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| **TARGET COMMODITY** | MANGANESE |
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| **250 000 K MAPSHEET** | MT YOUNG |
| **100 000 K MAPSHEET** | TAWALLAH RANGE |
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Report prepared by

**INTERNATIONAL GEOSCIENCE PTY LTD**

On behalf of

**Universal Splendour Investments PTY LTD**

# Tenement Summary Report for the period of 24th March 2012 to 23rd March 2013 for EL 27483

22th May 2013

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## EXECUTIVE SUMMARY

Exploration work on EL27483, referred to as USI's Lorella Project, has identified anomalous base metal and manganese occurrences.

The base metal mineralisation appears to be fault controlled and has some similarities to other mineralisation in the Mount Isa Belt and McArthur Basin. In particular copper mineralisation at Sly Creek outcrops along a 400 metre section of a northwest trending fault zone. Soil geochemistry suggests there is further mineralisation in the surrounding area and IP surveys indicate the mineralisation continues to the north and south and is open at depth.

Copper grades up to 25% make this occurrence worth further investigation and at least four diamond drill holes are recommended to test the mineralisation at depth.

Manganese mineralisation occurs to the northwest of the Sly Creek Copper occurrence, appears surficial and gives no significant IP or EM responses (using a CMD frequency domain instrument). The occurrence remains of interest because of the apparent proximity to base metal mineralisation and should not be discounted.

The results to date on the EL are encouraging and further soil surveys and geophysical surveys are recommended to explore for further concealed mineralisation.

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# 1 OVERVIEW

The Lorella Project consists of one tenement (EL 27483), located in the northeast of the Northern Territory (Figure 1). Over the past two years International Geoscience have visited the project area several times and undertaken a significant amount of grass-roots exploration (Figure 2). To-date International Geoscience have discovered one new manganese prospect and re-discovered the Sly Creek prospect and the unnamed #00902 Pb occurrence from the NTGS database.

## 1.1 Access

Vehicle excess to the tenement is very good, with the Nathan River Road cutting north-south though the southwest of the tenement and the Lorella Springs Station access road cutting northeast-southwest through the centre of the tenement.

Possible access to the nearest port is via the Nathan River Road north to the new Western Desert Resources haul road running east to the Bing Bong Port used by McArthur River Mines.

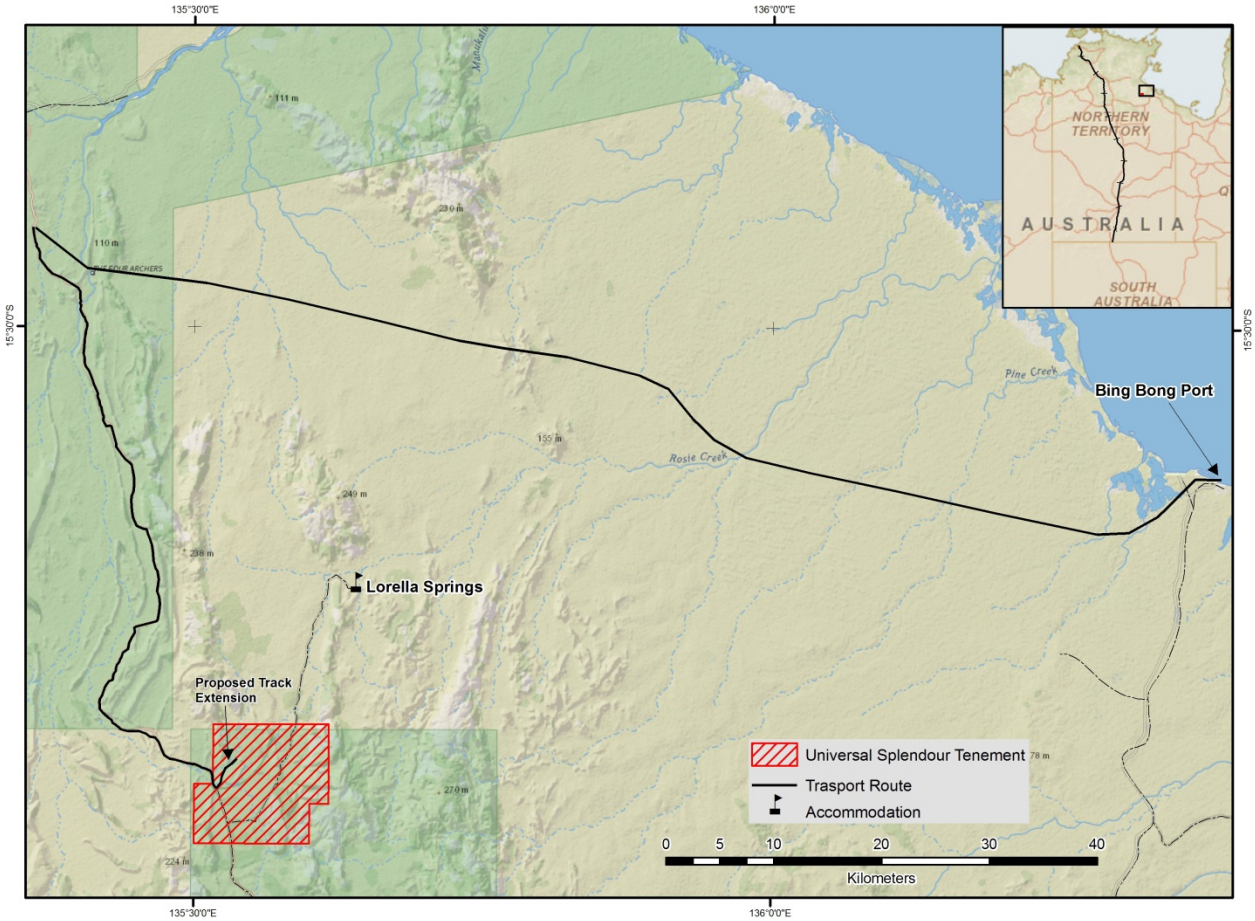



**Figure 1: Location of USI's Lorella project area, in the northeast region of NT.**

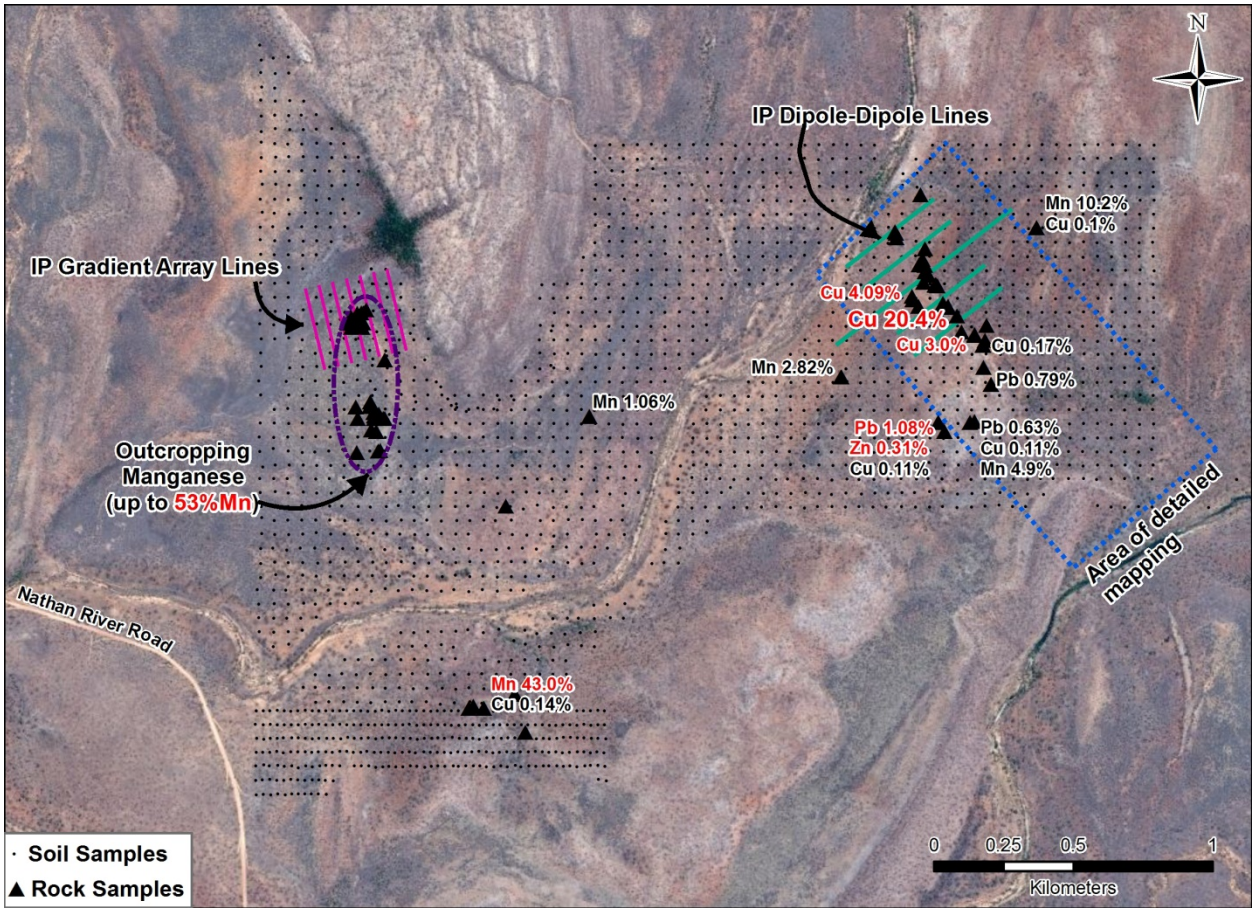



**Figure 2: Location of soil samples, selected rock samples, IP gradient array, IP Dipole-dipole survey and area of mapping within The Hammer and Sly Creek mineral prospects. See Figure 3 for the locations of the prospects.**

## 2 OVERVIEW OF COPPER, LEAD-ZINC AND MANGANESE PROSPECTS

In the northwest of the EL, International Geoscience has discovered one large patchy area of high grade manganese mineralisation (The Hammer), and rediscovered the historical Sly Creek copper prospect and well as one unnamed lead occurrence (#00902) which International Geoscience proposes to call Blade Runner (Figure 3).

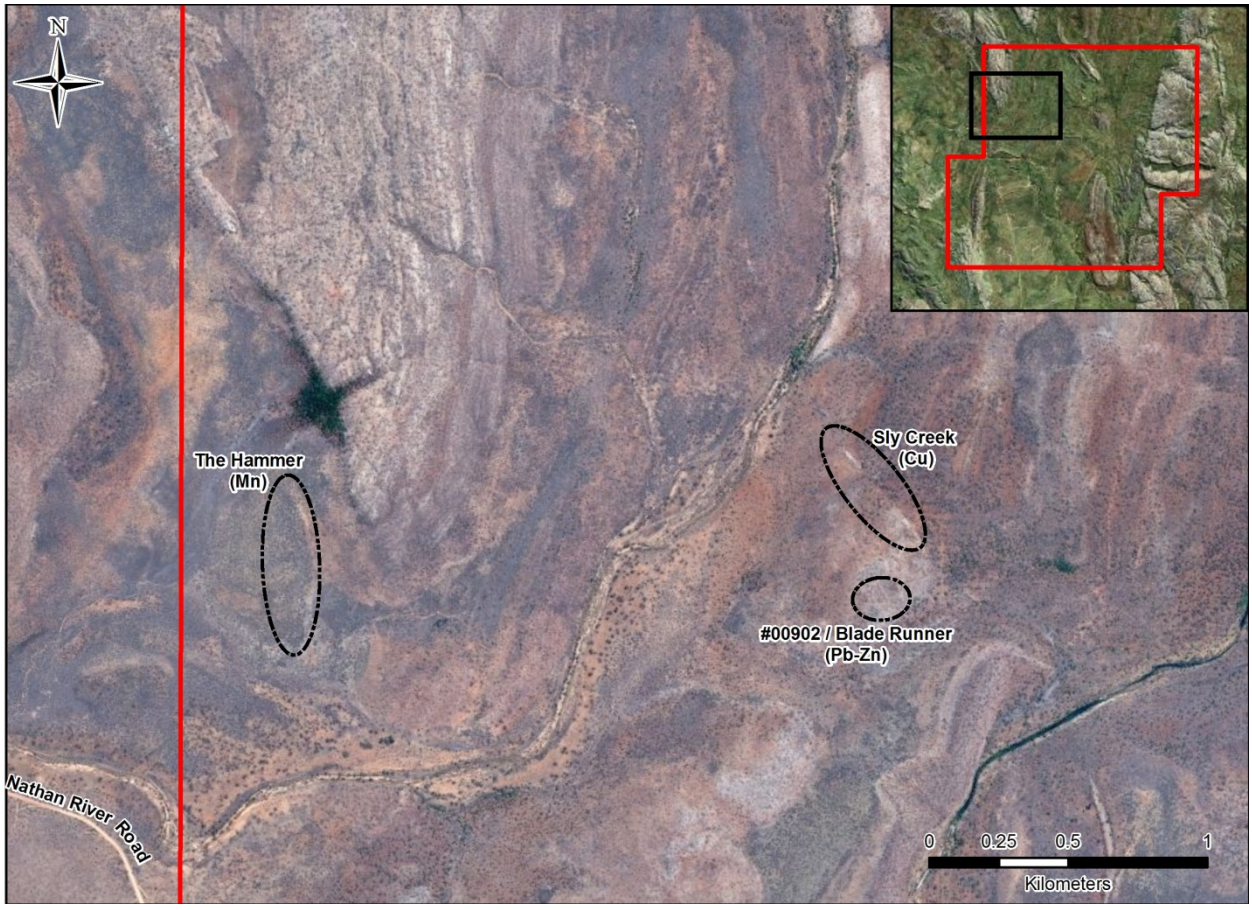



**Figure 3: Location of prospects within the northwest of the Lorella project.**

### 2.1 Sly Creek

Sly Creek Copper was discovered in 1976 by either Carpentaria Exploration Company (CEC) or just prior by Amad NL (aka Normandy Mining). The first reference to the Sly Creek prospect was by CEC but it was in the section of their report on 'Old Workings'. The company to work on the tenement before CEC was Amad NL but no reference can be found to the discovery of Sly Creek.

Subsequently no significant work appears to have been completed on the prospect until 1983-84 by John Howard Hartley Steer (Figure 4). Steer appears to have dug several trenches (Figure 5) and completed a soil geochemical program. The two main mineralised trenches are described as oxide or fresh based on the form of copper mineralisation. The oxide trench is reported to have returned Cu between 1.4% and 25.6%. The fresh trench returned values of Cu 0.417% to 8.1% Steer appears to have been unsuccessful in securing a JV partner and combined with the falling copper price and the remote nature of the prospect surrendered the tenement on 18th of July 1984.

