GEOLOGY OF THE
OBERON 1:100 000
SHEET AREA:
PRELIMINARY REPORT
AND DATA RECORD

by
D A Wallace and P G Stuart-Smith

RECORD 1994/12
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D.A.WALLACE and P.G. STUART-SMITH

AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
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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 Organisation 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 area¹, 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 work². 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

¹The 'Oberon 1:100 000 sheet area' will henceforth be referred to as OBERON
²An 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 Group3. 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 Copperhannia 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

3As 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 unnamed 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 Burrage 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
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 synclinalorial 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, Burrara, 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 Kildrununie 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 Burrara 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; unnamed 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
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 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 Geoterrax 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

<table>
<thead>
<tr>
<th>Unit</th>
<th>Map symbol</th>
<th>Description</th>
<th>Thickness/m</th>
<th>Field relationships</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANOZOIC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUATERNARY</td>
<td>Qs</td>
<td>Silt, sand, silt and gravel.</td>
<td></td>
<td>Forms raised terraces overlapping older rocks near the confluence of the Fish and Campbells Rivers.</td>
<td>Alluvium.</td>
</tr>
<tr>
<td></td>
<td>Csg</td>
<td>Geotactic quartz cobble conglomerate.</td>
<td></td>
<td>Forms resistant hill-top cappings over older rocks.</td>
<td>Remnant lava flows.</td>
</tr>
<tr>
<td>TERTIARY</td>
<td>Tb</td>
<td>Alkal basalt.</td>
<td></td>
<td>Forms terraces and gently sloping colluvial deposits unconformably overlaying deeply weathered Palaeozoic rocks. Overlay by basalt flows.</td>
<td>High level alluvial terraces and colluvium.</td>
</tr>
<tr>
<td>PALAEOZOIC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CARBONIFEROUS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evans Crown Granite</td>
<td>Pink medium-grained equigranular biotite leucogranite and pink medium-grained porphyritic quartz syenite.</td>
<td></td>
<td>Intrudes Tarana Granite and Devonian metasediments.</td>
<td>Late-stage high level felsic I-type granite</td>
</tr>
<tr>
<td></td>
<td>Eustah Granite</td>
<td>Pink coarse-grained porphyritic biotite granite and pink medium-grained equigranular leucogranite.</td>
<td></td>
<td>Intrudes Devonian metasediments.</td>
<td>I-type granite</td>
</tr>
<tr>
<td></td>
<td>Tarana Granite</td>
<td>Pink medium-grained equigranular leucogranite.</td>
<td></td>
<td>Intrudes Late Devonian and older rocks.</td>
<td>Zoned I-type granite</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pink coarse-grained equigranular to seriate biotite granite.</td>
<td></td>
<td>Unconformably overlain by Permian sediments. Inluded by the Evans Crown Granite and numerous dolerite and felsite dykes. Inludes the Bathurst Granite.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pink and grey coarse-grained biotite hornblende granite.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pink medium-grained equigranular biotite leucogranite.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Strongly magnetic phase in subsurface.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pink coarse-grained equigranular biotite granite.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coarse-grained porphyritic hornblende biotite granite.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pink coarse-grained porphyritic biotite granite.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coarse-grained equigranular biotite granite.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coarse-grained porphyritic biotite granite.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coarse-grained equigranular biotite granite.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bathurst Granite</td>
<td>Coarse-grained porphyritic biotite hornblende granite.</td>
<td></td>
<td>Intrudes Late Silurian and older rocks. Inluded by the Tarana Granite.</td>
<td>Zoned I-type granite</td>
</tr>
<tr>
<td></td>
<td>Oberon Granite</td>
<td>Pink medium-grained equigranular biotite granite.</td>
<td></td>
<td>Intrudes Ordovician metasediments and the Sloggets Granite.</td>
<td>Zoned I-type granite</td>
</tr>
<tr>
<td></td>
<td>Sloggets Granite</td>
<td>Pinkish grey coarse-grained equigranular biotite hornblende granite.</td>
<td></td>
<td>Intrudes Ordovician metasediments. Inluded by the Oberon Granite.</td>
<td>Zoned I-type granite</td>
</tr>
<tr>
<td></td>
<td>Dackmooli Granite</td>
<td>Grey coarse-grained biotite granite.</td>
<td></td>
<td>Intrudes Late Silurian and older metasediments.</td>
<td>I-type granite</td>
</tr>
<tr>
<td></td>
<td>Burrara Granite</td>
<td>Leucocratic coarse-grained biotite granodiorite.</td>
<td></td>
<td>Intrudes Late Silurian and older metasediments.</td>
<td>I-type granite</td>
</tr>
<tr>
<td></td>
<td>Isabella Granite</td>
<td>Coarse-grained equigranular to seriate leucogranite.</td>
<td></td>
<td>Intrudes Ordovician metasediments.</td>
<td>I-type granite</td>
</tr>
<tr>
<td></td>
<td>Black Springs Granite</td>
<td>Grey medium-grained equigranular to seriate hornblende biotite granite.</td>
<td></td>
<td>Intrudes Ordovician metasediments.</td>
<td>I-type granite</td>
</tr>
<tr>
<td></td>
<td>Tea Tree Granite</td>
<td>Pale pink coarse-grained equigranular biotite granite.</td>
<td></td>
<td>Intrudes Ordovician metasediments.</td>
<td>I-type granite</td>
</tr>
<tr>
<td></td>
<td>Tuglow Granite</td>
<td>Pale pink medium-grained hornblende granite.</td>
<td></td>
<td>Intrudes Ordovician metasediments.</td>
<td>I-type granite</td>
</tr>
<tr>
<td></td>
<td>Mount Stromlo Granite</td>
<td>Pink fine-to coarse-grained porphyritic biotite granite.</td>
<td></td>
<td>Intrudes Late Silurian and older metasediments.</td>
<td>High level dyke swarm.</td>
</tr>
<tr>
<td>UPPER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEVONIAN</td>
<td>Limestone Group</td>
<td>Interbedded meta silty to coarse-grained orthoquartzite, siltstone, shale, minor meta volcaniclastic arenite and conglomerates near base.</td>
<td>1300</td>
<td>Unconformably overlies older units. Inluded by Tarana, Evans Crown and Eustah Granite.</td>
<td>Shallow-marine deposits.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diorite.</td>
<td></td>
<td></td>
<td>Small stock possibly related to the Winburn Tuff.</td>
</tr>
<tr>
<td>MIDDLE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEVONIAN</td>
<td>Winburn Tuff</td>
<td>Laminated meta sandy siltstone.</td>
<td>200</td>
<td>Unconformably overlies Limestone Group. Inluded by the Tarana Granite. Faulted against the Rocky Volcanics.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Meta dioctolite tuff and arenite; polymictic cobble conglomerate; minor meta siltstone.</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Limestone Group</td>
<td>Shale.</td>
<td>100</td>
<td>Unconformably overlains the Limestone Group and underlain by the Cunningham Formation. Inluded by the Tarana Granite.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cunningham Formation</td>
<td>Meta fine-grained quartz arenite.</td>
<td>50</td>
<td>Overlain by the Limestone Group and inluded by diorite.</td>
<td></td>
</tr>
</tbody>
</table>

