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EL 1893

#### **POONDINGA**

## PARTIAL SURRENDER REPORT FOR THE PERIOD 23/11/93 TO 22/11/98

Submitted by

Equinox Resources NL 1998

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# "POONDINGA" EXPLORATION LICENCE EL1893 WESTERN GAWLER CRATON SOUTH AUSTRALIA

Partial Surrender Report 23rd November 1993 - 22nd November 1998

by

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#### **SUMMARY**

The Poondinga region is recognised as having considerable potential for Au and Cu/Au mineralisation associated with shear zones active about the time of emplacement of Hiltaba Suite and related granites.

The area comprises a broad spectrum of lithologies and structures. Sequences range from reworked Archaean greenstones and felsic (± garnet) gneisses to large, A-type, Mesoproterozoic composite granitoid plutons (?Hiltaba Suite) and potential equivalents of the clastic Tarcoola or Labyrinth Formations. Granite gneisses similar to the Lincoln Complex of Eyre Peninsula are common. Hiltaba Suite granites which are widespread around the margins of the Gawler Ranges Volcanic Province and are host to the giant Olympic Dam Cu-Au-U-Ag-REE orebody, are represented in the tenement by coarse grained megacrystic granites with large pink aligned tabular K-feldspars. Major E-W shear zones traverse the northern margin of the licence and are possibly the locus of sedimentary troughs or basins potentially filled with clastic sediments of similar age to the Tarcoola (host to Au mineralisation at Tarcoola) and/or Labyrinth Formations. Other structures within the region include several NE-trending throughgoing faults some of which can be traced for over 50 km.

Detailed stereographic photointerpretation of 1:87,400 scale colour aerial photographs was undertaken in 1994 to identify, locate and assign AMG co-ordinates to any potential basement outcrops, near-surface outcrops, structural trends and topographic peculiarities. This identified a substantial palaeotopography and palaeodrainage system predating the sief dune complex.

Due to limited vehicular access, vegetation and the remote nature of the tenement, geological mapping was undertaken by helicopter in November 1994. This proved to be very effective and, although sporadic, basement outcrop was found to be significantly more extensive than originally mapped on the FOWLER and CHILDARA 1:250000 Geological Map Sheets. Samples collected during this program were analysed for base metals and gold but no anomalies were identified. Some thin sections were prepared and petrological work undertaken.

Since the entire EL is within Nullarbor Regional Reserve and subject to various Native Title Claims, no field work has been undertaken since 1994. Discussions and plenary meetings with the Native Title Tribunal, Aboriginal Legal Rights Movement, Far West Coast Native Title Working Group, Department of Environment and Natural Resources and local Aboriginal communities at Ceduna continued throughout most of the period but particularly in 1997, and on October 25th 1997 an "Access Clearance and Native Title Mining Agreement" was signed by representatives of the Native Title Claimants.

Aboriginal heritage site clearances were undertaken in late 1997 and area clearance reports were received early in 1998. Apart from an area 5km in radius around Moornaba Rockhole and and a small area in the northeast, most of the area relinquished has been cleared for reconnaissance exploration including calcrete sampling.

No calcrete or soil sampling has been undertaken in the area relinquished.

#### 1.0 INTRODUCTION

The Poondinga Exploration Licence (EL 1893) is located on the eastern edge of the FOWLER 1:250,000 sheet area, approximately 70km north-northwest of Ceduna and 110km southwest of Tarcoola in western South Australia, extending eastward onto the CHILDARA 1:250,000

sheet area (Fig. 1). EL 1893 originally covered an area of 1505 square kilometres entirely within Yellabinna Regional Reserve.

In 1998, the area of the Poondinga tenement was substatially reduced to approximately 948 sq. km within the central core area of the original tenement (Fig. 2). This report covers the areas relinquished and has been compiled from confidential annual technical reports (Parker et al., 1994; Parker, 1995).

During 1994, detailed interpretation of South Australian Exploration Initiative (SAEI) aeromagnetics and review of existing open file information were undertaken. Detailed aerial photo interpretation and a helicopter-borne reconnaissance geological mapping and sampling program were also undertaken. Due to Native Title (NT) considerations (see below), no field work was undertaken on the tenement from 1995 to 1998 inclusive.

