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ABSTRACT

New geological mapping of the Oberon 1:100 000 sheet area, forming part of a joint National Geoscience Mapping Accord project between AGSO and the NSW Department of Minerals and Energy, has highlighted a number of significant changes to previous work in the area. This new interpretation was accomplished using high-resolution airborne magnetic and gamma-ray spectrometric data as an essential supplement to geological field-work carried out in 1991/92. As a result of this investigation the principal Palaeozoic groups and formations have been further subdivided and the Triangle Group has been renamed Adaminaby Group, because the nominated type-section for the former was found to contain rocks belonging to the Rockley Volcanics. The new mapping has identified a considerably larger area of the potentially gold-bearing Rockley Volcanics which were previously mapped as Triangle Group. Five distinct mappable horizons were recognized in the Rockley Volcanics together with additional outcrops of ultramafic rocks. Ten subunits replace the previous three broadly defined subunits in the Campbells/Kildrummie Group. Concentric zones of granite and leucogranite were recognized in the previously undifferentiated Tarana, Bathurst and Oberon Granites. A monzodiorite/quartz porphyry complex identified south of Black Springs may be a prospective target for Au/Cu mineralization.

INTRODUCTION

This investigation forms part of the Lachlan Fold Belt Project undertaken jointly by the Australian Geological Survey Organisatiion and the NSW Department of Minerals and Energy. The National Geoscience Mapping Accord, endorsed by the Australian (now Australian and New Zealand) Minerals and Energy Council in August 1990 is a joint Commonwealth/State/Territory initiative to produce, using modern technology, a new generation of geoscientific maps, data sets, and other information of strategically important regions of Australia over the next 20 years.

In New South Wales the Mapping Accord Program during 1991-1993 focussed on completing a new edition of the Bathurst 1:250 000 geological map, with attached geophysical digital maps, enhanced Landsat images, and point databases (geographically positioned mineral deposit, lithology, geochemical, structural, gamma-ray spectrometry and magnetic susceptibility databases). AGSO took responsibility for the Blayney and Oberon 1:100 000 Sheet areas and the NSW Geological Survey undertook the completion of the other four 1:100 000 sheets in the Bathurst sheet area.

This report summarizes the geology of the Oberon 1:100 000 sheet area[1], and presents data relevant to the investigation. More detailed explanatory notes (Stuart-Smith & Wallace, in prep.), will be published in 1994 to accompany the 1:100 000 geological map.

Field mapping of OBERON (Fig.1), totalling 24 man-weeks, was carried out in 1991/1992 by 2 geologists (P.G. Stuart-Smith and D.A. Wallace). Geological field observations were recorded in notebooks specifically designed for the NGMA program. Preliminary interpretations of the geological structure of the area, incorporating interpretation of gamma-ray spectrometry and magnetic data, were drawn on 1:25 000-scale colour aerial photographs, from which compilation sheets were prepared using the 1:25 000 topographic maps issued by the Central Mapping Authority of NSW as bases. The preliminary interpretations were refined in the light of previous and current work[2]. The 1:25 000 compilation map sheets were subsequently scanned and processed by ARC/INFO as separate GIS coverages, each with distinct geological or geophysical attributes.

REGIONAL GEOLOGY

OBERON lies within the Lachlan Geosyncline (Fig. 2), forming part of a wide belt of

[1]The 'Oberon 1:100 000 sheet area' will henceforth be referred to as OBERON

[2]An extensive bibliography of all relevant university theses, and unpublished open file company reports held by the NSW Department of Minerals and Energy is given in Appendix 1

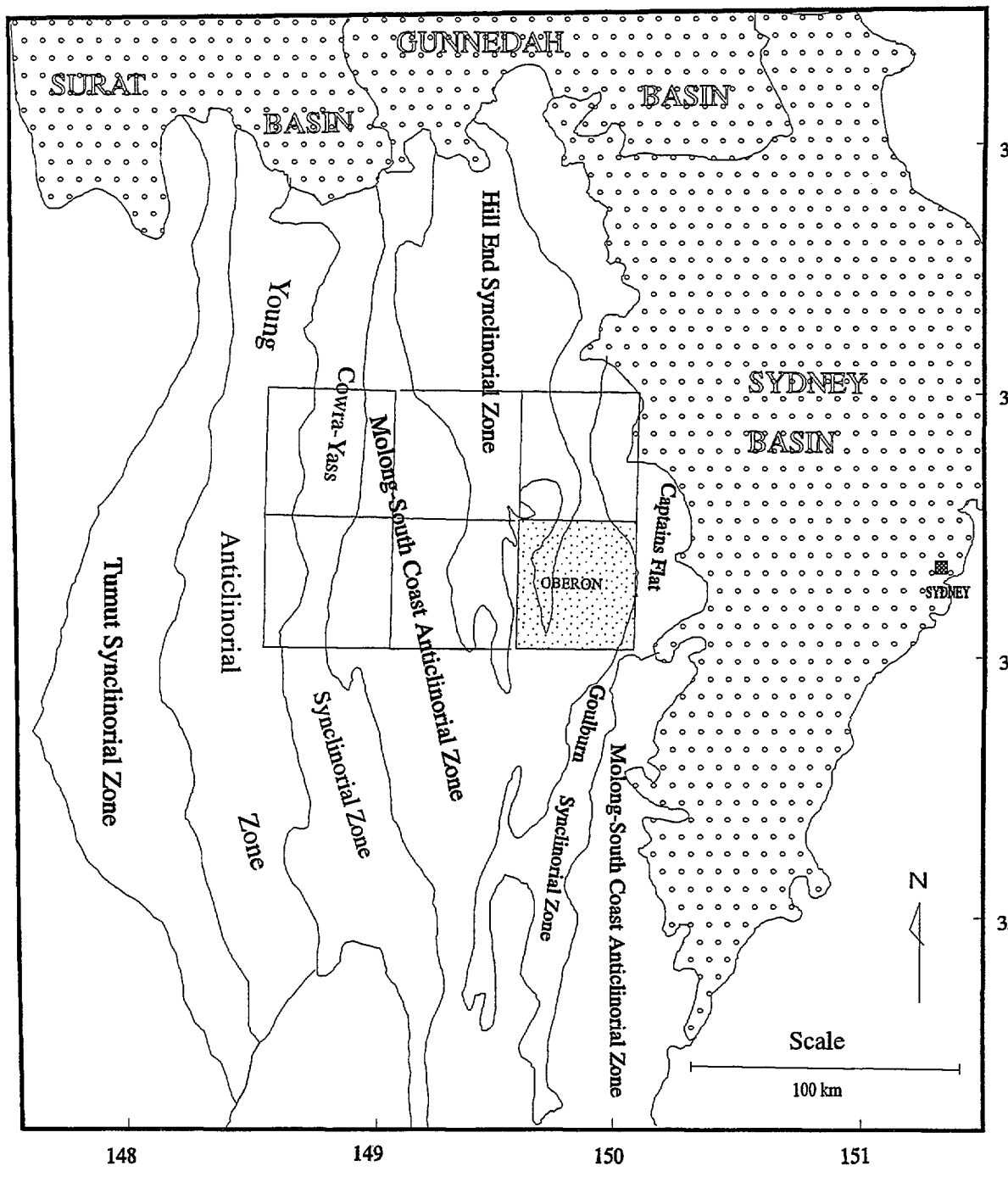


Figure 1. Locality map of OBERON and regional setting (adapted from Scheibner, 1985)

folded Ordovician-to-Devonian sediments and volcanics, known as the Hill End Synclinorial Zone (Packham, 1968b). The HSZ is bounded by the Molong-South Coast Anticlinorial Zone to the east, west, and south, and is overlain by the Great Australian Basin to the north. A more detailed account of the regional geological setting and tectonic history is given by Packham (1969) and Scheibner (1987, 1989)

The oldest rocks in the region are Early to Late Ordovician quartz-rich arenites (greywackes), siltstones, grey slates, and carbonaceous slates of the Adaminaby Group[3]. These sediments are overlain by and interfinger with the Rockley Volcanics, an interbedded sequence of shallow to deep marine mafic and ultramafic volcanic rocks, volcaniclastic rocks and chert. In places, subvolcanic shoshonitic mafic to felsic plutons intrude comagmatic lavas, and are locally associated with copper-gold mineralisation. The Rockley Volcanics now form part of the *Cabonne Group*, a new group which incorporates other Ordovician volcanic and volcanoclastic formations in the region.

Locally, west of the Copperhania Fault, both Ordovician groups were deformed and metamorphosed prior to Late Silurian felsic igneous activity and sedimentation.

Silurian to Devonian strata of the 'Hill End Trough' sequence unconformably overlie the Ordovician rocks. The stratigraphy and development of the trough have been described by Packham (1969). East of the Copperhannia Fault, where not affected by later faulting, the base of the Silurian strata is a low-angle unconformity. In the Bathurst area the Campbells/Kildrummie Group forms the base of the trough sequence and is characterised by local dacitic or rhyolitic volcanic piles which interfinger laterally with shallow-marine limestone and deeper-water clastic sediments. The clastic sediments include: feldspathic quartz arenite, siltstone, shale, conglomerate, felsic volcanolithic arenite, and rhyolitic breccia, together with minor mafic volcanics. Rhyolite dykes and minor granite plutons, intruding Ordovician strata in the vicinity of Silurian felsic volcanic piles, probably represent Late Silurian subvolcanic intrusions.