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### LATE SILURIAN - LOWER DEVONIAN

<table>
<thead>
<tr>
<th>Formation</th>
<th>Sequence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davies Creek Granite</td>
<td>Sdg</td>
<td>Foliated to massive pink medium-grained equigranular biotite granite and leucogranite.</td>
</tr>
<tr>
<td>Jerula Granite</td>
<td>Srg</td>
<td>Dark pink coarse-grained porphyritic granite.</td>
</tr>
<tr>
<td>Taralga Granite</td>
<td>Srg</td>
<td>Course-grained leucogranite.</td>
</tr>
<tr>
<td>Drogheda Dolerite</td>
<td>Dd</td>
<td>Dolerite.</td>
</tr>
</tbody>
</table>

### CRUDINE GROUP

<table>
<thead>
<tr>
<th>Formation</th>
<th>Sequence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adderley Formation</td>
<td>S-Dua</td>
<td>Meta silt to very coarse-grained and pebbly feldspathic volcanilithic arenite; meta rhyolitic agglomerate; minor slate.</td>
</tr>
<tr>
<td>Kowmung Volcaniliths</td>
<td>S-Dck</td>
<td>Felsic ignimbritic volcanilithics.</td>
</tr>
<tr>
<td>Buckburraga Slate</td>
<td>S-Dob</td>
<td>Laminated silty slate.</td>
</tr>
<tr>
<td>Dunchurch Formation</td>
<td>S-Dud</td>
<td>Very fine- to very coarse-grained meta feldspathic quartz arenite; minor interbedded slate, tuff and dacite.</td>
</tr>
<tr>
<td></td>
<td>S-Dud</td>
<td>Meta dacite.</td>
</tr>
</tbody>
</table>