The area lies within the western Gawler Craton (Fig. 2) and comprises a broad spectrum of lithologies and structures. Sequences range from reworked Archaean greenstones and felsic (± garnet) gneisses to large, A-type, Mesoproterozoic composite granitoid plutons (?Hiltaba Suite) and potential equivalents of the clastic Tarcoola or Labyrinth Formations. Granite gneisses similar to the Lincoln Complex of Eyre Peninsula are common. Hiltaba Suite granites which are widespread around the margins of the Gawler Ranges Volcanic Province and are host to the giant Olympic Dam Cu-Au-U-Ag-REE orebody, are represented in the tenement by coarse grained megacrystic granites with large pink aligned tabular K-feldspars. Major E-W shear zones traverse the northern margin of the licence and are possibly the locus of sedimentary troughs or basins potentially filled with clastic sediments of similar age to the Tarcoola (host to Au mineralisation at Tarcoola) and/or Labyrinth Formations. Other structures within the region include several NE-trending through-going faults some of which can be traced for over 50 km.

With the exception of sporadic rockholes and a few local outcrops within interdunal corridors, the tenement is devoid of basement outcrop; it is covered by a relatively thin veneer of Tertiary sediments and an extensive Quaternary seif dune complex. Detailed stereographic photointerpretation has identified a substantial palaeotopography and palaeodrainage system predating the sief dunes.

Since renewal of the tenement in November 1994, EL 1893 has been subject to NT clearance. There are no known historical Pastoral Leases over the area and several NT Claims have been lodged over the region. Because of these claims, no field work was possible after 1994 and planned drill testing of target anomalies and soil/calcrete sampling were deferred.

Discussions and plenary meetings with the Native Title Tribunal, Aboriginal Legal Rights Movement, Far West Coast Native Title Working Group, Department of Environment and Natural Resources and local Aboriginal communities at Ceduna continued throughout most of the period. Two significant meetings of NT Claimants, legal representatives and mining companies were held in Ceduna in early 1997 and following those meetings in which Equinox Resources played a significant role, an "Access Clearance and Native Title Mining Agreement" was drafted. Following extensive negotiations, this agreement was signed by representatives of the NT Claimants at a special meeting on October 25th 1997 at the Head of the Bight.

Based on that agreement, Aboriginal heritage site clearances were undertaken in late 1997 and an area clearance report was received early in 1998. Apart from an area 5km in radius around Moornaba RH (319500mE, 6516940mN) and a small triangular area in the northeast (ca. 356000mE, 6540000mN), most of the area relinquished has been cleared for reconnaissance exploration up to and including calcrete sampling. Although outcrops in the very northeastern corner of the tenement were not identified specifically in the area clearances,

they are known to contain a rockhole and old campsites at 366360mE, 6536190mN and should also be avoided.

#### 2.0 METHODS

#### 2.1 Aeromagnetic Interpretation

During 1994-95, careful evaluation of varied representations of the SAEI aeromagnetic data at scales from 1:500,000 to 1:100,000 was undertaken in order to produce a regional solid geology map of the area and to identify and delineate as closely as possible, all magnetic features that might be related to potential mineralisation.

Regional evaluation of the area was undertaken at 1:250,000 then refined to 1:100,000 scale using various relief-shaded colour TMI images, relief-shaded grey-scale first vertical derivative images and detailed, closely-spaced colour-contour plans. This included establishing the character of bedrock in relation to suitable host lithologies, an assessment of the presence or otherwise of appropriate structural and magmatic environments, and identification of magnetic features that would constitute targets for Archaean Au, Proterozoic Au/Cu type and diamond deposits. Target generation and interpretation were based on SAEI 400m line-spaced aeromagnetic data.

#### 2.2 Photo-interpretation

Detailed stereographic photo-interpretation of 1:87,400 scale colour aerial photographs (flown in 1987) was undertaken in order to identify and locate any basement outcrops, near-surface outcrops, structural trends and topographic peculiarities. AMG locations for the potential outcrop sites were evaluated by extrapolating the AMG grid from 1:100,000 topographic sheets onto the aerial photographs.

A significant outcome of this interpretation was the identification of a major palaeodrainage system predating the sief dune complex throughout the EL but in particular around Moornaba Rockhole. Most granite exposures occur on the top of regional topographic highs.

