Mt Sorell EL42/2008 Clark Valley Field Work 2015

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Summary

Significantly enhanced VHMS (Volcanic Hosted Massive Sulphide) prospectivity has resulted from recent field work and GIS interpretation. Geological mapping and rock chip sampling (No.=42) focused on a large IP (Induced Polarisation) chargeability anomaly and previously sampled 0.6g/t Au in rock chip vicinity. Composite re-sampling returned a highly significant 15.5g/t Au, accompanied by 7.7ppm Ag and minor Zn (0.1%).

This sample comes from the northern end of a zone of silica – sericite – iron oxide altered felsic volcanics extending ~150m along SSE strike toward the vicinity of an anomalous basemetal zone, bearing Zn to 0.15% in rock chip and soil samples. Notably, two strongly altered float boulders were located near the 15.5g/t Au rock chip. These rocks contain moderate intensity pervasive silica, bearing irregular iron oxide halo's to relict stringer pyrite veining in a weakly foliated sericitic matrix.

A coherent zone of anomalous basemetals (Cu, Pb, Zn, Ag & Au) in rock chip and soils is now better defined through the anomalous gold in rock chip area. VHMS prospectivity is further upgraded with presence of anomalous key pathfinder elements (Tl, Sb and As). Potential to find a Rosebery or Que-Helyer like VHMS in the grid area is considered high.

Re-evaluation of a 1970's gradient array Induced Polarisation survey in conjunction with Airborne EM has provided further interpretive vectors to a relatively focused VHMS prospective zone coincident with anomalous geochemistry. The black shales were found to commonly correspond with high chargeability and low resistivity. The investigated chargeability anomaly and black shale are not un-expectantly also coincident with significant WTRMP airborne EM cx980k and cx7k EM anomalies.

The black shales mapped extent thins considerably at the chargeability anomalies southern end, whilst chargeability remains high. This suggests that some component of the chargeability footwall to the Au in rock chip anomaly maybe mineralisation related. Immediately south of the shales termination and Au in rock chip anomaly is a relatively strong EM anomaly reflected in all channels. This is a VHMS target! Further supporting a VHMS focus in this area is a broad elevated chargeability zone coincident with Au and Zn in soils within the footwall to the EM anomaly and 15.5g/t Au rock chip. This feature is not evident footwall to other chargeability anomalies in the area. A significant resistivity high zone coincident with strong albite – silica alteration footwall to the Au in rock chip anomaly also supports potential VHMS fluid focus in this area.

An earlier WSW to WNW orientated cleavage disrupted and overprinted by the dominant NW aligned foliation was identified at several localities in the northern footwall. This may reflect earlier Cambrian deformation, possibly reactivating Cambrian rift faults active during VHMS formation.

Introduction

Work planned to identify / enhance VHMS drill targets within the tenement via geological mapping and rock chip sampling in the northern portion of the Clark Grid. The main focus was investigation of a potential VHMS horizon extending north of a 0.6g/t Au rock chip sample near 6600N collected during 2014. This anomaly lies at the southern end of a strong gradient array IP chargeability anomaly, identified by The Mt Lyell Mining and Railway company work in the 70's. Mapping also targeted various chargeability and airborne EM features extending south of the gold in rock chip anomaly. Investigation of previously unvisited areas included the high Ti/Zr inferred basalt extrusive focus in the geochemically anomalous central Clark grid zone.

The Clark Valley was visited on four days during late March and Early April 2015. Work was undertaken utilising daily quad bike access, from a Queenstown base. Note that the Corona camp on the south Darwin Plateau has been moved and was unavailable. Work utilised the existing grid for access. Forty two rock chip samples were collected, mostly as composites comprising >6 to 12 individual chips from the general area of up to ~10m^2.

Photo 1: Mt Sorell and Clark Valley with the chargeability anomaly and main work focus along the valley centre.

Geological Observations

The 0.6g/t Au in rock chip vicinity was re-visited with geological mapping being focused here and to the immediate south. This sample site (87707) was re-sampled as a composite, returning 15.5g/t Au (Figure 1). Notably, two strongly altered float boulders (Sample No.'s 47705 & 6 and Photo 2) were located near the 15.5g/t Au rock chip. These rocks contain moderate intensity pervasive silica, bearing irregular iron oxide halo's to relict stringer pyrite veining in a weakly foliated sericitic matrix. The protolith appears to be felsic volcanic. Similar less intensely altered felsic volcanics were located along strike to the SSE for ~150m along SSE strike toward the vicinity of an anomalous basemetal zone bearing Zn to 0.15% in rock chip and soil samples.

The 87707 sample site was located on a slope (Photo 3) with a gully ~25m west and a flat top ridge ~30m E. The latter represents a possible drill pad, but would involve drilling the wrong direction; hangingwall to footwall. The gully base near the creek bend approximately 25m SW is relatively flat providing a potential but likely boggy drill pad area. The vegetation changes markedly at the top of slope to the east changing from a rain forested gully to tea tree and cutting grass extending further east.

Notably the creek draining west from the stringer pyrite altered zone contains moderate iron oxidation as moderate to strongly oxidised recemented creek bed covered in more recent quartz vein fragment rich alluvium including common iron oxidised felsic volcanic fragments. Much of the iron oxide is likely derived from increased pyrite alteration in the vicinity. Alluvium also included common milky buck quartz veining to 35cm which are a further potential iron source. Two other nearby creeks, including that immediately east of the anomalous (0.15%) Zn in rock chip sites, bear minor gossanous oxidised fragments, which possibly originated as eroded gossan from nearby. Many creeks in the area bear common quartz vein fragments and black shale distribution is also traceable from alluvium.

