

**TNG** LIMITED

**ENIGMA MINING LTD**

**MOUNT HARDY CU PROJECT**

**HISTORICAL EXPLORATION REPORT**

**EL 29219**

## 1. INTRODUCTION

The Mount Hardy Copper Project is located on the northern edge of the historical Mount Hardy Copper Field approximately 300 km northwest of Alice Springs. The project area is situated on the Mount Doreen (SF52-12) and Mount Theo (SF52-08) 1:250,000-scale sheets. Access to the Mount Hardy tenement is via the Tanami Highway and then along station tracks and fencelines.

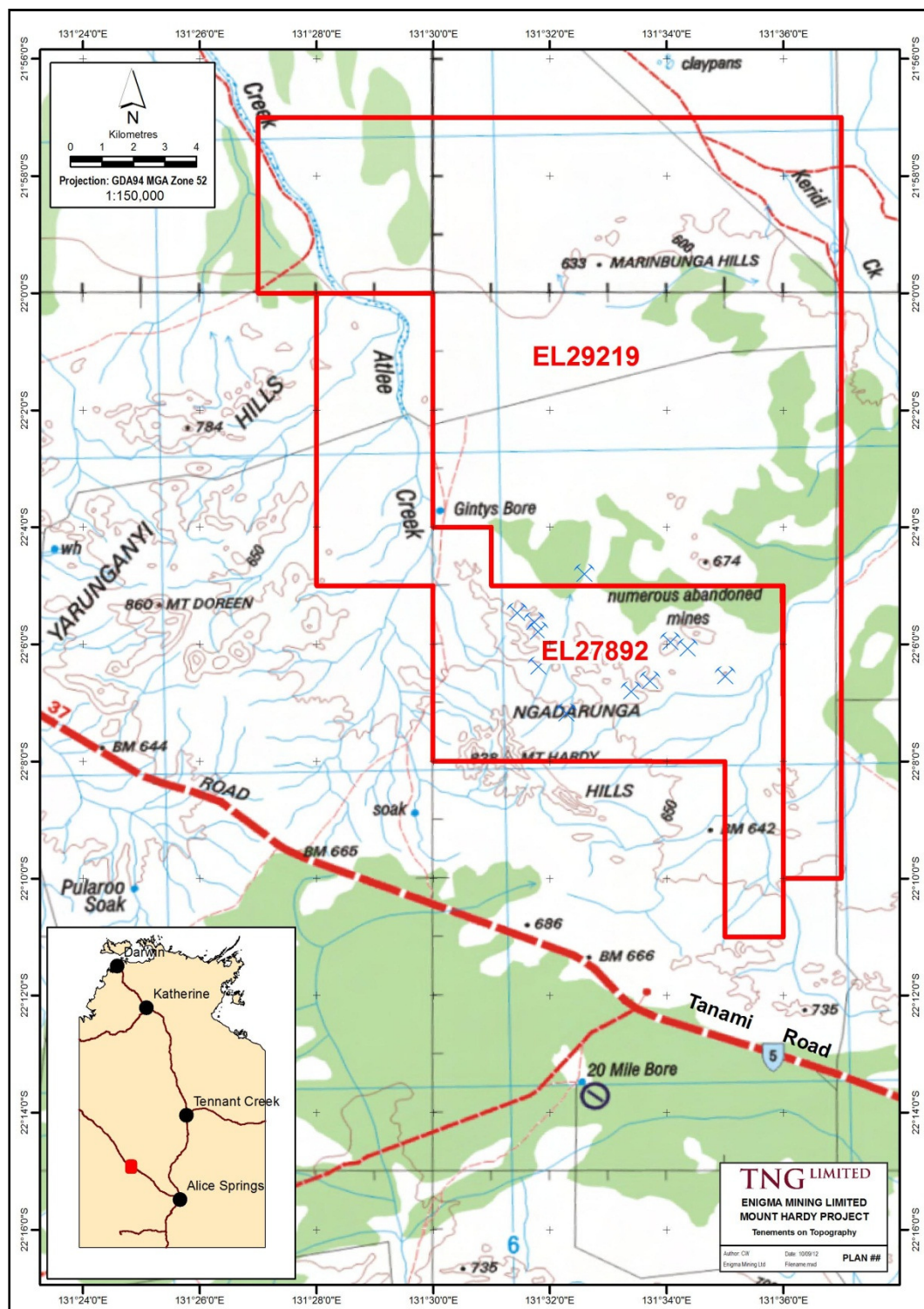


Figure 1: Location of the Mount Hardy exploration licence, EL 29219.

## **2. REGIONAL GEOLOGY**

The Mount Hardy Project area lies within the Aileron Province of the northern Arunta region. The oldest rocks in the area are metamorphosed Palaeoproterozoic siliciclastic sediments of the c.1840 Ma Lander Group (Rohde, 2005). These sediments were multiply deformed and variably metamorphosed during the c.1810 Ma Stafford Event and numerous subsequent events. The previously reported magmatic age of 1880 Ma for the Ngadarunga Granite and consequent older age for the Lander Group and proposed Yuendumu Tectonic Event (Young et al., 1995) has been re-evaluated and is now interpreted to be much younger (Jon Claoué-Long, personal comment; Rohde, 2005).

The Lander Group is interpreted to be stratigraphically equivalent to the Tanami Group, which hosts significant gold mineralisation at The Granites, Dead Bullock Soak and Coyote. As such, the Lander Group metasediments are considered prospective for gold mineralisation.

Rare amphibolite and metagabbro occurs within the Lander Group and are interpreted to be metamorphosed dolerite sills. Volcanic units have not been identified in the Lander Group. There are other Palaeoproterozoic volcanosedimentary successions in the Mount Doreen area, including the ~1770-1790 Ma Reynolds Range Group, Patmungala and Nicker beds, but these are relatively insignificant (Rohde, 2005).

There have been two main periods of granite intrusion in the Mount Doreen area; the c.1780 Ma Carrington Suite and the c.1580 Ma Southwark Suite. The Southwark Suite has geochemical affinities with granite associated with Proterozoic Au-Cu mineralisation elsewhere in Australia (Wyborn, 1998). Correlatives of the 1820-1790 Ma granites in the Tanami region (Frederick and Grimwade Suites) are unknown in the Mount Hardy area and may have implications for mineralisation models (Rohde, 2005).