Later explorers do not appear to have undertaken any further work on Sly Creek until International Geoscience in 2011-2012.

International Geoscience discovered the old workings in field reconnaissance and collected samples from both trenches. The Cu mineralisation consists of malachite, chalcopyrite, chalcocite and minor bornite. Recent samples from the fresh trench were as high as 1.6%Cu and an average of 0.6% Cu. Samples from the oxide trench returned Cu values as high as 20.4% and an average of 11.5%.

One additional outcrop of Cu was identified to the west of the main copper trend and the results of 2 samples were 4.1% and 2.2%.

Due to the significant amount of outcropping geology a soil geochemical program was undertaken to identify additional mineralisation.


**Figure 4 Historical tenement claim sign by John Howard Hartley Steer.**

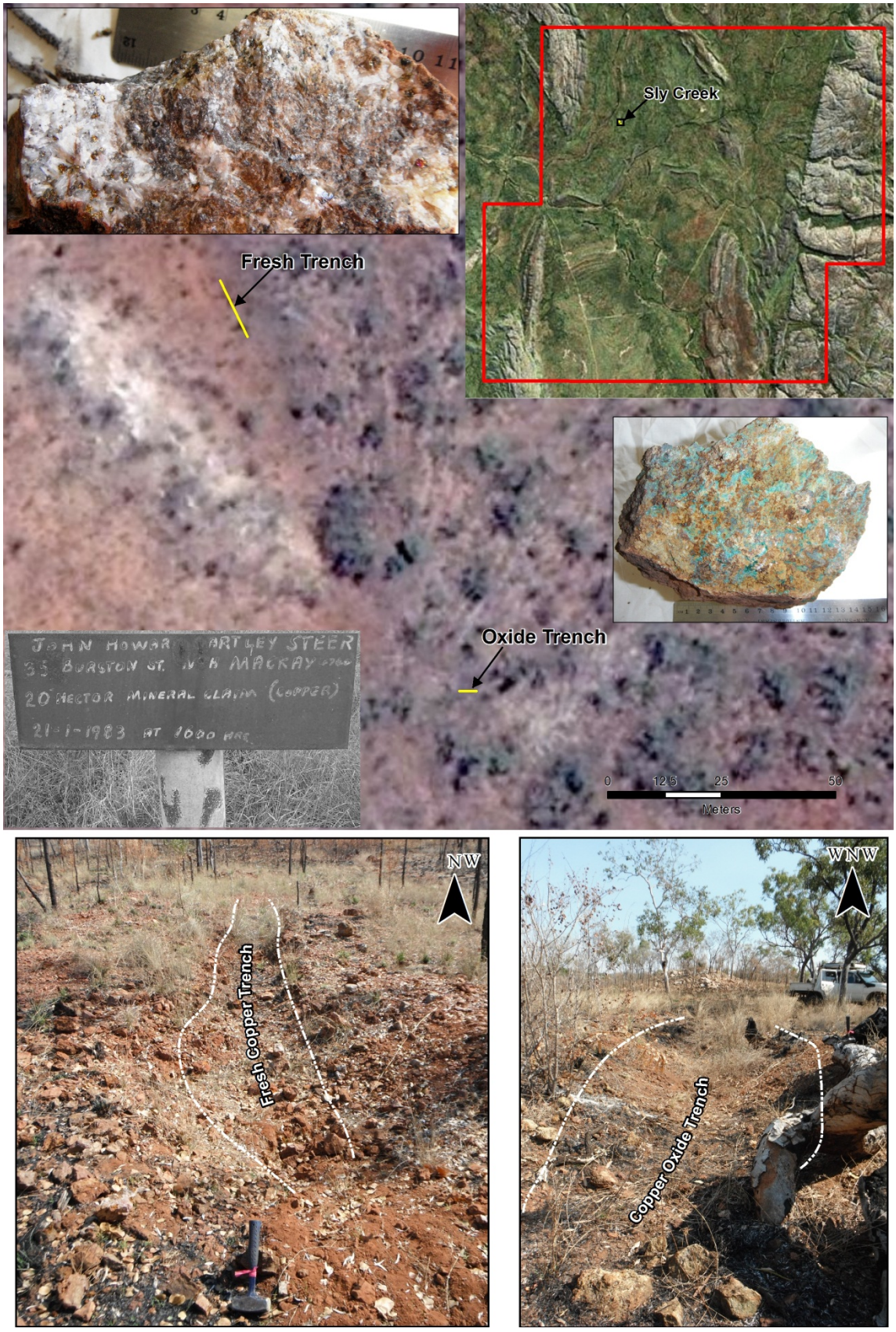



**Figure 5: Location of the Sly Creek copper prospect with fresh and oxide copper trenches indicated as yellow lines. Fresh trench mineralisation in dominated by chalcopyrite and the oxide trench is dominated by malachite.**

### 2.1.1 Mapping

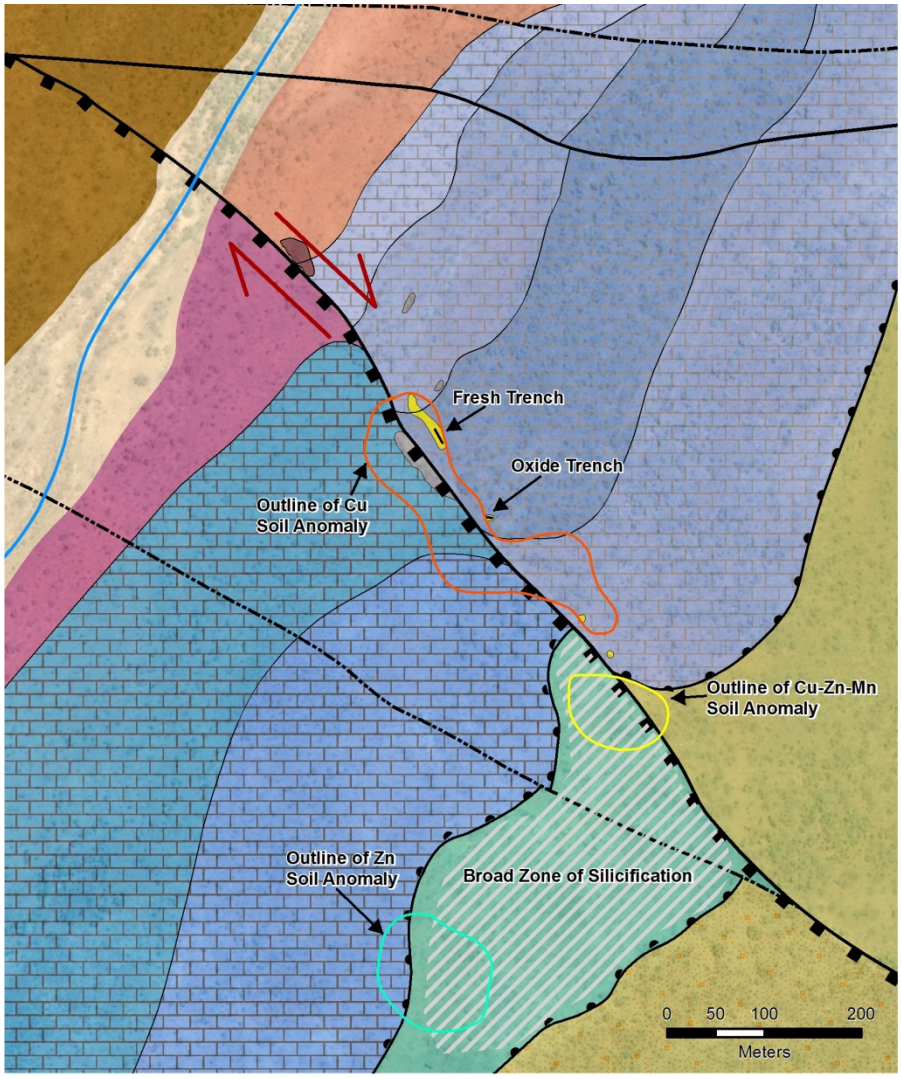
The mineralisation appears to be fault controlled and therefore trends northwest-southeast along the main structure. The area surrounding Sly Creek was mapped in order to gain a better understanding of the mineralisation and its controls. The data was interpreted along with the available magnetic data and the NTGS geology map (Figure 6).

To the south of the fresh copper trench is a silicified ridge of brecciated carbonate which parallels the mineralisation and the fault. Further to the northwest along the fault is a ridge of massive fine to medium grained haematite. The proximity of this haematite to the mineralisation and coincidence with the main fault are worth further investigation. Further to the south correlating to the Balbirini Dolomites is a broad zone of silicification which forms a broad hill in the otherwise flat terrain. This silicified area is gossanous in areas and is the host to the Blade Runner lead occurrence. Minor additional patches of silicification have been mapped in the carbonates.

Combining the results of the geochemical program with the geology allowed the subdivision of the carbonate units into various sub-units containing higher Cu/Mn/Zn.

The main copper soil anomaly trend coincides with the mineralised trenches as well as continuing to the north and south along the fault. The main fault controlling mineralisation has been mapped as a normal structure as seen by the juxtaposition of the younger strata next to the older strata. The fault also has a significant transverse dextral component as seen by the ‘dragging’ of the Amelia Dolomite into the fault zone.

The coincident Cu-Mn-Zn soil anomaly to the south of the main Cu trend lies along the same fault and may be representing a transition of mineralisation from Cu to Zn as supported by the large Zn soil anomaly to the south of the main fault.




**Legend**

**Transported**
- Current Drainage

**Roper Group**
- Mantungula Formation

**Nathan Group**
- Balbirini Dolomite: Elevated Cu and Zn

**McArthur Group**
- Tooganinie Formation
- Tooganinie Formation: Elevated in Cu and Mn
- Tatoola Sandstone
- Amelia Dolomite
- Amelia Dolomite: Evelated in Cu, Mn and Zn
- Amelia Dolomite: Elevated in Zn
- Mallapunyah Formation
- Masterton Sandstone

**Tawallah Group**
- Wununmantyala Sandstone

- Fault
- Fault - Inferred
- Fault - Normal
- Geological Boundary
- Geological Boundary - Unconformity
- River
- Cu-Zn-Mn Soil Anomaly
- Cu Soil Anomaly
- Zn Soil Anomaly

- Copper Mineralisation Outcrop
- Haematite Outcrop
- Silicificaiton Outcrop
- Broad Zone of Silicification

**Figure 6: Interpreted geology map based on; field mapping, magnetic data and historical geology maps.**

### 2.1.2 Geophysics

In June 2012 six dipole-dipole survey lines were carried out over the Sly Creek copper prospect. The survey comprised five 400m long current electrode arrays with 50 metre dipole spacing, and one 800 m line carried out with 100 metre dipole spacing. The survey parameters and location information are summarized in Table 1 and Table 2 below. A location map is shown in Figure 7.

The data was sufficiently close spaced to perform a 3D inversion of the data. The results show a chargeable anomaly trending along the fault and open to the southeast, northwest and at depth. The anomaly is at least 600m long, approximately 150m wide and open to 250m depth. Several drill targets can be generated to test the anomaly but a conservative drill program has been plotted to conserve the amount of drilling but still test the core of the anomaly and the depth extent (Figure 8 and Figure 9).

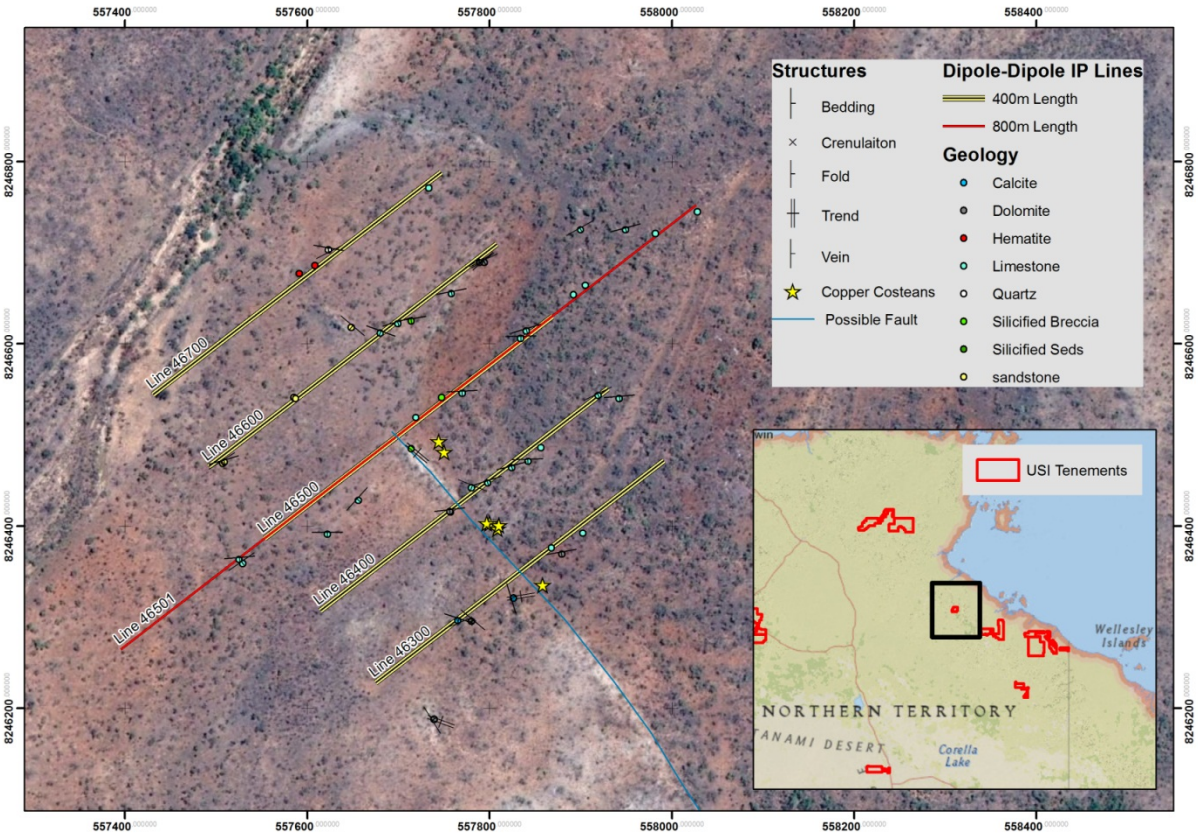



**Figure 7: Location of the Dipole-Dipole IP lines overlaid on the field mapping results.**

**Table 1: Sly Creek Dipole Dipole IP Survey Parameters**

| | |
|---|---|
| **Contractor** | Quadrant Geophysics |
| **Instrument** | Scintrex IPR12 |
| **Tx Frequency** | 0.125 Hz |
| **IP Decay Interval Int.** | 450-1100 ms |
| **Max N Level** | 8 |