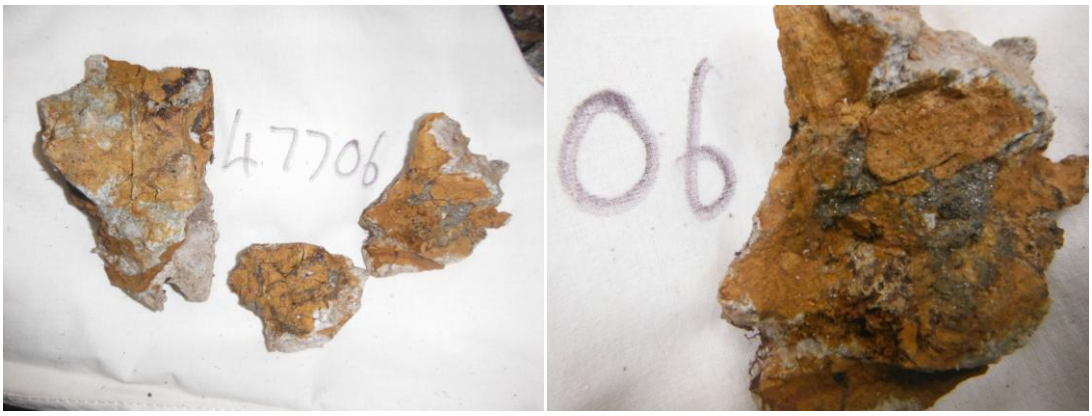

Photo 2: Sample 47706; FeO haloes on irregular stringer pyrite veining.

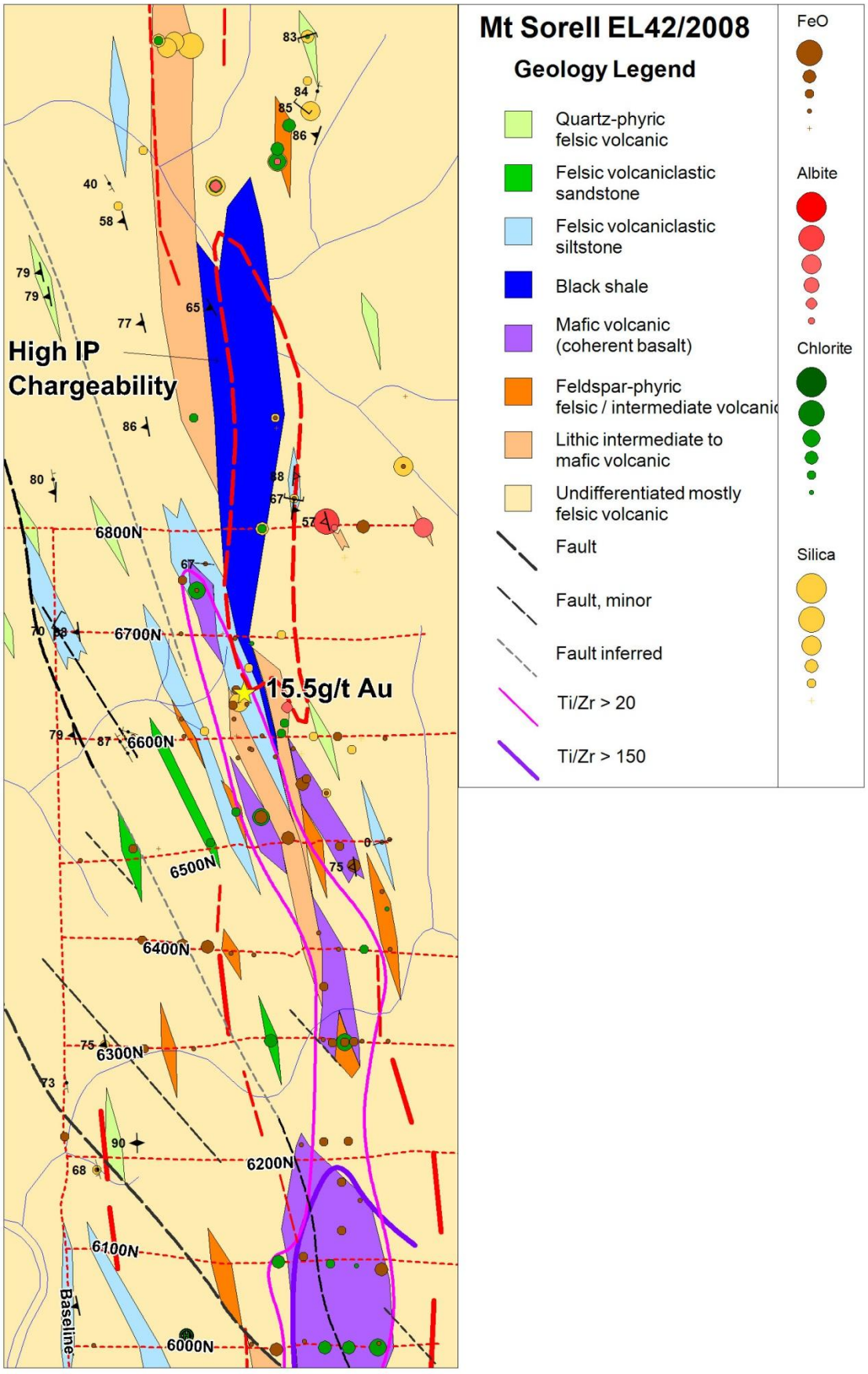

Figure 1: Geology of the northern half of the Clark River Grid, showing chargeability anomalies (red) and thematic mapped alteration distribution.


Photo 3: General vicinity of Sample 47706

Black shale was found coincident with the targeted chargeability anomaly. This unit tapers / thins considerably at it's south extent (6500N; Figure 1). An intermediate volcanic component was noted within black shale on 6600N, suggesting that the andesitic volcanic inferred host horizon conformably overlies the shale, being syn to post shale deposition. Suspected shale rip up clasts in hangingwall lithic volcanics support a local unconformity at or above the black shale horizon. The volcanic texture is similar to mapped pumiceous lithic felsic volcanics, but microscopic examination supports a shale rip up clast origin, with cleavage shown in one example (Photo 4). Chargeability is diminished locally along strike at the shale horizon, which possibly reflects where the black shale is eroded on an unconformity (eg. 6300 to 6600N). The thicker and less altered black shale in the vicinity of 7000N displays no obvious cross structure and may have been a relative palaeo topographic high during the Cambrian.