### NEW GROUP

<table>
<thead>
<tr>
<th>Formation</th>
<th>Sequence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hollands Formation</td>
<td>St</td>
<td>Siltstone.</td>
</tr>
<tr>
<td></td>
<td>St</td>
<td>Interbedded limonite, muscovite and volcanoclastic arenite.</td>
</tr>
<tr>
<td>Kildrummie Formation</td>
<td>Sk</td>
<td>Interbedded felsilous limonite and meta feldspathic arenite; minor conglomerate and slate.</td>
</tr>
<tr>
<td>Campbell Formation</td>
<td>Sc</td>
<td>Interbedded slate, phyllites, meta siltstone; meta fine- to very coarse-grained feldspathic quartz arenite; felsilous limonite; minor fine- to medium-grained meta quartz arenite.</td>
</tr>
<tr>
<td>Wallbrook Metabasalt</td>
<td>Sed</td>
<td>Felsilous limonite.</td>
</tr>
<tr>
<td></td>
<td>Sev</td>
<td>Metabasalt.</td>
</tr>
<tr>
<td>Katwina Formation</td>
<td>Ska</td>
<td>Meta feldspathic quartz arenite, conglomerate and meta siltstone.</td>
</tr>
<tr>
<td>Vale Creek Volcanics</td>
<td>Sv</td>
<td>Meta rhyolitic lava, breccias and volcanioclastic; minor lenses of tuff, schist, calcite and marble.</td>
</tr>
<tr>
<td>Soldiers Hill Member</td>
<td>Sv5</td>
<td>Meta fine-grained to pebbly felsic volcanoclastic arenite and meta basalt.</td>
</tr>
<tr>
<td>Alton Limestone Member</td>
<td>Svl</td>
<td>Thickly bedded white coarse-grained felsilous marl with rare tuff schist interbeds. Actinolite schist.</td>
</tr>
<tr>
<td>Foster Creek Conglomerate</td>
<td>Sfc</td>
<td>Olymctic boulder conglomerate, meta feldspathic quartz arenite and siltstone.</td>
</tr>
</tbody>
</table>

### ORDOVICIAN

<table>
<thead>
<tr>
<th>Formation</th>
<th>Sequence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swatchfield Monzonite</td>
<td>Om</td>
<td>Medium-grained meta monzonite.</td>
</tr>
</tbody>
</table>

### NEW GROUP

<table>
<thead>
<tr>
<th>Formation</th>
<th>Sequence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rockley Volcanics</td>
<td>Om</td>
<td>Actinolite tuff schist, minor meta mafic volcanoclastic arenite and meta siltstone.</td>
</tr>
<tr>
<td></td>
<td>Om</td>
<td>Metalasalt, amphibolite.</td>
</tr>
<tr>
<td></td>
<td>Om</td>
<td>Thinly bedded chert with lesser meta siltstone and meta mafic volcanoclastic arenite.</td>
</tr>
<tr>
<td></td>
<td>Or1</td>
<td>Meta mafic volcanoclastic arenite; rare breccia or conglomerate near base.</td>
</tr>
<tr>
<td></td>
<td>Or2</td>
<td>Interbedded meta mafic volcanoclastic arenite, meta basalt, meta quartz arenite, slate, phyllices, silicious carbonaceous slate and meta chert.</td>
</tr>
</tbody>
</table>

### NEW GROUP

<table>
<thead>
<tr>
<th>Formation</th>
<th>Sequence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ot</td>
<td>Meta quartz arenite, siltstone and slate.</td>
</tr>
<tr>
<td></td>
<td>Otf</td>
<td>Meta quartz arenite and carbonaceous slate.</td>
</tr>
<tr>
<td></td>
<td>Otn</td>
<td>Carbonaceous slate, chalcedony.</td>
</tr>
</tbody>
</table>

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## TABLE 2
Rock Properties of selected stratigraphic units and lithologies

