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DEPARTMENT OF MINES  
SOUTH AUSTRALIA

PROGRESS OF MAPPING IN THE OLARY REGION

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<u>CONTENTS</u>	<u>PAGE</u>
ABSTRACT	1
INTRODUCTION	2
SEDIMENTARY ROCKS	2
IGNEOUS ROCKS	9
STRUCTURE	12
METAMORPHISM	13
ECONOMIC GEOLOGY	14
CONCLUSIONS	15
REFERENCES	15

FIGURES

<u>Plan No.</u>	<u>Title</u>	<u>Scale</u>
70-63	Geological sketch plan	1:250,000

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ABSTRACT

Between 1967 and 1969 preliminary mapping of about 225 days duration has covered about five-twelfths of the OLARY 1:250,000 area, mainly in the south.

Oldest rocks of the Proterozoic Adelaide System (overlying the Willyama Complex) are strongly folded conglomerates in the Mutooroo region, probably equivalent to the Rhynie Sandstone of the Burra Group. Siltstones, dolomite rocks and quartzite of the Burra Group are overlain unconformably by the Appila Tillite at the base of the Umberatana Group. This is succeeded by the "Benda Siltstone", in places containing haematite siltstones of the Braemar Iron Formation, then unconformably overlain by the Willyerpa Quartzite. The youngest Adelaidean formation is the Wonoka Formation in the Wilpena Group.

The Anabama Granite with associated greisen and acid and intermediate dyke rocks extends over about 36 miles in a northeasterly direction and appears to be largely post-kinematic and of Lower Palaeozoic age.

Younger deposits include minor Tertiary sandstone, ferricrete and silcrete in the south-east, Pleistocene Blanchetown Clay, Telford Gravel, calcrete, Pooraka Formation and Loveday Soil.

Tectonism began in the Precambrian and the main Lower Palaeozoic movement produced folds trending east-northeasterly with steep axial surfaces. There was probably more than one phase of folding.

Metamorphism is generally of the biotite zone, but locally near the Anabama Granite andalusite, amphibole and pyroxene developed.



## INTRODUCTION

The present programme of mapping in the OLARY region commenced in July, 1967. Activities have not been continuous, and to December, 1969, preliminary mapping has been completed for an equivalent of five one-mile areas involving about 225 days of actual mapping. Status of one-mile areas worked in is as follows:-

Yunta completed (B.G. Forbes)

Winnininnie 80 percent (J.N. Cramsie): report available.

Oakvale completed (R.A. Callen): report available.

Mutooroo completed (A.F. Williams)

Ballara 10 percent (R.A. Callen)

Wadnaminga completed (B.G. Forbes)

Olary 30 percent (A.L. Currie)

Manunda 20 percent (B.G. Forbes).

This report will briefly summarize information gathered as a result of the above mapping within areas of Adelaide System and younger rocks.

Petrological work, mainly descriptions of metamorphic and igneous rocks, has been carried out by Mrs. S. Whitehead and Mr. D. Smale of AMDEL.

## SEDIMENTARY ROCKS

### Burra Group

Oldest rocks within the Adelaide System so far mapped are interbedded conglomerate, coarse-grained arkose

and siltstone in the lower part of the Burra Group (unit Pb1 of the accompanying plan) in the Mutooroo region. The coarse-grained beds are overlain by greyish phyllitic siltstone with minor dolomite and are possibly equivalent to the Rhynie Sandstone.

Rocks higher in the Burra Group (unit Pb2) occur in anticlinal structures in the Wadnaminga area. Here the lowermost sequence is composed of alternating feldspathic quartzite, grey phyllite and dark grey dolomite. Quartzite beds are flaggy to medium-bedded, laminated and mainly fine-grained. Minimum thickness of this sequence is about 2,000 feet; it is tentatively equated with the Cradock Quartzite.

The ?Cradock Quartzite is overlain by a thick succession of interbedded siltstone, dolomite rock and quartzite (unit 3). The lower part of this is composed of predominantly fine-grained grey siltstones, slates and dolomite rock and may be equivalent to the Saddleworth Formation; total thickness is of the order of 9000 feet. These are succeeded by coarser-grained laminated dolomitic siltstones and sandstones, the base of which is probably the base of the Belair Sub-Group (Thomson, 1969, pp.61-62) and may be seen in old workings of the Wadnaminga gold field near Virginia Well. Higher in this sequence is a zone of lenticular quartzite beds which is an extension of the quartzite bed on Manunda chosen as the basal unit of the Sturtian (Mirams, 1962, pp.5-7). The quartzite zone is

absent in the Virginia Well-Taltabooka region but reappears northeast of Giles Nob. The rocks of the Belair Sub-Group in Wadnaminga are described in more detail in an unpublished report (Forbes, 1969, pp.38-40, units 4 to 46); total thickness is about 6,000 feet.