The shale bears disseminated, bedding parallel, fracture fill and veined pyrite. A component is likely to be diagenetic, but some pyrite veined textures are clearly hypogene (Photo 4), which is not unexpected given the high tenor of the chargeability anomaly and presence of strong footwall alteration. Microscope investigation shows very fine slickensides on some foliation suggesting that veining could also in part result from remobilisation during deformation.

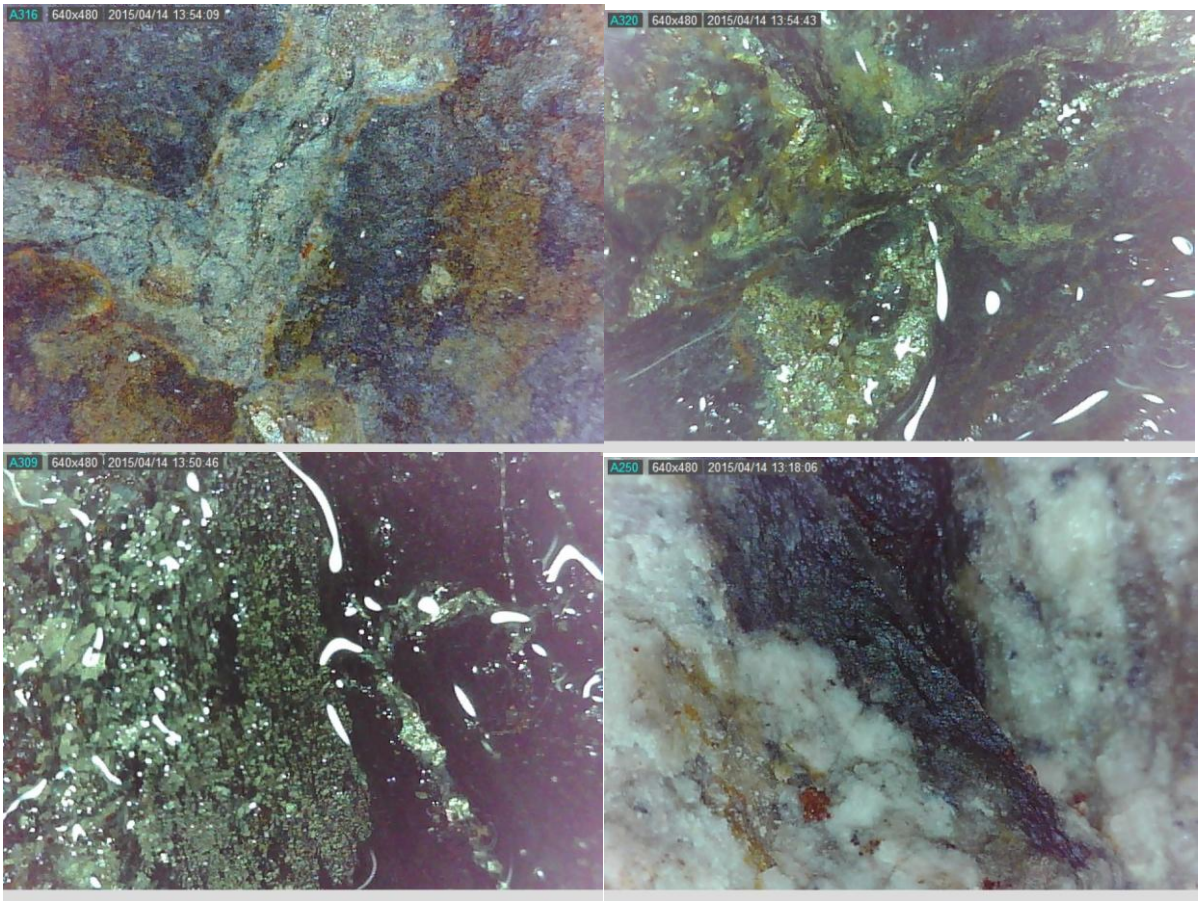

Photo 4: Pyrite +/- silica veining and fracture fill examples (Sample 47720) in shale and shale rip up clast in felsic volcanic in lower right (Sample 47701); Approx 40x magnification.

In the ~7200N vicinity pumiceous felsic volcanics are located hangingwall and to a lesser extent footwall to the black shale. The hangingwall northwest of the black shale in particular is a massive un-foliated, silicified pale green feldspar phyric pumiceous felsic volcanic. The silicification is matrix pervasive, but also replaces green sericitic relict fiamme. Local yellow 3mm relict feldspar phenocrysts are another feature. Whilst, microscope examination shows chloritic and silicified fiamme in a pervasively silicified matrix bearing sparse quartz phenocrysts (Photo 5). On 6900N, a green sericitic lithic felsic volcanic (Sample 47726) is weakly chlorite spotted and veined, and bears oxidised lithics suggesting rip up derivation from a palaeo oxidation surface; VHMS exhalative? A potential analogy of the pumiceous unit to similar rocks hangingwall to the Rosebery VHMS exists.

A Ba/Sr in soils hangingwall anomaly on 5900N west of the high Ti/Zr and coincident with weak chargeability and sulphur in soils was investigated finding no outcrop.

A weak airborne EM anomaly on the northwest margin of the core Ti/Zr anomaly area was investigated. Massive basalt subcrop is scattered through the area. A 15m wide gully (Wpt 197) corresponding to an inferred fault is possibly too small to provide a surficial (alluvium) explanation for the EM anomaly. of the high Ti/Zr in soils. This basalt is locally amygdaloidal and along with more intermediate volcanics weathers to tan coloured clay.