#### 2.3 Geological Mapping

Due to the limited vehicular access, vegetation and remote nature of the tenement, a Bell Jetranger 206 helicopter was chartered from Lloyd's Helicopters for 7 days. A helicopter-borne geological survey of the localities identified from the photointerpretation was then carried out by a team of 4 geologists. At the time of this survey, there were no Native Title Claims over the area and approval was granted in writing by the Far West Aboriginal Progress Association Ltd to conduct geological field work in the licence area.

Outcrops ranged from large (100-200m across), continuous, pristine rock surfaces (often containing rock holes) to scattered fragments of highly weathered basement material and gritty, feldspathic sands. Basement outcrop and near-surface outcrop was usually associated with scattered nodular calcrete, coarse feldspathic sand (particularly in and around Hiltaba Suite outcrops) and/or palaeotopographic highs clearly seen from the air.

#### 2.4 Analytical Methods

All samples collected during the helicopter-based program were sent to AMDEL for base metal and gold geochemistry. Thin sections were prepared by Pontifex and Associates.

#### 3.0 RESULTS

#### 3.1 Regional Geology

The Gawler Craton in southern South Australia is a crystalline basement terrane flanked on all sides by significantly younger sedimentary basin successions. The oldest known rocks in the craton are granite-greenstone type terranes dated as latest Archaean to earliest Proterozoic. Several Palaeo- and Mesoproterozoic phases of tectonism and magmatism have reworked substantial parts the Archaean protolith. The region of interest is in the central western region of the craton within the Wilgena Subdomain (Drexel et al., 1993) although the majority of the southern part of the tenement could be considered as a separate subdomain with character intermediate between the Wilgena and Nuyts Subdomains.

The "type area" for the Wilgena Subdomain is the Tarcoola-Wilgena-Glenloth region which is separated from the southern region by several major E-W trending shear zones one of which extends across the northern boundary of EL 1893.

The Wilgena Subdomain is characterised by high metamorphic grade gneisses of mixed Archaean and Palaeoproterozoic age and incorporating granitic gneisses, mafic gneisses (amphibolites), garnetiferous and calcsilicate para-gneisses, BIFs and, locally, ultramafic rocks. These are intruded by Palaeoproterozoic granitoids which have been deformed into major gneiss complexes then subsequently sheared and locally intruded by Mesoproterozoic granites and major NW-trending mafic dyke swarms.

The Nuyts Subdomain is characterised by large, variably deformed semi-circular batholiths of predominantly younger granitoids ranging in age from 1650 Ma to ca. 1530 Ma. There are no confirmed outcrops of Archaean or Palaeoproterozoic metasediments or paragneisses but some areas have been interpretted to comprise remnants of high metamorphic grade Archaean and/or Palaeoproterozoic gneisses. Felsic volcanics range in age from 1670-1590 Ma but appear to be restricted to the eastern region of the subdomain.

The main E-W shear zone along the northern edge of EL 1893 merges westwards with NE-SW trending Fowler Shear Zone just west of the tenement. The Fowler Shear Zone and related structures traverse the northwestern Gawler Craton, and have continued to be active until relatively late in the overall tectonic history of the craton. Outcrop of the Colona Fault Zone (Lake Tallacootra) and diamond drill intersections in the Karrari Fault Zone (KFZ) indicate that the kinematics of these well developed demagnetised mylonite zones is mainly northwest-block-down with largely steeply-plunging, down-dip mineral lineations overprinted by predominantly sinistral strike-slip shearing. Therefore, they are best interpreted as the manifestation of an inclined thrust stacking of pre-existing gneisses above some detachment, if only because the shear zone geometries (largely vertical movements) necessitate a flattening of these structures with depth.

The age of the Fowler Shear Zone is constrained by a ca. 1540 Ma U-Pb zircon age on sheared high metamorphic grade amphibolites near Nundroo (S.J. Daly & C.M. Fanning, pers. comm., 1995), the age of typical but deformed Hiltaba Suite granites at ca. 1585-1595 Ma and the age of post-orogenic granites on southern Eyre Peninsula (Spilsby Suite) ca. 1530 Ma suggesting that shearing took place ca. 1540-1530 Ma. Although most undeformed megacrystic granites in the Poondinga-Moornaba-Streaky Bay region have been equated to the Hiltaba Suite, some may be equivalent to the Spilsby Suite.

The significance of structures of this age has recently been exemplified by the discovery of gold by Equinox Resources NL in EL 2035 along a similar but northerly-trending major shear zone truncated by but locally deforming Hiltaba Suite granite. That is, it appears that shearing

and granite emplacement are approximately coeval providing not only a source for mineralising fluids but also potential pathways and accommodation zones.