Neoproterozoic to Palaeozoic sedimentary rocks of the Ngalia Basin overlie the Palaeoproterozoic to Mesoproterozoic Arunta basement in the central part of the Mount Doreen 1:250,000 sheet (Rohde, 2005).

## **3. MOUNT HARDY GEOLOGY**

The Mount Hardy target area is approximately three kilometres north of the historical Mount Hardy Copper Field located within the Ngadarunga Hills, 30 km northwest of the Yuendumu community. The geomorphology at Mount Hardy is dominated by the rugged ranges of the Ngadarunga Hills, which comprise high quartzite ridges of the Reynolds Range Group, and lower rounded hills formed by schists and gneisses of Lander Group metasediments (Rohde, 2005). Regolith is dominated by colluvial gravels and skeletal soils overlaying relatively fresh bedrock on ridge-tops and hillsides, giving way downslope to deeper valley filling colluvial fans and fluvial gravels. To the north of the ranges are low flat grass plains with thick stands of mulga and occasional low ridges and hills of bedrock schist. The plains have a shallow transported cover of 1-5 m alluvial sand, gravel and clay overlying weather bedrock (Rohde, 2005).

The Mount Hardy copper workings are hosted within the Lander Group and are dominated by psammite and lesser pelite, which have been metamorphosed to amphibolite-facies mica schist and andalusite(?) porphyroblastic schist. Complex mesoscopic-scale folding of schistosity/bedding is observable. Greenschist facies Lander Group schists and Reynolds Range Group quartzites lie to the south of the workings separated from the higher grade schists by a major east-west fault. Dolerite and pegmatite stocks and dykes are common in the area, the pegmatites most likely related to granite plutons of the Southwark and Carrington suites lying to the west and south of the Ngadarunga Hills (Rohde, 2005).

The copper workings display strong structural controls, being hosted within quartz veined shear zones. Surficial mineralization comprises copper carbonates and gossans within sheared mica-schist wallrocks and boudinaged and brecciated quartz veins. Quartz veins range for tabular and consistently strike over 10 to 100's of metres to complexly fractured and folded plunging rocks (Rohde, 2005).

Two main structural trends are evident from the distribution of the workings and lineations observable in Landsat imagery and aeromagnetics: NW to WNW (parallel to trans-Tanami regional scale structures in the region), and ENE-WSW (Rohde, 2005).

#### **4. PREVIOUS EXPLORATION**

The following exploration was carried out on the Mount Doreen mapsheet and around the Mount Hardy area:

- Mount Hardy copper prospects were discovered by W.W. Braitling in 1935.
- Uranium Development and Prospecting N.L. carried out diamond drilling in the area in 1956.
- Bureau of Mineral Resources (BMR) conducted aeromagnetic, radiometric and gravity surveys in the 1960s.
- Central Pacific Minerals held AP1722 in the Mount Hardy area from 1967-69 (See Section 4.1).
- NTGS assessed the economic feasibility of the Mount Hardy and Clarke copper deposits from 1968 to 1972.
- NT Geological Survey and BMR completed 2nd edition mapping of Mount Doreen sheet in the 1990s.
- White Industries conducted exploration on EL 5688 from 1988-90. Rock chip and stream sediment sampling was carried out from Wolfram Hill through to Mount Hardy (Section 4.2).
- Bruce and Mules' explored the Silver King area for gold and base metals from 1988-1991.
- MIM/Roebuck Resources Joint Venture targeted magnetic highs in the early 1990s and explored the silver King deposit.
- Yuendumu Mining Company/Posgold explored the western parts of the Mount Doreen area from 1992 to 1996, particularly Terry's Find, other targets were 'Buger' and 'Grasshopper' (Section 4.3).
- BMR completed airborne magnetic and radiometric surveys in 1993.
- Aberfoyle Resources were granted EL's 8913 and 8608 in late 1994. They undertook ground magnetics surveys and significant RAB drilling. Exploration failed to locate significantly anomalous gold mineralisation and the tenement were surrendered (Section 4.4).
- BHP tested the northern Mount Doreen and southern Mount Theo mapsheets for Cu-Au in the late 1990s, but concluded that no major deposits were likely.
- Tanami Gold NL explored for Tanami-style gold mineralization and Tennant Creek-style copper mineralization in the Mount Doreen area from 2001 to 2005. The main target areas were the Terry's Find, Mount Hardy and Pyramid Hill Prospects. 7 Rock chip samples returned copper assays of 7032 ppm to 217972 ppm (Section 4.5).
- Deep Yellow conducted exploration for uranium in the Mount Hardy area in 2009 and 2010 (Section 4.6). No other commodities were investigated.

#### **4.1 Central Pacific Minerals N.L.**

Central Pacific Minerals N.L held Authority to Prospect 1722 from 1967-1969. No work was conducted in the Mount Hardy area, but a review of early exploration and the geology of the area are provided.

Kiek (1941) reported that the Mount Hardy copper prospects were discovered by W.W. Braitling in 1935. Uranium Development and Prospecting N.L. carried out diamond drilling in the area in 1956. The drilling ceased in 1957 apparently due to the 'broken nature of the country and the falling price of copper' (Layton, 1967), but the more likely reason is the low grade of intersections made (Clark, 1969). Radiometric investigations were carried out in the area, but not reported on favourably (Clark, 1969).

In 1958 the BMR completed an aeromagnetic survey in the area but did not discover any anomalies within the boundaries of A.P. 1722. Australian Geophysical Pty Ltd prospected in the same area in 1966 carrying out geophysical surveys, stream sediment sampling and geological mapping.

Subsequent to this, Aboriginal people from the Yuendumu settlement, with support from the Commonwealth Government mined and leached the secondary copper ore from the Mount Hardy deposits. Drilling by the Mines Branch in 1967 proved that only small tonnages of the secondary ore were suitable for leaching. Primary mineralisation is of small size, and low grade (Clark, 1969).

The following summary of the Mount Hardy copper prospects was included in Clark (1969) as it was thought that similar geological environments may exist elsewhere in the Mount Doreen area.

"Kiek (1941) described the copper prospects as 21 quartz reefs, 11 pegmatite and 8 cupriferous schist bodies scattered over ten square miles. The country rocks are schist and gneiss of the Arunta Complex which are intruded by the Mount Doreen granite. Mineralisation occurs in the pegmatites and quartz reefs and as impregnations in schist. Pegmatite occurs in the immediate vicinity of all lodes suggesting a definite genetic relationship. The deposits show great variation in length and width ranging from a few feet to a maximum of 1,008 feet long and a few inches to 30 feet wide. Average width is three to four feet and average length is 300 feet, but copper mineralisation generally only occurs in small sections of the reefs. Malachite, azurite, chalcocite, cerussite and galena have all been recorded in the workings.

