Significant Findings of the Ernest Henry Cover Project
Preliminary to the Final Report

Prepared for MIM Exploration and Ernest Henry Mining
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Highlights

Several secondary geochemical dispersions have been identified in the vicinity of the Ernest Henry Cu-Au deposit. They are depicted in the generalised long section of Figure 1 and are listed below:

1. a copper anomaly at >500ppm over an area of 0.6 km^2 (1000x600m) at the Proterozoic-Mesozoic unconformity;
2. a multi-element anomaly comprising Au, Cu, As, Ag, Mo, U, Co and W and measuring about 500m by 500m (0.25 km^2) within the broader Cu anomaly at the Proterozoic-Mesozoic unconformity;
3. a very strong multi-element anomaly extending over an area of more than of 1000m by 700m or (0.70 km^2) within the Mesozoic sands of the Gilbert River Formation;
4. extensive As, W and Mo anomalies, up to 1000m by 1000m across, within shale units of the Wallumbilla Formation and in redox horizons in the sand unit of the Wallumbilla Formation; and
5. coherent, vertical Ag (Mo) and halogen anomalies that are spatially associated with faults in the basement and cover sequence and which extend to the near surface environment at the periphery of the orebody (vertically projected).

These results independently confirm and substantiate the secondary dispersions identified separately by WMC and MIMEX in orientation surveys during the 1993-95 period (*e.g.,* Figure 2). To a large extent, the present study has defined the intensity and size of the "halos", thereby providing direct criteria for future geochemical exploration surveys in covered ares of the Cloncurry region.

Exploration Implications

The secondary dispersions observed at any given location within the overburden appear to be related to the details of local stratigraphy, the spatial distributions of fresh and oxidised mineral assemblages in the basement, the locations of faults in the basement and overburden, and the inter-relationships of these factors with the paleotopography at any particular location. The result is that several styles of metal anomaly, or secondary dispersion, can be present at any sample site, indicating that careful logging and evaluation of the cover sequence is required in all drilling programs.

Although subject to probable refinement in the final report, the following sampling strategies are recommended on the basis of the secondary dispersions listed above.

(1) An Ernest Henry-like deposit which subcrops directly beneath unconsolidated transported cover should be locatable by broadly spaced aircore or RAB drilling and sampling of the basement on 250-400m centres.
(2) Locally derived cover units like the Gilbert River formation should be routinely analysed for evidence of mineralised fragments once eroded from nearby topographic highs (the basement vertically beneath such secondary dispersions could be unmineralised).

(3) In some target areas grid drilling to the basement will be prohibited by excessive cover thicknesses. Here, sampling of shale units below the Tertiary-Mesozoic unconformity and redox zones, both below and above the unconformity, could reveal elevated levels of pathfinder metals over hundreds of square metres related to deeper and oxidised Ernest Henry-style mineralisation. Based on the results of the present study, a mineralised topographic high may be a prerequisite to generate such dispersions.

Setting

The Ernest Henry Cu-Au deposit is located 38 km NE of Cloncurry, Queensland. It is completely covered by Phanerozoic sediments of the Carpentaria and Eromanga Basins. Mapping and evaluation of the cover sequence through pit exposures and drilling during this study have produced a detailed understanding of the cover units and the effects of a complex weathering and ground water history within and over-printing this sequence. The geology and development of the cover sequence will be discussed in more detail in the final report of the project (due end of May). Descriptions of the cover sequence are also available in the project's Quarterly Reports.

An extensive suite of trace elements is associated with the economic Cu and Au mineralisation at Ernest Henry. It includes As, U, REE, Mo, and Co. The compilation work associated with this project reveals that Ag and W also belong to the mineralisation suite. High abundances of both elements occur at the Proterozoic-Mesozoic unconformity in contact with mineralisation, and both are recognised in the dispersion halos within the cover sediments.

