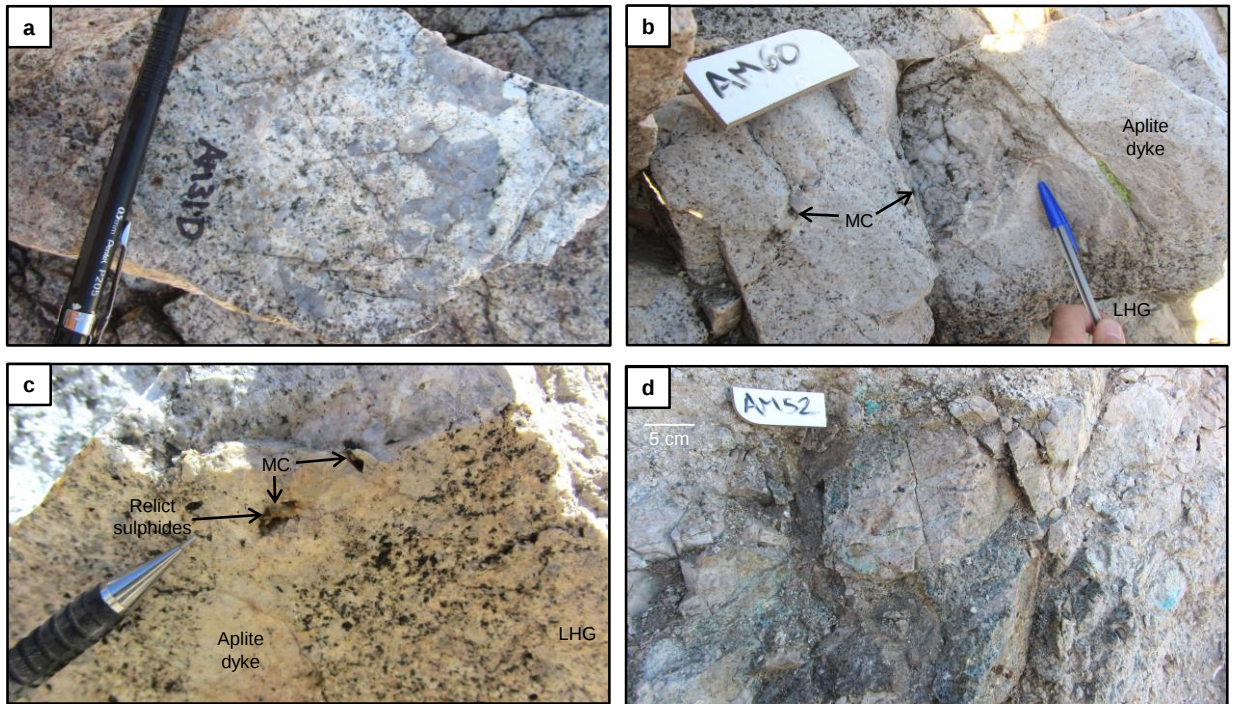


Figure S3. Textural evidence for undercooling, magmatic-hydrothermal fluid exsolution and mineralisation in aplite dykes: Field photographs showing; **a**, Quartz unidirectional solidification textures (USTs) in an aplite dyke which cuts the LHG cupola palaeo-vertically beneath the Ann Mason porphyry deposit; **b & c**, cupola zone of LHG cut by an aplite dyke which hosts mineralised miarolitic cavities (MC); **d**, Mineralised aplite dyke cutting the LHG cupola bearing chalcopyrite-mineralised A- and B-type quartz veins (nomenclature after Gustafson & Hunt, 1975). Secondary copper staining prevalent. **d** after Carter et al. (2021).



Figure S4. Propylitic alteration in Fulstone Spring volcanics: which overlie the Yerington porphyry system (Dilles, 1987). Epidote (apple green; Ep) is seen replacing primary plagioclase (milky white; Pl). Pen for scale. Zircon LA-ICP-MS trace element data for this sample (BS10) is presented in Fig. 7.