The few observations that have been made of ripple marks suggest sediment transport in a northwesterly or southeasterly direction.

Mirams (1962, p.10) has mapped on Manunda sandstone dykes in the lower part of the Belair Sub-Group (and also in the Wilyerpa Quartzite). Sandstone dykes may be expected elsewhere on OLARY but have not yet been observed.

#### Umberatana Group

The lowermost formation in the Umberatana Group, the Appila Tillite, overlies in places a surface of angular unconformity representing a period of moderate folding and erosion of the Burra Group. The Appila Tillite varies in thickness from a few feet on Wadnaminga to about 10,000 feet on Manunda and is composed commonly of a grey pebbly and bouldery sandy siltstone, sometimes accompanied by pebbly quartzite, quartzite, siltstone, dolomite rock and hematitic tillite and siltstone (Braemar Iron Formation).

The "Benda Siltstone" appears to conformably overlie the Appila Tillite and is composed of calcareous siltstone, commonly dark in colour, limestone, dolomite, sandstone, minor

boulder beds and, notably in Manunda, hematite siltstone (Braemar Iron Formation). Maximum thickness is about 3,000 feet. The term "Benda Siltstone" is proposed because although this sequence corresponds approximately to the Braemar Iron Formation it does not always carry ironstone and the Braemar Iron Formation in its type section incorporates the upper part of the Appila Tillite.

Above the "Benda Siltstone" is a fairly persistent brownish-weathering dolomite bed, sometimes pebbly or bouldery, which locally forms the base of the Wilyerpa Quartzite. In places this dolomite lies directly upon the Burra Group and it is evident that prior to its deposition there was some folding, faulting and erosion giving rise to an angular unconformity. The Wilyerpa Quartzite is perhaps more appropriate as Wilyerpa "Formation" since it is composed of greenish siltstones, dolomite, fine-grained quartzites and pebbly or bouldery beds. The siltstones cover an extensive area of south-west Manunda from south-west to northeast of "Tiverton" O.S. where they reach a thickness of about 3,000 feet. North of "Oak Park" the Wilyerpa Quartzite is only about 200 feet thick and directly overlies siltstones and quartzites, probably of the Burra Group.

The Tindelpina Shale Member of the Tapley Hill Formation (5,600 feet) overlies the Wilyerpa Quartzite from Olary to Manunda. Following the Tapley Hill Formation is the Tarcowie Siltstone (2,000 feet) best represented on Yunta and Winnininnie by grey sandy laminated siltstones. This formation

is also probably present west of "Wadnaminga" but appears to thin out southwest of "Benda".

Overlying the Tarcowie Siltstone is the Waukaringa Siltstone Member (4,000 feet; defined as a member of the Tarcowie Siltstone) comprising grey laminated calcareous siltstones and limestone. This may be seen along the Barrier Highway between Yunta and Mannahill. It is just as distinguishable from the Tarcowie Siltstone as is the Tarcowie Siltstone from the Tapley Hill Formation, and could therefore be considered a formation in its own right.

It is suggested here that the entire upper glacial sequence, which succeeds the Waukaringa Siltstone, be referred to as the Pepuarta Tillite, since pebbly and bouldery beds are incorporated somewhere or other in each of the four upper glacial units.

As used on the ORROROO geological map, these units are:-

(uppermost) unnamed siltstones and pebbly siltstone (1000 feet)

Grampus Quartzite (150 feet)

Pepuarta Tillite (600 feet)

(lowermost) Gumbowie Arkose Member of Pepuarta Tillite (300 feet).

The Grampus Quartzite is a discontinuous zone of lenticular quartzite beds within the Pepuarta Tillite and could well be regarded as a member of the Pepuarta Tillite. Much of the Pepuarta Tillite is massive dark brownish-weathering calcareous

pale grey siltstone - a rock-type favoured by past aborigines for carvings.