The locations of contacts between the various cover units were imaged to produce a series of surfaces that clearly show the variation in their paleo-topographies. These relationships provide a framework for understanding the distribution and possible mechanisms for secondary geochemical dispersions into the overburden.

The distribution of the anomalies has been controlled by a number of inter-related factors:

- the effects of the paleotopography at the Proterozoic unconformity in relation to the position of primary mineralisation and supergene mineralisation;
- the geology of the cover units and the formation of aquifers in the Gilbert River Formation and the Wallumbilla Formation sand unit;
- the nature of the contact between these units and the Proterozoic basement at the paleo-topographic high;
- the effects of basement faults and shears in the deposition of, and late movement in, the cover sequences; and
- access of oxidised ground waters and probable reduced and oxidised marine waters to the mineralisation and cover units through a combination of faults and the paleo-high.

Geochemistry

Proterozoic-Mesozoic Unconformity. Figure 3

Figure 1 shows schematically how the location and depth of weathering of the deposit is clearly controlled by known major faults within the basement. In Figure 3, supergene mineralisation is strongly developed between Fault 4 and the HWSZ, south of the NC Fault. The strongest expression of hypogene mineralisation occurs north of the NCFault between the FWSZ and Fault 4.

Despite the complex weathering history, very coherent patterns and high abundances of ore-related metals are observed in basement samples located at the unconformity. Sub-ore grade levels of Cu, Au, As and Mo are observed in a broad zone between the Hanging Wall Shear Zone (HWSZ) and the Footwall Shear Zone (FWSZ) and is elongated along the NW-trending NC fault.

In detail, the Cu levels at > 500 ppm Cu extend over an area of about 1000m long by 600m. This observation alone significantly increases the geochemical target size for an Ernest Henry look-alike deposit. An inner halo at greater than 1000 ppm Cu is elongated along the axis of the NC fault and is approximately 800m by 300m in size. Generally associated with this zone are significant levels of Au (>30 ppb), As (>50 ppm), Mo (>10 ppm), as well as other elements such as Ag, Mn, and Co. Elements such as Mn, Co, Ag, U and W produce similar distributions to those for Au and As, but are not presented in this summary. The highest results for all elements occur directly over ore, within both the supergene hypogene blocks.

Gilbert River Formation. Figure 4

Most samples collected from the Gilbert River Formation are extremely anomalous in several ore-related elements. Anomalous Cu values (> 200 ppm) occur throughout this unit with the exception of samples in the southeast corner of the survey area. Similarly, anomalous As (>10 ppm) and Mo (>5 ppm) values are common north of the Marshall Shear Zone. Coherent Au anomalies (Zarg >50 ppb and BCL >5 ppb) seem to fan-out from Cu-Au mineralised basement topographic highs. Ag is distributed in two distinct halos. The first is associated with other pathfinder elements on the western margin of the survey area. The second is associated with anomalous Cu in the vicinity of the Marshall Shear Zone.

The Cu anomaly in this cover unit remains open to the south and southwest of the deposit, and it seems likely that it extends more than 1000m beyond the deposit. It is therefore a priority target horizon for any future exploration in the region. Mechanical dispersion directly downslope of the Ernest Henry deposit is the likliest explanation.

Wallumbilla Formation

Samples from the Wallumbilla Formation were acquired from two surveys. Those located within the centre of the pit area were collected prior to mining activities by MIMEX and were analysed by ANALABS. Samples from the margin and outside the pit area were collected as part of this study and analysed by ALS.

Anomalies developed in the Wallumbilla Formation show a major departure form those in the Gilbert River Formation and the Proterozoic-Mesozoic unconformity. Coherent patterns or anomalous levels of Cu and Co are not evident.

Wallumbilla Formation - lower shale unit, Figure 5

Extensive anomalies exist in the lower shale unit in Mo and W at >5 ppm, and As at >30 ppm. The Mo and As anomalism still open to the west and north. Maximum values generally occur where the shale unit is in contact with the basement and mineralisation. To the south and west, away from the paleo-high, the lower shale unconformably overlies Gilbert River Formation and metal values are lower. Significant Ag anomalism appears spatially associated with the Marshall Shear Zone in the south east of the survey area and with the NNE-trending fault along the western side of the pit.