The Crudine Group, conformably overlying the Campbells/Kildrummie Group, represents continuing sedimentation within the trough from the latest Silurian through to the Early Devonian. The group comprises basal fine to coarse-grained feldspathic arenite and minor interbedded slate and tuff overlain by intermediate to felsic lavas and volcaniclastic rocks. Middle Devonian shallow-marine quartz-rich clastic sediments, minor limestone and later redbeds conformably overlie the Campbells/Kildrummie Group, representing the youngest

[3]As the type-section nominated for the Triangle Group (Stanton, 1956) has been found to contain rocks belonging to the Rockley Volcanics the Triangle Group has been renamed as the Adaminaby Group

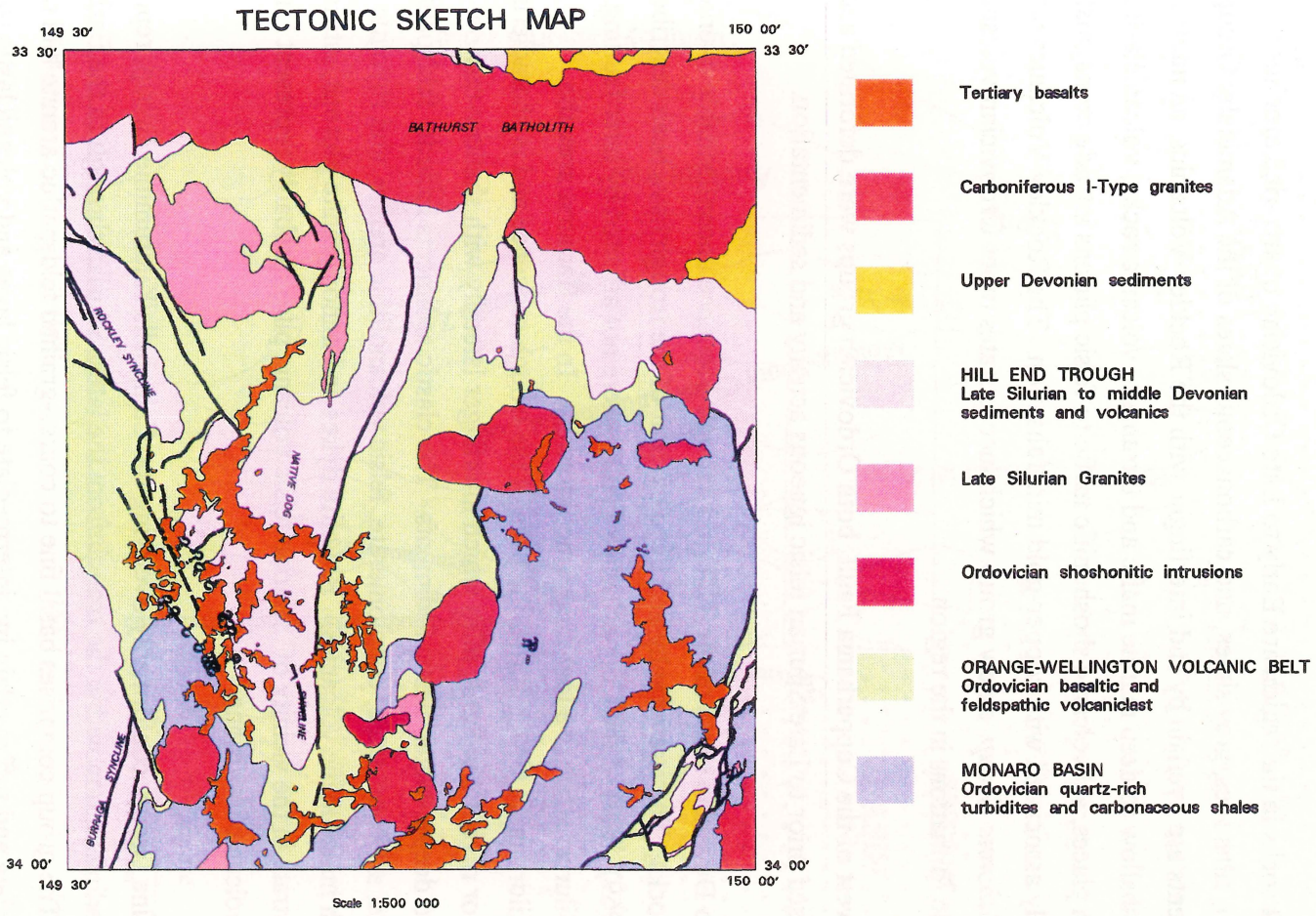


Figure 2. Generalised geology of the Oberon 1:100 000 Sheet area

strata of the Hill End Trough.

A regionally extensive east-west compressive deformation associated with lower to upper greenschist-grade regional metamorphism (the Tabberabberan Orogeny) affected Ordovician, Silurian and Devonian strata alike, forming meridional open to tight folds and a penetrative subvertical axial-plane cleavage. Folding was associated with reactivation of the Copperhannia Fault and formation of the Wiagdon Fault and numerous other unamed faults. Movement on these zones resulted in overthrusting of Ordovician rocks over younger strata and locally complex polyphase deformation. In the Oberon area the regional north-trending synclines such as the Rockley Syncline, the Burraga Syncline, and the Native Dog Syncline formed during this event.

Extensive fractionated I-type granite plutons of Carboniferous age, such as the Bathurst Granite, intruded the deformed Devonian and older rocks with mostly discordant contacts. Widespread contact metamorphic aureoles typically surround the plutons and contain a range of hydrothermally related metalliferous deposits.

The remainder of the Phanerozoic was predominantly a period of erosion, except for slight overlaps of Sydney Basin and Oxley Basin sedimentation over the HSZ and deposition of Great Australian Basin sediments in the north. Erosion continued through to the Tertiary, when alkali olivine basalts were widely extruded from the Late Eocene to the Miocene, mainly as valley-fills along river courses.

North-trending dolerite dyke swarms of probable Carboniferous age intruding both granites and metamorphic rocks may be related to the Tertiary magmatism.

GEOLOGY OF OBERON

Most of OBERON forms a plateau lying about 1200m above sea level, straddling the divide between the Macquarie and Abercrombie drainage systems. The plateau has a mature upland topography, which developed as a peneplain in the late Cretaceous to Early Tertiary.

The generalised geology of OBERON is shown in Fig. 3. Previous work on the Oberon area, synthesised in the 1st edition of the Bathurst 1:250 000 Sheet (Packham, 1968), included mainly the results of mapping carried out in the 1950s and early 1960s by staff and students of the Sydney University Geology Department. Packham (1969) summarised the geology and Picket (1982) revised and discussed in more detail the Silurian stratigraphy. Work by universities and exploration companies since Packham's (1969) synthesis and the current NGMA program have substantially modified both the Ordovician and Silurian stratigraphy. A

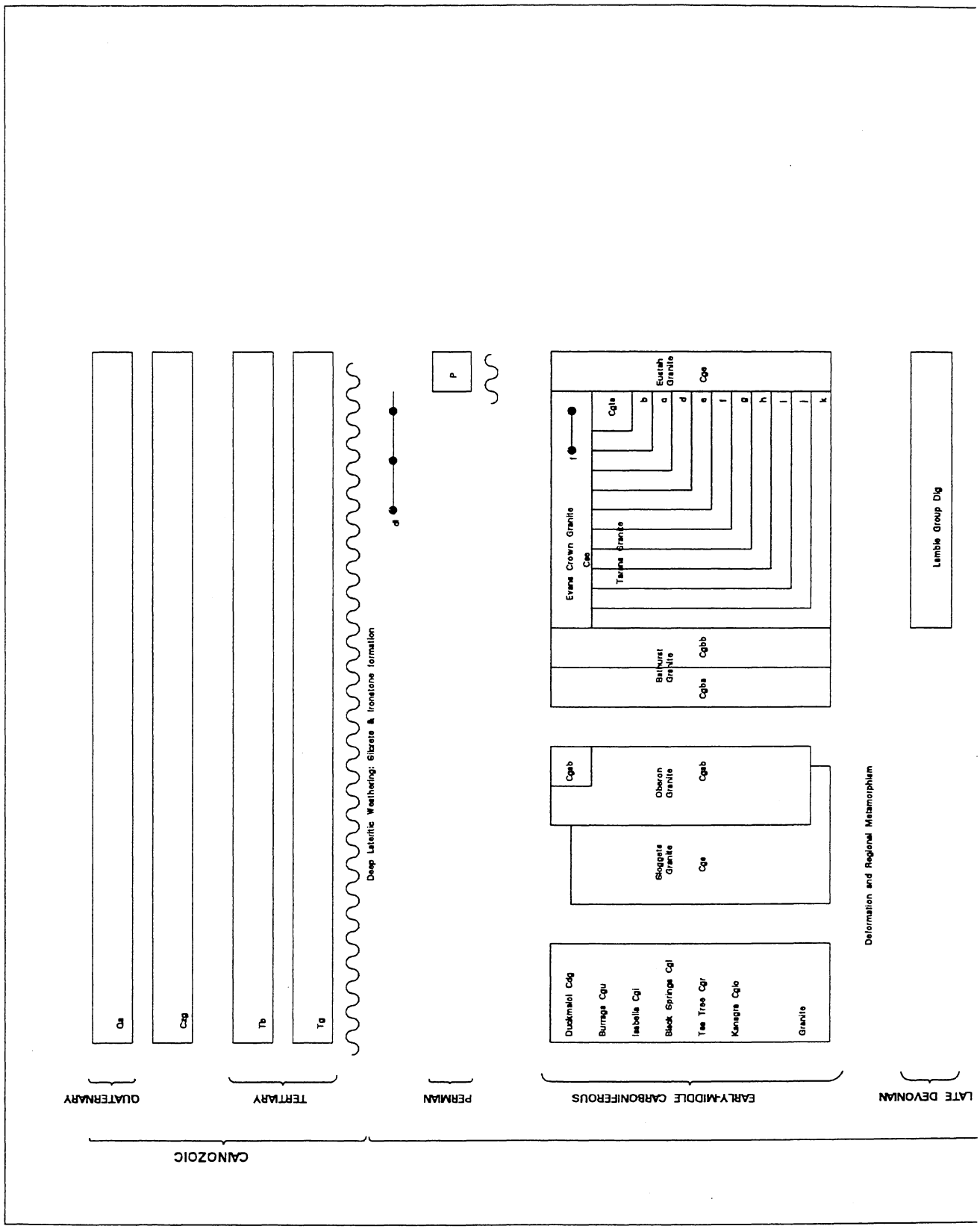
summary of stratigraphy is given in Table 1 and diagrammatic relationships are shown in Figure 4. The oldest rocks in OBERON are quartz-rich flysch deposits of the Ordovician Adaminaby Group which are overlain by the extensive Middle-to-Late Ordovician mafic/ultramafic volcaniclastic and chert horizons of the Rockley Volcanics. The Adaminaby Group crops out in the cores of two regional anticlinorial zones in the southeastern and southwestern parts of the area. The Rockley Volcanics are more extensive, and occupy most of the intervening synclinorial zones.