Kiek (1941) established a strong structural control for several deposits, but noted that field mapping would be required to elucidate the full extent of structural control. The Mount Hardy lodes are hydrothermal deposits undoubtedly related to the nearby Mount Doreen granite. Pegmatites and mineralisation are related to the younger fine-grained granite phase of the intrusion."

#### **4.2 White Industries**

Exploration Licence 5688 was granted to White Industries Limited in February 1988. The licence extends from the Wolfram Hill tungsten mine in the west through to the copper shows centred around Mount Hardy (Stidolph, 1989). The Mount Hardy prospects consist of pegmatite and quartz reefs containing copper mineralisation. Previous investigations in the area have concentrated around these prospects, which are too small to warrant significant further work, but virtually no attempt has been made to explore the surrounding country (Stidolph, 1989).

Nine rock chip samples were taken in 1989. All three samples taken from the Mount Hardy copper mine were enriched in gold, the highest assay being 2.55 g/t Au (Messenger, 1990a).

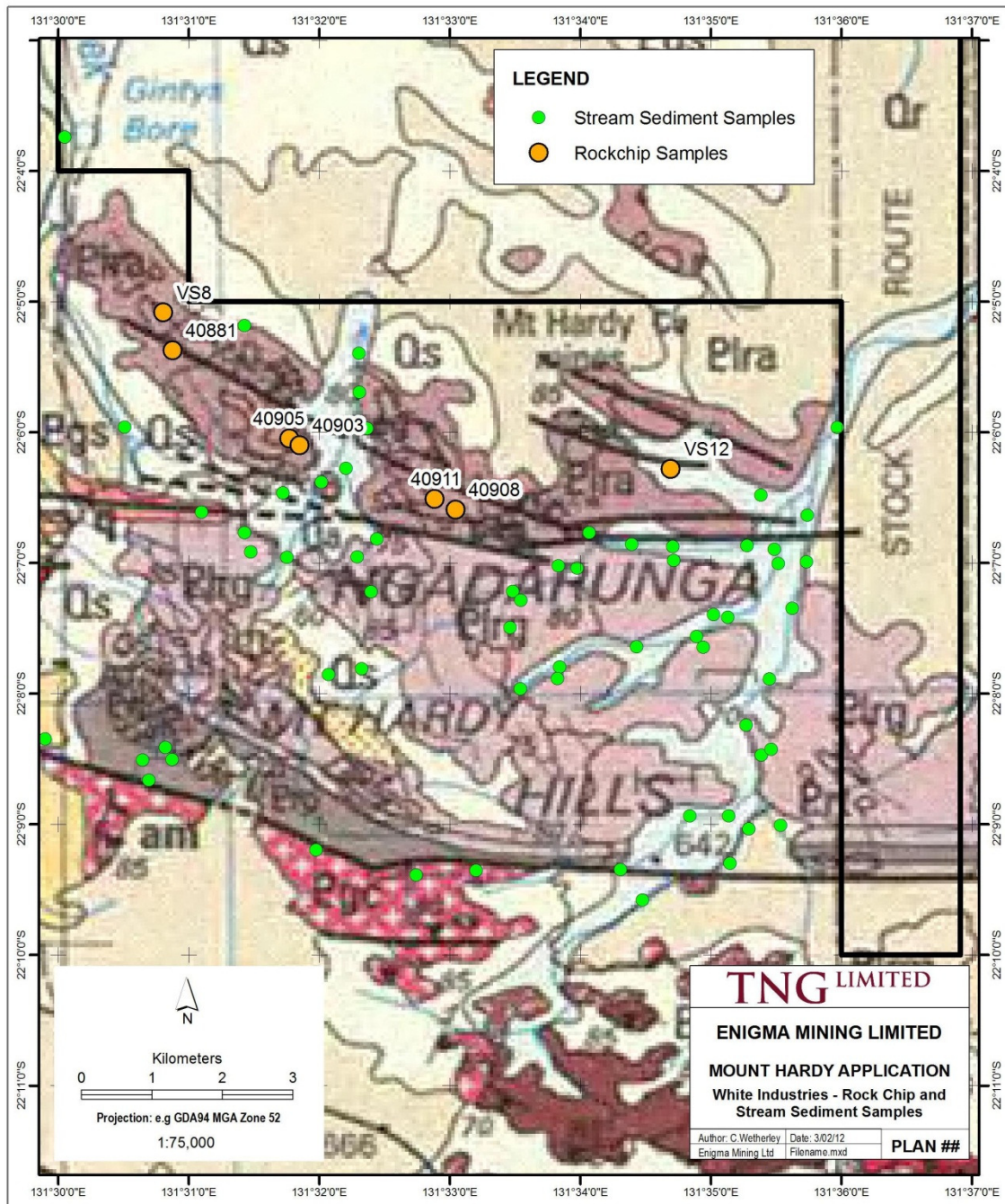
Stream sediment and rock chip sampling was undertaken in 1990 (Figure 2). Elemental statistical analysis was conducted on the stream sediment samples (Messenger, 1990b) and while a number of the results were above the elemental mean they were still significantly subdued (ie four samples averaging 20ppm Cu and 30ppm Zn).



Significant rock chip results are shown in Table 1.

**Table 1: Rock chip sample results, White Industries, 1990 (Messenger, 1990b).**

Sample ID	Ag (ppm)	Cu (ppm)	Pb (%)	Zn (ppm)
40903	6	2500	0.15	250
40905	100	92000	1.47	6000
40908	12	2350	0.28	1860
40911	145	145000	17.6	118000



**Figure 2: Location of White Industries stream sediment and rock chip sampling.**

Due to the state of the economy no further work was carried out on the area.

### 4.3 Yuendumu Mining Company

Exploration Licence 7986 was granted to Yuendumu Mining Company in March 1993 and extended from the Mount Hardy Copper Field in the east through Wolfram Hill to the area surrounding the Clark Copper Mine in the west (Figure 3).