The Poondinga tenement is covered by an extensive vegetated seif dune complex. Sand dunes in the area are generally 10-15m high, trend roughly WNW (ca. 095°-115°TN) and consist of fine to medium grained, off white to pale reddish fawn aeolian quartz sand. Interdune corridors are largely comprised of sandy red clay with local patches of soft calcrete.

An extensive palaeodrainage system (Fig. 3) gives rise to a gently rolling topography which clearly predates the dunes and which is possibly of Pliestocene age. Relict streams cause linear topographic lows, often running at high angles to the dune system. In the vicinity of Moornaba Rockhole in the SW corner of the EL, the palaeotopographic relief is quite accentuated ranging in elevation from 210m down to <100m over a few kilometres. Despite this relief, the Holocene sand dunes extend straight across the palaeovalleys and palaeohighs with little or no deflection.

#### 3.2 Aeromagnetic Interpretation

The licence area encompasses a very sinuous, comparatively strongly magnetic belt of rocks trending roughly east-west but truncated by a much less sinuous, E-W trending series of magnetic lows along its northern margin, interpreted as a north-dipping system of shear zones. Several diffuse features occur within these zones which may be associated with relatively thick sedimentary cover possibly of middle Proterozoic age (Fig. 4). Narrow linear magnetic features (probably magnetic mafic dykes) are very common and oriented approximately northeast-southwest and north-south, with relatively few, but very prominently magnetic east-west examples.

Just east of centre in the licence area, there is a cluster of overlapping-circular features which are interpreted to represent separate plutons comprising a large composite granite batholith correlated with typical Hiltaba Suite granites from the nearby Gawler Ranges region.

Elsewhere within and immediately adjacent to the licence area, there are several other low magnetic intensity, roughly circular magnetic features which are also interpreted to be Hiltaba Suite granites. Granite outcropping at Moornaba Rockhole just SW of the licence area, is interpreted as Hiltaba Suite and occurs within but close to the margin of a very large >40 km wide batholith.

Host rocks into which the granite plutons were emplaced appear to consist of a complex of interleaved quartzofeldspathic and mafic gneisses (Fig. 4). Drill holes that have encountered amphibolites in the east of the licence area (MESA Open File Env. 5077) are located on highly magnetic rocks with a strong SE-NW fabric. These are part of the sinuous E-W trending, highly magnetic belt noted earlier which suggets that all these areas may largely contain amphibolites, mafic gneisses and minor felsic to intermediate gneisses. The features are notably directly along strike from Archaean mafics and ultramafic rocks on southern TARCOOLA 1:250 000 map sheet. Drilling by Afmeco and CRA Exploration 26 km SW of Moornaba Rockhole, within a similar sinuous magnetic belt, intersected magnetic amphibolite and ultramafic locally altered to talc-chlorite rock (MESA Open File Env. 3837 and 5010).

The several wide, approximately E-W shear zones along the northern margin of the licence area extend for at least 100 km along strike and almost certainly dip moderately to shallowly north. A sense of shearing cannot be established from the map pattern. Due to their width and very low magnetic intensity (cf. shear zones at Lake Tallacootra), they are interpreted to consist of mylonitic schists and gneisses. The shear zones occur within a shear belt about 10 km wide. Several outcrops of gneiss have been discovered within this belt but correspond to

areas interpreted to be gneissic granite. They are dominantly granite gneisses similar to Lincoln Complex gneisses but deformational fabrics have been variably developed and confirm the presence of local shear zones with lineations plunging steeply to the north and northeast. The low magnetic intensity and diffuse nature of features within much of the shear belt suggest that the sheared gneisses may be in part overlain by syn-tectonic sediments (see below).

Drilling in the east of the licence area was centred on magnetic anomalies on a regionally high magnetic background. However, other parts of the licence area comprise weaker magnetic highs (amphibolites) on a regionally low magnetic background. The less or non-magnetic anomalies are attributed to quartzofeldspathic, possibly granitic gneisses with or without garnet. A few elliptical, very low magnetic areas have been interpreted as possible undeformed or weakly deformed granites as confirmed by outcrops in the NE corner of the licence.