**Table 2: Line Coordinates of the Dipole-Dipole surveys carried out at Sly Creek**

| Line | Line Start Coordinates | | Line End Coordinates | | Dipole Spacing | Electrode Array Length |
|---|---|---|---|---|---|---|
| | Easting MGA53 | Northing MGA53 | Easting MGA53 | Northing MGA53 | | |
| 46300 | 557675 | 8246228 | 557991 | 8246472 | 50 | 400 |
| 46400 | 557614 | 8246307 | 557930 | 8246551 | 50 | 400 |
| 46500 | 557553 | 8246386 | 557869 | 8246630 | 50 | 400 |
| 46501 | 557395 | 8246264 | 558027 | 8246752 | 100 | 800 |
| 46600 | 557492 | 8246465 | 557808 | 8246709 | 50 | 400 |
| 46700 | 557431 | 8246544 | 557747 | 8246788 | 50 | 400 |

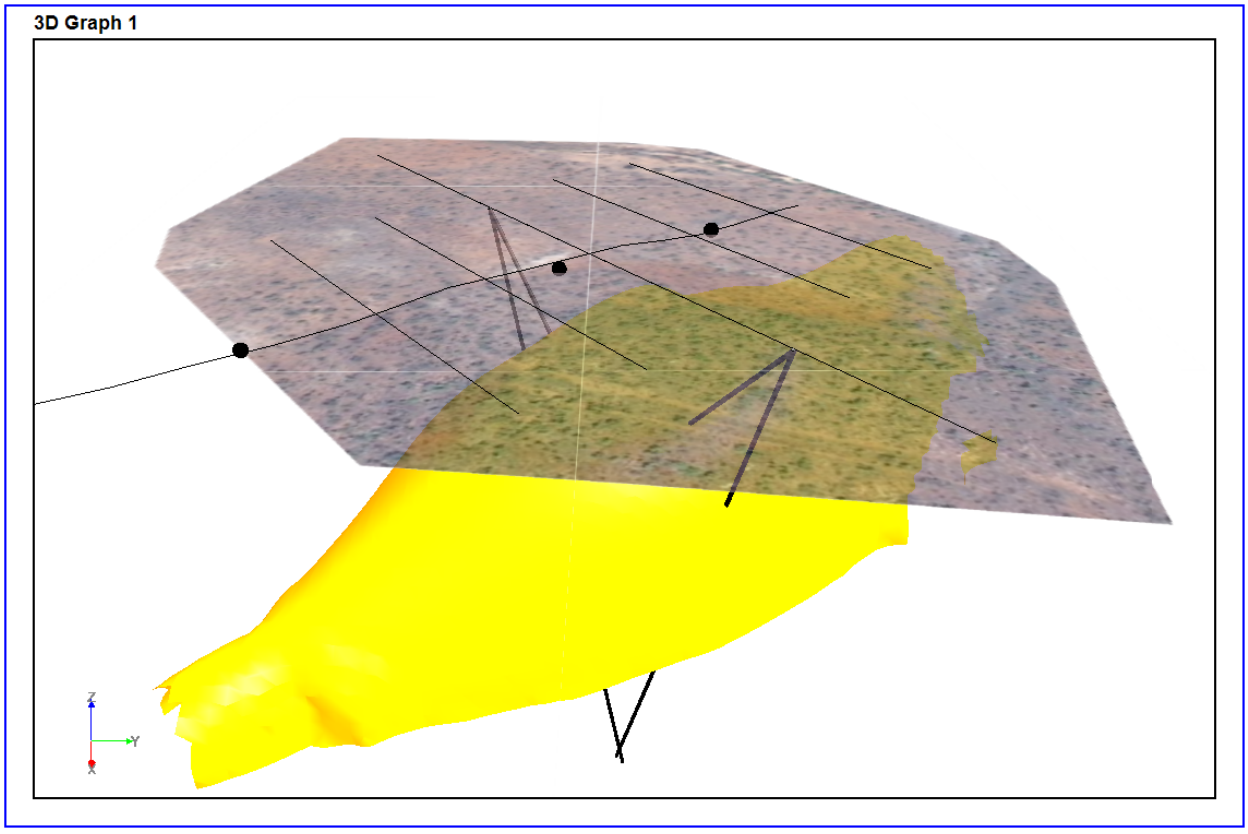



**Figure 8: Sly Creek IP chargeability iso-surface superimposed with airphoto, IP dipole-dipole survey lines, copper-costeans (black dots), fault trace (black line), and proposed drill holes as viewed from the East. The IP anomaly follows the trend of the fault, plunging down to the North-West and South-East, and is open at depth. The dip appears to be vertical from the IP data. As such the proposed drill holes consist of opposing 45° and 70° holes, testing both the shallow and deep parts of the anomaly. Total drilling is 1800 metres.**

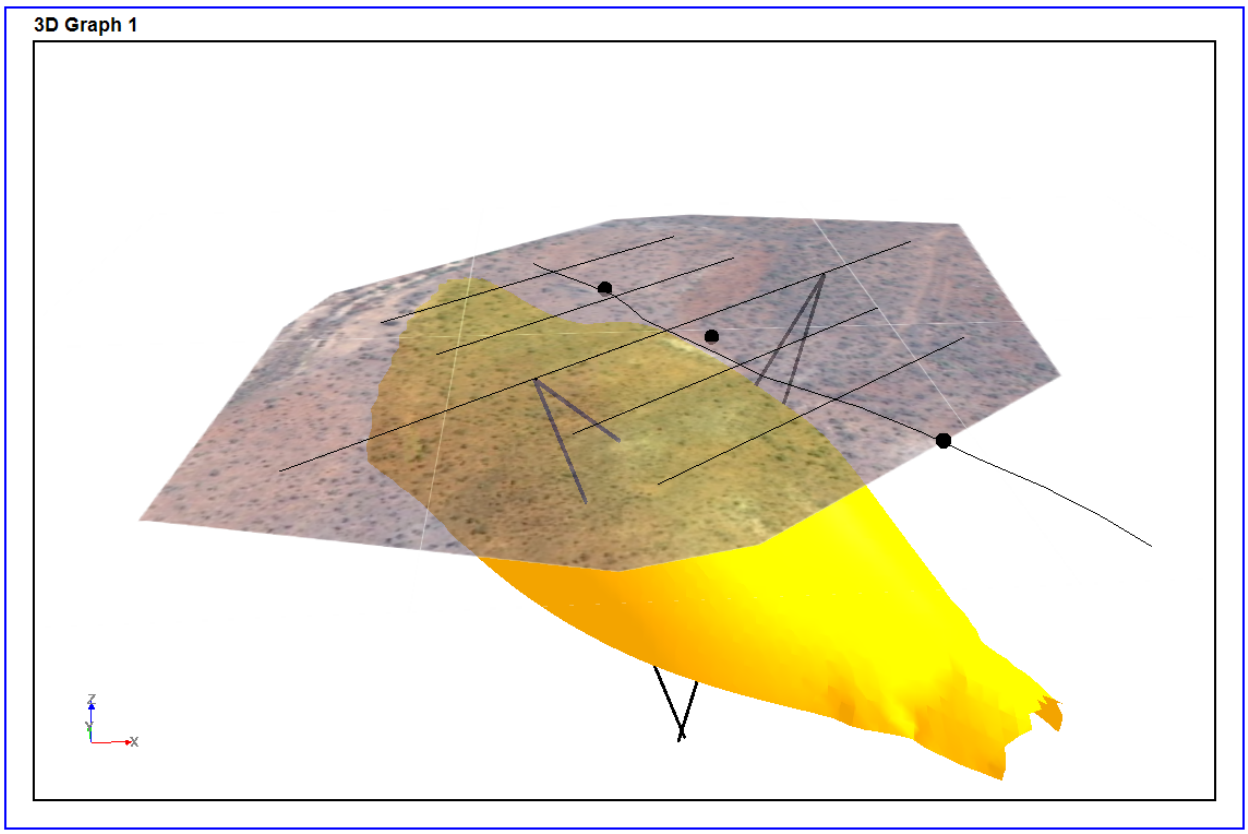



**Figure 9: Sly Creek IP chargeability iso-surface superimposed with airphoto, IP dipole-dipole survey lines, copper-costeans (black dots), fault trace (black line), and proposed drill holes as viewed from the South. The IP anomaly follows the trend of the fault, plunging down to the North-West and South-East, and is open at depth. The dip appears to be vertical from the IP data. As such the proposed drill holes consist of opposing 45° and 70° holes, testing both the shallow and deep parts of the anomaly. Total drilling is 1800 metres.**

## 2.2 Unnamed #00902 / Blade Runner

One lead occurrence is located within the EL (unnamed #00902), situated just to the northwest of Sly Creek based on the NTGS database. It is likely that the position of the occurrence is not correct and is actually to the southeast of Sly Creek (Figure 10). It is described as '*minor galena found in cherty rubble of the Billengarrah Fm'.*

The rock samples collected during the 2012 field season returned three anomalous lead assays (1.08, 0.79 and 0.63 %Pb) and one anomalous zinc (0.31%Zn).

Further work is required in order to identify the; grade, distribution, size of the mineralisation and the connection to the copper and manganese in the area. Geophysical methods (IP, EM, SAM) are recommended to further define the area of mineralisation.

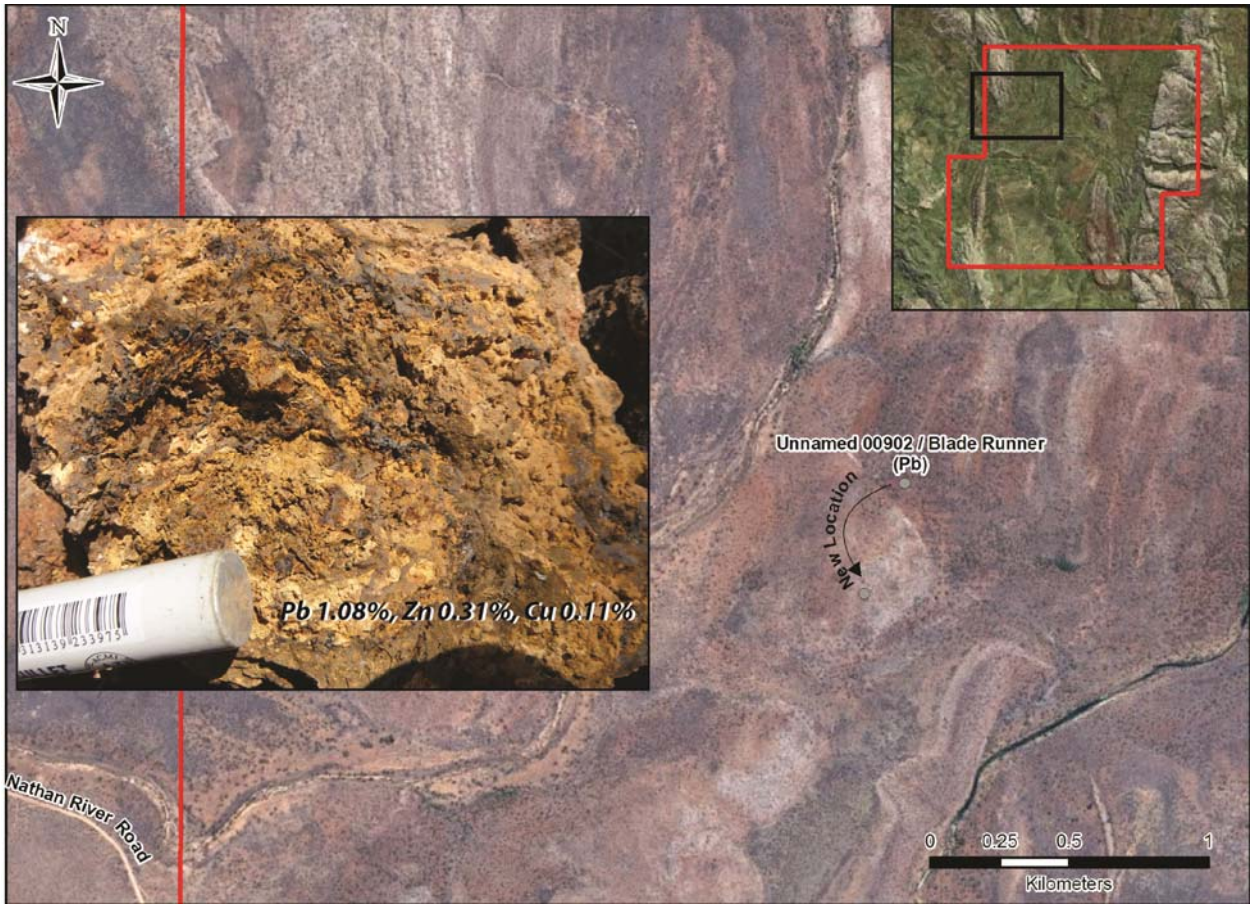



**Figure 10: Original and new location of unnamed00902 / Blade Runner Pb occurrence (557762E 8245987N). Outcrop appears gossanous.**

## 2.3 The Hammer

The Hammer was discovered during a search to locate the Sly Creek copper prospect in the same region. The manganese mineralisation consists of nodules within a sandstone host rock (Figure 11). The nodules are patchy and no massive outcrop was located. Several rock samples were collected and high manganese was detected in several samples (Figure 10).

Petrographic work was undertaken on the samples in order to better define the origin/style of mineralisation.