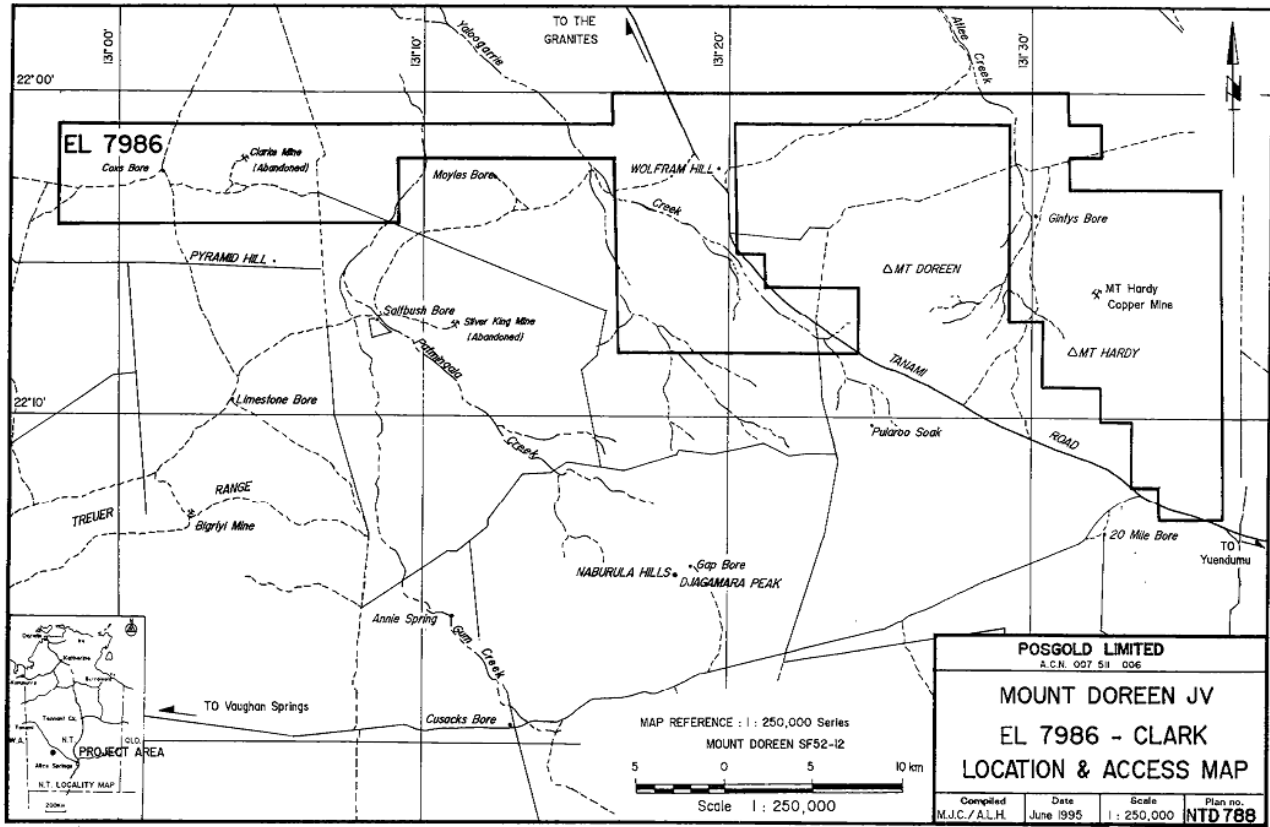


Figure 3: Location of EL 7986, Yuendumu Mining Company (Baarda, 1995).

The licence became part of a joint venture with Posgold Limited in September 1994. The licences were applied for to target structurally controlled gold mineralisation within gneisses, schists and amphibolites of the Lander Rock Beds (Price et al., 1995).

Soil and lag sampling was undertaken in the Mount Hardy area in 1995 (Figure 4). No significant results were returned and no further work was completed (Price et al., 1995).