Two well defined zones of narrow, demagnetised lineaments traverse the licence area. These NE-trending zones are almost certainly relatively late fault systems. In general, they cross-cut all lithologies, including broader shear zones and some of the granite phases, and they commonly illustrate sinistral displacements, although one of these fault systems terminates against a similar almost orthogonal feature on the northern side of the licence area. Given that much of the gross layering and many of the demagnetised shear zone-like features probably dip north, the apparent sinistral displacements are taken to reflect west-side-down normal displacements on these faults. Magnetic features are very diffuse and subdued within magnetic troughs associated with the fault systems and it is speculated that there may be a thick sedimentary cover within them. This cover is potentially similar in age to the Hiltaba Suite granites, as the related faults also appear to have been active or developing during their emplacement. If slightly older than and intruded by the granites, they could represent either Tarcoola or Labyrinth Formations (respectively ca. 1,650 and 1,600 Ma in age). The latter is regarded as more likely, given the probable approximately E-W extension inferred, which contrasts with the probable N-S extensions required for Tarcoola Formation distribution. In either case, they would be prospective for Tarcoola-style, reef-hosted gold (Tarcoola Goldfield). The magnetic character and close association with Hiltaba granites is very similar to the Tarcoola region and invites comparison.

#### 3.3 Geochemistry

Representative rock-chip samples were collected from most outcrops visited during the helicopter survey for petrology, geochemistry and future reference. Portions of all samples were sent to AMDEL for gold and base metal assays (see Appendix A). No major anomalies have been identified.

#### 3.4 Petrology

Four thin sections, prepared by Pontifex and Associates, were briefly examined petrologically (see Appendix B). Undeformed and unmetamorphosed Hiltaba Suite granite from Moornaba RH (POON28) showed weak undulose extinction in quartz but primary igneous textures were still well preserved with no evidence of recrystallisation.

Granitic gneisses from the northeast of the EL (POON54-55) are of primary igneous origin but have been deformed and recrystallised to form a moderately strong foliation defined by alignment of mica, hornblende and/or dynamic recrytallisation of quartz.

#### 4.0 CONCLUSIONS AND RECOMMENDATIONS

There is considerable potential in the Poondinga region for structurally-controlled Au and Cu/Au mineralisation hosted by either Mesoproterozoic granites (Hiltaba Suite and/or Spilsby Suite) or paragneissic basement that developed during the Kimban Orogeny and subsequent orogenic event(s) from an early Proterozoic/Archaean protolith. Uplift and exhumation of the granites and gneisses is probably in part related to the development of major shear zones which may have been very important in the localisation of mineralisation and which may have been active at the time of granite emplacement.

Recent work in the western Gawler Craton has emphasized the potential of calcrete sampling and geochemsitry in locating concealed gold mineralisation. The entire EL is covered by sand dunes but reconnaissance field work in 1994 recognised local outcrops of calcrete in interdunal corridors. Therefore, regional calcrete sampling program could be undertaken within the interdunal corridors perhaps allied to a soil and mobile metal ion geochemical program where calcrete is not present.

#### **5.0 REFERENCES**

- Drexel, J.F., Preiss, W.V. and Parker, A.J., 1993. Geology of South Australia. Volume 1, The Precambrian. *South Australia. Geological Survey*. Bulletin 54.
- Parker, A.J., Hammond, R.L. and Teasdale, J.P., 1994. "Poondinga Rock Water" Exploration Licence 1893, Western Gawler Craton, South Australia Preliminary Solid Geology Interpretation from SAEI Aeromagnetic Data, Target Generation and Geological Field Mapping Report. Equinox Resources NL. Unpublished Annual Technical Report, December 1994.
- Parker, A.J., 1995. "Poondinga Rock Water" Exploration Licence 1893, Western Gawler Craton, South Australia. *Equinox Resources NL*. Unpublished Annual Technical Report, December 1995.