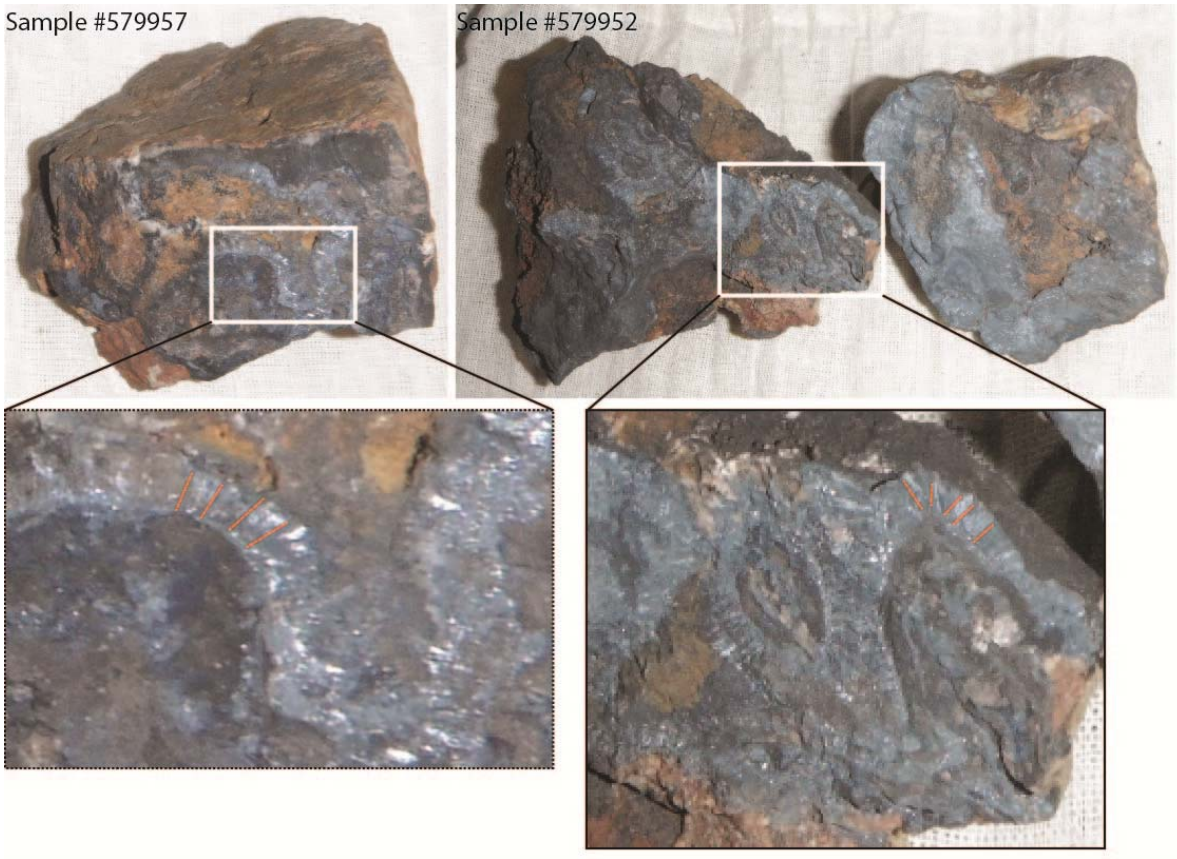



**Figure 11: Samples from The Hammer occurrence displaying radial manganese crystal (red lines depict crystal orientation)**

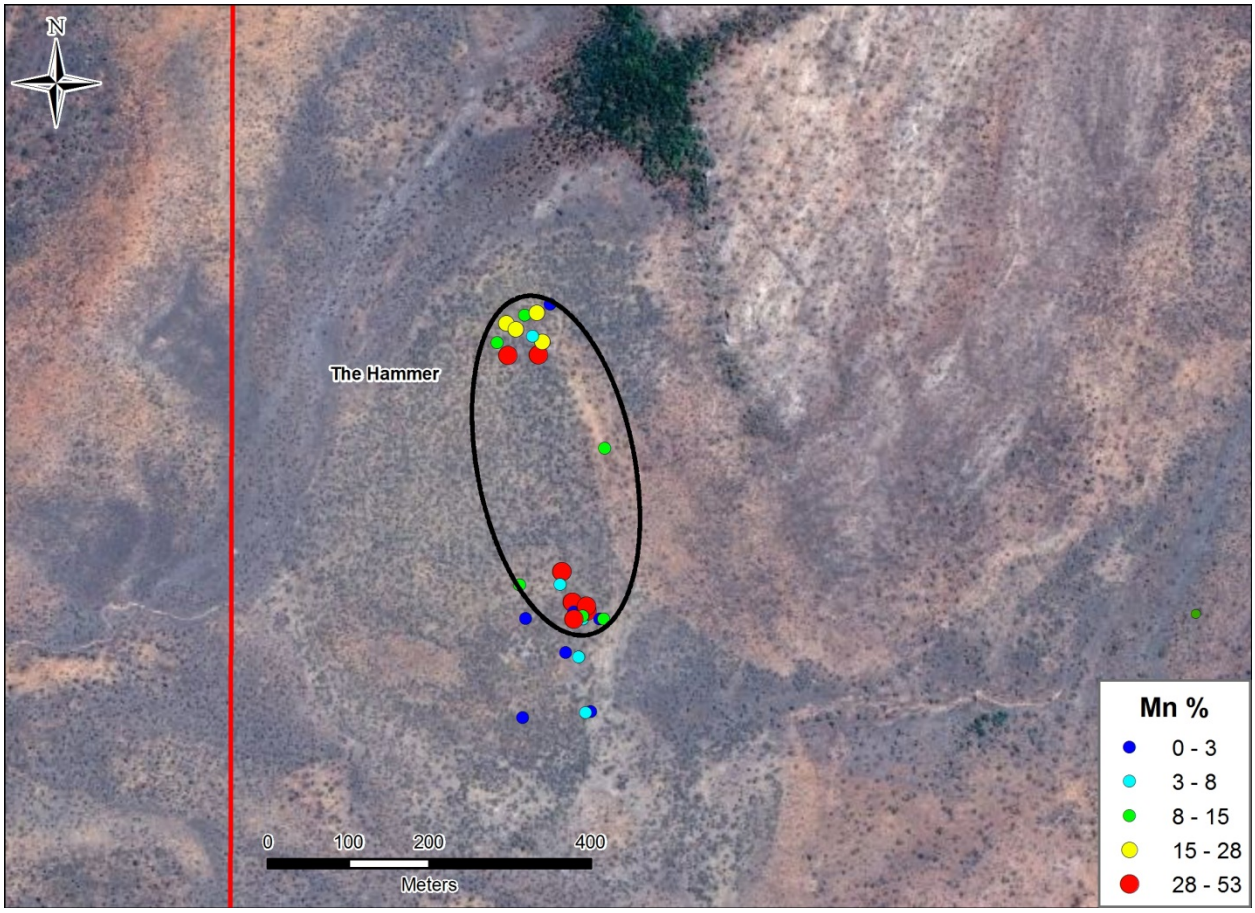



**Figure 12: Sampling locations from The Hammer manganese occurrence in northwest EL27483.**

### 2.3.3 Petrographic Summary

One sample from The Hammer was submitted for petrographic analysis to Pathfinder Exploration Pty Ltd.

The sample consists of medium-fine grained sandstone with colloform textured manganese mineralisation. The main manganese minerals present are a mixture of pyrolusite ($MnO_2$) and psilomelane ($Ba,H_2O)_2Mn_5O_{10}$) (Figure 13). Pyrolusite has locally replaced psilomelane.

The presence of psilomelane supports the anomalous Ba recorded by the Niton XRF analysis (Ba= 3.12%). Chalcedony-microcrystalline quartz matrix is thought to represent low temperature assemblage, contemporaneous with the deposition of psilomelane – pyrolusite mineralisation.

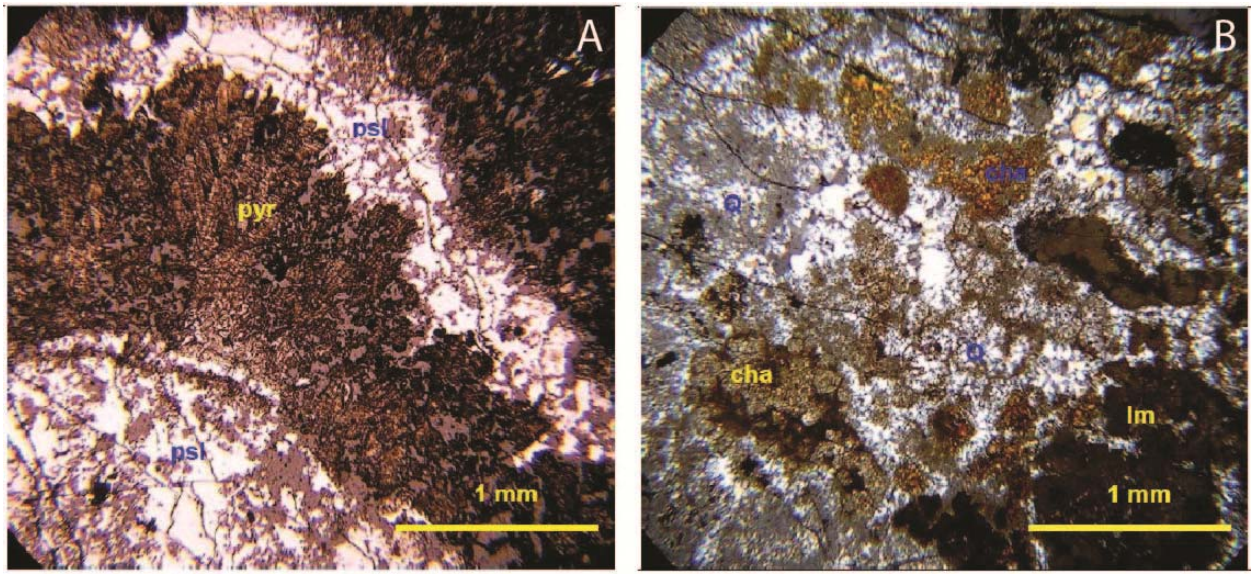



**Figure 13: Thin section images of The Hammer sample A) Plane polarised reflected light. B) Crossed polars. pyr= pyrolusite; psl= psilomelane; Q= quartz.**

### 2.3.4 Geophysics

A gradient array IP survey and electromagnetic conductivity survey (CMD) were carried out at the "Hammer" manganese prospect at Lorella in June 2012.

The gradient array IP was carried out with a Scintrex IPR12. The data were acquired along 50m spaced lines using 50m receiver dipole separation. Some stations in the North West corner were omitted because poor access due to a swamp.

The IP resistivity and chargeability grids are shown in Figure 14. The chargeability displays moderate to poor correlation with the mineralisation while the resistivity displays virtually no correlation with either the mineralisation or geology. Overall the IP gradient survey was not successful at identifying further manganese mineralisation at The Hammer.

The conductivity metre survey was carried out with a CMD multi-frequency instrument, with non-differential GPS acquired simultaneously during acquisition. The CMD data is more detailed relative to the gradient array IP data because it was carried out at 15 metre line spacing.

Figure 15 shows gridded conductivity data overlaid on a geological map. The CMD data shows distinct intersecting trends oriented both north-west and north-east. It also shows an apparent correlation between the manganese mineralisation and slightly higher conductivities, but the total range is only 60 mS/m.

The low conductivity zone in the west is a swamp. The eastern part backs onto a quartzite ridge. It is not possible to tell whether the more conductive parts are directly related to manganese mineralisation, or just related to near surface weathering and variable soil profiles.

Although the results do not show a compelling correlation between the manganese mineralisation and the high conductivity zones, it may be worthwhile targeting some areas of high conductivity as part of a larger drilling campaign.

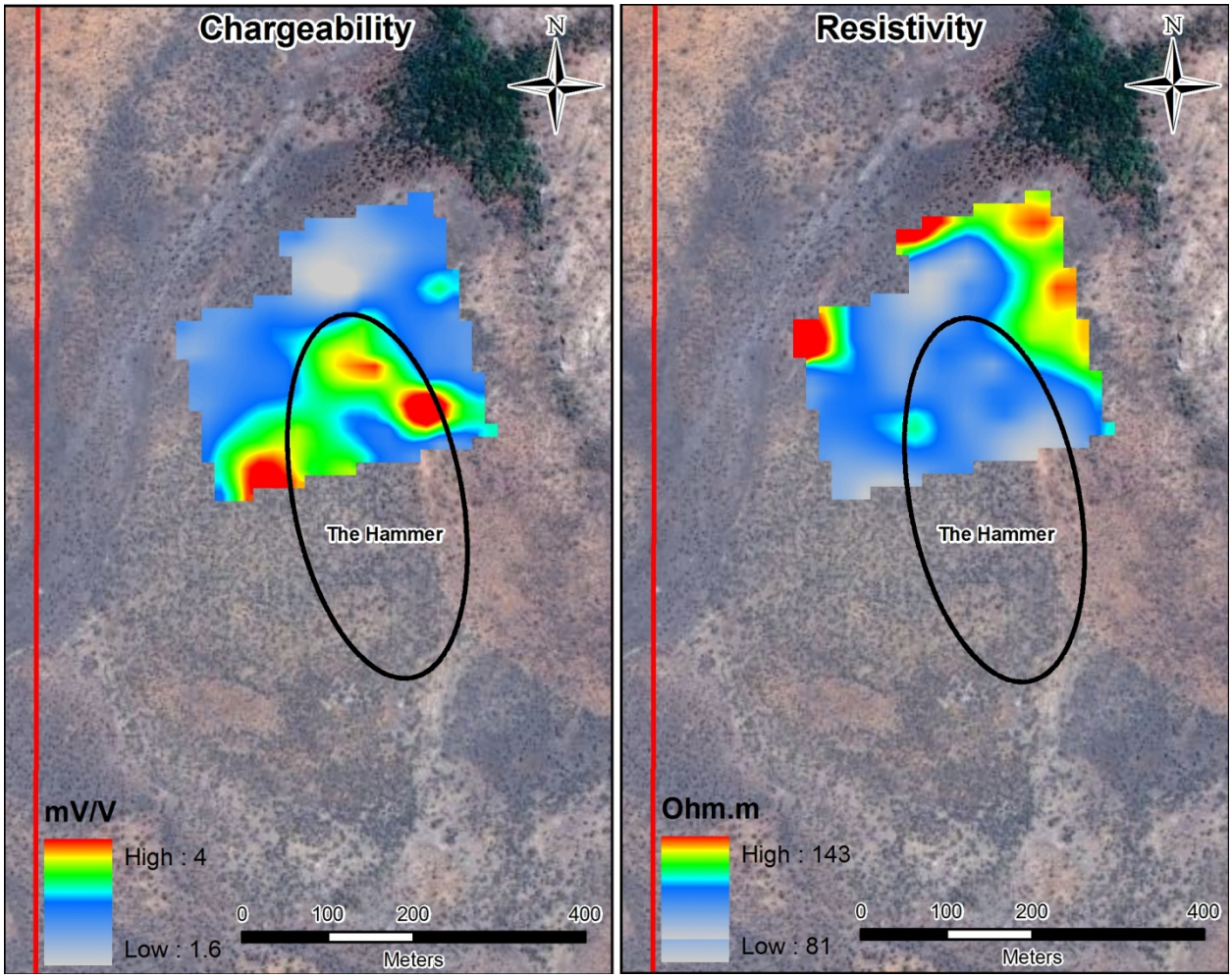



**Figure 14: Results of a test IP gradient array survey over the northern portion of The Hammer. The chargeability displays moderate to poor correlation with the outcropping mineralisation and the resistivity displays no correlation with mineralisation.**