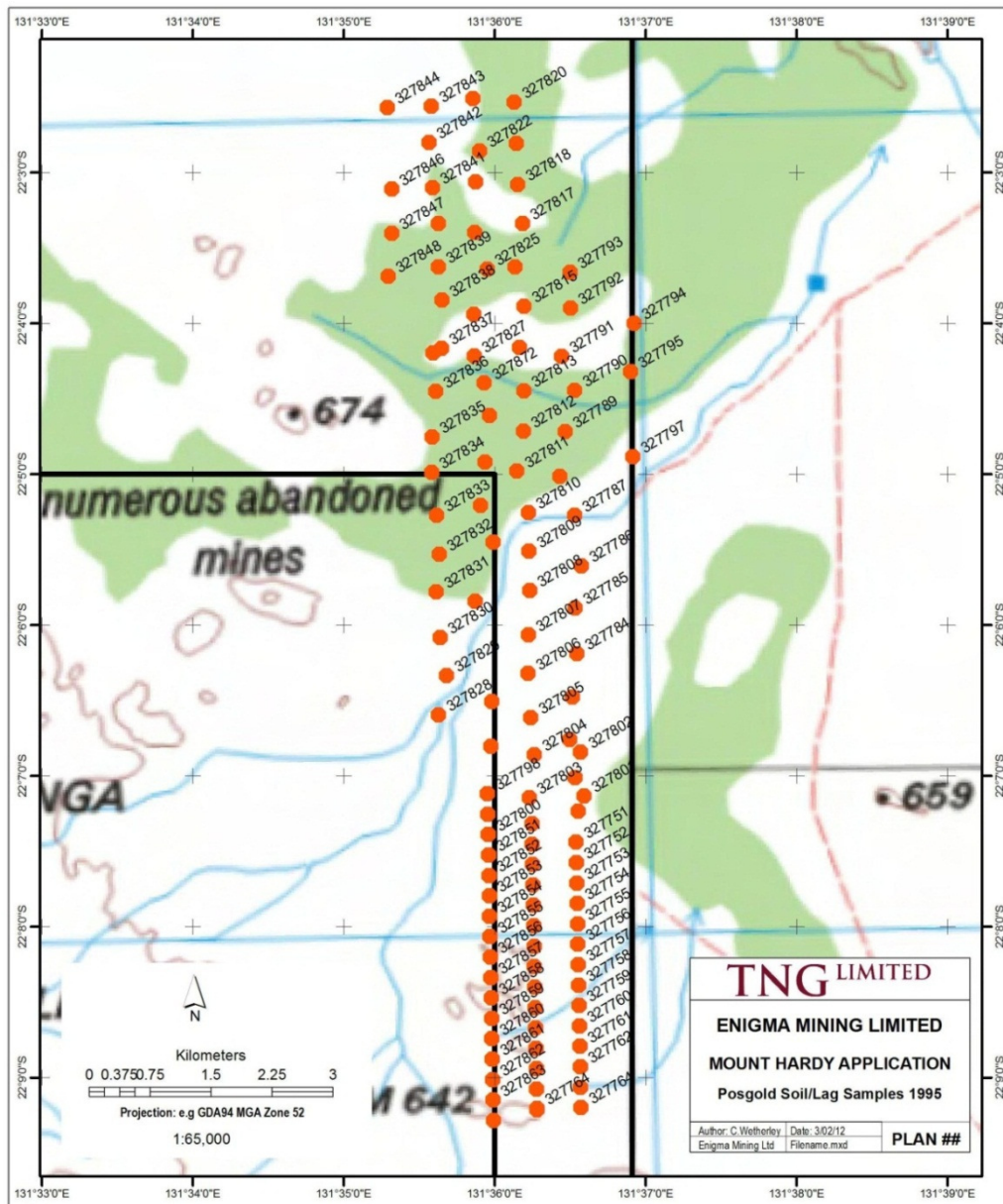


Figure 4: Soil and Lag sampling locations, Posgold 1995.

#### 4.4 Homestake Gold

EL 9673 was granted in October 1996 primarily to investigate the gold and copper potential of the area. All exploration was carried out to the south and west of TNG's EL29219. Thirty stream sediment samples were taken from the eastern part of the tenement in Year 1 of exploration (south of EL 29219; Figure 15). The survey was abandoned due to rain, but assays returned indicated a low probability of finding a large gold deposit (Stewart, 1997).

BLEG stream sampling was carried out in the same area in Year 2 of exploration. Samples were only assayed for gold and results were disappointing (Lindsay-Park, 1998).



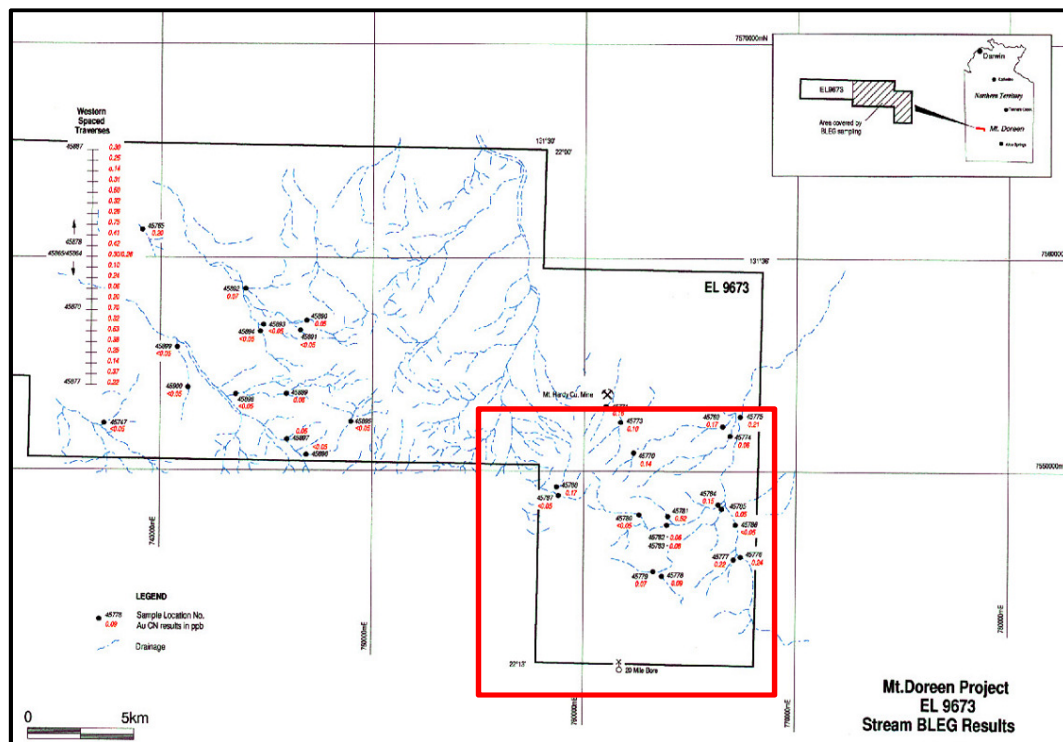


Figure 15: Location and results of stream sediment sampling (Stewart, 1997).

#### 4.5 Tanami Gold

Tanami Gold NL identified the potential for Tanami-style gold mineralisation and Tennant Creek-style copper-gold mineralisation in the Mount Doreen area of the northern Arunta region in 1998 leading to the acquisition of the significant tenement package forming the Mount Doreen Project (Smith, 2002; Figure 16).

Exploration by Tanami included a significant amount of surface geochemical sampling and vacuum and RAB drilling at the Weaner Bore, Silver King, Mt Irene and the Mount Hardy Cu prospect. Previous exploration data were also compiled to assist in exploration.

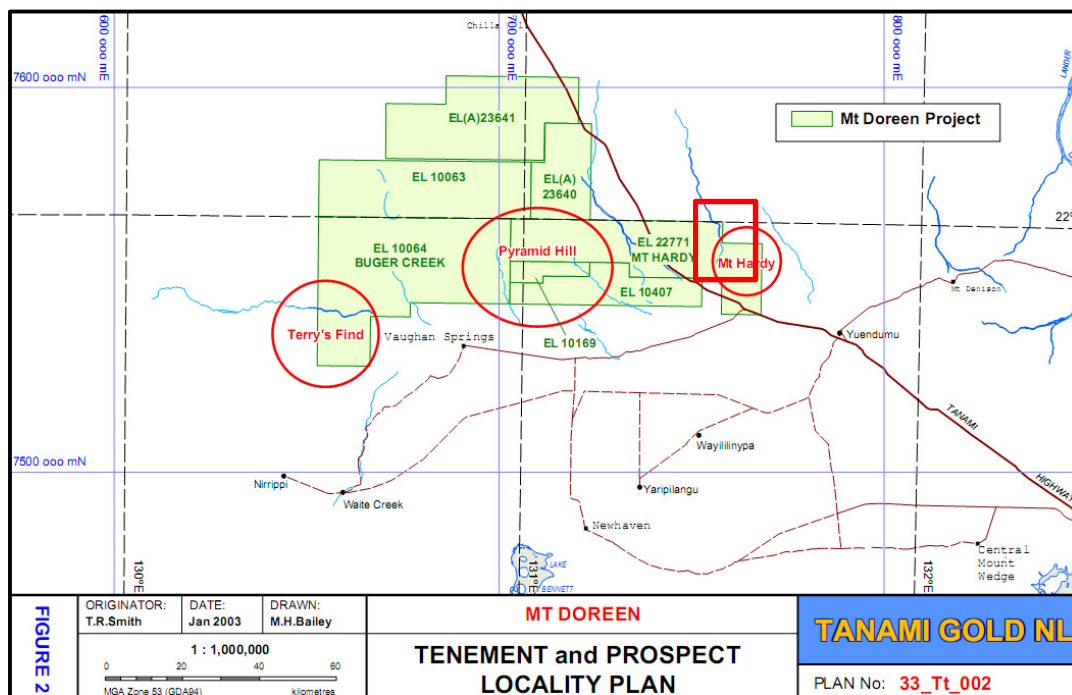


Figure 16: Location of Tanami Gold's Mount Doreen Project tenements (Smith, 2002).