## Appendix A

## **Geological Field Notes and Geochemistry**

## APPENDIX A: Geological Field Notes

LOCALITY	AMG	AMG	ZONE	РНОТО	DESCRIPTIVE	SAMPLE	LITHOLOGY	THIN	STRUCTU	JRE	
	EAST	NORTH		NUMBER	LOCATION	NUMBER		SECT.	CODE	DIP	DIPDIR
BWN16119428	319400	6517000	53	3859-081	Moornaba RW		mg even m-bi gran, mass, few veins				
BWN19119405	366389	6536000	53	3859-048			f-mg Q-KF-Bi gran, even grn, peg patches, mod fln		s1	85	335
BWN19119405	366389	6536000	53	3859-048			f-mg Q-KF-Bi gran, even grn, peg patches, mod fln		<b>I</b> 11	5	60
AJP16119428	319495	6516940	53	3859-081	Moornaba RW	P00N28	mass mg equigran PI-Q-Kf-Mu-Bi gran, no Kf pc's	у			
AJP19119454	366360	6536190	53	3859-046	Rock Hole	P00N54	mass mg equigran KF-Q-Bi foliated granite, Bi-rich	у	s1	85	166
AJP19119454	366360	6536190	53	3859-046	Rock Hole		schlieren, some big KF pc's		j1	83	264
AJP20119455	367400	6536598	53	3859-046		P00N55	mg Q-F-Bi foliated gran, mafic granitoid porph xenos	уу	s1	86	332

### **APPENDIX A: Geochemistry**

LOCALITY	SAMPLE NUMBER	Au	Ag	Cu	Pb	Zn	As	Bi	Mo	Cr
AJP16119428	POON28	0.01	-1	15	5	15	-3	5	-3	-2
AJP19119454	POON54	-0.01	-1	8	35	16	-3	-5	-3	6
AJP20119455	P00N55	-0.01	-1	15	20	42	-3	-5	-3	19

## Appendix B

## **Summary Petrology**

#### **Appendix B: Summary Petrology**

POON28	Medium (	grained granite (Hiltaba Suite)
K-feldspar Quartz Plagioclase Biotite Opaques, Zircon Muscovite	25% 40% 10% 5% 5%	Distinctive cross-hatching -> microcline Very weak undulose extinction

This sample is virtually unaltered, undeformed and not at all recrystallised. It is equigranular, and exhibits classic igneous textures (embayments, asymmetric triple junctions etc).

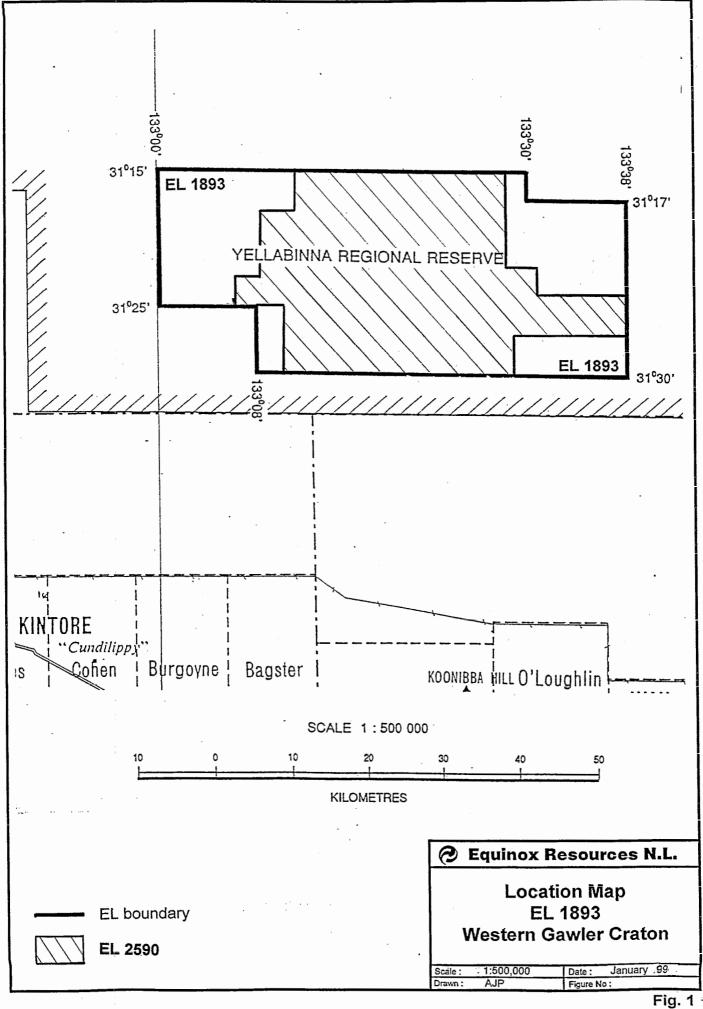
POON54	Medium gr	rained foliated granite (?Early Proterozoic granite gneiss?)
K-feldspar Quartz	25% 50%	Strong undulose extinction
Plagioclase	25%	Strong undulose extinction
Biotite	<5%	