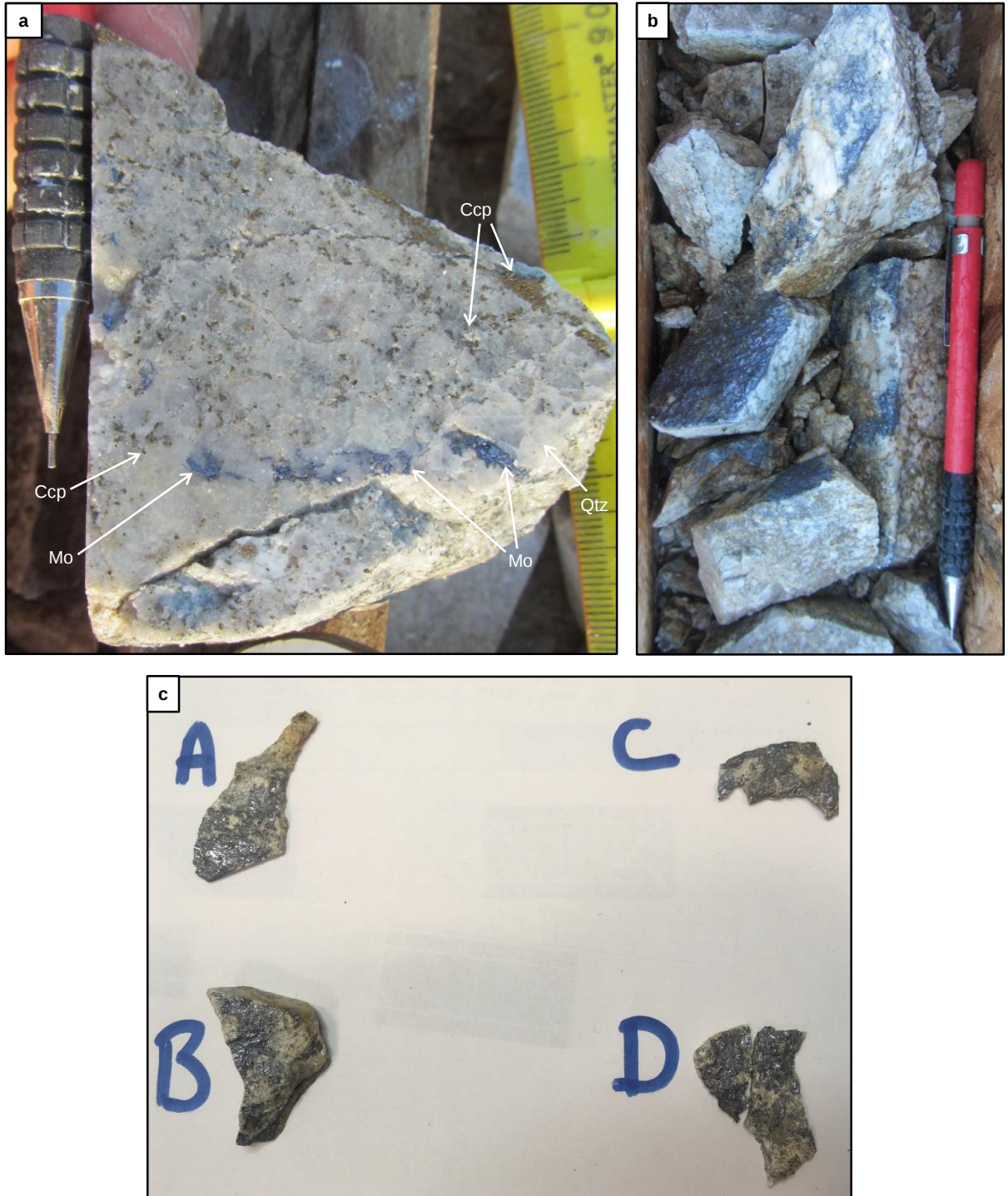


Figure S5. Samples for molybdenite Re-Os age determinations: Photographs of drillcore samples from the Ann Mason porphyry copper deposit. **a**, Sample AC12 is a chalcopyrite-molybdenite-quartz (Ccp-Mo-Qtz) vein cutting LHG; **b & c** Sample AC21MP is a molybdenite paint vein cutting LHG which was approximately split into 4 equal subsamples.