The first year of exploration in the Mount Hardy area comprised rock chip and soil sampling and vacuum drilling. The southern part of TNG's tenement was included in this exploration. A total of 68 rock chip samples, 197 soil samples and 1,543m of vacuum drilling were completed in the Mount Hardy area.

At Mount Hardy, first-pass lag sampling at 2000 x 100 m spacing was conducted over residual regolith terrain to the south of the Mount Hardy workings with the rationale that underlying greenschist facies Lander Group metasediments were potentially more prospective for gold mineralisation. No significant results were obtained for Au, but significant Cu assays are shown in Table 4.

**Table 4: Cu in soils (Smith, 2002).**

Sample	Cu ppm
MHS003	146
MHS004	215
MHS005	389
MHS006	656

Rock chip sampling was conducted over known copper occurrences and working with an additional thirteen occurrences and workings mapped and sampled. Most of the samples taken from the Mount Hardy area returned anomalous values for Au, Ag and Cu.

**Table 5: Significant rock chip results.**

Sample	Au ppb	Ag g/t	Cu ppm
MK035	54.2	104	126828
MK036	32.8	312	48378
MK037	2.4	316	7032
MK038	47.6	126	173522
MK039	8.3	59	53357
MK040	15.7	178	73328
MK041	22.2	332	190045

A major program of first pass vacuum drilling (249 holes for 1543 metres) was conducted over areas of deeper alluvial cover north of the Ngadarunga Hills to an average spacing of 1000 x 100 metres over conceptual structural targets identified in Landsat and aeromagnetics (Attachment 1). Vacuum drilling proved to be an effective medium over the area with most holes penetrating shallow transported cover to weathered bedrock, the only impediment being thick mulga bush in places. Numerous anomalous assays were returned from the drilling to maximum values of 28ppb Au, 547ppm Cu and 56.2g/t Ag (Smith, 2002).

In the second year of exploration three RAB drilling programmes (Attachment 2) were conducted in the Mount Hardy area. The first program consisted of 14 angled RAB holes (MHB1 to 14, for 999m) was conducted to test for strike extensions of Mt Hardy No. 1 copper workings beneath cover to the northeast and southwest (Potter and Anderson, 2003). No significant gold results were received however an intersection of 6m @ 0.6% Cu from 40m depth in MHB 13 indicated continuity of the mineralised system 500m SW along strike from the workings (Potter and Anderson, 2003).

Two drilling programs were carried out during 2003 at Mt Hardy, which consisted of a large number of 'posthole' RAB holes. The aim of the first drilling program was to define and constrain the previously established sporadic low-level Au, Cu and Ag anomalism developed from vacuum drilling in 2002 (Potter and Anderson, 2003).

The initial program carried out in August 2003 consisted of 298 RAB holes for 2,877 metres on nominal grid spacing of 400 x 100m. North-south traverses targeted WNW trending anomalism identified in 2002 (Potter and Anderson, 2003).

A further 92 holes were drilled in September 2003 for 1,025 metres testing strike continuation and tenor of the best anomalies returned from Phase 1 drilling with the aim of defining +100ppb Au targets for RAB hammer or RC drill testing. Drilling was completed over five target areas.

From the initial program, gold assay results included twenty-five +4ppb Au, with three +10ppb Au results to a maximum of 22ppb Au. Several zones of anomalism in adjacent holes (100m apart) and over +1km strike lengths were identified.

Copper returned thirteen +100ppm results to a maximum of 450ppm Cu. Silver was disappointing, returning eleven +0.2ppm results to a maximum of 0.5ppm Ag, and failing to repeat the high grades returned in 2002 vacuum drilling. Both copper and silver were elevated coincident with Au indicating they are potential geochemical pathfinders in the region.

The second program confirmed and further defined the anomalism. Significant results are listed in Table 6.

**Table 6: Significant results from the drilling conducted by Tanami Exploration in 2003.**

Hole	Depth From	Depth To	Sample Type	Au ppb	Ag ppm	Cu ppm
<b>First Program</b>						
MHB017	8	13	R	4	0	18
MHB017	21	25	R	4	0	26
MHB032	13	17	R	5	0	70
MHB036	16	18	R	4	0.1	34
MHB049	13	17	R	4	0	205
MHB049	21	23	R	7	0.2	273
MHB073	3	7	R	4	0	16
MHB089	9	13	R	4	0	16
MHB113	12	15	R	11	0	76
MHB114	10	12	R	5	0	9
MHB125	2	4	R	7	0.1	12
MHB148	1	2	R	4	0.5	233
MHB173	1	2	L	4	0.1	59
MHB188	2	6	R	4	0	27
MHB194	1	2	L	9	0	85
MHB195	1	2	L	22	0.3	17
MHB213	2	6	R	7	0	26
MHB232	7	10	R	4	0	24
MHB245	1	2	L	2	0	305
MHB245	2	6	R	15	0	450
MHB245	6	10	R	5	0	173
MHB246	5	9	R	4	0.1	48
MHB246	9	13	R	5	0.1	90
MHB248	10	12	R	4	0	33
MHB250	3	4	L	7	0	6
MHB296	9	13	R	7	0.2	126
<b>Second Program</b>						
MHB352	34	36	R	6	NA	28
MHB358	5	7	L	6	NA	32
MHB362	3	6	L	8	NA	14
MHB390	1	5	R	6	NA	23
MHB396	1	3	L	12	NA	33
MHB396	2	6	R	8	NA	13
MHB396	6	8	R	6	NA	25
MHB400	0	4	R	9	NA	61
MHB400	4	6	L	6	NA	107

No further work was conducted on EL 22771. A data review was completed and the tenement area was surrendered based on the geology and previous exploration results (Rohde, 2006).