### Wilpena Group

The basal formation of the Wilpena Group is a thin dolomite member of the Nuccaleena Formation or the lateral equivalent of this, red-brownish weathering feldspathic quartzites, up to 400 feet thick often with interbedded dolomite. The quartzites are very likely the Seacliff Sandstone Member of the Brachina Formation (Thomson, 1966, pp.7-9). During mapping the Seacliff Sandstone Member has occasionally been confused with the Grampus Quartzite.

In many places there then succeed greenish siltstones of the Ulupa Siltstone (4,000 feet) but on Winnininnie (Cramsie, 1968, p.16) and elsewhere there is a thin sequence of grey siltstones which may eventually merit separate recognition.

The most extensive exposures of Wonoka Formation are in southwest Yunta where interbedded flaggy limestone, calcareous siltstones and sandstone discordantly overlie the Ulupa Siltstone. Discordance of attitude is probably related to slumping and brecciation evident at the junction of the two formations. The effects are similar to those described by Coats (1964, pp.1, 2) in the Flinders Ranges where he postulates the formation of discordant basins of Wonoka Formation through slumping.

### Tertiary

Patches of silcrete and some sandstone and ferricrete, probably of early to middle Tertiary age, have been mapped in southeast Oakvale. Mirams (1962, p.11) reports similar deposits on Manunda. The sandstone is chiefly white and clayey where it is not silicified or ferruginized; grain size is variable.

### Pleistocene

Older Pleistocene deposits are not extensively exposed: the Blanchetown Clay is represented by grey, brownish and pinkish mottled clays in a few creek banks and dams on Mutooroo and Manunda. On Manunda Creek west of "Manunda" there is a small exposure of fine-grained laminated sandstone which may be equivalent to the Blanchetown Clay. Some dams on Mutooroo also expose fragments of hard pinkish-brown limestone which are possibly the Bungunnia Limestone.

Much more extensive is a rubbly pale brownish calcrete in Bakara Soil, which is sometimes associated with the Telford Gravel (particularly near large water courses). The Telford Gravel is composed of rounded pebbles and boulders up to 20cm. in diameter. These may form a conglomerate cemented by calcrete. The calcrete and Telford Gravel overlies the Blanchetown Clay and are overlain by extensive brownish clays and gravels of the Pooraka Formation which frequently contains the calcareous mottling of the Loveday Soil. This may be seen in many creek banks.

### Recent

Deposits of the Recent include gravels and sands of present-day creek channels, veneers of silt and gravels and reddish dune sands of Oakvale and Mutooroo. Dunes trend a little north of west.

### IGNEOUS ROCKS

The main igneous mass is the Anabama Granite which extends from eastern Manunda to northeastern Wadnaminga over a distance of 36 miles. Lack of continuous outcrop admits the possibility that the granite is not continuous over this distance. It trends parallel to regional fold axes and occupies a synclinal zone within the Appila Tillite. Maximum width is about 7 miles. Grain size varies from about 2mm. to 3cm. and granitic rock-types include biotite granite, adamellite, granodiorite and tonalite.

The rock is commonly pale grey and outcrops as tors or whalebacks in areas of grus. Sheet weathering is commonly displayed. There seems to be no systematic variation in grain-size or composition. Foreign inclusions are rarely seen within the granite.

The margin of the granite has not been seen, but adjacent to it there are commonly biotitic or quartzose hornfelses or a zone of gneissic quartz-muscovite rock.

North of "Dlorah Downs" there is a separate small intrusion of leucogranite. Giles Nob also represents a minor separate intrusion, but this is largely altered to a



quartz-muscovite rock or greisen. Westsouthwest of Anabama Hill there is a small intrusion of biotite adamellite within Appila Tillite.

Dykes, joints and veins within the granite show little preferred orientation. In some outcrops there seems to be a preferred orientations of feldspar crystals and elongation of outcrop in a northeasterly direction, but this is based on only four observations. For nine observations, gneissosity shows a moderate preferred orientation in an east-west direction, with steep dip. Obvious penetrative linear features are not common in outcrop.

Dykes of aplite and pegmatite are common within and near the granite; they vary from a few inches to a few feet in width.