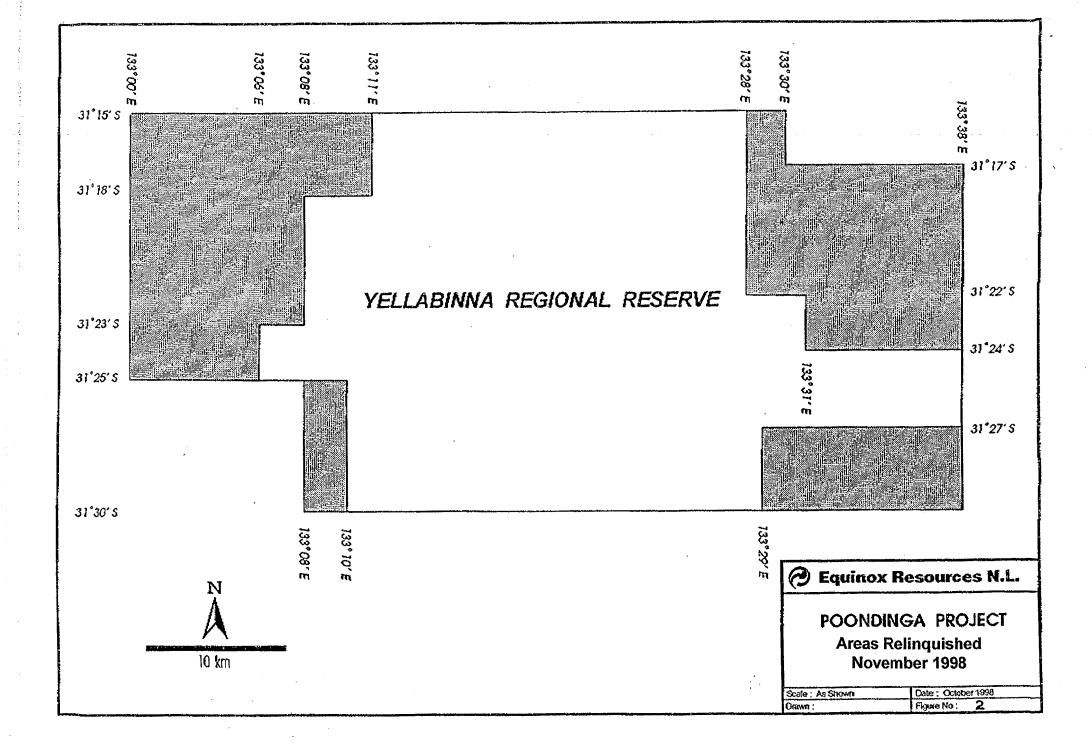
This sample is very leucocratic, granoblastic (but not equigranular) and exhibits recrystallisation of felsic phases (especially quartz). Roughly 50% of the sample is granular, fine grained recrystallisation product. The foliation is very weak in thin section due to the low mica content.

POON55	Medium grained foliated granite (?Early Proterozoic granite gneis	(2)
PUUNOO	nedium diamed ionaled diame (?cany Proleiozoic diame dineis	5:1