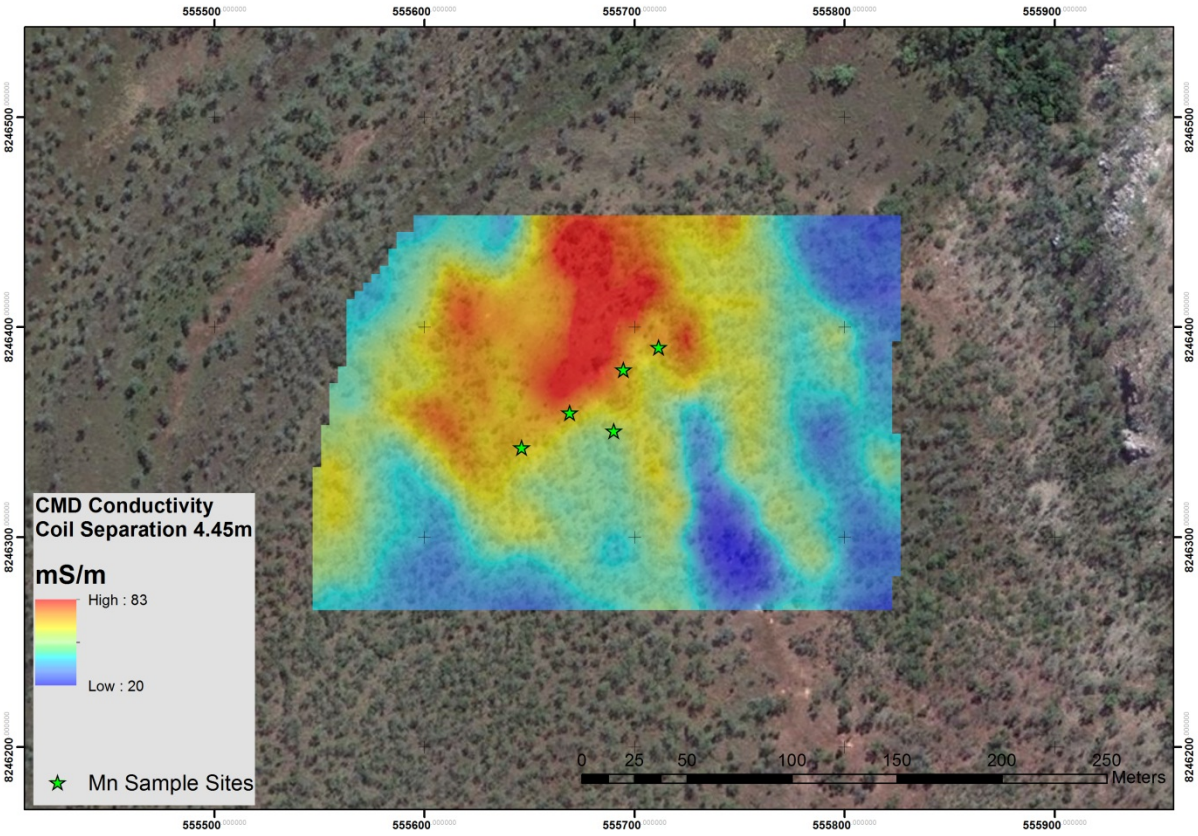



**Figure 15: CMD conductivity overlaid on the local geology map and manganese occurrences**

# 3 SOIL PROGRAM

A total of 1966 soil samples were collected from the northwest of the Lorella tenement Figure 16. Two sample spacing's were used, 50mx50m over the majority of the survey and 25mx50m for the southern portion. The 50mx50m survey spacing was selected first and after the return of the assay results a new anomalous area was identified in the south of the survey. A follow-up survey was carried out to better define the new anomalous area and tighter sample spacing was used to improve the resolution of the mineralised area. All soil samples were assayed using ICP-AES at SGS labs in Perth and each sample was analysed for Cu, Zn and Mn.

The results of the copper mineralisation correlate very well with the outcropping mineralisation at Sly Creek (Figure 17). A possible extension of the copper to the south has been detected by the soil analysis and this follows along the same structural feature which is controlling the mineralisation. Two additional anomalies were identified to the north of Sly Creek and these should be investigated although they lie off the main controlling fault. A relatively large area of anomalous copper was identified to the south of the survey. The assay values for copper in this area are approximately 2.5 times higher than the values obtained for Sly Creek but the colour bar was set to a maximum to best display the copper trend at Sly Creek. The southern anomaly is very promising and is a likely target for geophysical targeting (IP, EM or SAM).

Three zinc anomalies have been identified in the soil program (Figure 18). One is coincident with the Blade Runner Lead occurrence (previously unnamed #00902). This anomaly is relatively large and strong. The two anomalies are coincident with the extension of the copper to the southeast and the southern copper/manganese anomalies.

Several manganese anomalies have been identified in the soil survey, although no significant anomaly was identified at The Hammer (Figure 19). The manganese assays ranged as high as 2.5% Mn but an upper limit was placed at 0.5% Mn in order to best represent the majority of the data. One strong anomaly was identified southeast of Sly Creek and a relatively large anomalous area in the south of the survey which correlates to the southern copper anomaly. The significance of the manganese is currently uncertain but it is suspected that the manganese may be representing a 'halo' effect around the copper and possibly lead-zinc, as seen at the McArthur lead-zinc mine.

The correlation of the three elements (Cu, Zn and Mn) with known outcropping mineralisation and the identification of additional unknown mineralised anomalies suggests that this region within the tenement has significant potential for copper-lead-zinc and possibly manganese mineralisation.

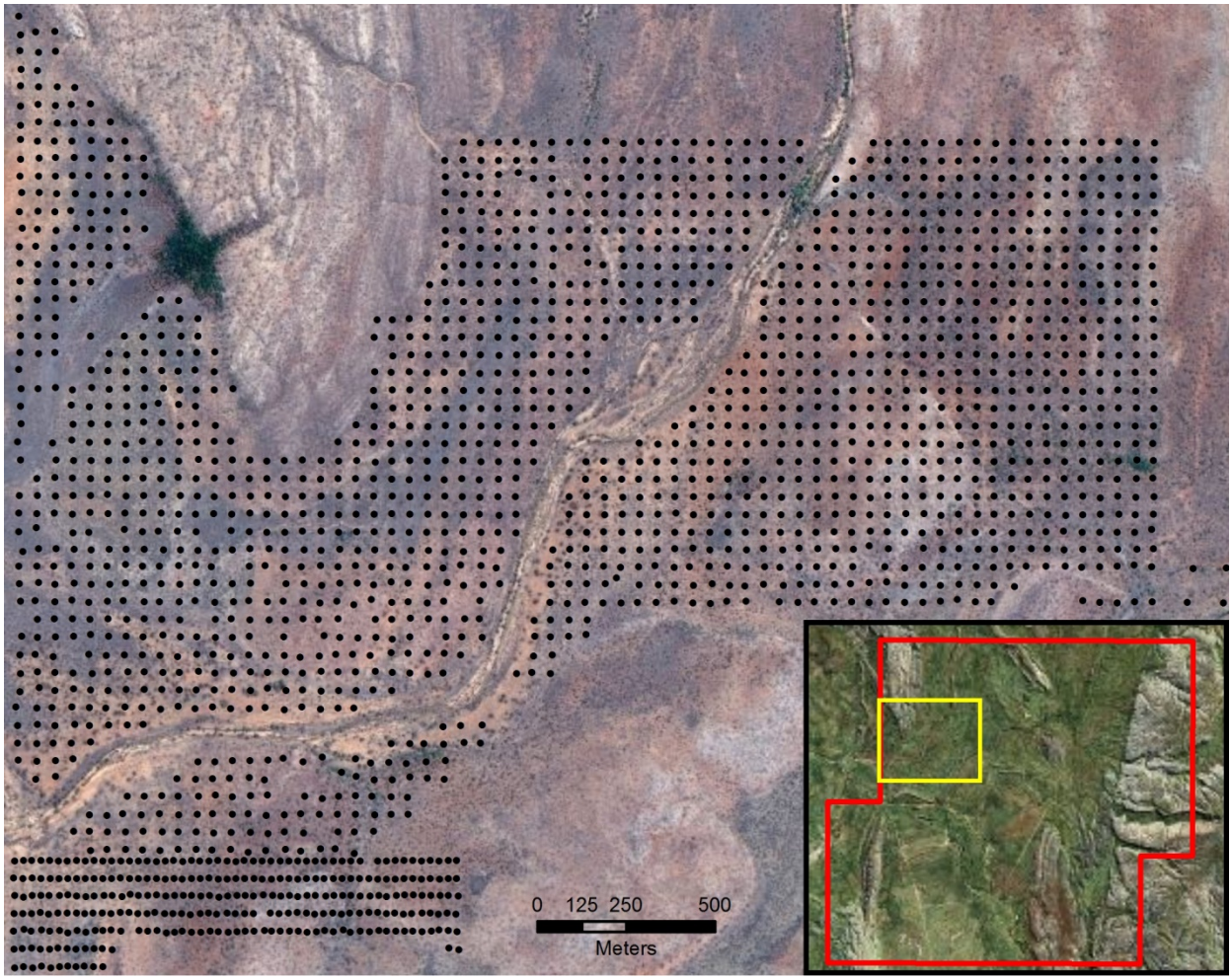



**Figure 16: Location of soil samples collected within the northwest of the Lorella tenement. Note the two different sample spacing (50mx50m and 25mx50m).**

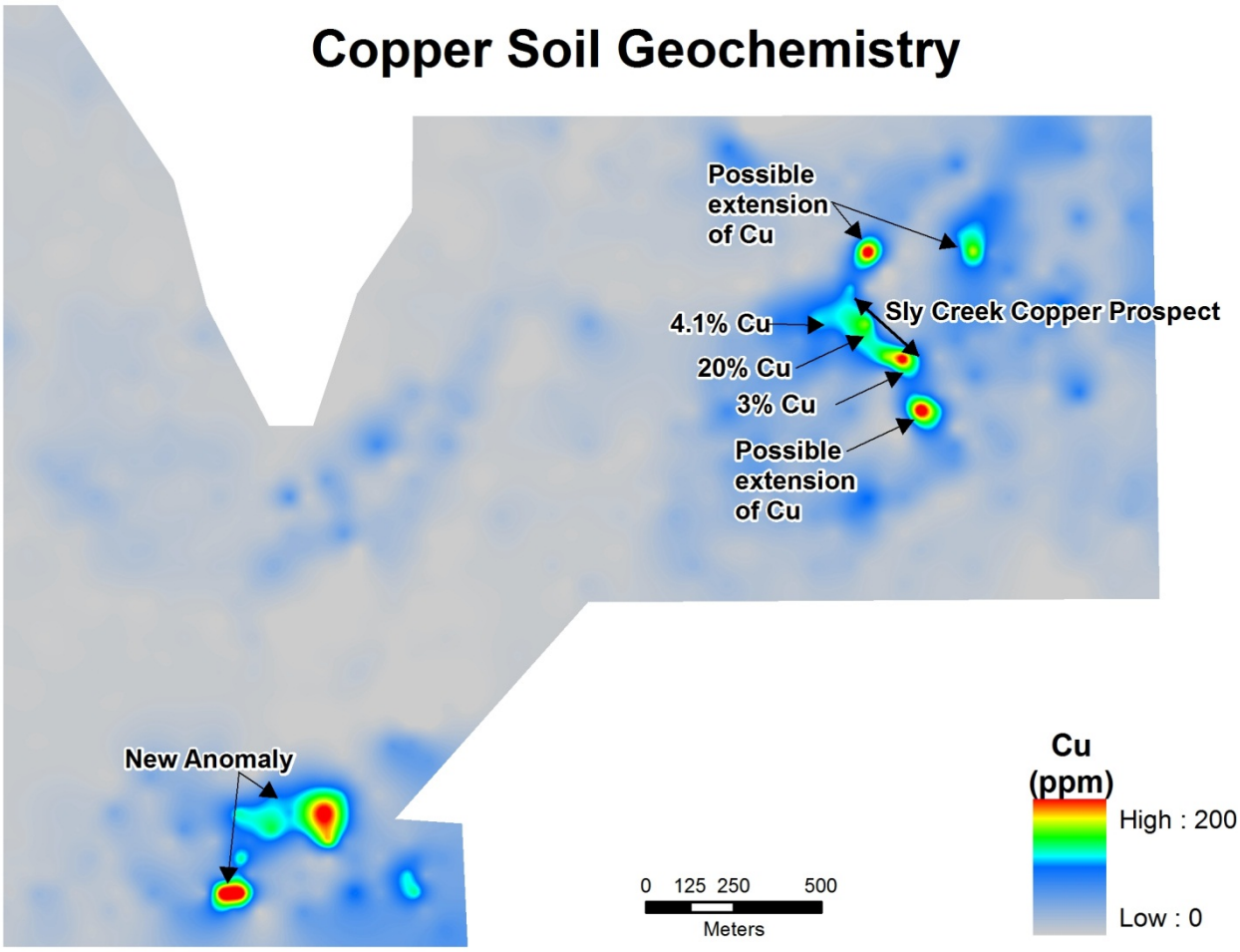



**Figure 17: Soil grid of copper assay results. Location of Sly Creek, possible extension of Sly Creek and two new copper anomalies indicated. Values of %Cu have been indicated for select rock samples.**

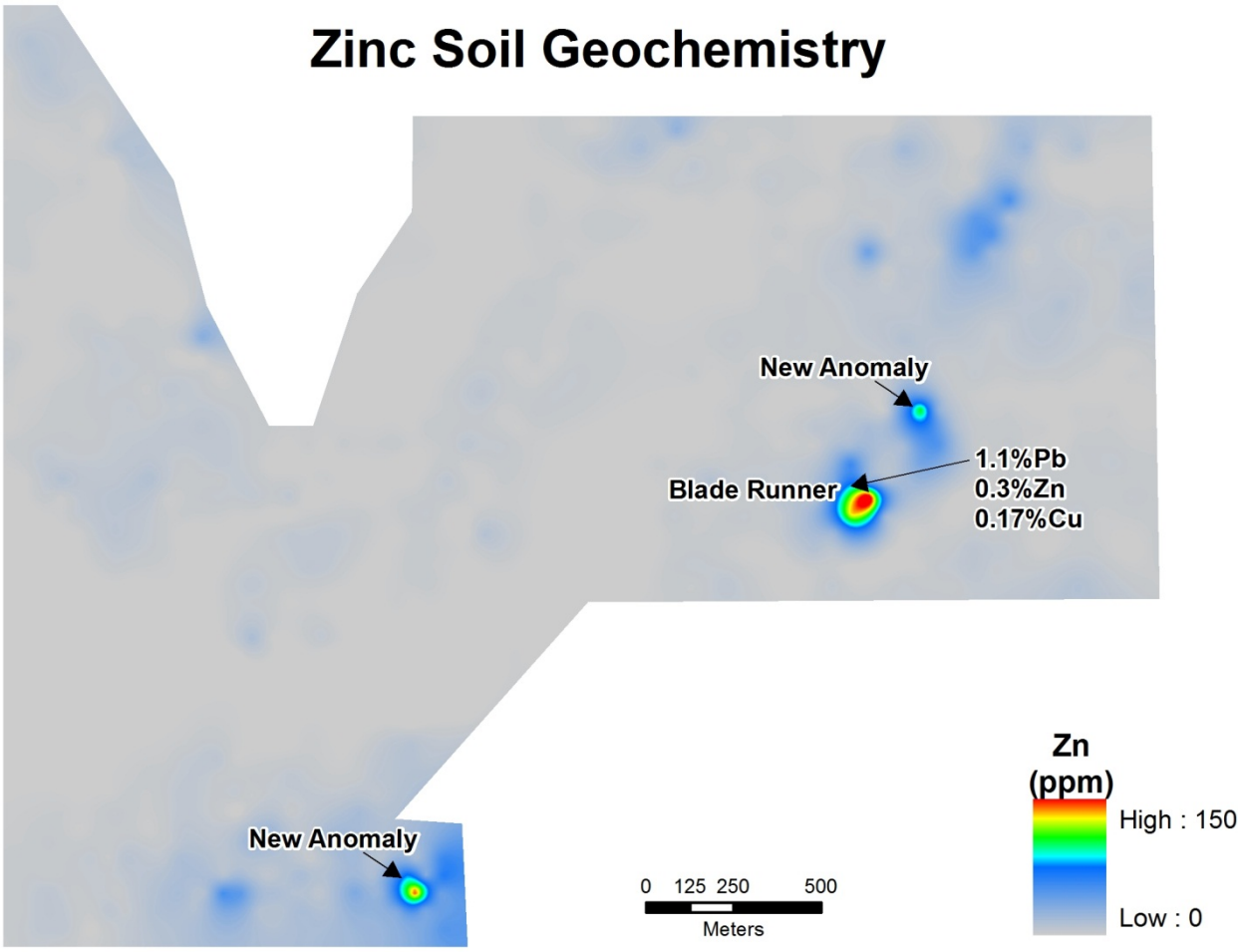



**Figure 18: Soil grid of zinc assay results. Location of Blade Runner and the new anomalies indicated. Values of %Pb, %Zn and %Cu have been indicated for select rock samples.**