Pale grey dyke rocks of acid composition are met with up to 4 miles from the granite and often show partly cross-cutting relationships with the Adelaide System country rock. Rocks that have been described range in composition from rhyolite to dacite, are largely aphanitic but sometimes contain visible plagioclase, and less commonly, quartz phenocrysts up to 2mm. in length. A pale grey laminated flinty rock west of Boucaut West Dam on Anabama may also belong to this group. At least some of these dykes appear to be post-granite in age since some occur within the Anabama Granite.

Medium to dark grey porphyry dykes have been noted near Anabama Hill; these rocks are coarser grained and more

basic in composition than the pale dyke rocks. One such rock is a porphyritic microdiorite while another has a similar composition and appearance but is richer in quartz (porphyritic rhyodacite). Plagioclase phenocrysts up to 2mm. are common. One such dyke cuts and displaces a pegmatite dyke within the Anabama Granite.

A third group of dyke or sill rocks is pale to medium greenish-grey in colour; one of these dykes cuts the Anabama Granite. One specimen has been described as a porphyritic micromonzonite which occurs as a sill southeast of "Netley Gap".

A muscovite-quartz rock or greisen and granite and dyke rocks containing much secondary muscovite appear to represent a late stage alteration by residual fluid in some marginal areas of the granite. Giles Nob, Anabama Hill and isolated hills near Anabama Hill are composed mainly of this rock or muscovitised granite. Less altered igneous rock appears to occupy a lower-lying position in these areas, possibly suggesting nearness to the roof of the intrusion. Large masses of white quartz accompany the greisen in some places.

Phases of igneous activity were thus in the following order: intrusion of granitic rocks, intrusion of pegmatite and at least some other dyke rocks, with some porphyries post-dating pegmatite, alteration by residual fluids. For lack of evidence, it is uncertain whether this late stage alteration was the final activity.

## STRUCTURE

The accompanying generalised geological map indicates the regional structure. As shown by cleavage, axial surfaces of folds are steep and trend on a bearing of about sixty degrees; plunges are variable. The simplest fold structures are the Waroonee and Ulupa Synclines (names used by Binks, 1968, fig.4). North of "Oulnina" there is a syncline displaced to the left. South of these synclines on Manunda and Wadnaminga there is a zone of anticlinal structures (Wadnaminga Anticlinorium of Thomson, 1969) in which also there appears to be a left-handed en echelon effect. There is considerable crushing in the central part of this zone north-east and south-west of "Netley Gap". Northwest of "Netley Gap" there is a sharp kink in the lower boundary of the Wilpena Group on the southeast limb of the Ulupa Syncline. This does not conform to the general pattern of folding and may be an extension of faulting, folding and brecciation northeast of "Oak Park" on Manunda.

There may have been more than one phase of Palaeozoic folding in the region but little evidence has been seen as yet suggesting this. West of Giles Nob (Wadnaminga) cleavage forming axial surfaces of minor folds has been slightly folded. Northeast of "Taltabooka" there are some tight synclines at variance with the main structure, but these may not necessarily represent a subsequent period of folding. Helicitic texture in some porphyroblasts is suggestive of more than one period of folding. Oliver (1969, p.19) reports

crenulation cleavage in Burra Group rocks of the Weekeroo area.

Joints in the metasediments tend either to parallel the bedding or lie normal to bedding. Plotting of just over twenty scattered observations does not show any marked preferred orientation, but for steeply-dipping joints there appears to be some clustering around bearings of 60 to 160 degrees. Strike of joints in the Anabama Granite appears to be dispersed mainly between northeast and southeast.

Some reverse faulting approximately normal to strike took place during deposition of the Appila Tillite and Benda Siltstone. Southeast of "Benda" pre-Wilyerpa Quartzite erosion stripped these formations from the high side of such a fault. There are many other minor normal and reverse faults oriented approximately northnortheast or northwest on Wadnaminga. Southwest of "Teetulpa" (Yunta) the upper glacial beds are closely dissected by strike faults. All of these faults appear to be steeply inclined.

Little work has yet been done on Anabama where Thomson (1969, p.34) has noted the Anabama-Redan fault zone adjacent to an inlier of Willyama Complex at Two Brothers.

#### METAMORPHISM

In the Yunta region, metamorphism appears to have just reached the biotite zone of regional metamorphism. Nearer the Anabama Granite siltstones of the Burra Group become schistose and biotite is more evident. In eastern Wadnaminga there are knotted schists with altered andalusite

or cordierite porphyroblasts enclosing an older foliation.