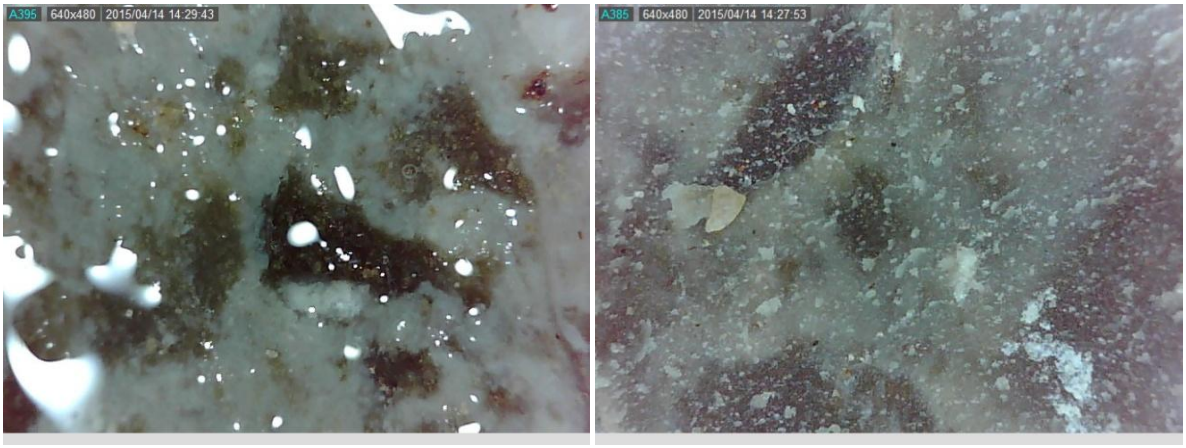

Photo 5: Microscope photo of chloritc, sericitic and silicified fiamme in a pervasively silicified matrix bearing sparse quartz phenocrysts (Sample 47736). Approx 40x magnification

Alteration

There appears to be a change in most abundant alteration styles in the vicinity of the Au in rock chip anomaly. Pervasive silica and albite alteration is most focused in the footwall, extending north of the Au rock chip anomaly (Figure 1). Whilst minor pervasive silica is noted further south in the CZA (Central Zinc Anomaly) area, although the footwall is little mapped here. Conversely, iron oxides are mostly evident south of the Au rock chip anomaly and within the inferred host horizon or associated with faulting. Chlorite alteration is relatively ubiquitous in the footwall and along the inferred host horizon.

Strong pink albite and weak to moderate chlorite alteration (47721) is evident in the footwall to the black shale horizon. Pink albite-chlorite semi pervasive to pervasive alteration appears to overprint pervasive silica alteration in this sample (Photo 6). The strong pervasive albite possibly represents a peripheral to VHMS zone, with Na increasing to the hangingwall and laterally away from hydrothermal focus in the footwall. Alternatively considering the 235ppm high Cu in soils in the north of the chargeability anomaly, a Magnetite-Cu Darwin Granite related origin is another possible origin for Albite here.

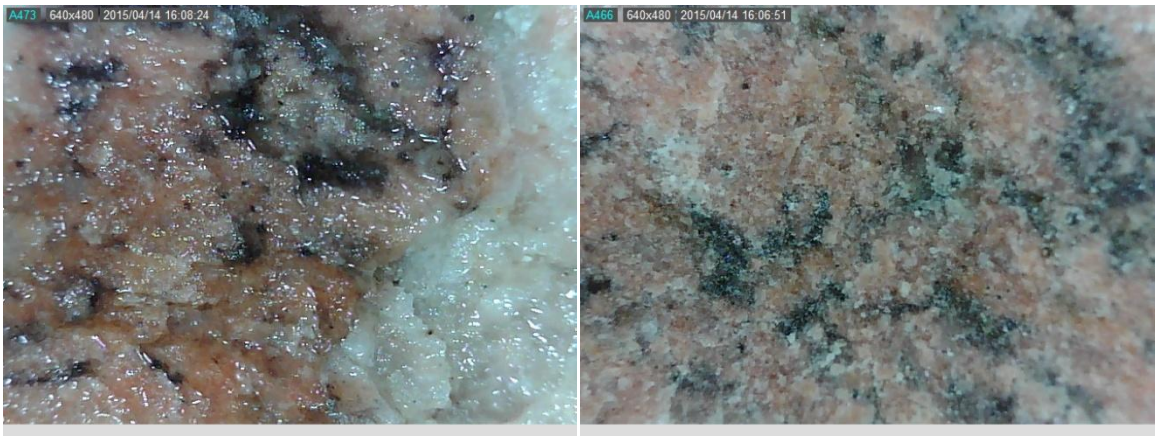

Photo 6: Albite(pink)-Chlorite(dark green) semi pervasive to pervasive alteration overprints pervasive silica alteration (Sample 47721). Approx 40x magnification

Structure

A key advance in structural understanding of the area is the identification of evidence for possible Cambrian faulting of inferred SW-NE orientation and sinistral offset. This predates the dominant NNW to NW aligned Devonian foliation and likely the NW to NNW orientated brittle structures of inferred dextral offset identified by Reid (2014).

Earlier WSW and WNW orientated cleavage is disrupted and overprinted by the dominant NNW to NW aligned foliation at several localities in the northern footwall, east of the large chargeability anomaly (Figure 1). The WSW and WNW orientated cleavage / cross fractures are variable developed, occurring as 10cm spaced fractures at wp173 and as a strong 1 to 3cm spaced fracture set at wp171. Notably, foliation appears less pronounced in highly altered footwall rocks in this area. A footwall example is at wp166 (7100N), where moderate pervasive silica, albite and chlorite alteration overprints a volcanic displaying no foliation. This possibly resulted from pre-deformation induration imparted by the alteration. Elsewhere on the Clark Grid, basalt is similarly little foliated in most cases. At one location (wp163) in the hangingwall (7100N) discontinuous silicification as foliation disrupted bands suggests pre to syn deformation timing of this alteration. The earlier cleavage may reflect reactivated Cambrian rift faulting, active during and post VHMS formation with closer spaced cleavage possibly reflecting proximity to these faults, which could have focused basalt and VHMS fluids.