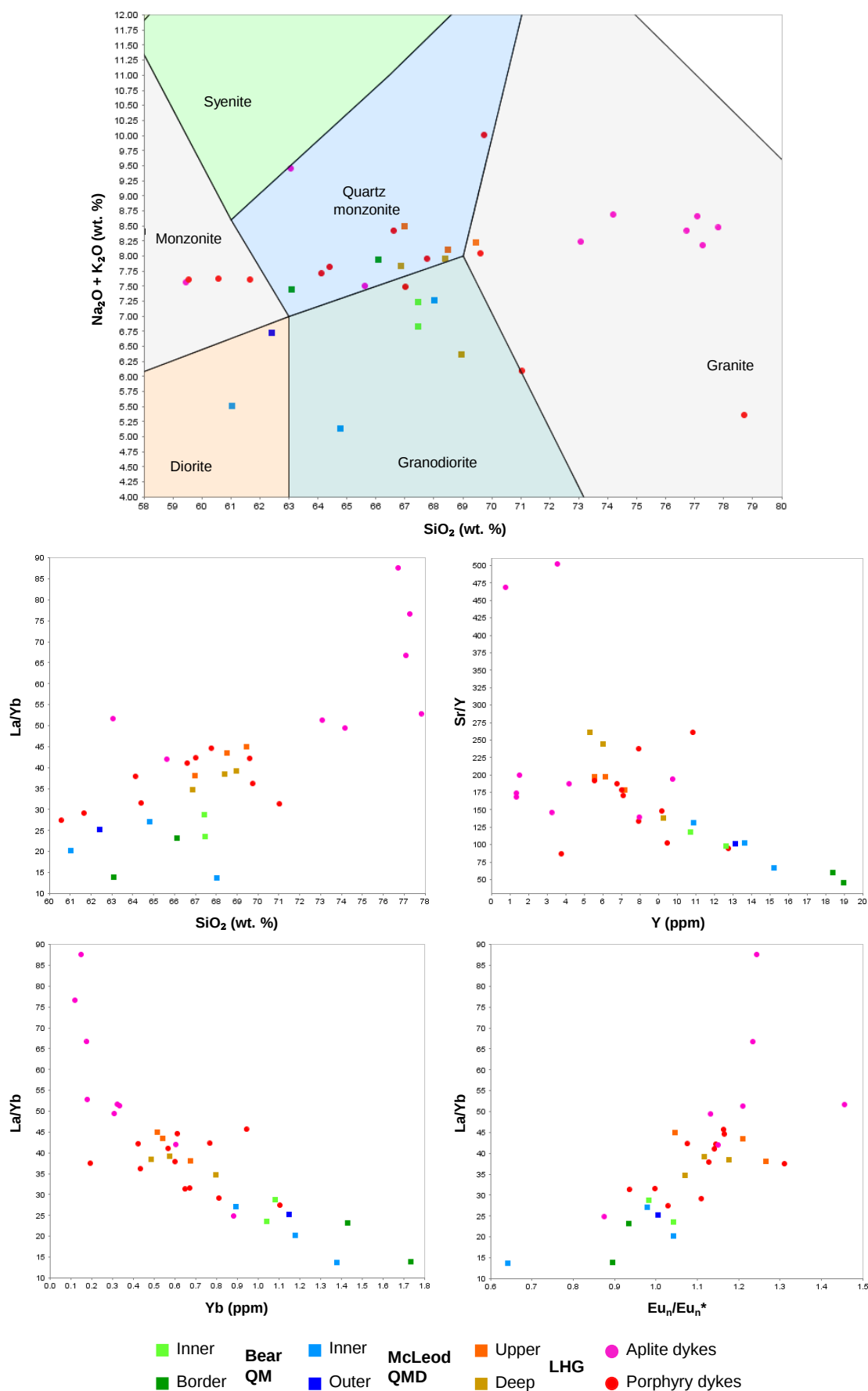


Figure S6. Plutonic TAS diagram (Middlemost, 1994) and whole-rock geochemistry through the Yerington magmatic system. Major elements partially overlap between the mineralogically distinct (Dilles, 1987) intrusive units. Distinct differences between pre- and inter-mineralisation units are seen in trace element ratios.