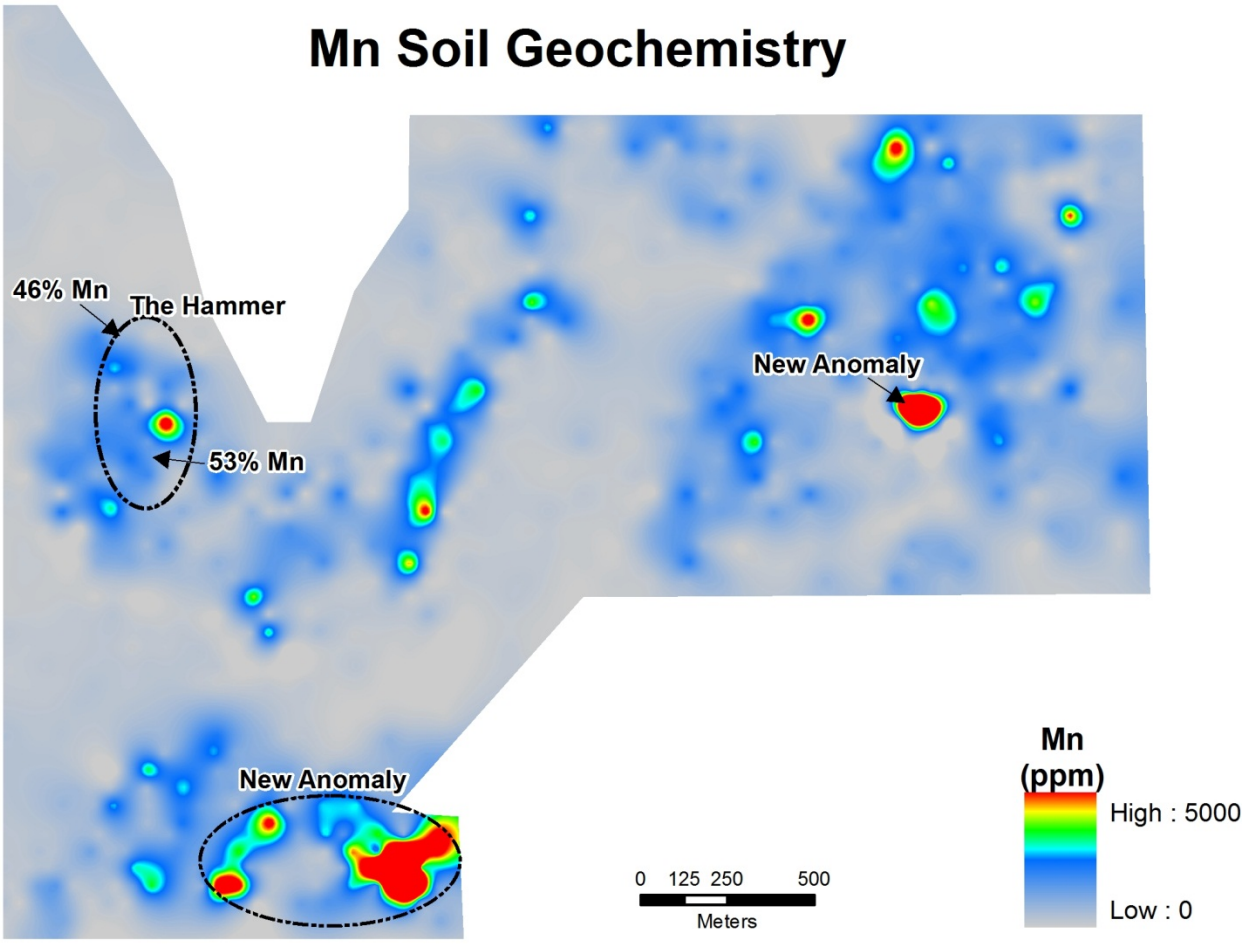



**Figure 19: Soil grid of manganese assay results. Location of The Hammer and new anomalies indicated. Values of %Mn have been indicated for select rock samples.**

# 4 GEOLOGICAL BACKGROUND

A detailed account of the geology for the region surrounding the Lorella project area can be found within the 250K explanatory notes for the Mt Young map sheet (Haines, et al., 1993). Only a brief summary has been included below.

The McArthur Basin dominates the geology of the Lorella project area and surroundings. The McArthur Basin consists of weakly to unmetamorphosed Palaeoproterozoic rock of the McArthur and Tawallah Groups with minor outcrops of the younger Nathan and Roper Groups and thin remnant of Cretaceous sediments (Figure 20).

The basement to the Tawallah Group, and the oldest unit in the McArthur Basin, is the Scrutton Volcanics (f5) which is limited in outcrop. Unconformably overlying the volcanics is the Tawallah Group which consists of various shallow water clastic, minor carbonates and interbedded volcanic rocks.

The McArthur Group unconformably overlies the Tawallah Group and consists of very shallow water carbonates and clastic rocks. This group is in turn unconformably overlain by the Nathan Group which is dominated by silici-clastics and carbonate rocks and covers a relatively minor portion of the basin.

The Roper Group is the youngest of the Proterozoic rocks and comprises a thick cyclic succession of shallow marine sandstones and mudstones. This group was relatively extensive and forms a significant portion of the outcropping geology in the region.

The Cretaceous rock in the McArthur Basin represent a marine transgression and form low plateaus throughout the basin.

Deformation within the McArthur Basin is largely dominated by compressional/extensional tectonic regime (E-W to NE-SW) resulting is a series of transpressional faults, thrusting and folding. The N-S trending Emu Fault Zone dominates the east and is considered to be the control on mineralisation for the HYC deposit at the McArthur Mine (Pb-Zn). This structure is deep-seated, flower structure and likely reactivated throughout time. Several parallel structures include the Lorella Fault and Four Archers Fault. These structures may represent flower structures associated with a later strike-slip deformation.

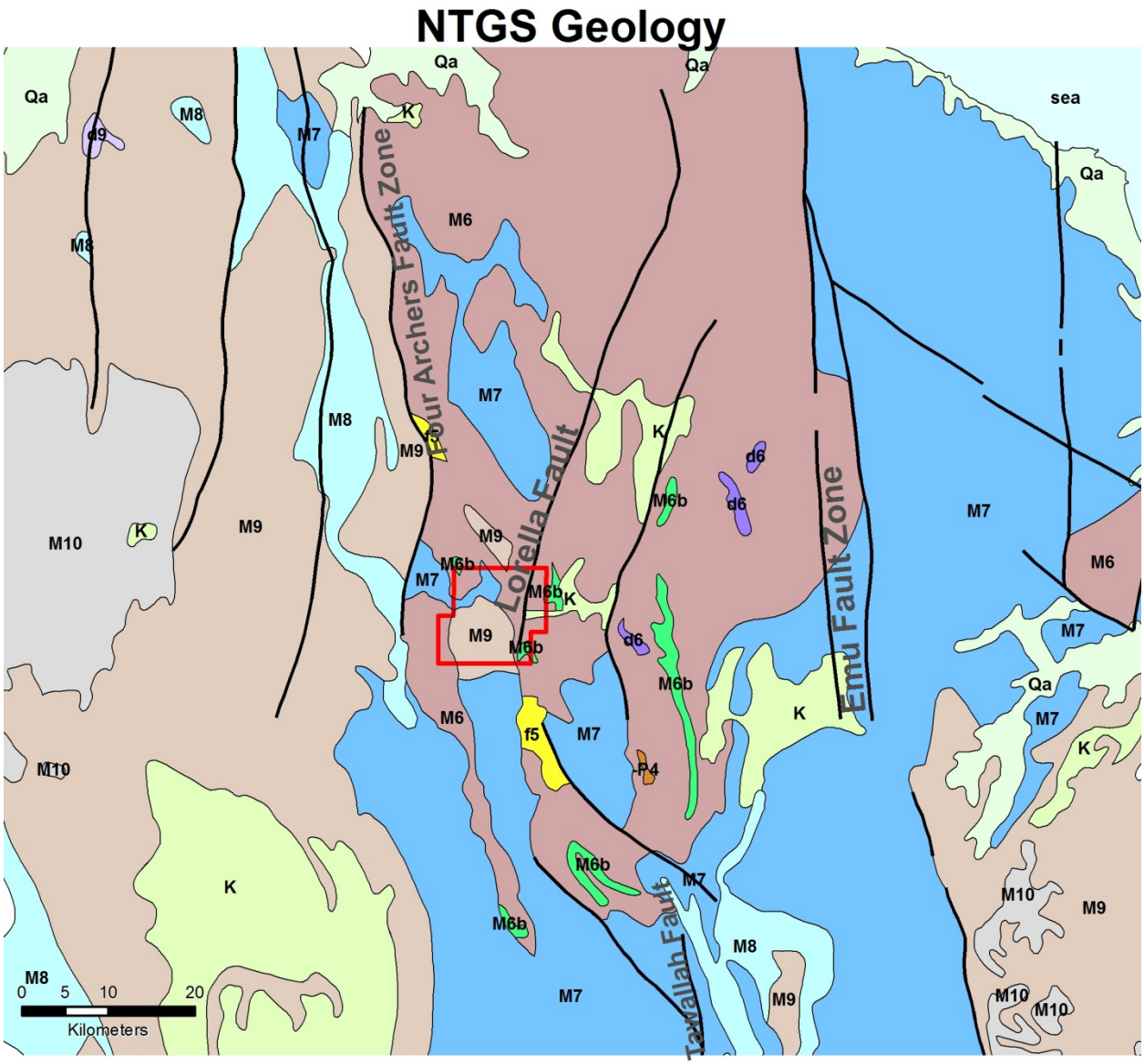



**Figure 20: Regional geology from the NTGS.**

## 4.1 Local Geology

EL 27483 lies within the Mount Young 1:250K map sheet and the 100K Tawallah Range map sheet. The geology of EL27483 consists of 4 main lithological groups: the Tawallah, Roper, McArthur and Nathan Groups (Figure 22).

The Tawallah Group is Palaeoproterozoic in age and consists of a series of sandstone formations, (including the Yiyintyi Sandstone, Seigal Volcanics, Sly Creek Sandstone, Rosie Creek Sandstone Member and the Aquarium Formation). The majority of the Tawallah Group is fault bound and dominates the east and western margins of the EL.

The McArthur Group is also Palaeoproterozoic in age and unconformably overlies the Tawallah Group. Six formations of this group are present within the EL: the Masterton Sandstone, Mallapunyah Formation, Amelia Dolomite, Tatoola Sandstone, Tooganinie Formation and the Emmerugga Dolomite. These formations are confined to the north of the tenement and are largely fault bound.

The Nathan Group unconformably overlies the McArthur Group and forms minor outcrops in the EL consisting of the Smythe Sandstone and the Balbirini Dolomite. These formations form ribbons overlying the McArthur Group.

The overlying Roper Group is Mesoproterozoic in age and appears fault bound in areas. Five formations have been mapped within the EL: Manturigula Formation, Limmen Sandstone, Mainoru Formation, Crawford Formation and the Abner Sandstone. These formations dominate the central-southern portion of the tenement and represent a possible ‘dropped block’ due to possible late extension.

Regionally, the EL is located within the northern extension of the Costello Range; part of the broad (50-80km) Batten Fault Zone which traverses north-south, covering the central region of the Mount Young map sheet. Within the tenement the dominant fault trend is parallel to the Emu Fault (N-S, Lorella Fault) and these faults are likely steeply dipping. Secondary cross-faulting is prevalent throughout the tenement with a pervasive NNW-SSE trending fault-set. The fault controlling the mineralisation at Sly Creek is along one of these faults. A significant vertical component as well as dextral is present.