Wallumbilla Sand and Redox Horizons, Figure 6

This predominantly pale grey-white coloured sand unit has 10-50 cm thick yellow-orange margins, except in the vicinity of the basement high where the entire unit was probably oxidised. The orange colouration indicates the accumulation of Fe-oxides.

The distribution of As and W anomalism in the middle sand unit mimic those of the lower shale unit (refer Figure 5). In detail, anomalous As and W is restricted to samples containing Fe-oxides, confirming that most of the unit situated over the basement high was oxidised prior to mining and removal. As-anomalous samples on the south and west margins of the pit were all collected from the lower redox horizon, while those north of the FWSZ were taken from the upper redox horizon. Silver and Mo distributions are independent of the Fe-oxides and occur spatially associated with the Marshall Shear Zone and in patches along the west of the pit.

Wallumbilla Formation – upper shale unit, Figure 7
Arsenic shows the only coherent anomaly in the upper shale horizon at similar abundances to that of the lower shale. The distribution is, however, largely restricted to north of the FWSZ. Although there is a lack of project samples from the centre of the pit area for this unit, the earlier work by WMC does indicate that an inner halo of elevated Mo and As, similar to the lower shale, may apply. Samples with anomalous silver are associated with the same two faults discussed in relation to the more extensive Ag anomalism in the shale units.

Tertiary-Mesozoic Unconformity, Figure 7
Silver and Mo display similar, though weaker, dispersion patterns to those in the underlying Wallumbilla Formation. Thus, vertically coherent patterns are evident that transect the sub-Tertiary overburden up to the Tertiary-Mesozoic unconformity. Although there is a general broadening of Ag and Mo anomalism at the unconformity, both are still spatially associated with known basement and cover faulting. At this level, a very strong coherent anomaly for both Cl and Br occurs spatially associated with the Marshall Shear Zone, where it is coincident with Ag (Mo) anomalism, including Ag MMI.

Upper Tertiary (base of soil profile), Figure 8
Considerable variation is evident in the results for some elements between the different phases of sampling (batch effects). Levelling of the data using response ratios has been performed for some elements to highlight trends in the data not resulting from baseline shifts. This work is still in progress, so discussion is confined to those patterns that can be discerned with confidence from the raw data.

Coherent anomalies are evident in the enzyme leach Cl and Br, and the Regoleach and MMI Ag data. The halogens display the classic pattern of an outer halo of anomalous results and an inner low. Generally, the anomalous samples are located in the vicinity of vertically projected basement faults and along the western and northern margins of the existing pit. The sample distribution and its relationship to the pit outline appears to suggest a sampling artefact. However, it is noted that such anomalies have been observed above the vertically projected peripheries of other buried ore deposits. In this respect, the Ernest Henry halogen pattern could constitute an annulus which on cross sections appear as classic “Rabbits Ears”.

Interestingly, Ag is commonly associated with elevated halogen levels at deeper levels within the Tertiary cover (Figure 7 and the schematic representation of Figure 1). This association is not conclusive at the oxidised base of the black soil profile.

Black Soil
Although MMI Ag and enzyme leach Cu anomalies have been reported in the past, metal signals at the surface, within the clay-rich soils, are generally weak. In addition, the compiled data from historical surveys and this project are subject to significant batch and inter-laboratory effects. Therefore, further analysis and levelling of the data is required before interpretations are presented in the final report.