Petrological evidence suggests that contact metamorphism was superimposed upon the above regional metamorphism. The Appila Tillite near the Anabama Granite is thus composed of hornfelses, some dark and rich in biotite, others lighter coloured and representing metamorphosed impure sandstones and sometimes containing amphibole and clinopyroxene.

North of "Dlorah Downs" tremolite and talc occur in altered quartzites of the Burra Group. This alteration possibly resulted from proximity to the Anabama Granite.

#### ECONOMIC GEOLOGY

During mapping the positions of old copper and gold shows (e.g. Teetulpa and Wadnaminga Goldfields) have been noted. Old copper workings are uncommon within the area so far mapped; minor copper carbonate occurrences have been worked near Giles Nob. Manganese in the form of pyrolusite is associated with carbonate rocks near the margins of synclinal areas southwest of "Panaramatee" and at the minor fold in the base of the Wilpena Group (Nuccaleena Formation) northwest of "Netley Gap".

Groundwater in the region is generally of poor quality and supply; reports are available for "Oulina Park" and "Benda" (Forbes, 1968, 1969b).

## CONCLUSIONS

This report is an incomplete coverage of information gathered during preliminary mapping of OLARY.

Subjects of particular interest have been the "Benda Siltstone" and the presence of the Wilyerpa Quartzite. It is probable these formations are present in other regions, including some already covered by published maps. Although some further knowledge of the Anabama Granite and associated rocks has been gained, adequate coverage of this subject probably requires a specialist project beyond the normal scope of regional mapping. It is hoped that enough field observations will eventually be made to allow comment on such subjects as Precambrian sediment transport directions and phases of Palaeozoic folding.

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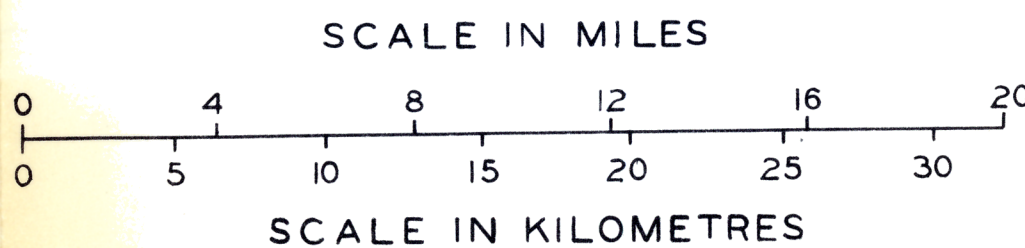
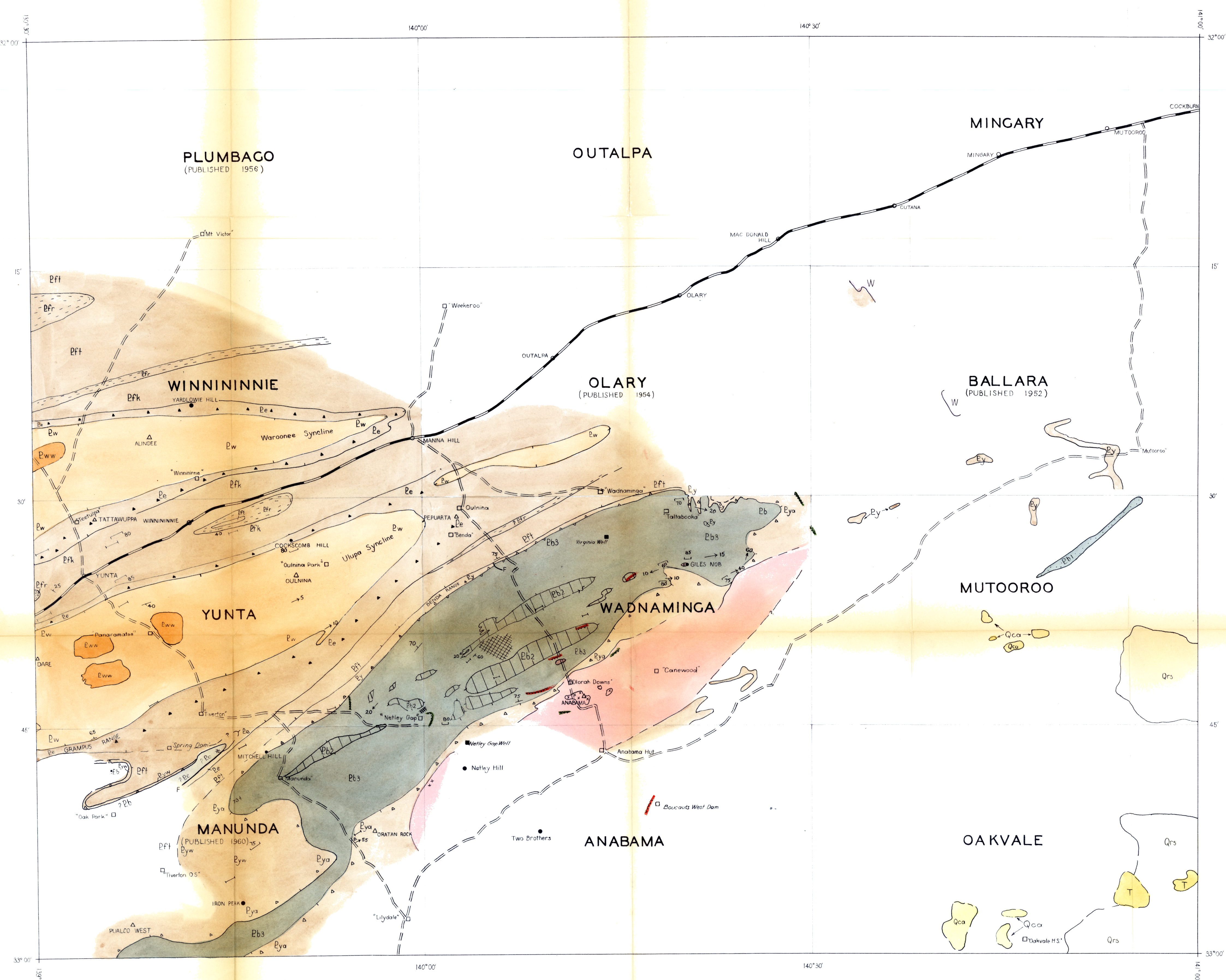
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LEGEND