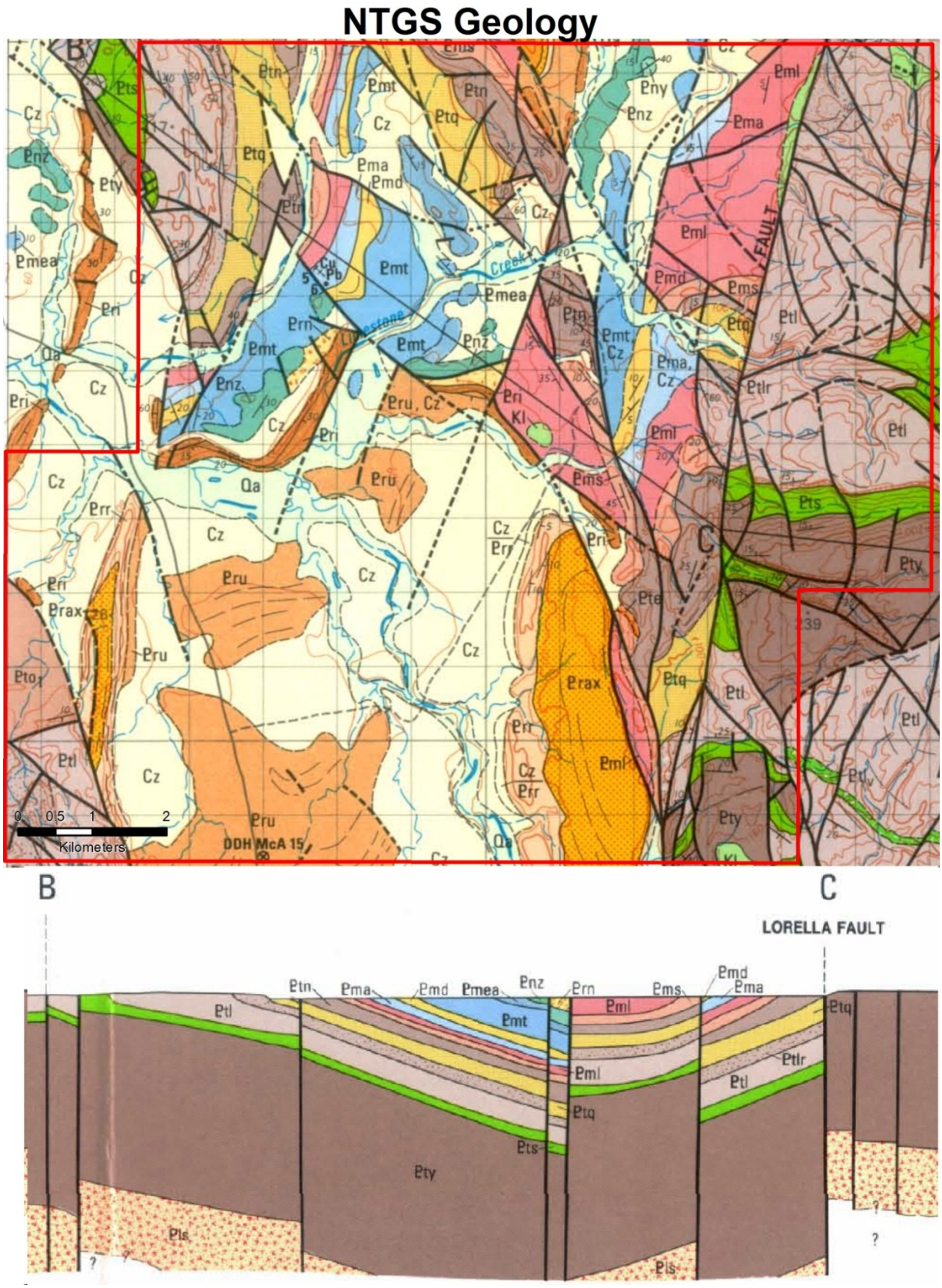
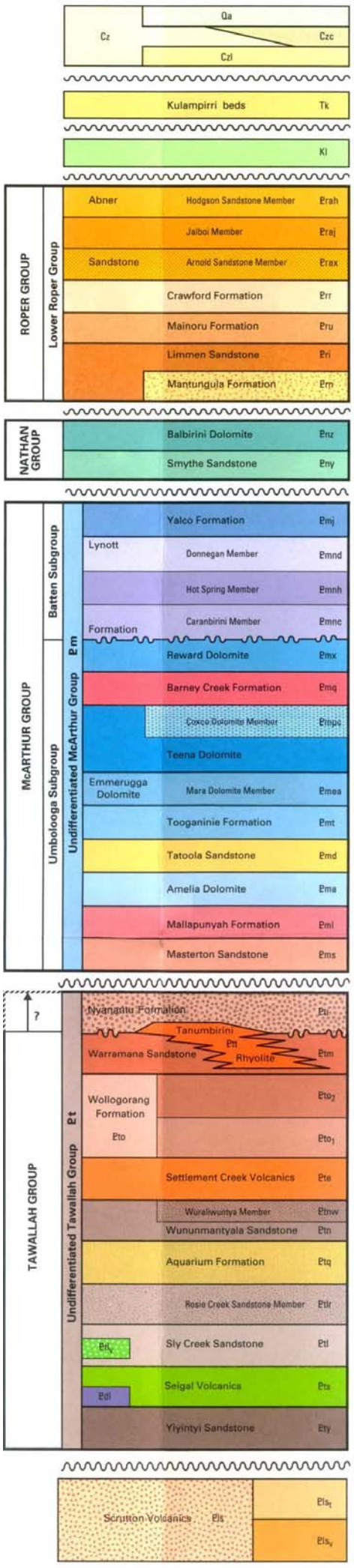



**Figure 21: Geology of the Lorella project area from the NTGS Tawallah Range 250K map sheet. See Figure 22 for legend.**




Qa Gravel, sand, silt: alluvium

Czc Sand deposits with distinct linear elements: ancient beach ridges

Cz Undifferentiated alluvial, colluvial and eluvial deposits: unconsolidated gravel, sand, silt, clay, ferruginous cemented detritus, minor calcrete, silcrete and ferricrete

Czl Ferricrete

Tk Travertine

Kl Lithic sandstone, quartzarenite, muddy sandstone, conglomerate, sandy mudstone, commonly ferruginised and silicified; mudstone contains bivalve and brachiopod shell impressions, ammonite and belemnite casts; sandstone commonly contains plant debris casts and leaf imprints

Ɛrah Quartzarenite, medium-grained, well sorted, rare thin quartz granule beds; medium- to very thick-bedded, planar and trough cross-bedded, pseudo-karstically weathered, strongly jointed

Ɛraj Quartzarenite and lesser lithic sandstone, very fine- to medium-grained with thinly interbedded, commonly micaceous mudstone; common cross-beds and mudstone intraclasts

Ɛrax Quartzarenite, medium-grained, well sorted, occasional quartz pebble chains; medium- to very thick-bedded, trough and planar cross-bedded, pseudo-karstically weathered, strongly jointed

Ɛrr Fine- to medium-grained glauconitic and micaceous sandstone; mudstone, commonly ferruginous and in places micaceous; thin- to medium-bedded; planar, trough and hummocky cross-beds; mudstone intraclasts, wave ripples, toolmarks and convolute beds

Ɛru Interbedded red-brown to purple commonly micaceous glauconitic mudstone and very fine-grained sandstone, minor dololutite and dolomitic mudstone; ubiquitously laminated, low-angle trough and hummocky cross-beds, flaser-linsen bedded, soft sediment deformation features

Ɛri Predominantly fine- to medium-grained, thin- to medium-bedded quartzarenite with thin interbeds of micaceous mudstone; minor poorly sorted, coarse-grained pebbly (quartz) sandstone; basal sandstone conglomerate in places; trough and hummocky cross-beds, abundant bedding parallel mudclasts, current ripples, tool marks and load casts

Ɛrn Red-brown micaceous and rarely glauconitic mudstone and fine-grained sandstone; thin bedded, laminated and cross-laminated, common convolute bedding, load casts and toolmarks; occasional basal conglomerate/breccia

Ɛnz Chertified dolostone, stromatolitic and massive to cross-bedded; dolomitic, lithic and feldspathic sandstone with mudstone intraclasts; chertified dolarenite; dolomitic mudstone and muddy dololutite, frequently containing evaporite pseudomorphs; conical, large columnar, stratiform and domal stromatolites; diagnostic silicified ooid beds; abundant pink ?tuffaceous mudstone

Ɛny Coarse-grained pebbly lithic sandstone with lesser polymict conglomerate; typically poorly sorted and trough cross-bedded

Ɛm McArthur Group; Undifferentiated, map face and cross-section

Ɛmj Thinly interbedded chertified stromatolitic dolostone, dololutite, dolarenite and minor sandstone with abundant intraclast chert breccia, chert nodules and laminae; abundant diagnostic small domal stromatolites and common desiccation cracks, tepee structures and gypsum pseudomorphs; minor botryoidal quartz nodules (enterolithic chert) and large elliptical ?pinch and swell nodules

Ɛmnd Dolomitic mudstone, fine- to coarse-grained dolomitic sandstone and lesser sandy dolarenite; thin-bedded, commonly rippled and cross-bedded or with polygonal shrinkage cracks; small botryoidal quartz nodules (cauliflower chert and enterolithic chert)

Ɛmnh Thin-bedded dolomitic mudstone, dololutite and muddy dololutite with interbeds of fine- to coarse-grained sandstone, chertified stromatolitic dolostone, dolarenite, sandy dolarenite, dolomitic sandstone and minor pink silicified ?tuffaceous mudstone; mudstone and dololutites commonly contain chert pods and pseudomorphs after sulphate evaporites and halite; sandstones are rippled and cross-bedded; stromatolites are mainly stratiform, conical and domal; common desiccation cracks, tepee structures and some botryoidal quartz nodules (enterolithic chert)

Ɛmnc Thin-bedded mudstone, dolomitic mudstone and carbonaceous-pyritic shale; muddy dololutite, dololutite and ?tuffaceous mudstone; lenses of slump and intraformational breccia; minor fine-grained dolarenite

Ɛmx Dololutite, algal laminated dololutite, muddy dololutite and dolarenite with lesser mudstone and pelletal dolarenite; laminated to massive and variably brecciated; small silica spheroids. Does not outcrop

Ɛmq Shale and mudstone, thin-bedded to laminated, variably dolomitic, carbonaceous and pyritic; dololutite, pink and green ?tuffaceous mudstone, rare breccia and sandstone; minor visible sulphides. Does not outcrop

Ɛmpc As for Ɛmp, with diagnostic radiating needle-like gypsum crystal pseudomorphs normal to bedding, rare conical stromatolites and evaporites. Does not outcrop; not differentiated on cross-section

Ɛmp Dololutite, thin-bedded, algal laminated or recrystallised; dolomitic-carbonaceous-?tuffaceous shale and mudstone, rare ?solution collapse breccia. Does not outcrop

Ɛmea Dololutite, stromatolitic dololutite, dolomitic mudstone, dolarenite and dolomitic breccia; domal and conical stromatolites, common halite casts and saccharoidal chert after evaporites

Ɛmt Dololutite, stromatolitic dololutite (stratiform, domal, columnar and conical forms), red-brown dolomitic mudstone, ripple marked and cross-bedded dolarenite, sandy dolarenite and sandstone; common desiccation cracks and pseudomorphs after gypsum and halite; breccia beds and ooids in dolarenites

Ɛmd Dominantly white flaggy fine-grained sandstone and lesser mudstone, in places dolomitic; common tool marks, synaeresis cracks, runzel marks, low-angle cross-beds and some mudclasts; lesser dolostone, in places silicified and stromatolitic with interbedded medium- to coarse-grained, medium-bedded dolomitic sandstone, typically vuggy, cross-bedded and ripple marked

Ɛma Stromatolitic dololutite (stratiform, domal, conical and columnar forms) and muddy dololutite with interbeds of dolarenite, mudstone and rare fine-grained sandstone; ooidal, brecciated and conglomeratic intervals common; often chertified; localised development of sideritic 'marble' after sulphate evaporite

Ɛml Interbedded red to purple dolomitic mudstone and variably dolomitic cross-bedded sandstone; stromatolitic dolostone, flat-pebble breccia and rare carbonaceous shale and pink ?tuffaceous mudstone; common botryoidal quartz nodules (cauliflower chert), ripples, slumping, desiccation cracks, and gypsum and halite casts and moulds

Ɛms Quartzarenite, white to pink, locally red-purple, fine- to medium-grained, well-sorted, thin- to medium-bedded, cross-bedded, extensively rippled with common mudclast impressions; minor intervals of very fine-grained flaggy sandstone and mudstone; distinctly ferruginous mottled sandstone with halite and gypsum casts and pseudomorphs occurs mainly in uppermost beds; common basal sandstone conglomerate

Ɛu Coarse-grained pebbly sandstone and cobble-boulder conglomerate; immature, poorly sorted, lithic, abundant angular to rounded pink spherulitic rhyolite clasts; minor red aphanitic rhyolite lava, flow banded

Ɛt Tawallah Group; Undifferentiated, cross-section only

Ɛtt Porphyritic rhyolite lava with phenocrysts of quartz and feldspar set in a spherulitic groundmass. Does not outcrop

Ɛtm Dominantly medium-grained, lithic, feldspathic and quartzose sandstones; lower red haematitic medium- to thick-bedded sandstone is separated from upper white thin- to medium-bedded sandstone by pisolitic and massive ironstone; abundant trough cross-beds, uncommon mudstone-dolostone intraclasts, ripple marks, discoidal gypsum pseudomorphs, liesegang banding; pseudo-karstic weathering pattern

Ɛto Undivided Wollogorang Formation (cross-section only)

$Ɛto_2$ Interbedded buff fine-grained flaggy sandstone and red-brown mudstone, micaceous and dolomitic; abundant soft sediment deformation features, flaser bedding, evaporite casts and mud clasts. White, fine- to coarse-grained, thin- to medium-bedded, lithic and feldspathic sandstone; trough cross-beds, ripple marks and mud clasts; rare basal polymict conglomerate

$Ɛto_1$ Mainly dololutite, dark grey-weathered, thinly bedded with characteristic ovoid nodules, sometimes pyritic or stromatolitic; flat pebble breccia; mudstone, partly tuffaceous, sometimes carbonaceous and pyritic, rare evaporite mineral casts and sulphides; rare coarse-grained dolomitic sandstone; rare rhyolite lava, red aphanitic, flow banded or vesicular; localised ferruginised felsic pyroclastic flow, fall and surge deposits

Ɛte Basaltic-doleritic lava, reddish-brown to dark grey spheroidally-weathering, massive to amygdaloidal, generally potassium metasomatised; rhyolite lava and autobreccia, red, flow banded and aphanitic to cryptocrystalline

Ɛtnw Fine-grained and rarely medium-grained sandstone and mudstone; mottled brown to fawn, very thin- to medium-bedded, typically flaggy; variably glauconitic, feldspathic, lithic and micaceous; soft sediment deformation features, ripple and tool marks, runzel marks, flute casts

Ɛtn Sandstone, red-brown to purple, haematitic, rarely feldspathic or lithic, mainly medium-grained, moderately- to well-sorted and thin- to thick-bedded with bedding laminations, planar and trough cross-beds, abundant ripples and mud clasts, synaeresis cracks; thin, red-brown mudstone interbeds

Ɛtq Upper part: dolostone, red-purple and grey, sometimes stromatolitic, in places recrystallised, ooidal or chertified; thinly bedded dololutite, muddy dololutite and fine- to medium-grained dolarenite, subordinate flat pebble breccia and coarse-grained dolomitic sandstone; thin- to medium-bedded, in places wavy and cross-bedded; mudstone. Lower part: interbedded red and green mudstone and fine-grained sandstone; variably dolomitic, ripples, planar trough and hummocky cross-stratification, flaser bedding, soft sediment deformation features, tool and runzel marks; sandstone contains shale clasts, minor glauconite and is micaceous in places, rare halite casts; rare red aphanitic rhyolite lava