A bend in the apparent distribution of soil geochemistry and the intermediate to mafic volcanics between 6300 and 6600N, where SW-NE aligned lineaments in the gridded chargeability cross, supports a sinistral fault offset (<100m) in this area (Figure 3). The chargeability lineament orientation is also parallel to a weakly defined ground magnetic lineament identified further south.

Geochemistry

Forty two rock chip samples were collected, mostly as composites comprising >6 to 12 individual chips from a general area of up to ~10 by 10m. Samples were submitted to ALS Burnie for multi-element ICP-MS and fire assay for Au analysis. Data is digitally appended.

Overall, peak analyses were 15.5g/t Au, 7.7ppm Ag, 151ppm Cu, 321ppm Pb and 1180ppm Zn. Aside from the highly anomalous Au rock chip, the range of basemetal analysis values returned was of similar tenor to those collected during previous campaigns. However, the resulting geochemical distributions have better focused VHMS exploration.

The stand out 15.5g/t Au composite rock chip was returned from sample 47704, which re-sampled a 0.6g/t Au anomaly (Sample No. 87707). This sample also returned high Ag (7.7ppm) and elevated results for Cu, Ba, Bi, Cd, Fe, Mo, Pb, Sb, S, Tl and Zn when compared to rock chips from the Clark area. Notably anomalous 38ppm Bi and 45ppm Mo point to a hydrothermal / magmatic source. Samples from the near proximity all bear elevated Ba (1500 to 2360ppm) and Tl (0.93 to 1.22ppm), supporting potential proximity to VHMS exhalite. However, Au in other nearby samples was low at <0.03ppm. Two strongly altered float boulders disappointingly returned Au below detection but contained 2.1ppm Ag.

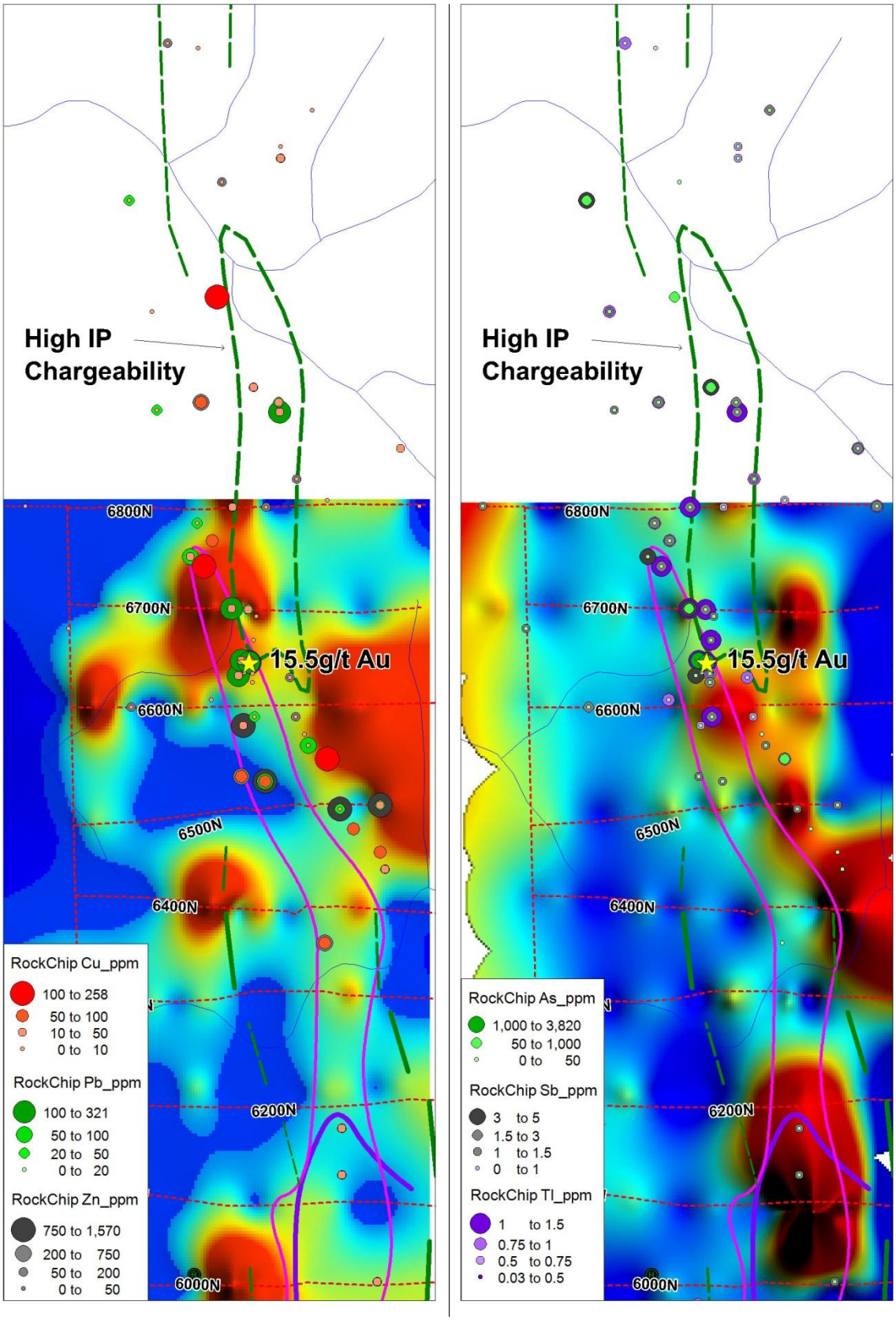

Figure 2: Rock Chip sampling results; Left is Cu, Pb & Zn with IP chargeability (green) and 15.5g/t Au in rock chip over Au in soils grid and Right is VHMS pathfinders As, Sb & Tl with IP chargeability (green) over Tl in soils grid.