A conformable sequence of Late Silurian to Early Devonian shallow-marine to deeper water sediments of the Campbells/Kildrummie and Crudine Groups unconformably overlies the Rockley Volcanics in three major north-trending synclines: the Native Dog, Burraga, and Rockley Synclines; and in a faulted belt along the eastern margin of the sheet area (Fig.3). Major units present in the Campbells/Kildrummie Group include: basal submarine fan deposits of the Fosters Creek Conglomerate and the Karawina Formation; a felsic volcanic complex - the Vale Creek Volcanics; the shallow-marine reefal Kildrummie and Hollanders Formations; and the Campbells Formation, a laterally extensive turbiditic unit. The Crudine Group includes the turbiditic Dunchurch Formation, Buckburraga Slate, and Adderley Formation and a laterally equivalent subaerial volcaniclastic unit, the Kowmung Volcanoclastics, in the far southeast. A narrow band of intensely contact metamorphosed Middle Devonian strata (the Winburn Tuff, Limekilns Group, Cunningham Formation, and Lambie Group), conformable with the Crudine Group, crop out only in the north along the margin of the Tarana Granite.

Both the Ordovician and Silurian metasediments and volcanics were folded and regionally metamorphosed to upper greenschist facies during the Late Devonian Tabberaberran Orogeny. Complex reverse faulting and folding occurred locally in the west in a 5 km wide imbricate zone extending from Cow Flat in the northwest to Burraga in the southwest, and in a faulted belt passing through the Tuglow area along the eastern margin of the sheet area.

Numerous extensive, undeformed, fractionated Carboniferous I-type granite plutons, such as the Bathurst and Tarana Granites, intrude the deformed Devonian and older rocks with mostly discordant contacts and widespread contact metamorphic aureoles. Other intrusive rocks in the area include: Late Silurian granite plutons (e.g. Davies Creek Granite); the Early Devonian Drogheda Dolerite; unamed rhyolite and dolerite dykes; and a small body of diorite intruding Cunningham Formation metasediments in the far north.

Hilltop cappings of remnant Tertiary alkali olivine basalt valley-fill flows form an inverted topography and commonly overlie either silcrete, or thin unconsolidated alluvial and colluvial deposits. In places, minor Quaternary alluvial deposits of sand, silt and clay fill the main watercourses and remnant higher terraces of goethitic gravels reflect present-day downcutting



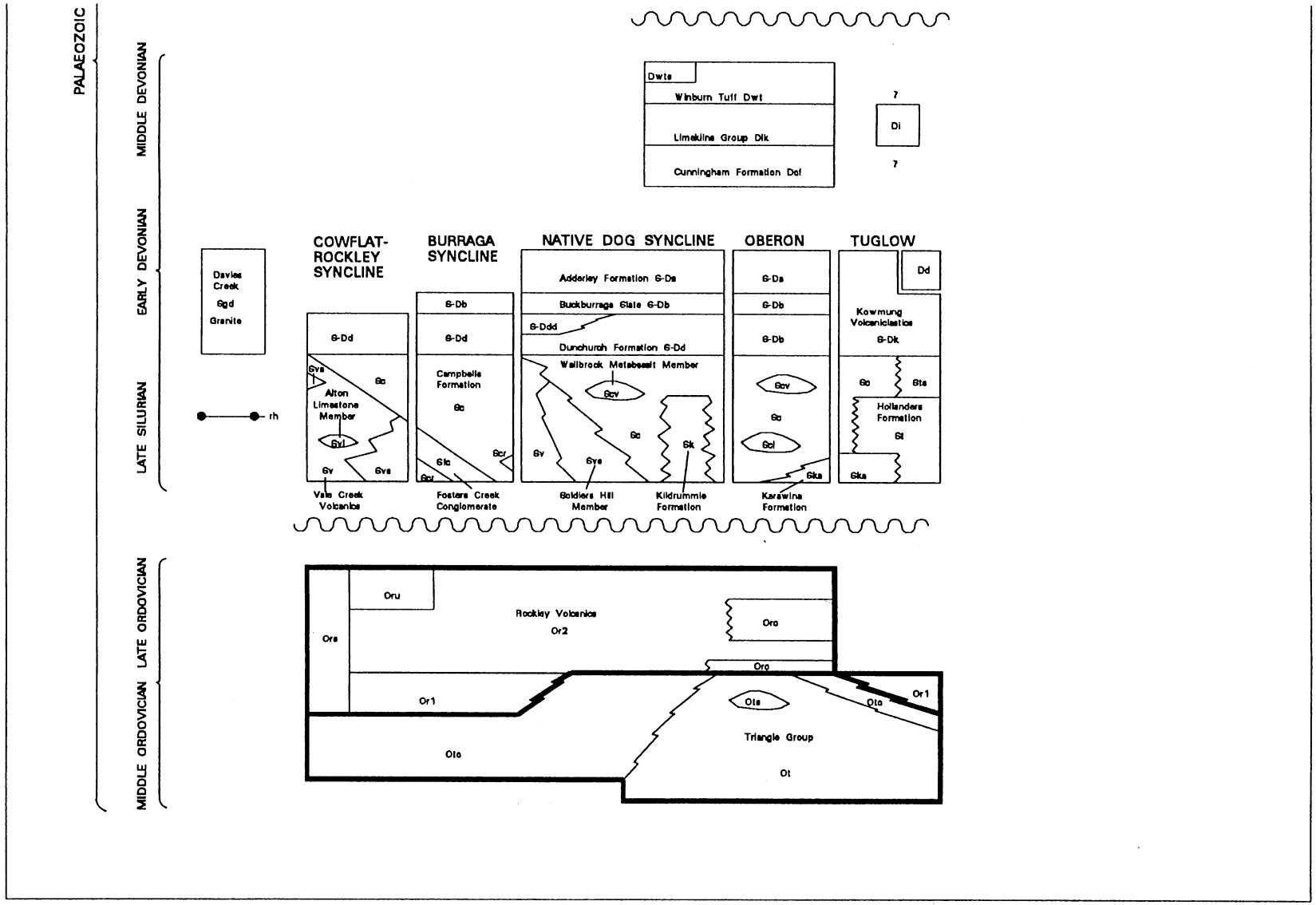
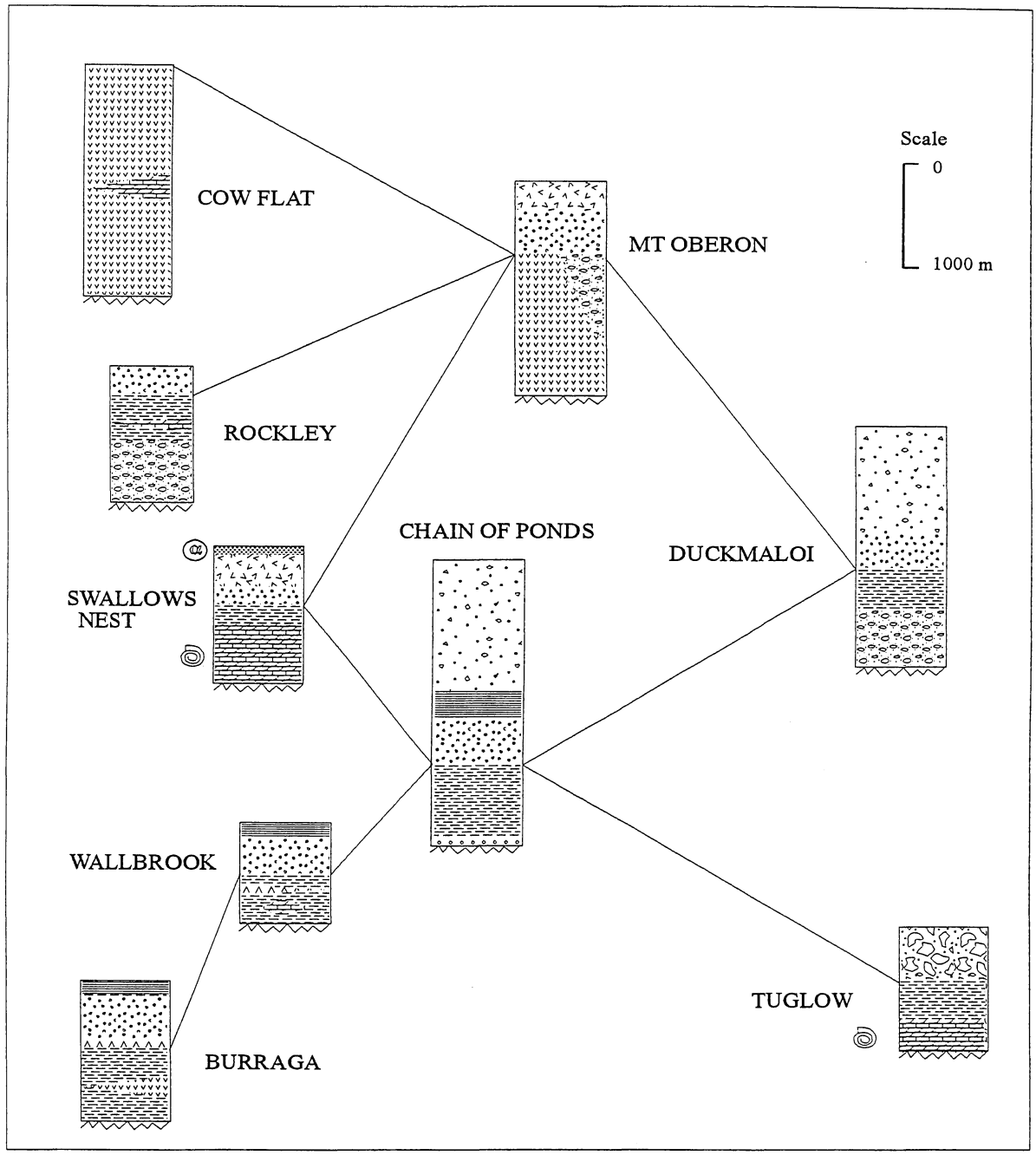


Figure 3. Rock Relationships



KEY - Table 1 refers

SDca Volcanolithic arenite
SDd Ashstone
Scv Metabasalt
Fossil Locality (L.Ludlovian to E. Pridolian)[1]
SDk Felsic ignimbrite
SDd Qtz arenite
Sc Slate, siltst,arenite
Radiometric age date (411 ± 4 Ma)2
SDcb Slate
Scr, Sv Rhyolite lava/volc'clastics
Ska Arenite, conglom'te, siltst
Unconformity
SDdd Dacite
Sk, St Limestone

[1]Pickett (1982)
[2]AGSO unpublished data

Figure 4. Stratigraphic correlations - Late SILURIAN to Early DEVONIAN

of streams and a decrease in water volume since the Tertiary.