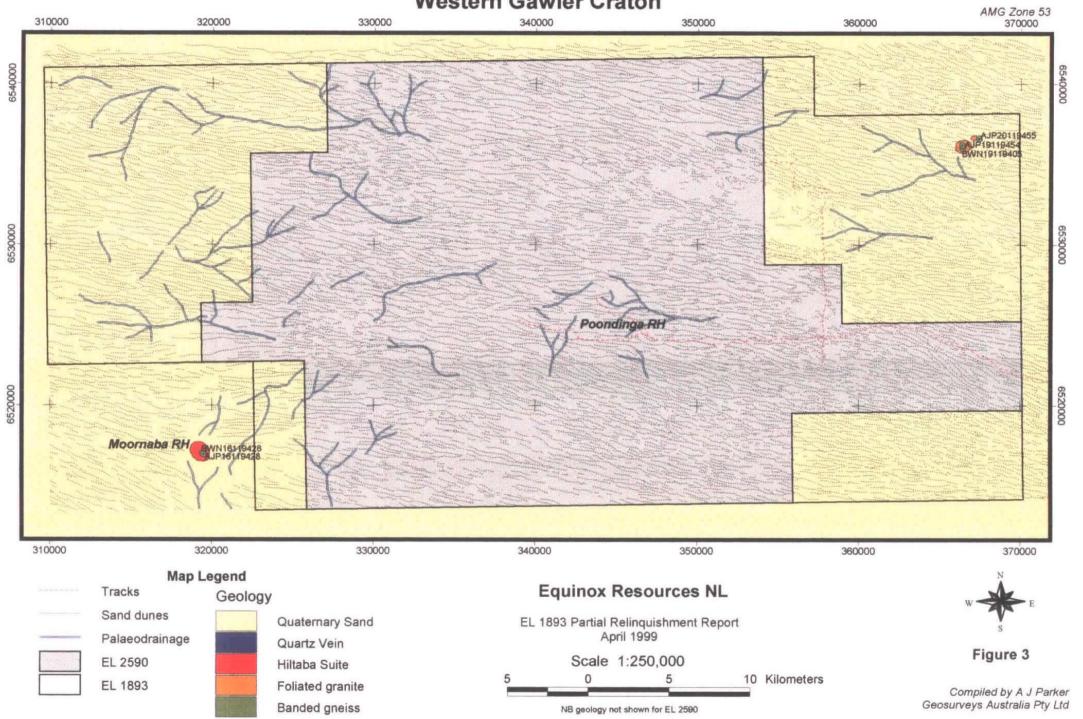
K-feldspar Quartz	30% 50%	Cross-hatching -> microcline Very strong undulose extinction
Hornblende	5%	Brown
Biotite	10%	Forms mica "fish"
Opaques	5%	

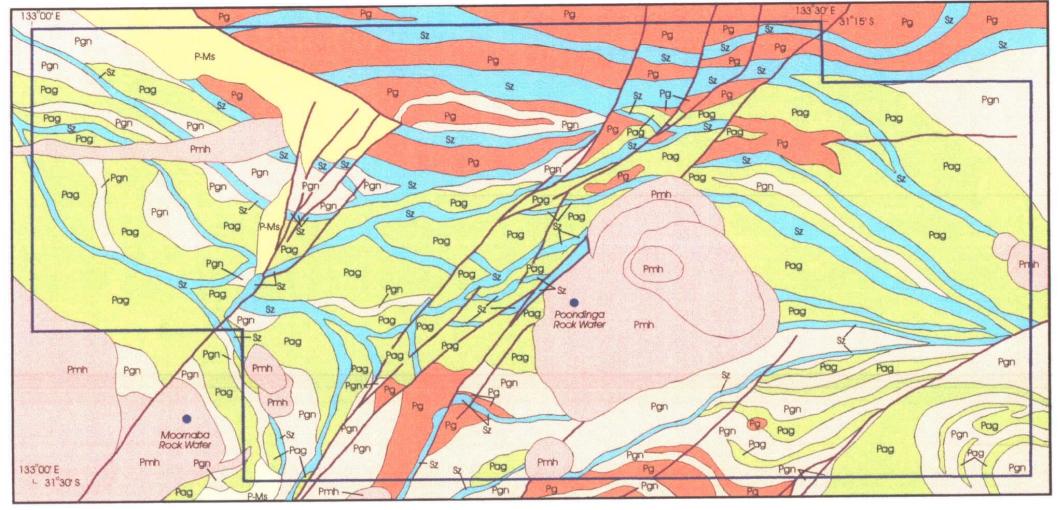
The sample is largely recrystallised, but relict igneous textures can be observed. The foliation is defined by alignment of micas and hornblende, and the micas often form "fish". Due to the recrystallisation, the sample is not equigranular (although both igneous and recrystallised phases are independently equigranular).





## Poondinga Region Geological Map Western Gawler Craton





#### REFERENCE

P-Ms Sediments in localised troughs

Pmh Hiltaba Suite Granites

Pg Foliated and Unfoliated Granitoids

Pgn Quartzo Feldspathic Gneiss

Pag Mafic Gneiss

Standard Zone

Fault Zone

Equinox Resources N.L. EL 1893 Tenement Boundary

#### **EQUINOX RESOURCES NL**

## REGIONAL SOLID GEOLOGY AEROMAGNETIC INTERPRETATION

POONDINGA REGION WESTERN GAWLER CRATON

Interpretation by R J Hammond & A J Parker December 1993

> Compiled by Geosurveys Australia Pty Ltd April 1999