Anomalous Zn (to 0.16%) in rock chip defines a linear zone extending SE of the 15g/t Au (Figure 2). This area is clearly basemetal (Zn, Pb and Ag) anomalous, with Pb more concentrated near the gold anomaly. This area is clearly more Ag anomalous than the rest of the grid. Ag peaks at the gold anomaly (7.7g/t Ag) with elevated values (>0.25ppm) roughly delineating the approximate host horizon, as well as footwall including the black shale. Au and Ag is anomalous in soils along a NNW strike through this area, coincident with the inferred host horizon, but with elevated Au in soils also extending into the footwall.

High Ni and Cr in soils immediately south of the area, indicates a peripheral to basalt location. The basalt is flanked by elevated Tl; a good VHMS indicator. Strong albite alteration in rock chip coincides with anomalous Na in soils. This alteration is interpreted as peripheral to VHMS with a potential feeder zone marked by low Na adjacent and coincident with anomalous Zn in soil and rock chip extending into the inferred footwall.

A key element indicator for proximity to VHMS is considered to be Tl (Large et. al., 2001 & Gemmell and Fulton, 1998). This and elements As, Sb and Mo form a coincident elevated zone in the vicinity of the 15.5g/t Au in rock chip (Figure 2). Elsewhere, the high Ti/Zr zone bears strong Sb adjacent to but not coincident with a Tl anomaly. Mo appears to be a good indicator for strong mineralisation, being most elevated in pyrite and iron oxide mineralised and pervasive silica altered samples. Elevated Mo was located at the Au in rock chip anomaly as well as immediately south in the footwall to elevated Zn.

Ba notably ranged up to 0.55% (Sample No. 47740). This sample came from a lithic volcaniclastic coincident with a weak chargeability anomaly on 6200N in the hangingwall west of the high Ti/Zr in soils. Extensive but weak pervasive silicification and weak to moderate intensity quartz veining with local oxidised veinlets was apparent. Sample 47740 also returned weakly anomalous Pb at 76ppm.

Elevated Ag at the base of Black Shale, north of the Au RC anomaly, may indicate that VHMS formation extended through the quiescent time of shale formation.

Discussion

Investigation of IP grids derived from Howland-Rose (1978), shows that black shales commonly correspond with chargeability highs and low resistivity (Figure 3). Basalt and intermediate volcanic distribution also generally corresponds to lower resistivity, but mostly not with elevated chargeability. An exception and potential VHMS target is a chargeability high within intermediate volcanic, extending between 5700 & 5800N. Further, chargeability highs in the immediate hangingwall differ being associated with moderate / elevated resistivity. Elevated resistivity forming a zone in the footwall between 6300 and 6700N likely reflects silica alteration, further enhancing VHMS prospectivity.

The chargeability anomaly and black shale are not un-expectantly coincident with significant WTRMP airborne EM cx980k and cx7k EM anomalies (Figures 4 & 5). Comparatively, BHP's 1990 UTEM survey (Cameron and Read, 1991), ending 1km north of the 6600N gold in rock chip anomaly, found that black shales produced low to moderate amplitude early time responses and some shales produced no response. The cx7k channel best defines the northern Clark Grid mapped shale distribution, whist stronger cx980k responses are evident at this shale units mapped extents. Curiously the later airborne EM high is not well reflected by low resistivity.