Changes in stratigraphy

Changes to the the previous work resulting from the 1991/92 investigation include more detailed subdivision and redefinition of the principal Palaeozoic Groups and Formations in the sheet area. This is particularly significant for the Rockley Volcanics, in which five distinct mappable horizons have been recognized. Likewise, in the Campbells/Kildrummie Group, ten subunits replace the previously three broadly defined subunits, and the Group has been subdivided as five recognizable lithological horizons. The previously undifferentiated Tarana, Bathurst and Oberon Granites, comprise concentric zones of granite and leucogranite, which can be distinguished on the basis of gamma-ray spectrometry, magnetic, petrographic, and geochemical criteria.

The new mapping has defined a considerably larger area of Rockley Volcanics than previously mapped, and redefined their relationship to other units. These volcanics are potentially a source for gold-bearing metamorphic fluids. The volcanics conformably overlie, and are interbedded with quartz-rich turbidites and black mudstones of the Adaminaby Group. Rockley Volcanics are now known to extend around the Davies Creek Granite, where they were previously mapped as Triangle Group, and also to extend south around the Native Dog Syncline, almost to the southern margin of OBERON. They also extend into the Mount Diamond embayment of the Tarana Granite, an area previously mapped as Silurian sedimentary rocks. In addition to the ultramafic members of the Rockley Volcanics recognised near Dog Rocks, a belt of ultramafic rocks has been discovered at Dunns Plains to the west of Rockley. Further outcrops of ultramafic rocks, containing 22% MgO, have been found south of Black Springs, south of Shooters Hill, and near Jeremy south of Burraga. A previously unknown, poorly exposed complex of monzodiorite and quartz porphyry of probable Ordovician and Silurian age respectively adjacent to the Isabella Granite south of Black Springs, may be a prospective exploration target for Au/Cu mineralization.

GEOPHYSICS

High-resolution airborne geophysical data are recognized as an essential basis for the creation of the new generation of geological maps and datasets in mineral provinces studied under the NGMA. A detailed airborne geophysical survey of the area at 250 m line-spacing was carried out by Geoterrex Pty Ltd, and digital gamma-ray spectrometric and magnetic images from this survey were available as hard-copy references during field mapping. Image processing using ERMapper and interpretation of images was carried out during field

TABLE 1
Summary of Stratigraphy

Unit	*Map symbol*	*Description*	*Thick-ness(m)*	*Field relationships*	*Remarks*
CAINOZOIC					
QUATERNARY					
	Qa	Silt, sand, clay and gravel.			Alluvium.
	Czg	Geothitic quartz cobble conglomerate.		Forms raised terraces overlying older rocks near the confluence of the Fish and Campbells Rivers.	Older alluvial terraces.
TERTIARY					
	Tb	Alkali basalt.		Forms resistant hill-top cappings over older rocks.	Remnant lava flows.
	Tg	Unconsolidated polymictic boulder conglomerate, ironstone.		Forms terraces and gently sloping colluvial deposits unconformably overlying deeply weathered Palaeozoic rocks. Overlain by basalt flows.	High level alluvial terraces and colluvium.
PALAEOZOIC					
PERMIAN	P	Polymictic boulder conglomerate.		Unconformably overlies Tarana Granite.	Basal fluviatile deposits.
CARBONIFEROUS					
Evans Crown Granite	Cvg	Pink medium-grained equigranular biotite leucogranite and pink medium-grained porphyritic quartz syenite.		Intrudes Tarana Granite and Devonian metasediments.	Late-stage high level felsic I-type granite
Eustah Granite	Ceg	Pink coarse-grained porphyritic biotite granite and pink medium-grained equigranular leucogranite.		Intrudes Devonian meta-sediments.	I-type granite
Tarana Granite	Ctga	Pink medium-grained equigranular leucogranite.		Intrudes Late Devonian and older rocks. Unconformably overlain by Permian sediments. Intruded by the Evans Crown Granite and numerous dolerite and felsite dykes. Intrudes the Bathurst Granite.	Zoned I-type granite.
	Ctgb	Pink coarse-grained equigranular to seriate biotite granite.			
	Ctgc	Pink and grey coarse-grained biotite hornblende granite.			
	Ctgd	Pink medium-grained equigranular biotite leucogranite.			
	Ctge	Strongly magnetic phase in subsurface.			
	Cgtgf	Pink coarse-grained equigranular biotite granite.			
	Ctgg	Coarse-grained porphyritic hornblende biotite granite.			
	Ctgh	Pink coarse-grained porphyritic biotite granite.			
	Ctgi	Coarse-grained equigranular biotite granite.			
	Ctgj	Coarse-grained porphyritic biotite granite.			
	Ctgk	Coarse-grained equigranular biotite granite.			
Bathurst Granite	Cbga	Coarse-grained porphyritic biotite hornblende granite.		Intrudes Late Silurian and older rocks. Intruded by the Tarana Granite.	Zoned I-type granite.
	Cbgb	Coarse-grained equigranular biotite hornblende granite.			
Oberon Granite	Coga	Pink medium-grained equigranular biotite granite.		Intrudes Ordovician metasediments and the Sloggets Granite.	Zoned I-type granite.
	Cogb	Pinkish grey coarse-grained equigranular biotite hornblende granite.			
Sloggets Granite	Csg	Pink coarse-grained megacrystic biotite granite.		Intrudes Ordovician metasediments. Intruded by the Oberon Granite.	Zoned I-type granite.
Duckmaloi Granite	Cdg	Grey coarse-grained biotite granite.		Intrudes Late Silurian and older metasediments.	I-type granite.
Burraga Granite	Cug	Leucocratic coarse-grained biotite granodiorite.		Intrudes Late Silurian and older metasediments.	I-type granite.
Isabella Granite	Cig	Coarse-grained equigranular to seriate leucogranite.		Intrudes Ordovician metasediments.	I-type granite.
Black Springs Granite	Clg	Grey medium-grained equigranular to seriate hornblende biotite granite.		Intrudes Ordovician metasediments.	I-type granite.
Tea Tree Granite	Crg	Pale pink coarse-grained equigranular biotite granite.		Intrudes Ordovician metasediments.	I-type granite.
Tuglow Granite	Ckg	Pale pink medium-grained hornblende granite.		Intrudes Ordovician metasediments.	I-type granite.
Mount Stromlo Granite	Cmg	Pink fine- to coarse-grained porphyritic biotite granite.		Intrudes Late Silurian and older metasediments.	High-level dyke swarm.
UPPER					
DEVONIAN					
Lambie Group	Dl	Interbedded meta silty to coarse-grained orthoquartzite; siltstone; shale; minor meta volcanilithic arenite and conglomerate near base.	2000	?Unconformably overlies older units. Intruded by Tarana, Evans Crown and Eustah Granites.	Shallow-marine deposits.
		Diorite.		Intrudes the Cunningham Formation.	Small stock possibly related to the Winburn Tuff.
MIDDLE					
DEVONIAN					
Winburn Tuff	Dwts	Laminated meta sandy siltstone.	100		
	Dwt	Meta dacitic lapilli tuff and arenite; polymictic cobble conglomerate; minor meta siltstone.	100	?Conformably overlies Limekilns Group. Intruded by the Tarana Granite. Faulted against the Rockley Volcanics.	
Limekilns Group	Dlk	Skarn.	100	?Conformably overlain by the Limekilns Group and underlain by the Cunningham Formation. Intruded by the Tarana Granite.	
Cunningham Formation	Dcf	Meta fine-grained quartz arenite.	50	Overlain by the Limekilns Group and intruded by diorite.	