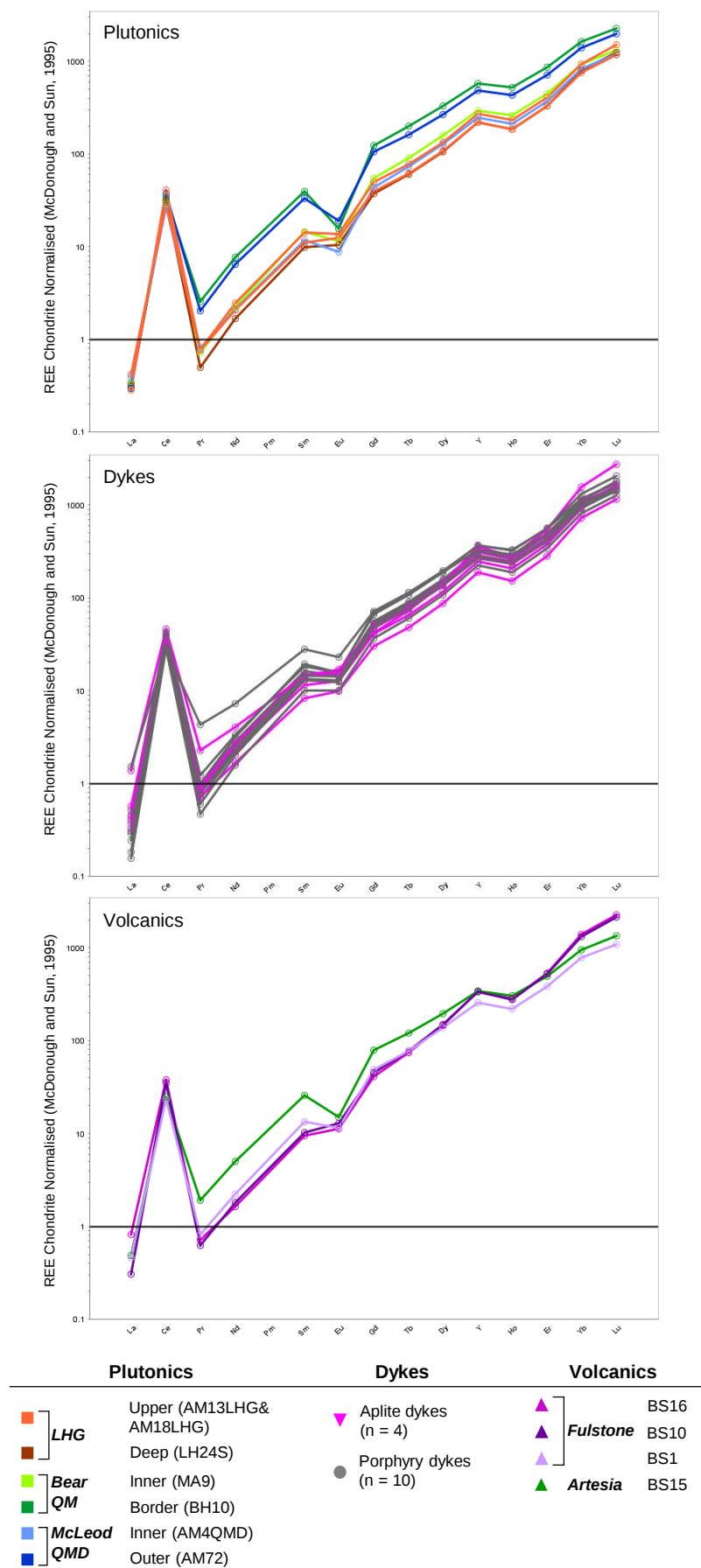


Figure S7. Zircon REE patterns: Zircon LA-ICP-MS REE patterns from samples temporally and spatially spanning the Yerington porphyry system.