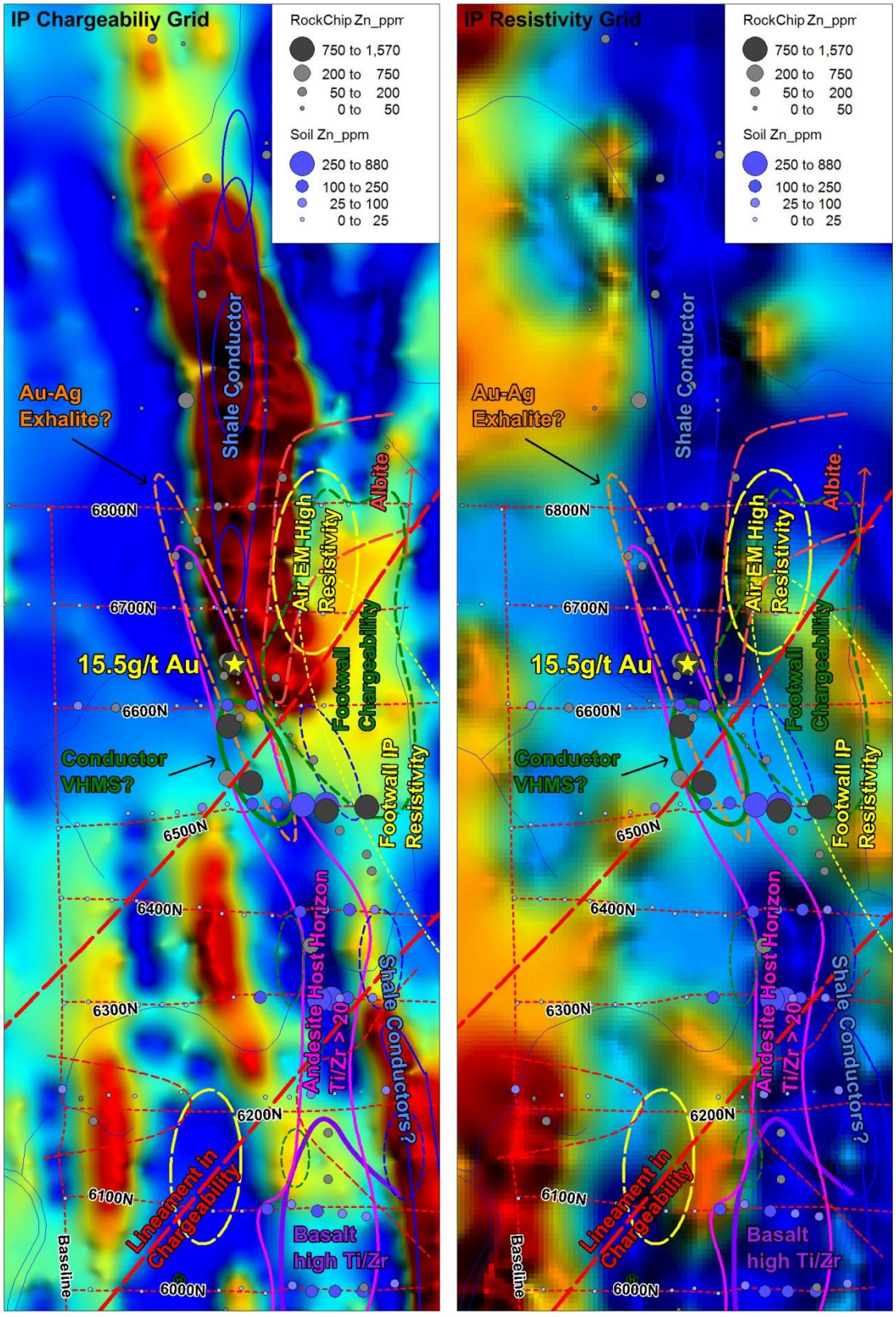

Figure 3: VHMS prospectivity map for the northern half of the Clark River Grid showing rock chip and soil Zn over gradient array IP Chargeability (left) and IP Resistivity (right).

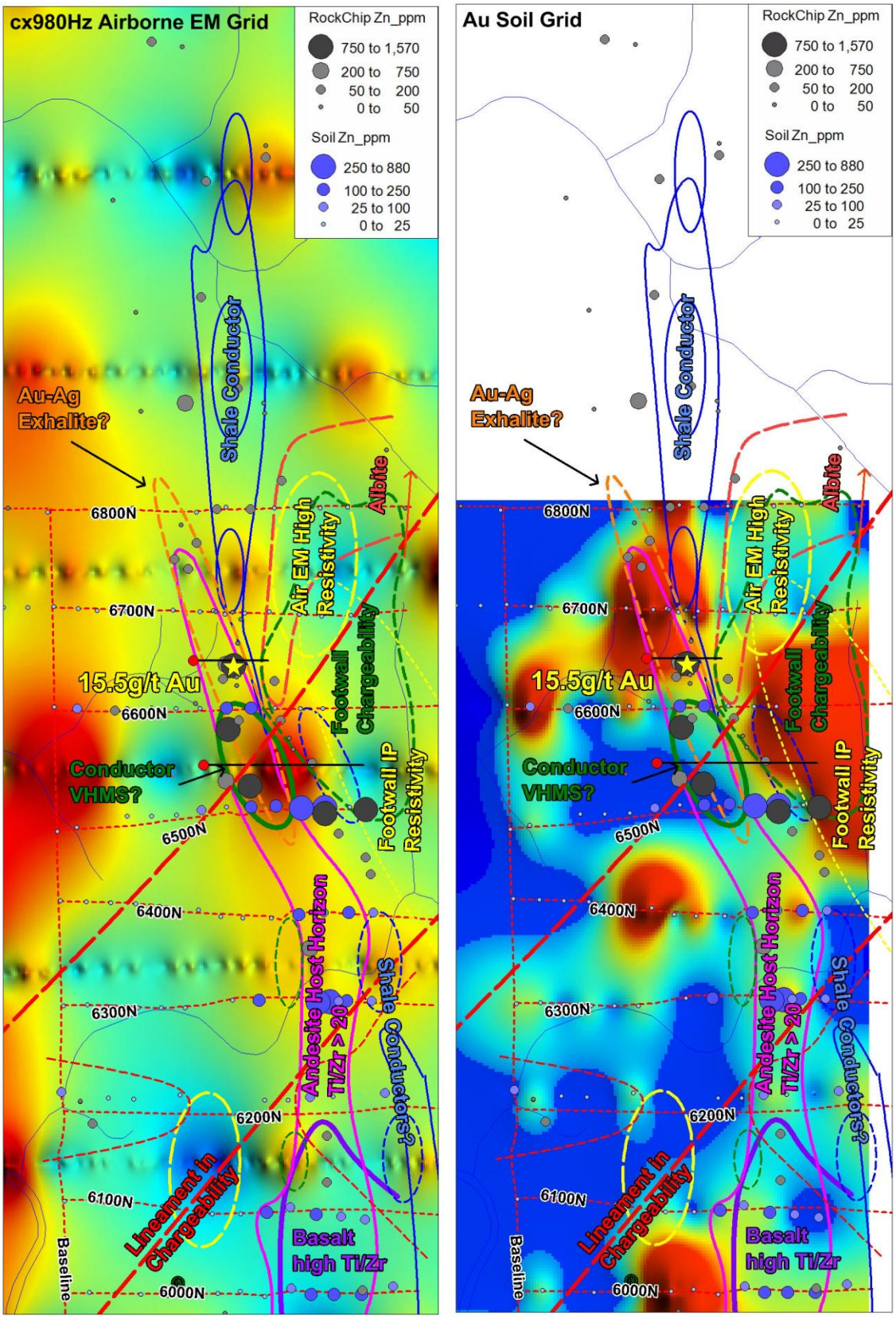

Figure 4: VHMS prospectivity map for the northern half of the Clark River Grid showing Zn in rock chip and soil thematic and recommended drill holes over WTRMP cx980Hz Airborne EM grid (left) and Au in soils grid (right).