Ɛtlr Sandstone, very fine- to very coarse-grained and rarely conglomeratic; generally moderately- to poorly-sorted, sometimes bimodally-sorted, in places feldspathic, ferruginous, micaceous or glauconitic; mud clast impressions, ripples, planar and trough cross-beds, rare synaeresis cracks, botryoidal quartz nodules (cauliflower chert), gypsum and halite pseudomorphs; mudstone, red, ferruginous and micaceous, commonly laminated

Ɛtl Quartzarenite, white to pale pink, mainly fine- to medium-grained and thin- to very thick-bedded with rare quartz pebble beds and conglomerate bands, medium- to large-scale trough cross-beds and channels, channel lag deposits, ripples, mud clasts, rare desiccation cracks and herringbone cross-stratification; minor thinly bedded mudstone, commonly micaceous

$Ɛtl_v$ Massive and foliated basaltic lava, partly amygdaloidal; pillow structures

Ɛts Basalt lava, amygdaloidal and massive, in part hyaloclastic

Ɛdl Dolerite sills and dykes

Ɛty Quartzarenite and minor feldspathic and lithic sandstone; fine- to coarse-grained, moderately- to poorly-sorted with scattered quartz pebbles in coarser units; thin- to very thick-bedded with medium- to very large-scale trough cross-beds and large channels, rippled in places

Ɛls Undivided Scrutton Volcanics

$Ɛls_t$ Volcaniclastic sandstone; immature, feldspathic, fine- to medium-grained

$Ɛls_v$ Rhyolitic to rhyodacitic ignimbrite and accretionary lapilli-bearing airfall tuff; dacitic pyroclastics, lavas, sills and dykes; rare dolerite intrusions; subordinate intercalated epiclastic mudstone and sandstone

| | | |
|---|---|---|
| QUATERNARY TO TERTIARY | | CAINOZOIC |
| EARLY CRETACEOUS | | MESO-ZOIC |
| ECTASIAN - CALYMMIAN | MESOPROTEROZOIC | PROTEROZOIC |
| STATHERIAN | PALAEOPROTEROZOIC | |
| OROSIRIAN | | |

$1690^{+29}_{25}$ Ma (Page, 1981)

1713 ± 6Ma (R.W. Page pers. comm. 1991)

1851 ± 7Ma (R.W. Page pers. comm. 1991)

**Figure 22: Geology legend for the Tawallah Range 250K NTGS geology map.**

# 5 MINERALISATION MODEL

At this early stage in such a complex area, it is difficult to develop a mineralisation model. The relationship between the copper, manganese, lead and zinc is uncertain but not entirely unusual. The Mount Isa deposit is dominantly a Pb-Zn-Ag mine but contains zones of economic Cu (Large, et al., 2005). Another mineralisation model that should be considered is the Sediment-hosted copper.

## 5.1 Mount Isa Model (after Large et al., 2005)

Sediments of the Mount Isa region can be broadly correlated with the McArthur Basin which indicates a shared tectonic/depositional history (Figure 23). Although the Mount Isa region is more intensely deformed and has experienced a higher degree of metamorphism the events related to these differences are thought to have occurred post mineralisation and therefore only represent an overprinting event (see Stanton, 1972).

The mineralisation at Mt Isa lies within the Urquhart Shale which has been dated at 1655±4Ma. There is a distinct zonation between the Pb-Zn-Ag and the copper mineralisation an Mt Isa (Figure 24). The copper ore lies proximal to the main fault (Paroo Fault) and is encased in what is referred to as silica dolomite. The Zn-Pb-Ag mineralisation is thought to have formed first during sedimentation whereas the copper ore was formed much later when the hydrothermal system intensified.

The approximate age of the Amelia Dolomite, which appears to host the Sly Creek copper, can roughly be considered older than the Tatoola Sandstone which is dated at 1648±3Ma. This age falls within the same period of deposition of the Mt Isa host (Urquhart Shale). An additional similarity can be seen in the identification of a structural control and the relationship between the copper mineralisation and the silica dolomite. Although these similarities are not definitive, and require further work to prove this connection, it does provide an initial starting model to be evaluated/re-evaluated as work progresses.

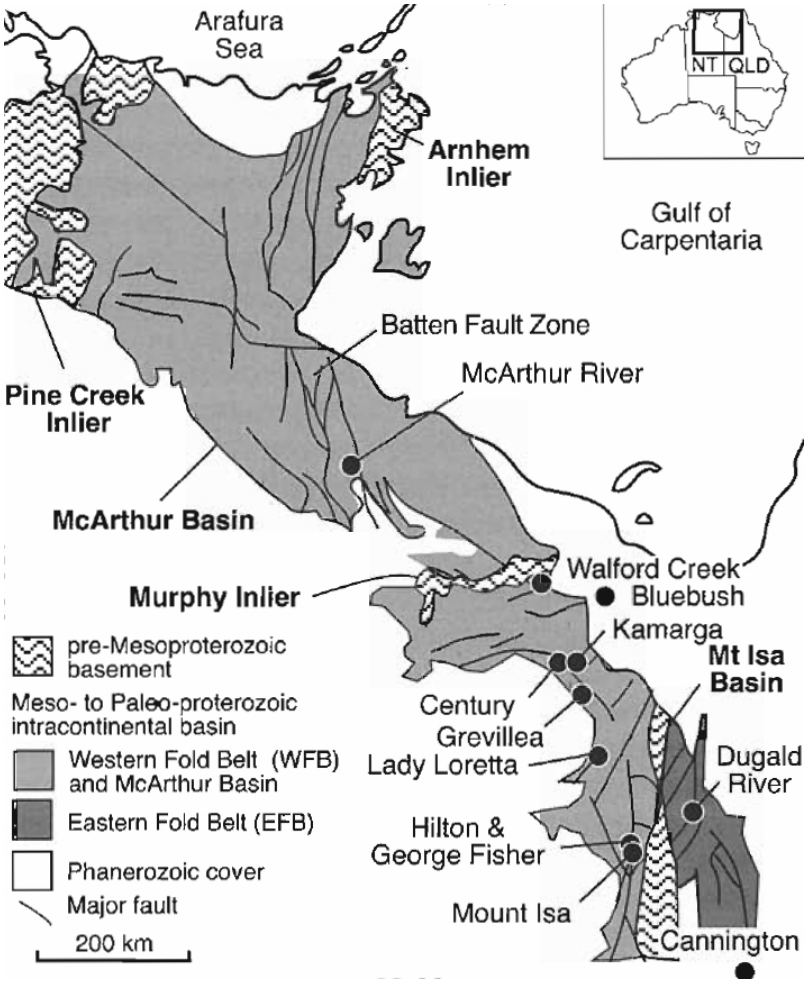



**Figure 23: Simplified regional geology of the Mt.Isa – McArthur basin systems with locations of stratiform Zn-Pb-Ag and strata-bound Ag-Pb-Zn deposits (from Large et al., 2005).**

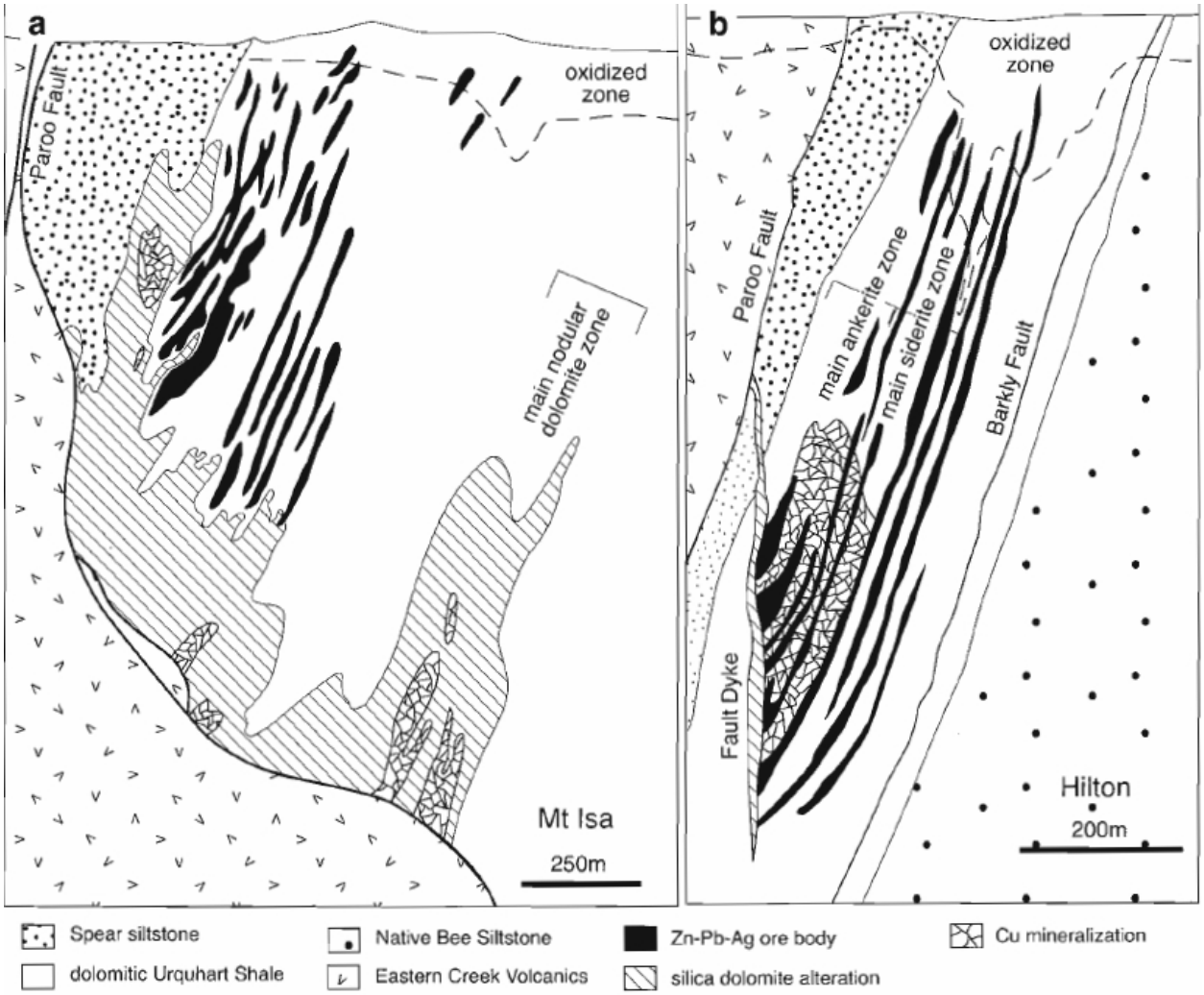



**Figure 24: Simplified geological cross section of Mt. Isa and Hilton. (from Large et al., 2005).**

## 5.2 Sediment-Hosted Copper Model (after Cox et al., 2007)

The rock types often associated with this model are: low-energy calcareous or dolomitic siltstone, shales and carbonates of marine or lacustrine origin; and high-energy sandstones of continental origin. The low-energy rocks are often thinly bedded and exhibit bacterial mat structures, stromatolites, mudcracks, crossbedding, ripple marks, etc.

Tectonically the most favourable settings are intracontinental rifts and passive continental margins. The major and growth faults are commonly contemporaneous with mineralisation.

Mineralisation is often zoned and can consist of: chalcocite, bornite, chalcopyrite, and subordinate galena and sphalerite.

In any sediment-hosted copper deposit four conditions are required: Oxidised source rock, source of brine to mobilize copper, reduced fluid to precipitate copper and conditions favourable for fluid mixing.

With respect to the Sly Creek prospect a source rock has not been identified but several volcanic units have been identified in the region and may prove to be the sources (Scrutton Volcanics, Settlement Creek Volcanics and the Tanumbirini Rhyolite). As for a source of brine to mobilize the copper, several formation underlay the Amelia Dolomite and contain various

amounts of evaporate minerals. At this time the unknown conditions are the source of reduced fluid and if the conditions were favourable for fluid mixing.

As work continues to be undertaken on the prospect and region the mineral models will require constant evaluation and re-evaluation in order to develop the mineral potential on the tenement.

# 6 SUMMARY AND RECOMMENDATIONS

A significant amount of greenfields exploration has been undertaken on EL 27483 over the past two years. Currently USI are awaiting final approval from the AAPA (Aboriginal Areas Protection Authority) and once received drilling can commence. International Geoscience proposes an ambitious program to develop the current prospects (Sly Creek, Blade Runner and The Hammer) and to identify additional mineralised areas within the tenement.

Below is a list of the highlights (italicised) and recommendations (bolded) for EL 27483:

## 6.1 Highlights

1. *The Sly Creek copper prospect has been re-discovered.*
    - *Historical copper values as high as 25.6% Cu and recent sampling has returned values as high as 20.4% Cu.*
    - *Copper mineralisation consists of chalcocite, malachite, chalcopyrite, and minor bornite.*
    - *Six dipole-dipole IP lines were acquired across the prospect. The data was inverted and a chargeable anomaly 600m long, 150m wide and at least 250m deep has been identified. The anomaly is open along strike in both directions and at depth.*
    - *Mapping has identified a significant fault which appears to be controlling the mineralisation.*
    - *Soil sampling has mapped the area of known mineralisation very well.*
    - *High priority drill targets have been identified to test the core of the IP anomaly.*
2. *The unnamed #00902 Pb occurrence has been confirmed and named Blade Runner.*
    - *Several rock samples have been collected from around the mineral occurrence with Pb as high as 1.08% and Zn 0.31%.*
    - *Soil sampling has confirmed the presence of anomalous zinc.*
3. *A manganese occurrence was discovered; subsequently named The Hammer.*
    - *Rock sampling returned manganese Niton XRF results of up to 57%; laboratory ICP AES results up to 53%.*
4. *Several additional copper and Pb-Zn targets.*
    - *Soil sampling has identified possible extensions of copper at Sly Creek and a large anomalous copper anomaly to the southwest of Sly Creek.*
    - *Soil sampling has also identified additional zinc anomalies and very high manganese anomalies coincident with the new copper anomalies in the southwest.*
5. *Drill Targets.*
    - *A Mine Management Plan has been approved by the NTGS for drilling at Sly Creek.*
    - *The final approval of the AAPA Authority Certificate is expected shortly.*
    - *Several drill targets have been identified and the high priority targets have been designed to intersect the core and depth extent of the IP anomaly.*

## 6.2 Recommendations

1. Test holes using diamond drilling of the Sly Creek IP anomaly. If initial results are favourable the program should be extended to identify the extents of the mineralisation.

2. IP survey over the Blade Runner prospect and over the large Cu-Mn-Zn soil anomalies in the south of the soil program.

3. Further soil geochemical surveys are recommended to explore for other concealed mineralisation to the north, south, and east of the recent soil survey.

4. Review of other mineralisation in the surrounding area to investigate possible relationships with Sly Creek and build a geological model.

# 7 REFERENCES

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