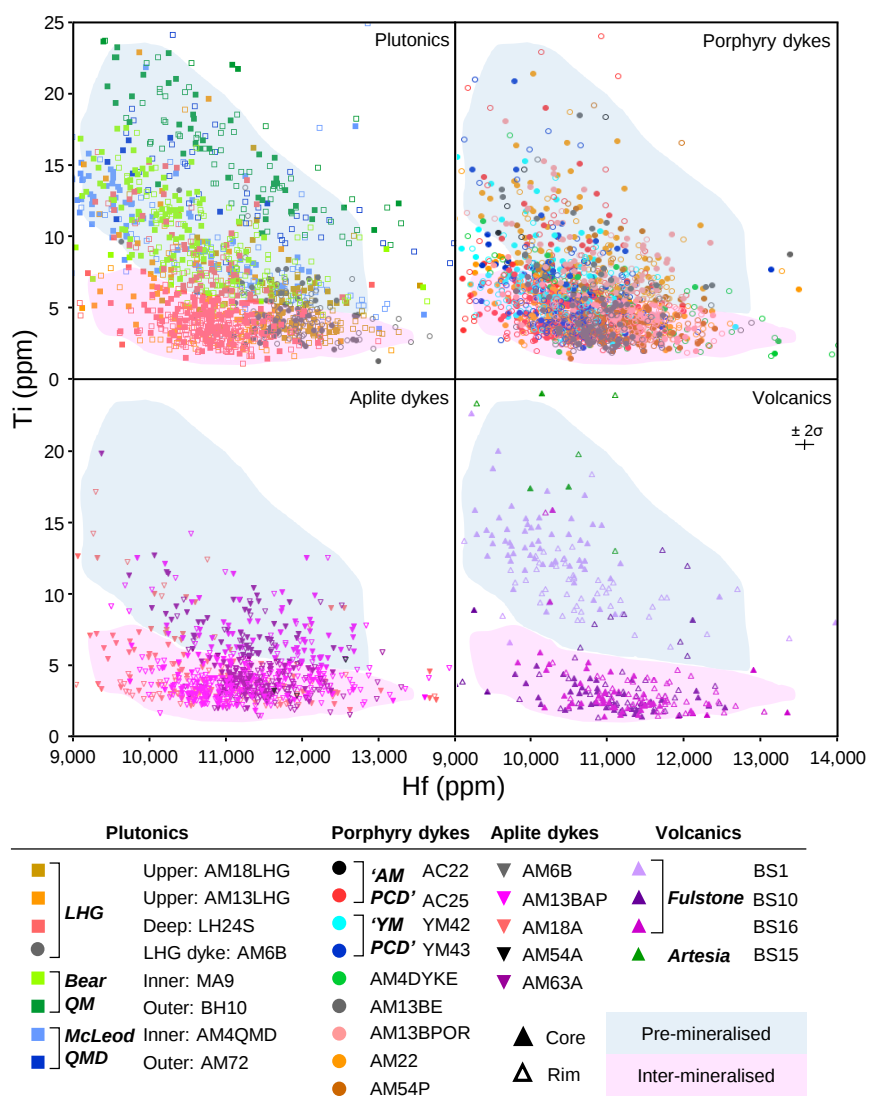


Figure S8. Zircon trace element signatures through the Yerington porphyry system: Zircon LA-ICP-MS trace element data from samples spanning, temporally and spatially, the Yerington porphyry system. Both core and rim data plotted. 'Pre-mineralised' and 'inter-mineralised' fields shaded. AM = Ann Mason porphyry deposit. YM = Yerington porphyry deposit.