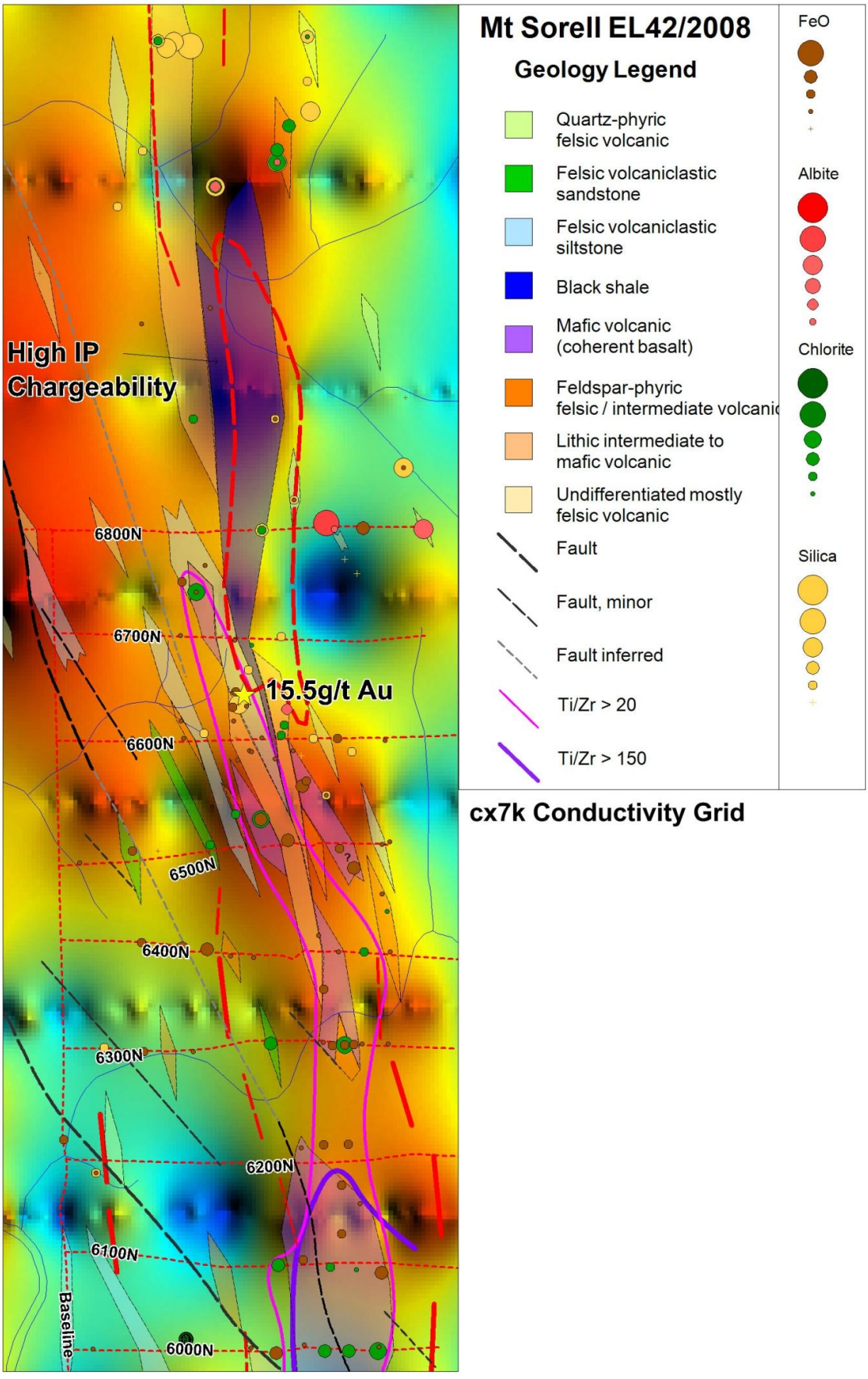

Figure 5: Alteration distribution and Interpreted Geology transparency over cx7k WTRMP airborne EM Conductivity Grid.

The black shale thins considerably at the chargeability anomalies southern end, whilst chargeability remains high (Figure 5 & 3). This suggests that some component of the chargeability footwall to the Au in rock chip anomaly maybe mineralisation related. Immediately south of the chargeability high and 6600N Au in rock chip anomaly is a relatively strong EM anomaly reflected in all channels (particularly cp34k, cx7k & cx980; Figures 4 & 5). This is a VHMS target! Further supporting a VHMS focus in this area is a broad elevated chargeability zone coincident with Au and Zn in soils within the footwall to the EM anomaly and 15.5g/t Au rock chip. This feature is not evident footwall to other chargeability anomalies in the area. A significant resistivity high zone coincident with strong albite – silica alteration footwall to the Au in rock chip anomaly also supports potential VHMS fluid focus in this area (Figure 3).

Recommendations

Drilling the 15.5g/t Au in rock chip anomaly as well as 100m south targeting anomalous geochemistry, EM and footwall chargeability is recommended (Figure 4). Down hole EM and surface EM surveys should follow as warranted.

Geological mapping now covers the central and northern grid area well, but further work is required to better characterise the southern portion which has not been mapped off grid line. Among other compelling features, an elevated Tl in soils zone, plus a green mineral occurrence which is possibly the VHMS hangingwall indicator mineral Fuchsite, suggest this area is worthy of follow up. Ultimately mapping should also extend more regionally, to the west of the grid where potential for folded repeats of the stratigraphy exists. This would cover chargeability zones, open anomalous Au and Na in soils on the Clark Grids western margin and elevated Zn in historic wide spaced soils near a structural intersection. Potential exists to undertake further soil sampling if warranted by expanded geological mapping and drilling results. The Au and Ag in soil anomaly evidently weakens in the north of the Clark Grid, but remains open, warranting extension of the soil sampling grid.

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Appendix

List of appended digital data files

EL422008_201505_01_ListOfAppendedDigitalData.txt
EL422008_201505_02_Field_Work_Report2015.pdf
EL422008_201505_03_RockChip2015.csv
EL422008_201505_04_Analysis_BU15054224.pdf
EL422008_201505_05_QC_BU15054224.pdf
EL422008_201505_06_Lookups.txt