<table>
<thead>
<tr>
<th>Formation</th>
<th>Rock type</th>
<th>Total counts</th>
<th>Mag. sus.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No min</td>
<td>max</td>
<td>mean</td>
</tr>
<tr>
<td>Bathurst G.</td>
<td>(a) c. porph. biot. hornbl. gr.</td>
<td>7</td>
<td>47</td>
<td>70</td>
</tr>
<tr>
<td>Bathurst G.</td>
<td>(b) c. equigran. biot. hornbl. gr.</td>
<td>3</td>
<td>62</td>
<td>94</td>
</tr>
<tr>
<td>Black Springs G.</td>
<td>grey med. equigran. hornbl. biot. gr.</td>
<td>3</td>
<td>42</td>
<td>55</td>
</tr>
<tr>
<td>Campbells Fm.</td>
<td>arenite</td>
<td>26</td>
<td>35</td>
<td>122</td>
</tr>
<tr>
<td>Campbells Fm.</td>
<td>conglomerate</td>
<td>1</td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>Campbells Fm.</td>
<td>rhyolite</td>
<td>1</td>
<td></td>
<td>64</td>
</tr>
<tr>
<td>Campbells Fm.</td>
<td>limestone</td>
<td>6</td>
<td>32</td>
<td>90</td>
</tr>
<tr>
<td>Campbells Fm.</td>
<td>slate</td>
<td>45</td>
<td>16</td>
<td>115</td>
</tr>
<tr>
<td>Crudine Group</td>
<td>agglomerate</td>
<td>1</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Crudine Group</td>
<td>arenite</td>
<td>13</td>
<td>34</td>
<td>86</td>
</tr>
<tr>
<td>Crudine Group</td>
<td>tuff</td>
<td>1</td>
<td></td>
<td>84</td>
</tr>
<tr>
<td>Crudine Group</td>
<td>dacite</td>
<td>4</td>
<td>30</td>
<td>80</td>
</tr>
<tr>
<td>Crudine Group</td>
<td>limestone</td>
<td>1</td>
<td></td>
<td>78</td>
</tr>
<tr>
<td>Crudine Group</td>
<td>slate</td>
<td>7</td>
<td>56</td>
<td>92</td>
</tr>
<tr>
<td>Devins Cl. G.</td>
<td>pink med. equigran. biot. gr.</td>
<td>7</td>
<td>48</td>
<td>78</td>
</tr>
<tr>
<td>dolerite dykes</td>
<td>dolerite</td>
<td>2</td>
<td>7</td>
<td>32</td>
</tr>
<tr>
<td>Kildrummie Fm.</td>
<td>limestone</td>
<td>10</td>
<td>15</td>
<td>36</td>
</tr>
<tr>
<td>Kildrummie Fm.</td>
<td>arenite</td>
<td>7</td>
<td>25</td>
<td>78</td>
</tr>
<tr>
<td>Kildrummie Fm.</td>
<td>silstone</td>
<td>1</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Lambie Group</td>
<td>quartzite</td>
<td>13</td>
<td>19</td>
<td>100</td>
</tr>
<tr>
<td>Oberon G.</td>
<td>(a) med. equigran. biot. gr.</td>
<td>1</td>
<td></td>
<td>90</td>
</tr>
<tr>
<td>Oberon G.</td>
<td>(b) c. equigran. biot. hornbl. gr.</td>
<td>1</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>rhyolitic dykes</td>
<td>rhyolite</td>
<td>10</td>
<td>32</td>
<td>110</td>
</tr>
<tr>
<td>Rockley V.</td>
<td>talc schist</td>
<td>2</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Rockley V.</td>
<td>carbonaceous slate</td>
<td>6</td>
<td>18</td>
<td>32</td>
</tr>
<tr>
<td>Rockley V.</td>
<td>chert</td>
<td>40</td>
<td>14</td>
<td>40</td>
</tr>
<tr>
<td>Rockley V.</td>
<td>mafic volcanics</td>
<td>9</td>
<td>7</td>
<td>25</td>
</tr>
<tr>
<td>Rockley V.</td>
<td>quartz arenite</td>
<td>15</td>
<td>18</td>
<td>72</td>
</tr>
<tr>
<td>Rockley V.</td>
<td>silstone</td>
<td>18</td>
<td>17</td>
<td>38</td>
</tr>
<tr>
<td>Rockley V.</td>
<td>slate</td>
<td>29</td>
<td>14</td>
<td>84</td>
</tr>
<tr>
<td>Rockley V.</td>
<td>volcaniclastic arenite</td>
<td>56</td>
<td>11</td>
<td>74</td>
</tr>
<tr>
<td>Sloggets G.</td>
<td>pink c. megaerys. biot. gr.</td>
<td>2</td>
<td></td>
<td>78</td>
</tr>
<tr>
<td>Tarana G.</td>
<td>(d) pink med. equigran. biot. leucogr.</td>
<td>5</td>
<td>52</td>