LATE SILURIAN - LOWER DEVONIAN					
Davies Creek Granite	Sdg	Foliated to massive pink medium-grained equigranular biotite granite and leucogranite.		Intrudes Ordovician units. Predates Late Devonian folding of Palaeozoic strata.	Deformed and altered.
Jerula Granite	Sjg	Dark pink coarse-grained porphyritic granite.		Intrudes Ordovician meta-sediments and monzonite. Predates Late Devonian folding of Palaeozoic strata.	
Taralga Granite.	Stg	Coarse-grained leucogranite.		Intrudes Ordovician meta-sediments. Predates Late Devonian folding of Palaeozoic strata.	Deformed and altered.
Drogheda Dolerite	Dd	Dolerite.		Intrudes the Late Silurian-Early Devonian Kowmung Volcaniclastics and older units. Unconformably overlain by the Lambie Group.	Small dyke intrusion.
CRUDINE GROUP					
Adderley Formation	S-Dca	Meta silty to very coarse-grained and pebbly feldspathic volcanilithic arenite; meta rhyolitic agglomerate; minor slate.	1000	Conformably overlies the Buckburraga Slate and Dunchurch Formation. Unconformably overlain by the Lambie Group and intruded by the Tarana Granite.	Felsic volcaniclastics and minor turbite deposits Shallow to moderate water depths (below wave base).
Kowmung Volcaniclastics	S-Dck	Felsic ignimbritic volcaniclastics.	500	Unconformably overlies Hollanders Formation. Unconformably overlain by Lambie Group.	Subaerial volcaniclastic deposits.
Buckburraga Slate	S-Dcb	Laminated silty slate.	150	Conformably overlain by the Adderley Formation and underlain by the Dunchurch Formation.	
Dunchurch Formation	S-Dcd	Very fine- to very coarse-grained meta feldspathic quartz arenite; minor interbedded slate, tuff and dacite.	500	Conformably overlies Campbells Formation and Vale Creek Volcanics. Overlain conformably by Buckburraga Slate. Intruded by the Tarana Granite.	Felsic volcanic sourced turbite deposits. Moderate water depths (below wave base).
	S-Dcdd	Meta dacite.	300		
NEW GROUP					
	Scr	Meta rhyolite.		Forms minor bodies within Campbells Formation.	Minor felsic flows and subvolcanic intrusions.
Hollanders Formation	Sts	Siltstone.	375	Interbedded sequence unconformably overlying Rockley Volcanics. Unconformably overlain by Kowmung Volcaniclastics.	Shallow-marine reef deposits.
	St	Interbedded limestone, mudstone and volcanolithic arenite.	300		
Kildrummie Formation	Sk	Interbedded fossiliferous limestone and meta feldspathic arenite; minor conglomerate and slate.	900	Intertongues with Campbells Formation. ?Unconformably overlies or faulted against Rockley Volcanics.	Shallow-marine reef deposits.
Campbells Formation	Sc	Interbedded slate, phyllite, meta siltstone, meta fine- to very coarse-grained feldspathic quartz arenite, fossiliferous limestone; minor fine- to medium-grained meta quartz arenite.	800	Unconformably overlies and faulted against Rockley Volcanics. Intertongues with Vale Creek Volcanics in the north and locally conformably overlies Fosters Creek Conglomerate in the west. Conformably overlain by Dunchurch Formation. Intruded by Tarana and Duckmaloi Granites.	Below wave-base marine turbidites with minor shallow-marine reef deposits and felsic and mafic lava flows.
	Scl	Fossiliferous limestone.	100		
Walbrook Metabasalt Member	Scv	Metabasalt.	50		
Karawina Formation	Ska	Meta feldspathic quartz arenite, conglomerate and meta siltstone.	500	?Unconformably overlies or faulted against Ordovician meta sediments and volcaniclastics. Conformably overlain and intertongues with Campbells Group and Hollanders Formation	Locally sourced submarine turbidite fan deposits.
Vale Creek Volcanics	Sv	Meta rhyolitic lavas, breccia and volcaniclastics; minor lenses of talc schist, actinolite schist and marble.	2000	Unconformably overlies Rockley Volcanics. Intertongues with and overlain by the Campbells Group. Conformably overlain by the Dunchurch Formation. Intruded by the Tarana and Bathurst Granites.	Shallow-water felsic volcanic dome and flanking clastic apron deposits. Minor shallow-marine reef deposits.
Soldiers Hill Member	Svs	Meta fine-grained to pebbly felsic volcanilithic arenite and metasiltstone.			
Alton Limestone Member	Svl	Thickly bedded white coarse-grained fossiliferous marble with rare talc schist interbeds.	300		
		Actinolite schist.	150		
Fosters Creek Conglomerate	Sfc	Olygmictic boulder conglomerate, meta feldspathic quartz arenite and siltstone.	550	Unconformably overlies Rockley Volcanics and conformably overlain by Campbells Formation.	Locally sourced submarine turbidite fan deposits.
ORDOVICIAN					
Swatchfield Monzonite	Om	Medium-grained meta monzonite.		Intrudes Rockley Volcanics. Intruded by the Jerula Granite.	
NEW GROUP					
Rockley Volcanics	Ors	Actinolitic talc schist; minor meta mafic volcanilithic arenite and meta siltstone.		Interbedded sequence conformably overlying and intertonguing with the Triangle Group.	Deep water turbidite deposits.
	Oru	Metabasalt, amphibolite.			
	Orc	Thinnly bedded chert with lesser meta siltstone and meta mafic volcanilithic arenite.			
	Or2	Meta mafic volcanilithic arenite; rare breccia or conglomerate near base.			
	Or1	Interbedded meta mafic volcanilithic arenite, meta basalt, meta quartz arenite, slate, phyllite, siliceous carbonaceous slate and meta chert.			
NEW GROUP	Ot	Meta quartz arenite, siltstone and slate.			Deep water turbidite deposits.
	Otc	Meta quartz arenite and carbonaceous slate.			
	Ots	Carbonaceous slate; shale.			

TABLE 2

Rock Properties of selected stratigraphic units and lithologies

		Total counts				Mag. sus.*			
Formation	*rock type*	*No*	*min*	*max*	*mean*	*No*	*min*	*max*	*mean*
Bathurst G.	(a) c. porph. biot. hornbl. gr.	7	47	70	59	7	250	900	570
Bathurst G.	(b) c. equigran. biot. hornbl. gr.	3	62	94	81	3	420	900	600
Black Springs G.	grey med. equigran. hornbl. biot. gr.	3	42	55	48	2	20	35	28
Campbells Fm.	arenite	26	35	125	65	26	5	200	27
Campbells Fm.	conglomerate	1			45	1			12
Campbells Fm.	rhyolite	1			64	1			5
Campbells Fm.	limestone	1			22				2
Campbells Fm.	siltstone	6	32	90	63	6	8	300	61
Campbells Fm.	slate	45	16	115	66	45	6	150	23
Crudine Group	agglomerate	1			50	1			20
Crudine Group	arenite	13	34	86	63	13	8	25	16
Crudine Group	tuff	1			84	1			20
Crudine Group	dacite	4	30	80	62	4	8	2000	521
Crudine Group	siltstone	1			78	1			10
Crudine Group	slate	7	56	92	73	7	7	30	17
Davies Ck. G.	pink med. equigran. biot. gr.	7	48	78	57	7	5	1500	700
dolerite dykes	dolerite	1			32	2	2000	4000	3000
Kildrummie Fm.	limestone	10	15	36	22	10	3	15	7
Kildrummie Fm.	arenite	7	25	78	47	7	5	70	26
Kildrummie Fm.	siltstone	1			40	1			12
Lambie Group	quartzite	13	19	100	46	13	2	35	16
Oberon G.	(a) med. equigran. biot. gr.	1			90				650
Oberon G.	(b) c. equigran. biot. hornbl. gr.	1			60	1			2300
rhyolitic dykes	rhyolite	10	32	110	62	10	3	40	12
Rockley V.	talc schist	2	6	8	7	2	30	50	40
Rockley V.	carbonaceous slate	6	18	32	24	6	2	15	7
Rockley V.	chert	40	14	40	22	40	5	27	9
Rockley V.	mafic volcanics	9	7	25	18	9	40	2000	295
Rockley V.	quartz arenite	15	18	72	31	15	10	45	24
Rockley V.	siltstone	18	17	38	27	18	4	40	21
Rockley V.	slate	29	14	84	34	29	5	50	20
Rockley V.	volcaniclastic arenite	56	11	74	28	56	8	250	50
Sloggets G.	pink c. megacrys. biot. gr.	2			78	2	1000	1500	1250
Tarana G.	(d) pink med. equigran. biot. leucogr.	5	52	100	74	5	5	1600	780
Tarana G.	(a) pink med. equigran. leucogr.	3	105	125	118	3	2	40	16
Tarana G.	(b) pink c. equigran/porph biot. gr.	3	100	140	117	3	400	2000	967
Tarana G.	(c) coarse porph. biot. hornbl. gr.	10	45	120	75	10	1300	3800	2340
Tarana G.	(f) pink c. equigran. biot. gr.	25	80	140	115	25	10	1000	500
Tarana G.	(g) c. porph. hornbl. biot. gr.	6	52	105	66	6	200	2200	1350
Tarana G.	(h) pink c. porph. biot. gr.	8	47	110	67	8	250	2500	1100
Tarana G.	(i) c. equigran. biot. gr.	6	68	100	79	6	2	900	350
Tarana G.	(j) c. porph. biot. gr.	6	42	74	64	6	250	2400	880
Tarana G.	(k) c. equigran. biot. gr.	4	38	150	82	4	5	420	150
Triangle Group	carbonaceous slate	15	24	85	65	15	7	16	12
Triangle Group	quartz arenite	42	15	70	53	33	5	25	10
Triangle Group	siltstone	6	42	74	62	5	12	20	15
Triangle Group	slate	21	58	90	75	13	7	20	16
Vale Ck. V.	actinolite schist	3	32	50	39	3	40	100	67
Vale Ck. V.	arenite	1			17	1			25
Vale Ck. V.	limestone	4	8	16	11	4	0	3	2
Vale Ck. V.	rhyolite	4	40	110	74	4	5	7	6
Vale Ck. V.	rhyolitic volcaniclastic	9	42	100	60	9	2	10	6
Vale Ck. V.	talc schist	2	28	36	47	2	5	10	8
Walbrook M. Mbr.	mafic volcanic	2	13	15	14	2	60	700	380

investigations. Both magnetic and gamma-ray spectrometric interpretations were incorporated into the final geological map and are available as separate coverages in ARC/INFO format. The primary airborne data, presently available from the contractor, will eventually be integrated into the National Airborne Geophysics Database.

The airborne geophysical data proved to be particularly useful in mapping the geology of OBERON. Outcrop is generally poor, and widespread improved pastoral land and forestry plantations render traditional air photo interpretation of little value. Because of the generally thin soil cover, developed *in situ* on the deeply weathered Palaeozoic rocks, and the lack of transported surficial material, airborne gamma-ray spectrometry data largely reflect basement geology rather than transported overburden, and were a useful discriminant in the interpretation of the surface geology.

On the other hand the airborne magnetic data were of little use in defining structures and stratigraphy in Ordovician and Silurian sedimentary sequences owing to the absence of strongly contrasting magnetic units. However, the magnetics proved invaluable in defining zonation within the Bathurst, Tarana and Oberon Granites. The magnetic data also revealed (a) the presence of widespread N-S trending dolerite swarms of hitherto unsuspected extent in the north and east of the area, and (b) evidence of anomalies suggesting subsurface intrusives north of Rockley and south of Black Springs. The latter are of possible interest as exploration targets.

Rock properties were measured in situ by portable instruments and entered into the NGMA Database (Table 2). Total count gamma-ray spectrometric measurements were made using a Geometrics portable scintillometer, and magnetic susceptibility measurements were made by a Geoinstruments JH-8 magnetic susceptibility meter. Figure 5 shows that such data discriminate reasonably well between various lithological units in OBERON

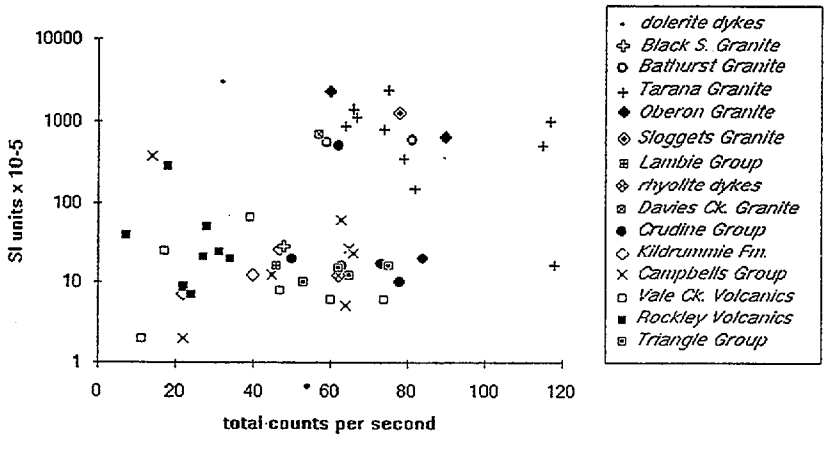


Fig. 5 Rock properties of selected stratigraphic units and lithologies

GIS COVERAGES

All geological and geophysical interpretation data have been digitised into an ARC/INFO geographic information system. Table 3 lists the coverages currently completed for OBERON. Reproductions of each coverage at reduced scale are presented in Appendix 2. Digital copies of the coverages are available from the AGSO copy service in any of the following formats: Arc/Info export format; DXF format; IGDS format; DLG3; and ASCII files.