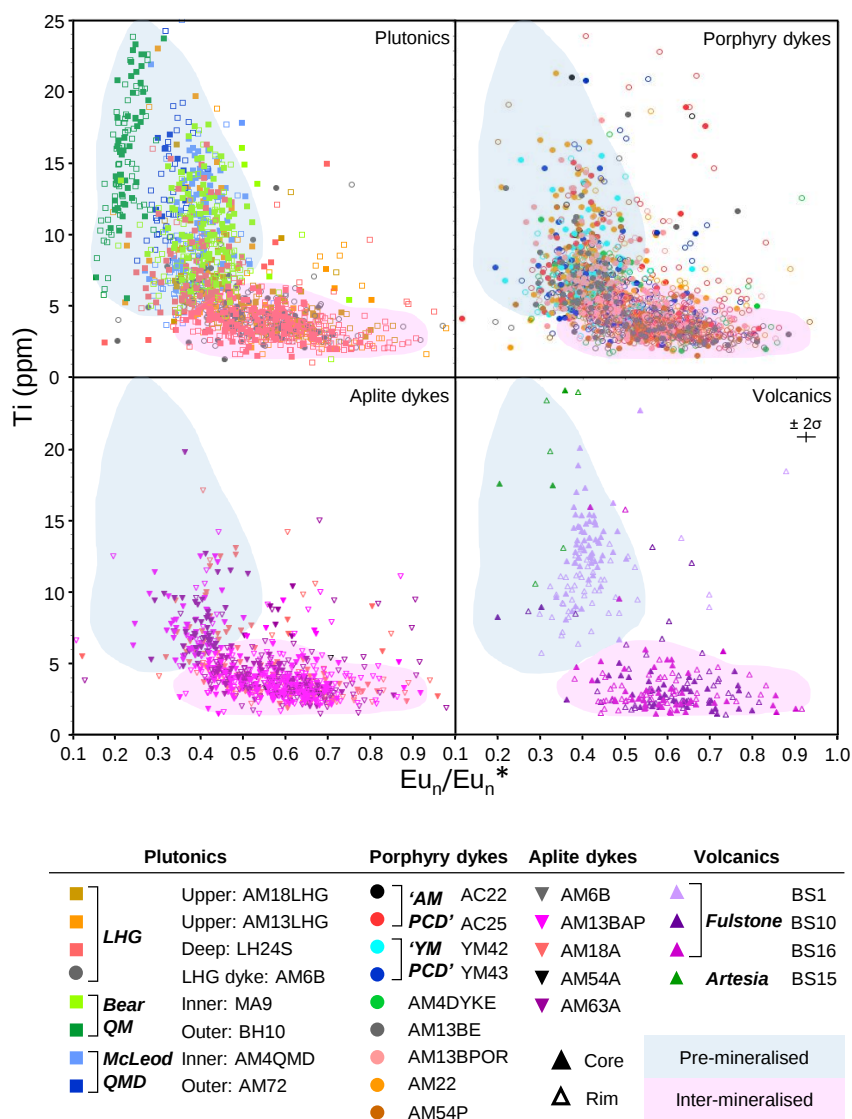


Figure S9. Zircon trace element signatures through the Yerington porphyry system: Zircon LA-ICP-MS trace element data from samples spanning, temporally and spatially, the Yerington porphyry system. Both core and rim data plotted. 'Pre-mineralised' and 'inter-mineralised' fields shaded. AM = Ann Mason porphyry deposit. YM = Yerington porphyry deposit.