<td>100</td>
</tr>
<tr>
<td>Tarana G.</td>
<td>(a) pink med. equigran. leucogr.</td>
<td>3</td>
<td>105</td>
<td>125</td>
</tr>
<tr>
<td>Tarana G.</td>
<td>(b) pink c. equigran/porph. biot. gr.</td>
<td>3</td>
<td>100</td>
<td>140</td>
</tr>
<tr>
<td>Tarana G.</td>
<td>(c) coarse porph. biot. hornbl. gr.</td>
<td>10</td>
<td>45</td>
<td>120</td>
</tr>
<tr>
<td>Tarana G.</td>
<td>(f) pink c. equigran. biot. gr.</td>
<td>25</td>
<td>80</td>
<td>140</td>
</tr>
<tr>
<td>Tarana G.</td>
<td>(g) c. porph. hornbl. biot. gr.</td>
<td>6</td>
<td>52</td>
<td>105</td>
</tr>
<tr>
<td>Tarana G.</td>
<td>(h) pink c. porph. biot. gr.</td>
<td>8</td>
<td>47</td>
<td>110</td>
</tr>
<tr>
<td>Tarana G.</td>
<td>(i) c. equigran. biot. gr.</td>
<td>6</td>
<td>68</td>
<td>100</td>
</tr>
<tr>
<td>Tarana G.</td>
<td>(j) c. porph. biot. gr.</td>
<td>6</td>
<td>42</td>
<td>74</td>
</tr>
<tr>
<td>Tarana G.</td>
<td>(k) c. equigran. biot. gr.</td>
<td>4</td>
<td>38</td>
<td>150</td>
</tr>
<tr>
<td>Triangle Group</td>
<td>carbonaceous slate</td>
<td>15</td>
<td>24</td>
<td>85</td>
</tr>
<tr>
<td>Triangle Group</td>
<td>quartz arenite</td>
<td>42</td>
<td>15</td>
<td>70</td>
</tr>
<tr>
<td>Triangle Group</td>
<td>silstone</td>
<td>6</td>
<td>42</td>
<td>74</td>
</tr>
<tr>
<td>Triangle Group</td>
<td>slate</td>
<td>21</td>
<td>58</td>
<td>90</td>
</tr>
<tr>
<td>Vale Cl. V.</td>
<td>actinolite schist</td>
<td>3</td>
<td>32</td>
<td>50</td>
</tr>
<tr>
<td>Vale Cl. V.</td>
<td>arenite</td>
<td>1</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Vale Cl. V.</td>
<td>limestone</td>
<td>4</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Vale Cl. V.</td>
<td>rhyolite</td>
<td>4</td>
<td>40</td>
<td>110</td>
</tr>
<tr>
<td>Vale Cl. V.</td>
<td>rhyolitic volcaniclastic</td>
<td>9</td>
<td>42</td>
<td>100</td>
</tr>
<tr>
<td>Vale Cl. V.</td>
<td>tect schist</td>
<td>2</td>
<td>28</td>
<td>36</td>
</tr>
<tr>
<td>Wallbrook M. Mbr.</td>
<td>mafic volcanic</td>
<td>2</td>
<td>13</td>
<td>15</td>
</tr>
</tbody>
</table>

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

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

<p>| TABLE 4. SUMMARY OF DATABASE ENTRIES, OBERON 1:100 000 SHEET AREA |
|-----------------|----------|-----------|-----------|-----------|</p>
<table>
<thead>
<tr>
<th>Sites</th>
<th>Rocks</th>
<th>Structures</th>
<th>Outcrops</th>
<th>Rockchem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1235</td>
<td>209</td>
<td>1883</td>
<td>1098</td>
<td>102</td>
</tr>
</tbody>
</table>

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.

ACKNOWLEDGEMENTS

The authors acknowledge the substantial cooperation and assistance given by the New South Wales Department of Minerals and Energy in providing material help and advice, also AGSO colleagues Doone Wyborn and Tony Henderson. Chris. Malouf assisted with GIS formatting. Rock analyses were carried out by John Pyke at AGSO Laboratory, Canberra.

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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

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APPENDIX IIIc

1. OUTCROPS

(a) Example of ORACLE OUTCROPS Form

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

(a) Example of ORACLE ROCKCHEM Form

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