#### 4.6 Deep Yellow

Deep Yellow conducted exploration on a number of tenements on the Mount Doreen and Mount Theo mapsheets (Figure 17). The exploration programme sought to identify near-surface calcrete or sand hosted uranium, with secondary targets comprising tabular lignitic or redox traps within deeper basinal sediments (Bridgewater, 2010).

Reconnaissance field trips were carried out to assess drill rig access and a single AC hole (DOAC201; 759624E, 7561314N) was drilled for 15m. Composite 3-5 metre samples of the top 10 metres were taken for uranium assay. All drill samples were measured for total gamma response with a hand-held RSS-125 spectrometer. All composite assay samples were submitted to ALS Chemex in Alice Springs and analysed for uranium by XRF (method ME\_XRF\_05) with a detection limit of 4 ppm (Bridgewater, 2010). No significant assays were returned. No other elements were assayed.

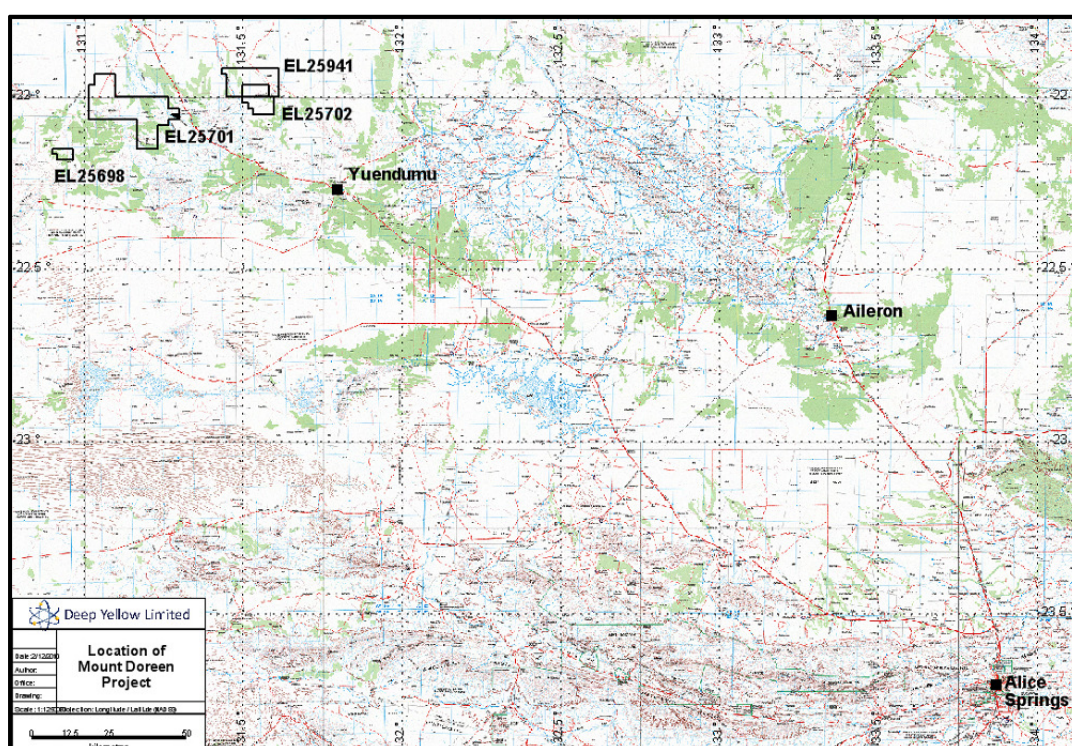


Figure 17: Location on Deep Yellow tenements (Bridgewater, 2010).

#### 4.7 Bluekebble Pty Ltd

During January 2011 consulting geologists Kastelco Geological Consultancy ("KGC") conducted a review of existing historical exploration data within the Northern Territory Geological Survey Database. This was conducted to identify any high potential base metal and uranium exploration targets and resulted in the identification of several targets that warrant further work.

The targeting was undertaken at a high level to identify areas of interest that stand out in the regional re-interpreted geophysical data. Historical prospects were reviewed to determine the effectiveness of the previous exploration and evaluate remaining potential within the Exploration Licence area.

On a regional basis the Mt Hardy tenement is located in the highly prospective Arunta Mineral Field. Through detail interpretation of airborne magnetic from the Northern Territory Geological Survey, the following magnetic (Figure X) and radiometric (Figure X) anomalies were identified as follow-up targets.