Schematic Diagram of Secondary Geochemical Dispersion Around The Ernest Henry Cu-Au deposit

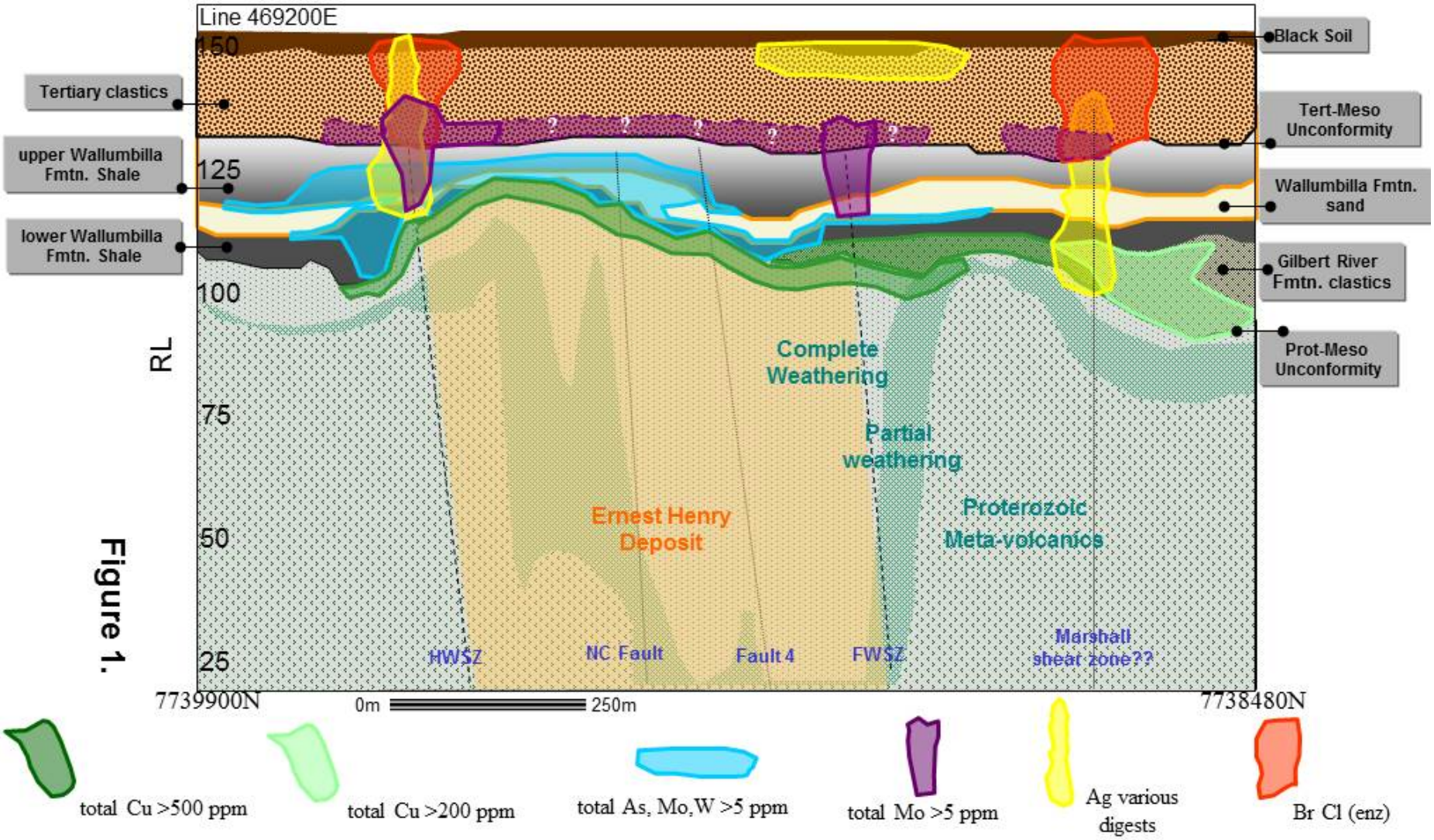

Figure 1.