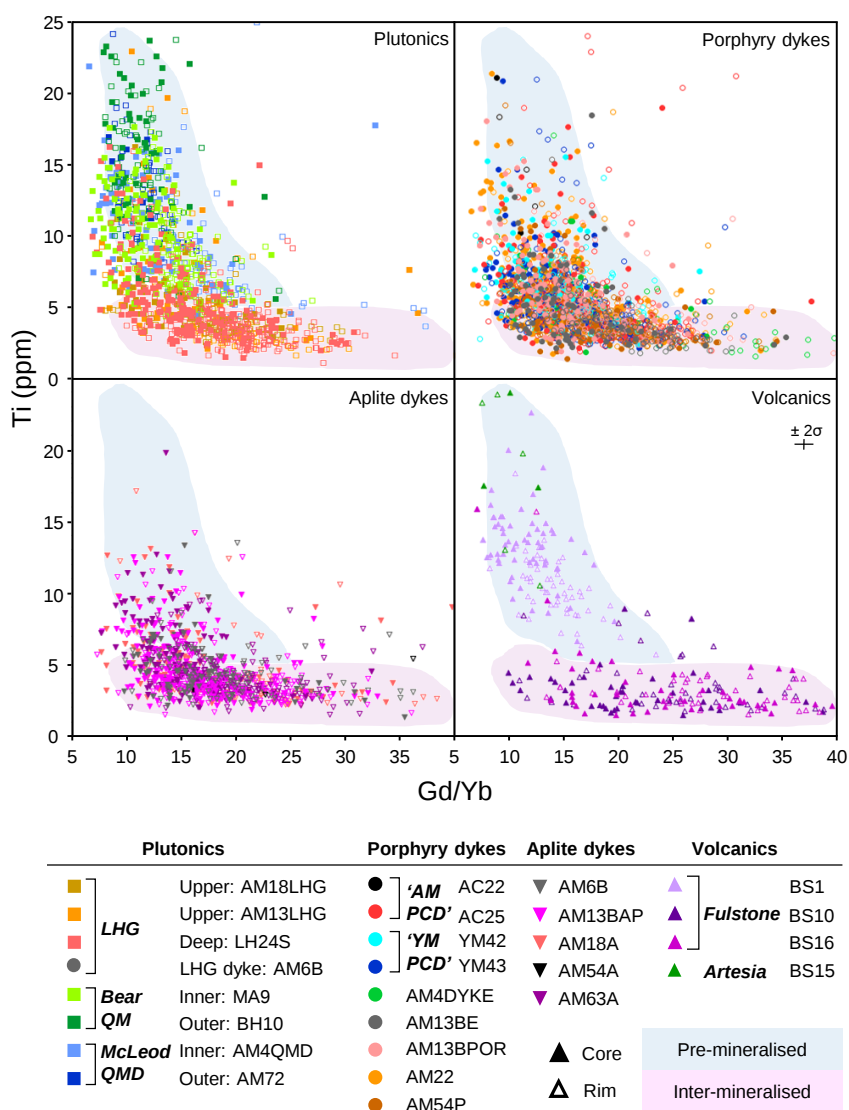


Figure S10. Zircon trace element signatures through the Yerington porphyry system: Zircon LA-ICP-MS trace element data from samples spanning, temporally and spatially, the Yerington porphyry system. Both core and rim data plotted. 'Pre-mineralised' and 'inter-mineralised' fields shaded. AM = Ann Mason porphyry deposit. YM = Yerington porphyry deposit.

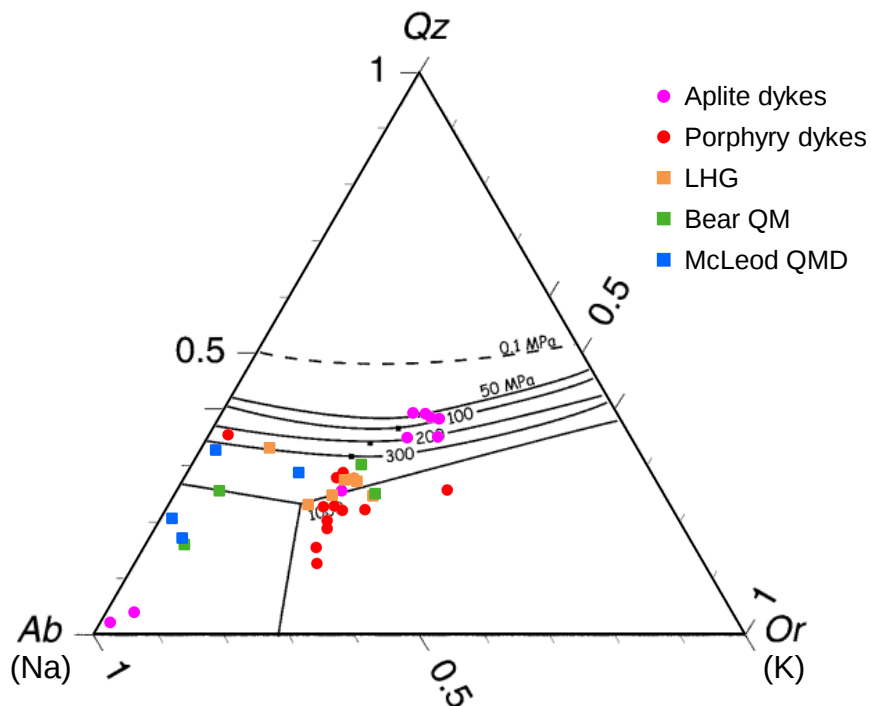


Figure S11. Depth of different magma sources: CIPW normative mineralogy (method of Lowenstern, 2000) from whole-rock XRF data plotted on the H₂O-saturated haplogranitic melt minima plot of Blundy and Cashman (2001). Cotectic lines and eutectics are a function of pressure and therefore the whole-rock data can be used to provide constraints for the pressure of magma differentiation (Annen et al., 2006), from which depth can be approximated. Other units plotted in Fig. S11.

Supplementary figure references

Annen, C., Blundy, J. D. & Sparks R. S. J. The Genesis of Intermediate and Silicic Magmas in Deep Crustal Hot Zones. *Jour. Petrol.* **47**(3), 505-539 (2006). <https://doi.org/10.1093/petrology/egi084>

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