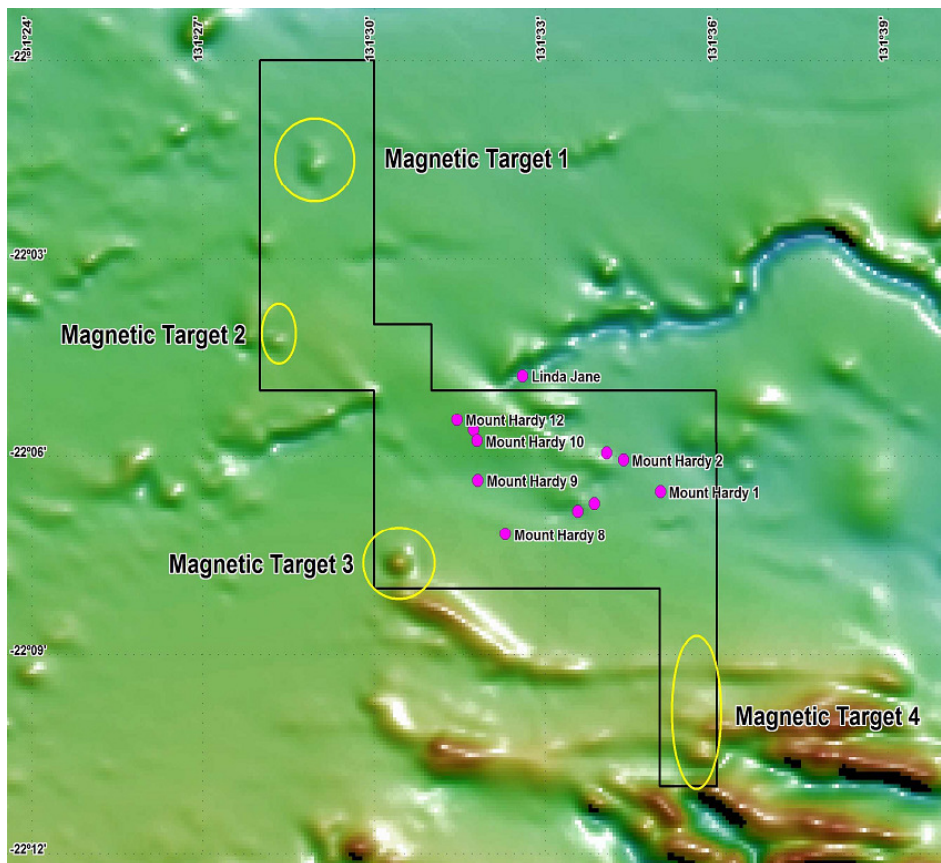
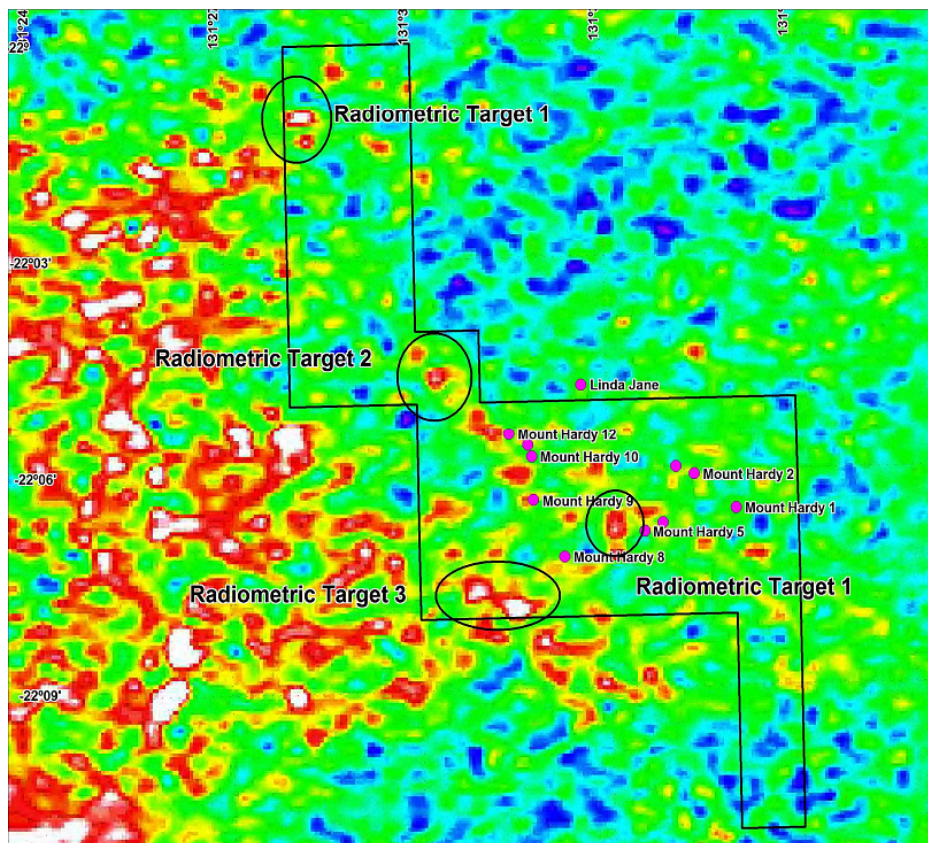


Figure X: Magnetic target anomalies identified within EL 27892.



- Ashby, J., 1997. Aberfoyle. CR1997-0766.
- Baarda, F.D., 1995. Yuendumu Mining Company. CR1995-0584.
- Barracrough, D., 1994. Yuendumu Mining Company. CR1994-0351.
- Bridgewater, H.L., 2010. Deep Yellow. CR2010-0786.
- Clark, D., 1969. Geological Report, Authority to Prospect 1722, Mount Doreen, Northern Territory.
- Drown, C.G., 1996. Aberfoyle. CR 1997-0015.
- Drown, C.G., 1995a. Aberfoyle. CR 1995-0865.
- Drown, C.G., 1995b. Aberfoyle. CR1995-0867.
- Hughes, S.L.M., 1997. Aberfoyle. CR1997-0064.
- Kastellorizos, P., 2011. First Annual Report over the Mount Hardy Base Metals-Silver Project. Arunta Mineral Field, Northern Territory. Mount Hardy Project Exploration Licence 27892. Bluekebble Pty Ltd.
- Kiek, S.N., 1941. The Mount Hardy Copper Field, Central Australia. AGGSNA Report, N.T. 55.
- Layton, W., 1967. Report on a visit to six Mineral Prospecting Authorities between 14<sup>th</sup> and 27<sup>th</sup> August, 1966, for Magellan Petroleum Corporation. Unpubl company report.
- Lindsay-Park, K., 1998. Homestake Gold. CR1998-0746.
- Messenger, P., 1990b. White Industries. CR1990-0217.
- Messenger, P., 1990b. White Industries. CR1990-0451.
- Potter, J.R., and Anderson, J.E., 2003. Second Annual Report EL's 10063, 10064, 10169, 10407, 22771. Mt Doreen Project. Tanami Exploration. CR2003-0497.
- Price, L.A., Baarda, F., and Worland, R., 1995. Posgold Limited. CR1996-0012.
- Schusterbauer, J., 1998. Aberfoyle. CR1998-0313.
- Smith, T., 2002. Tanami Gold. CR2002-0346.
- Stewart, J.I., 1997. Homestake Gold. CR1998-0275.
- Stidolph, P.A., 1989. White Industries. CR1989-0134.
- Rohde, C., 2006. Partial Relinquishment Report EL's 10063, 10064, 10407, 27711. Final Report EL 10169. Mt Doreen Project. Tanami Exploration. CR2006-0559.
- Wyborn, L.A.I., Bastrakova, I.V. and Budd, A.R., 1998. Australian Proterozoic Granites – characteristics, sources and possible mechanisms for derivation and emplacement. In: Abstracts for the Bruce Chappell Symposium: Granites, Island Arcs, The Mantle and Ore Deposits. Australian Geological Survey Organisation, Canberra.
- Young, D.N., Edgoose, C.J., Blake, D.H. and Shaw, R.D., 1996. Mount Doreen SF52-12 Explanatory Notes. 1:250 000 Geological Map Series. NTGS, AGSO.