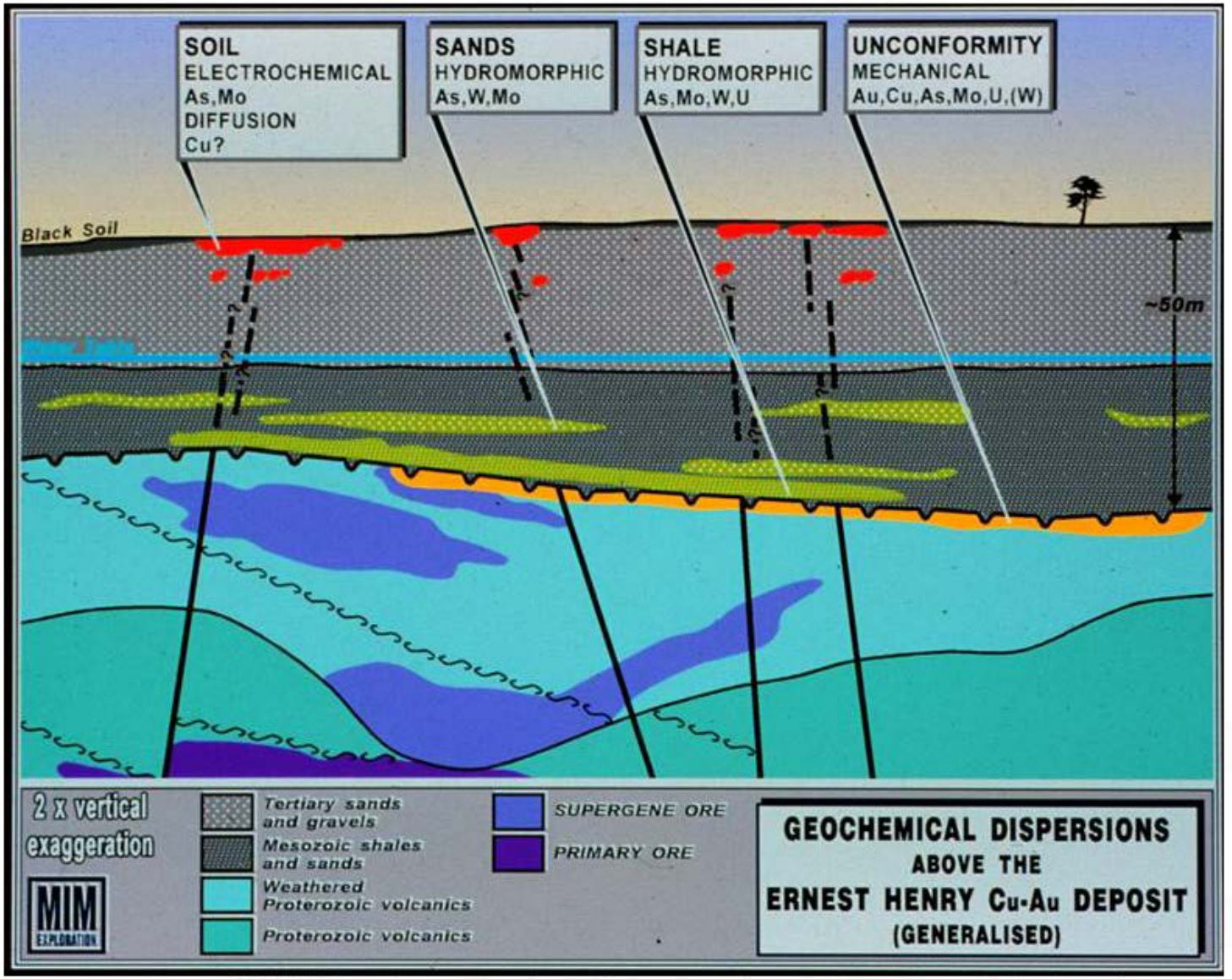

Figure 2.

From: Hannan, K.W, 1995, Hydromorphic Chemical Dispersions above the Ernest Henry Cu-Au Deposit, MIMEX Technical Memorandum 1995/040)