TABLE 3. GIS COVERAGES, OBERON 1:100 000 SHEET AREA

Name of coverage	*Content*
horizons_1	Magnetic horizon trend lines
veins&dykes_2	Aplite, dolerite, felsite, granite, rhyolite, quartz-feldspar porphyry dykes and quartz veins
linears_3	Aerial photograph - trend lines and lineaments
folds_1	Regional fold axes
faults_4	Accurate, approximate and inferred faults
geolpg_6	Geological boundaries with full polygon topology
magpg_1	Subsurface geological boundaries interpreted from magnetic data
structures_1	All measured geological structures
metpg_1	Interpreted metamorphic zone boundaries
tecpg	Generalised geological boundaries of major rock units
streams_1	Streams and rivers
grid	AMG grid and grid lines
frame	Map boundary
border	Map border
annoframe	Frame grid and graticule annotations
culture_1	roads, railways and forest boundaries

NGMA FIELD DATABASE

The NGMA Field database is a system of interconnected field and laboratory databases designed primarily for data generated by the National Geoscience Mapping Accord. The system uses the Oracle 6.0 relational database management system (RDMS) on AGSO's corporate database server, a DG AViiON 6240 computer running UNIX 5.4.

The primary source of data for the NGMA database is the basic information recorded by

field geologists in field notebooks. The notebooks were largely adapted from the Geological Survey of Queensland REGMAP Field Data Management System. They are designed to record field data in a format that is easily transferable into the NGMA database, and other structural relational databases which have been designed to support Geographical Information Systems (GIS) with information coded under a system which ensures effective GIS analysis within and between AGSO projects.

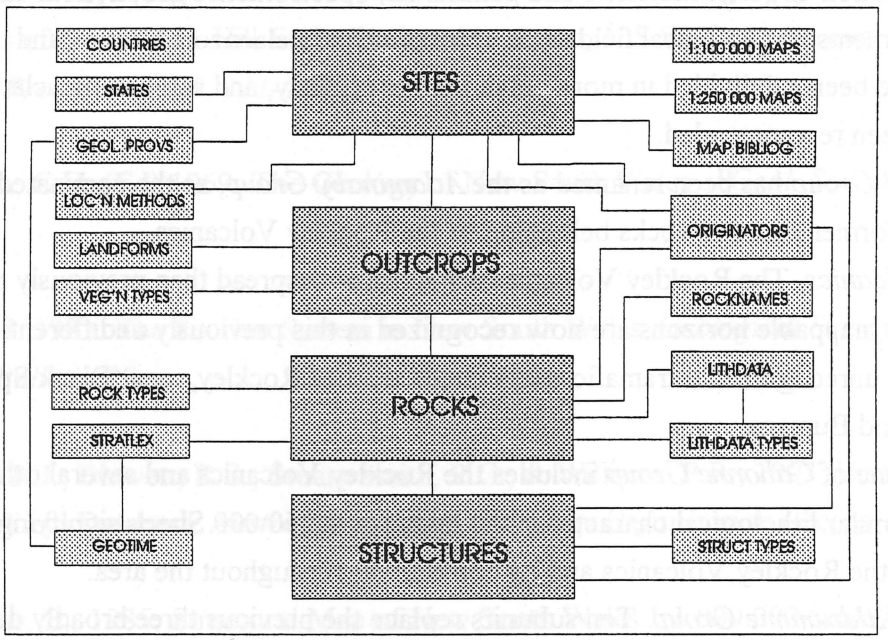


Figure 6. Structure of the NGMA Database. Adapted from Ryburn & others (1993)

Figure 6 illustrates the structure of the NGMA Field database. Table 4 summarizes the number of entries in the various databases for OBERON

TABLE 4. SUMMARY OF DATABASE ENTRIES, OBERON 1:100 000 SHEET AREA

Sites	Rocks	Structures	Outcrops	Rockchem
1235	209	1883	1098	102

The focus of the Field Database is the SITES table, which standardizes the recording of point location data and ensures the accuracy of coordinates. This is logically linked to the OUTCROPS and ROCKS tables via the **Site ID** and **Originator Number**. The OUTCROPS table stores data such as geological relationships at outcrop scale, and drill-hole data, while the ROCKS and LITHDATA tables record details of lithologies, rock properties, and samples collected. LITHDATA is the expandable attributes table for ROCKS - linked via an automatically generated key (**Rockno**). Examples of several data forms are illustrated in APPENDIX III together with plots of data point locations in OBERON. A more detailed description of the NGMA Field Database (Ryburn & others, 1993) is available on application from the AGSO

Publications Section.

CONCLUSIONS

Re-interpretation of the Oberon 1:100 000 sheet area has highlighted a number of significant changes to previous work in the area. This new interpretation was accomplished using high-resolution airborne magnetic and gamma-ray spectrometric geophysical data as essential supplements to geological fieldwork. The principal Palaeozoic Groups and Formations have been subdivided in more detail than previously, and some nomenclature changes have been recommended.

- *The Triangle Group* has been renamed as the *Adaminaby Group*, as the nominated type-section for the former contains rocks belonging to the Rockley Volcanics.
- *Rockley Volcanics*. The Rockley Volcanics are more widespread than previously mapped, and five distinct mappable horizons are now recognized in this previously undifferentiated group. Hitherto unrecognized ultramafic rocks occur west of Rockley, near Black Springs, Shooters Hill, and Burraga.
- The new name of *Cabonne Group* includes the Rockley Volcanics and several other formations of similar lithological character in the Bathurst 1:250 000 Sheet, signifying the wider extent of the Rockley Volcanics and its correlatives throughout the area.
- *Campbells/Kildrummie Group*. Ten subunits replace the previous three broadly defined subunits.
- Concentric zones of granite and leucogranite were recognized in the previously undifferentiated *Tarana, Bathurst and Oberon Granites*.
- A monzodiorite/quartz porphyry complex of probable Ordovician/Silurian age discovered south of Black Springs may be a prospective target for Au/Cu mineralization, and a subsurface magnetic anomaly north of Rockley may also be of interest as an exploration target.
- Airborne magnetics highlighted widespread dolerite swarms to the north and east of OBERON.

All geological and geophysical data were digitized into an ARC/INFO information system as 16 separate coverages. Over 4500 entries were made in the NGMA Field database covering OBERON, including 102 major and trace element chemical analyses.

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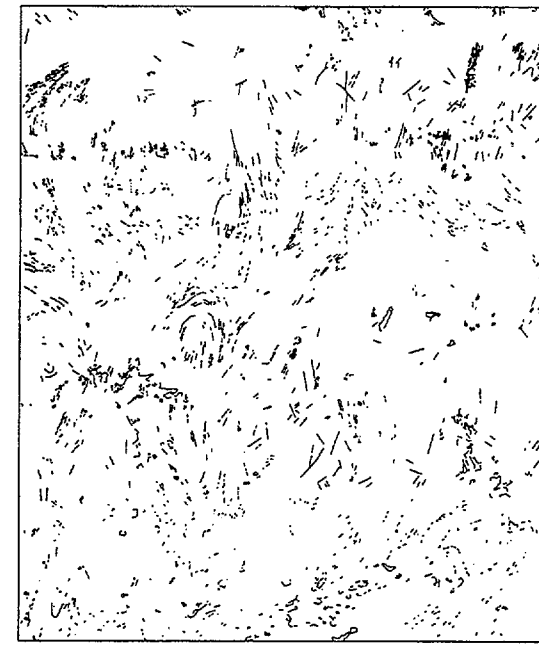
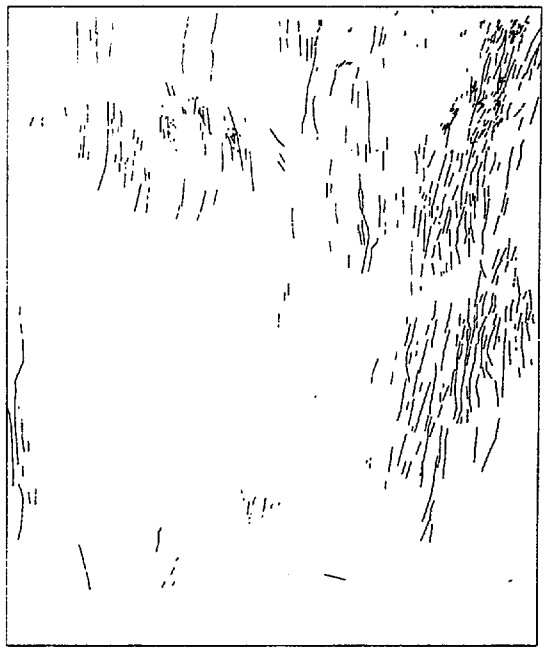
APPENDIX IIa
Plots of OBERON ARC/INFO geological coverages (Table 3 refers)

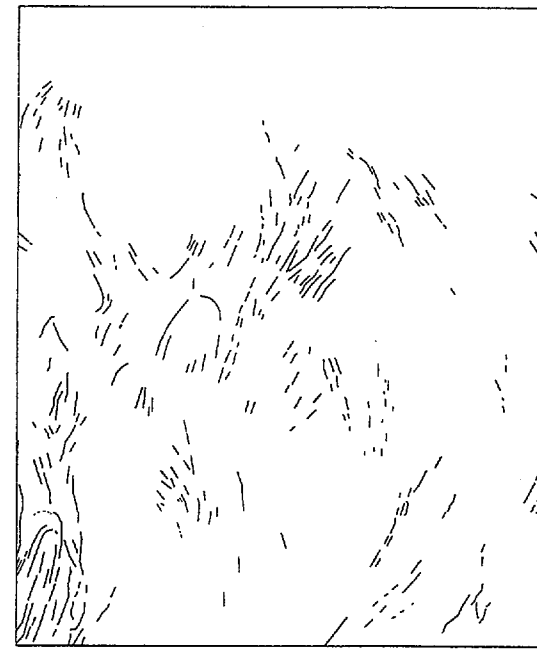
Geological boundaries (geolpg_6)