CAINOZOIC	TERTIARY QUATERNARY	PLEISTOCENE RECENT	Qrs	Reddish sand dunes of the south-east
			Qca	Calcrete (of Bakara Soil) of the south-east: widespread, but not shown, in hard rock areas
			T	Siltcrete and some sandstone
PALEOZOIC	ORDOVICIAN			Intermediate dyke rocks
				Acid dyke rocks
				Quartz-muscovite rock, muscovitised granite
				Anabama Granite
PROTEROZOIC	WILFENA GROUP		Pww	Wonoka Formation: limestone and siltstone often unconformable with Ulupa Siltstone
			Pw	Ulupa Siltstone, underlain by Nuscalteena Formation or equivalent brownish sandstone
	UMBERATIENA GROUP		Pe	Yerlina Subgroup: Pepurata Tillite, including Grampus Quartzite and Gumbowie Arkose Member (at base)
	ADELAIDIAN	FARINA SUB-GROUP	Pfk	Waukaranga Siltstone Member of the Tarcowie Siltstone
			Pfr	Tarcowie Siltstone
			Pft	Tapley Hill Formation
	YUNAMUTANA SUB-GROUP		Py	Wilyerpa Quartzite, "Benda Siltstone", Appila Tillite
			Pb3	Upper siltstones with minor quartzite, dolomite
			Pb2	Quartzite, siltstone, dolomite (? Cradock Quartzite)
	RURIA GROUP		Pb1	Conglomerate, arkose, siltstone (? Rhyndie Sandstone)
			Pc	Sandstone, siltstone, phyllite, dolomite
	WILLYAMUNA Coloured Beds		W	Willyama Complex
				Crush zone, possibly diapiric
	CARPENTARIAN			Cleavage, vertical, inclined
				Fault



Based upon mapping by R.A. Collen, J.N. Cramsie, A.L. Currie, B.G. Forbes, R.C. Mirams, A.F. Williams.

DEPARTMENT OF MINES — SOUTH AUSTRALIA			
OLARY 1:250000 GEOLOGICAL SKETCH PLAN SHOWING AREAS MAPPED 1967-1969			
REGIONAL MAPPING SECTION		Drm. B.G.F.	SCALE : 1:250000
		Ted. S.L.T.	70-63
		Ckd. L.V.W.	F.G.
		Exd.	DATE : 18 MARCH 1970
Director of Mines			