Trend lines & lineaments (linears_3)

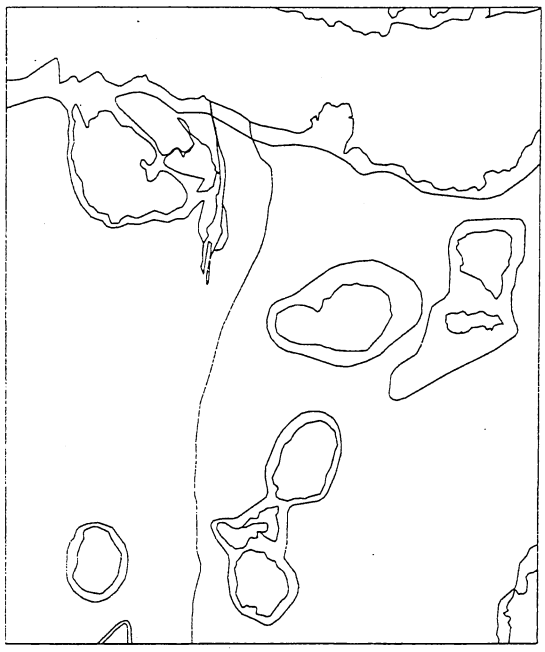


Veins & dykes (veins & dykes_2)

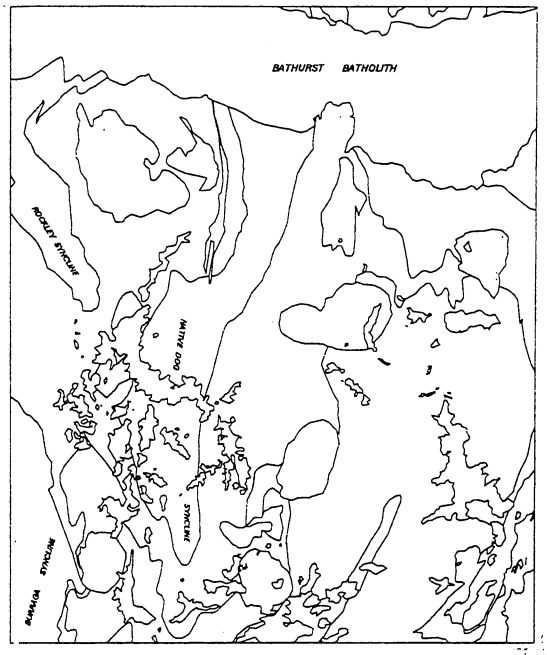


Magnetic trends (horizons_1)

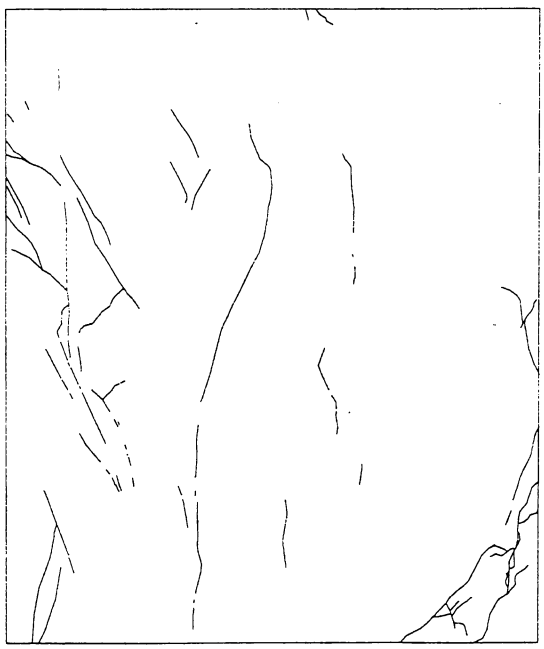
APPENDIX IIb



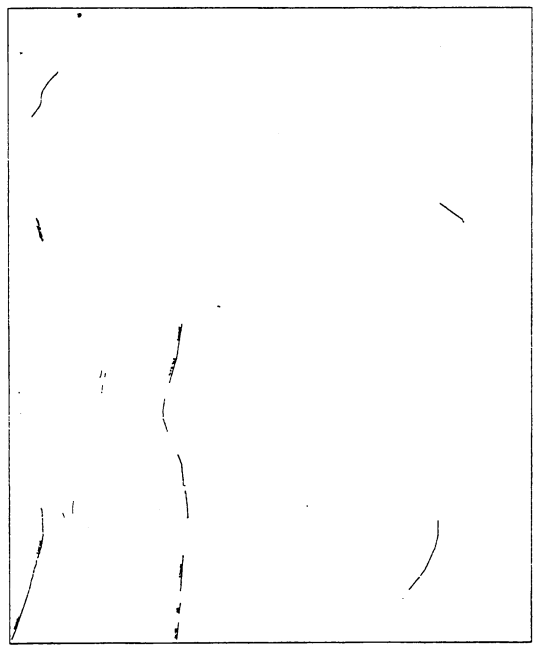
Metamorphic zone boundaries (metpg_1)



Major rock unit boundaries (tecpg_3)



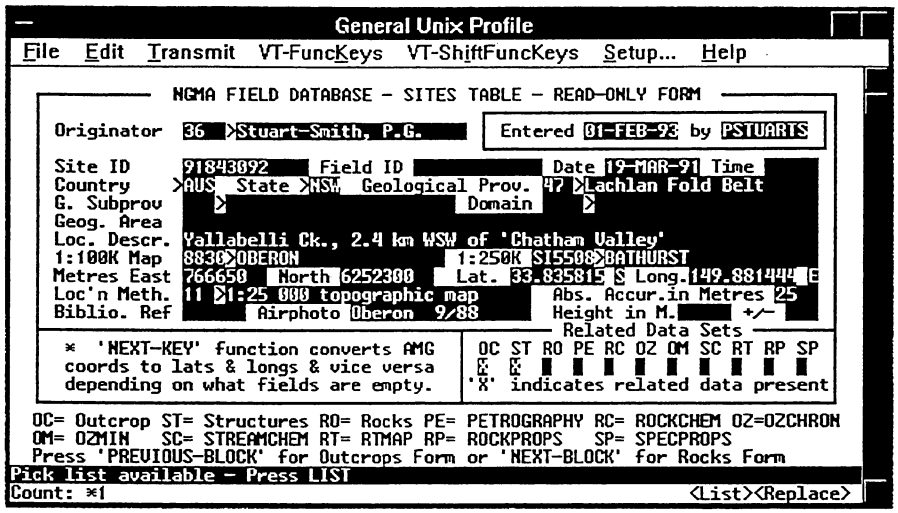
Faults (faults_4)



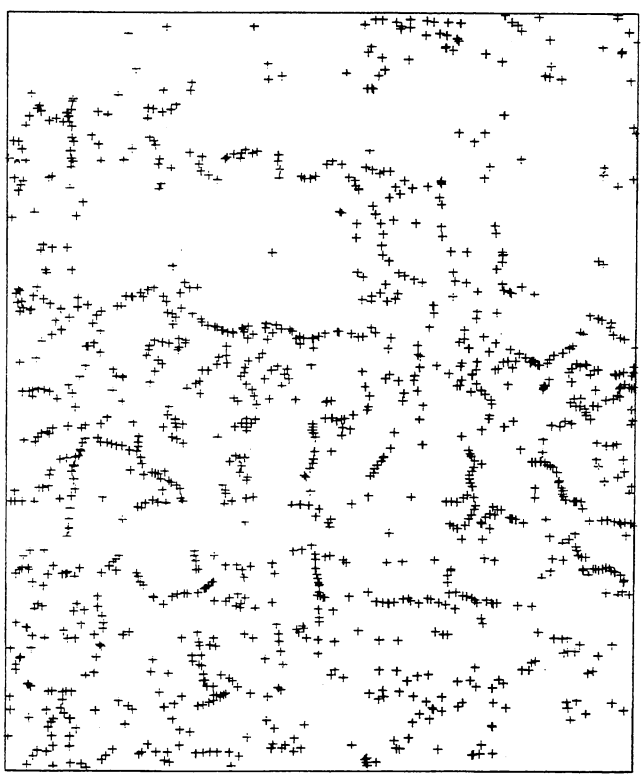
Regional fold axes (folds_1)

APPENDIX IIIa
ORACLE Forms and datapoints

1. SITES



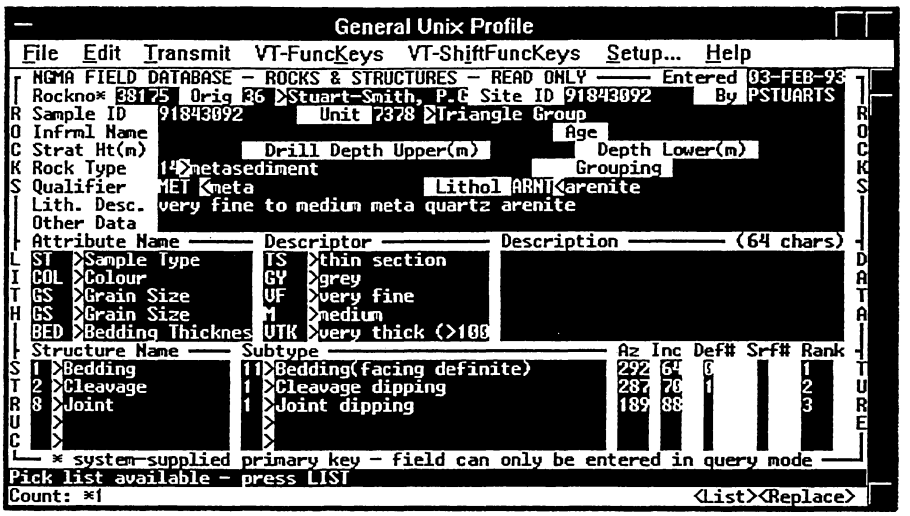
(a) Example of ORACLE **SITES** Form



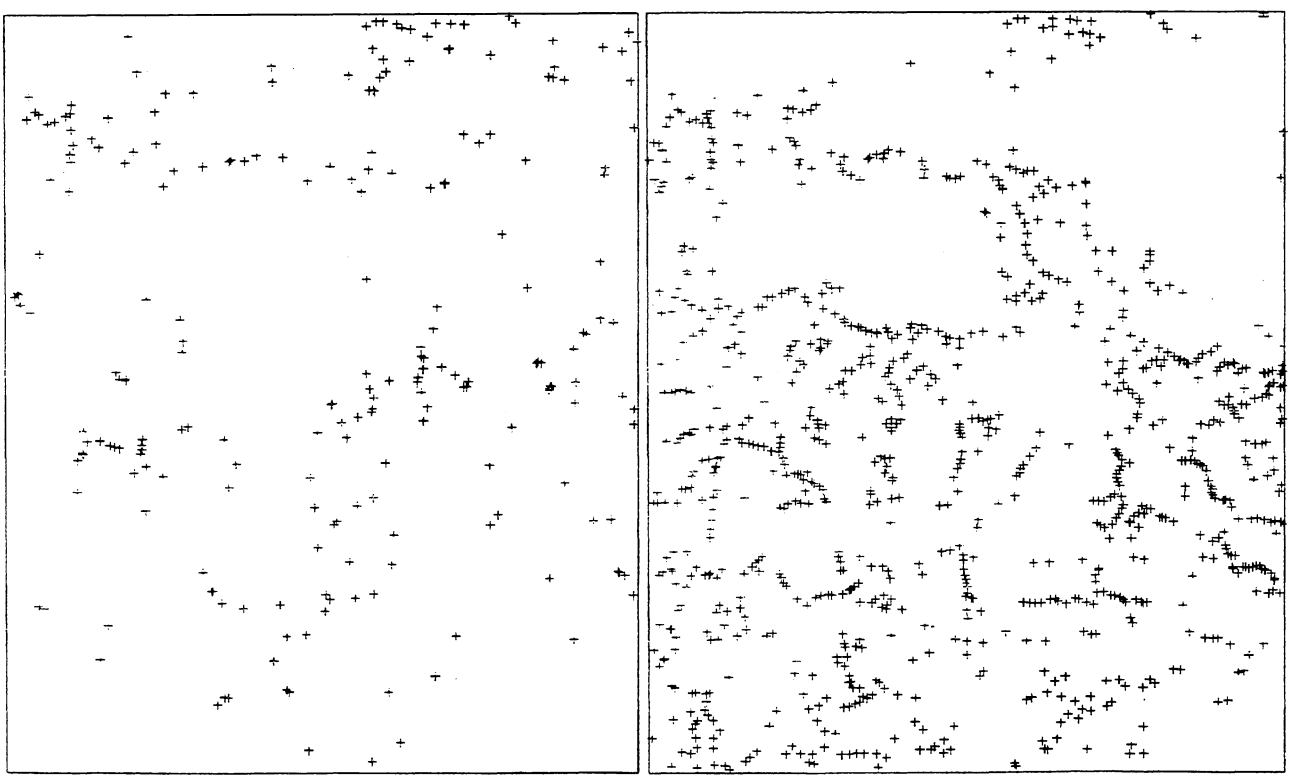
(b) 1:500 000 ARC/INFO plot of **SITES** points

APPENDIX IIIb

1. ROCKS AND STRUCTURES



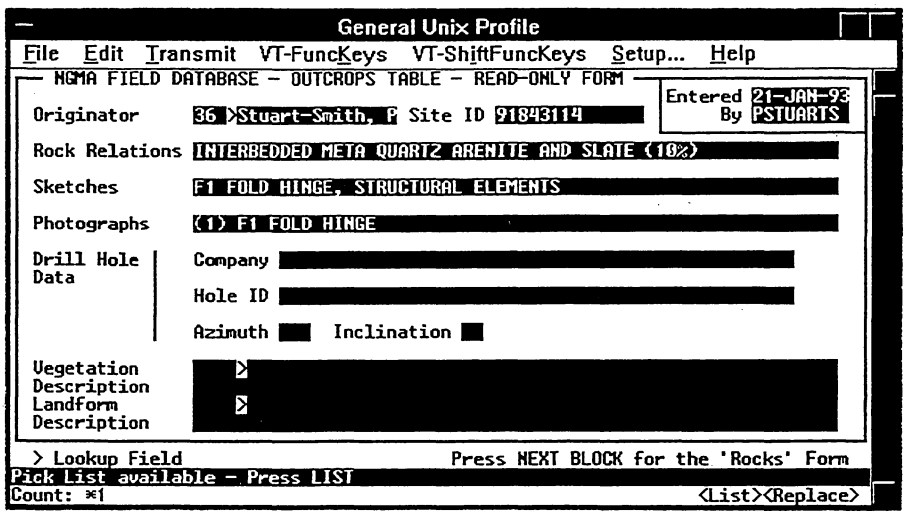
(a) Example of ORACLE **ROCKS AND STRUCTURES** Form



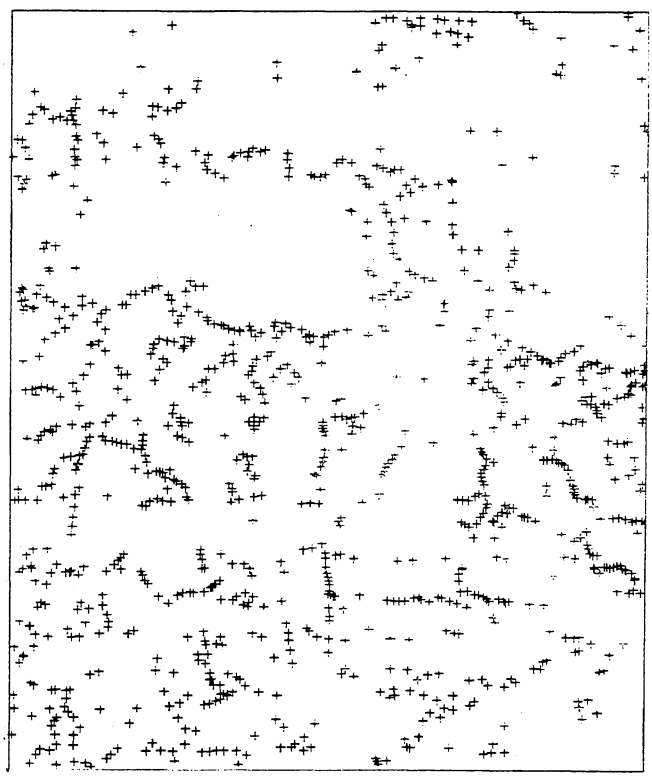
(b) 1:500 000 ARC/INFO plot of **ROCKS AND STRUCTURES** points

APPENDIX IIIc

1. OUTCROPS



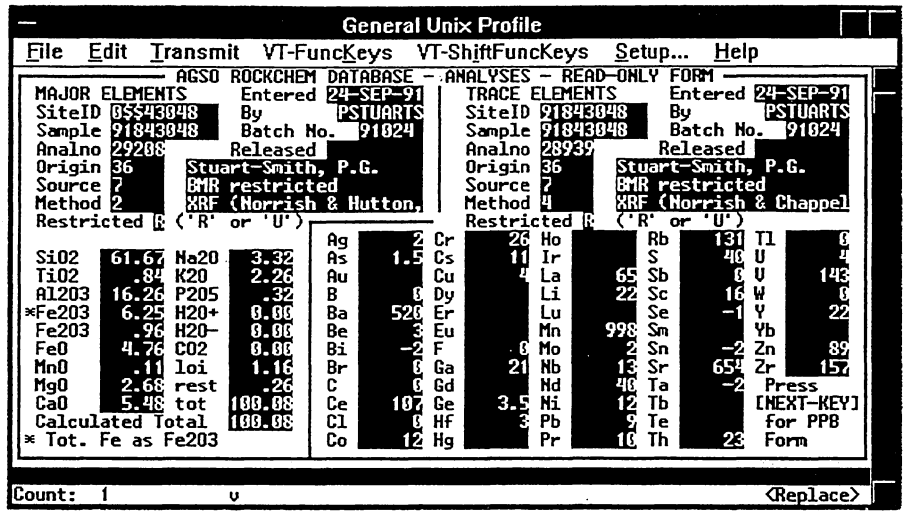
(a) Example of ORACLE **OUTCROPS** Form



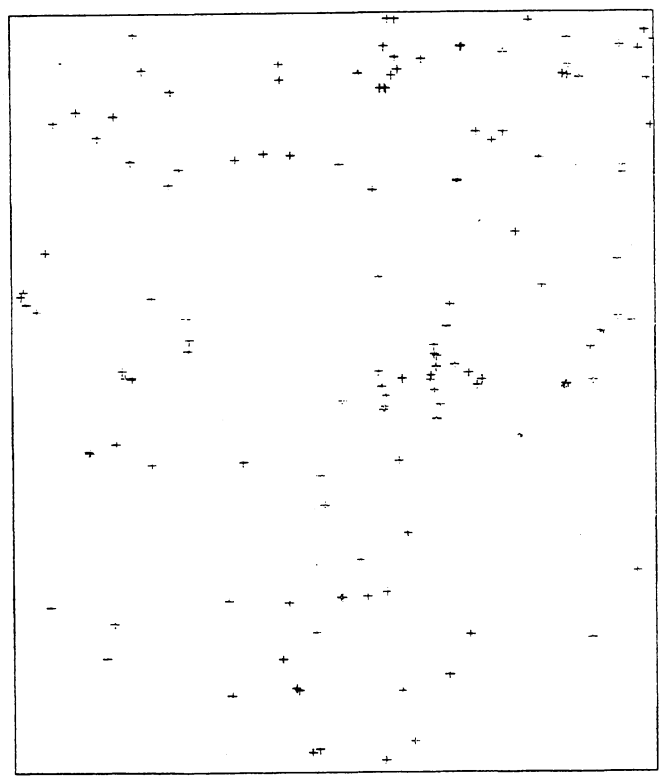
(b) 1:500 000 ARC/INFO plot of **OUTCROPS** points

APPENDIX IIId

1. ROCKCHEM



(a) Example of ORACLE **ROCKCHEM** Form



(b) 1:500 000 ARC/INFO plot of **ROCKCHEM** points