

**APPENDIX 4.**

**DESCRIPTION OF GEOLOGY UNITS (DUBBO AND  
NARROMINE SHEETS)**

## **DESCRIPTION OF GEOLOGY UNITS (DUBBO AND NARROMINE SHEET)**

The following descriptions are summarised from the Explanatory notes that accompany the Second Edition of the Dubbo Geology Map 1:250 000 and where noted, the First Edition of the Narromine Geology Map 1:250 000.

### ***Middle to Late Ordovician (or Early Silurian?) Volcanic Rocks***

#### **Cabonne Group**

The Cabonne Group is located to the east of Yeoval. It is the eastern extremity of the Cowra Trough. Within the Little River catchment, the formation runs north-south from below Ponto through Smokey Camp, Bournewood, Yullundry and Cumnock. As well, a small outcrop occurs just to the west of Yeoval.

The group is represented in this area by the Kabadah Formation (θck), Oakdale Formation (θco), and Sourges Shale (θcu) (moving from west to east). The majority of the area is comprised of the Kabadah Formation, with only small areas of the Oakdale Formation due south of Ponto and around Smoky Camp along the Manildra fault, and Sourges Shale outcrops along the Cudal fault around Cumnock.

The Cabonne Group is characterised by intermediate to mafic volcanic rocks, conglomerate, breccia, sandstones, shale and cherts. The Group forms steep to relatively gentle undulating terrain. The formation has been subjected to extensive faulting and folding and is highly complex.

The Cabonne group was deposited on the flanks of a largely submerged volcanic chain of islands. The Kabadah and Oakdale Formations were deposited in deep submarine basinal environment some distance from the volcanic source. (Possible sources include a volcano east of Yeoval (Gunnors Dam) and another east of Cumnock on the catchment boundary.) Debris flows moved the volcanic material into deep water forming extensive submarine fans. Some of the rocks have undergone low-grade metamorphism. The limestone areas are presumed to be sourced from carbonate reefs that fringed the volcanic island. The formation retains a close association with active volcanism.

The Kabadah formation (θck), overlies the Oakdale formation, and is overlain by the Canowindra Volcanics of the Cudal group. This formation is comprised of volcanoclastic sandstone, with siltstones, chert and conglomerates. The recent revised map has expanded the Kabadah Formation to include the Kabadah Beds, Loombah, Bournewood, Yullundry, and Myrangle Formation and Buckinbah Volcanics previously included in the Cudal or Goonigal group.

The Oakdale Formation (θco) forms hilly undulating topography. The Formation is comprised of mafic to intermediate lava, volcanoclastic breccia and conglomerate, sandstone and siltstone and scattered areas of limestone from volcanic sources deposited deep under the sea.

In the south-west around Cumnock, fine debris was deposited in a shallow water lagoon forming Sourges Shale (θcu). Sourges Shale is made up of well-bedded shale, siltstone, sandstone and limestone areas. The Shale is also bounded by faults and highly complex. It outcrops in only a small area north and south of Cumnock.

The Cabonne Group's geochemistry is an calc-alkaline suite with affinities ranging from medium K to shoshonitic. All areas have low TiO<sub>2</sub>, high but variable Al<sub>2</sub>O<sub>3</sub>, enriched levels of Rb, Ba and K and low levels of Nb, Zr, Ti and Y.

### ***Mid - Late Silurian Sedimentary and Volcanic Rocks***

#### **Mumbil Group**

On the eastern boundary near Eurimbla a small band of Barnby Hills Shale (Smb) (Mumbil Group) occurs. These are overlain by the Cudal and Gregra groups and only outcrop in limited areas, where the beds are generally vertical to the surface. They are comprised of bedded and laminated shales and siltstones, which were deposited under moderately deep, quiet marine environment.

#### **Cudal Group**

The Cudal Group is found on either side of the Cabonne Group, along the eastern part of the catchment running from Suntop to Cumnock on the eastern side and a much wider band west of the Cabonne Group to Yeoval, where it meets the Yeoval granites. It outcrops over a large area.

This unit overlies the Cabonne Group (Kabadah Formation) and is in turn overlain by the Goonigal and Gregra Groups or the Dulladerry Volcanics in the south west. The Yeoval Granites intrude into the Cudal Group through the central part of the catchment. The Cudal Group is mostly represented by the Canowindra Volcanics (Scv) and the Hanover Formation (Sce) within the Little River Catchment, along with minor areas of Burrawong (Scu), Cary (Scc) and an unnamed formation (Scet). It is a thick "shaley" sequence with local limestones and the base unit (the Canowindra Volcanics) being a massive volcanoclastic porphyry. The Cudal group was deposited in the Cowra Trough under shallow marine conditions.

The Canowindra Volcanics (Scv) are bounded in the east by the Cudal Fault and extends from south of Cumnock through to Geurie. These Volcanics are characterised by massive, rounded tors and form broad strike ridges. The rhyolite lava was probably laid down under shallow marine environments. These rocks have an S-type chemistry and are extremely mineral rich (approximately 80% of the rock are crystals). The dominant lithology is massive rhyolite porphyry. This is the base unit in the Cudal group and is overlain by the Hanover formation in many areas.

The Cary Formation (Scc) overlies the Canowindra Volcanics. It is fine-grained bedded siltstone, formed under similar conditions as the Hanover sediments.

Burrawong Limestone (Scu) outcrops west of Cumnock, running north- south, with a smaller outcrop north east of Yullundry at Loombah Ck. It outcrops in very limited areas as it has been faulted out below the surface and overlain by Goonigal sediments.

The Hanover Formation (Sce) is mostly shale, sandstone and siltstone which indicates a deep marine depositional environment. There are also a number of isolated limestone outcrops. Recent mapping has extended the boundaries of this unit. The Hanover formation overlies the Canowindra Volcanics. It outcrops in a number of complex meridional folds and fault repetitions from Geurie to Cumnock. In some places it is intruded or overlain by the Gregra Group (Cuga Burga Volcanics [Dgc] and Garra Limestones [Dgg]). It is highly fractured and

strongly cleaved due to folding and faulting. It is thought to have been deposited in quiet deep marine environment, similar to Barnby Hill Shales (Smb).

#### Goonigal Group

There is a small area of the Goonigal Group (the Wansey (Sgw) and Burgoon ( Sgb) Formations) and Jews Creek Volcanics (Sgj) to the south around Burgoon, which runs south toward Manildra. It is dominated by siltstone, sandstone and shale. The base layer is andesitic volcanic and the sequence coarsens upwards from Burgoon to Wansey. The Formation crops out as prominent strike ridges.

#### Toongi Group (Narromine notes)

Small areas of the Toongi Group (S-Dt) are found to the north west of Baldry. Sedimentary structures indicate storm surge deposits and deep water conditions. The sediments are mostly interbedded siltstone and mudstone with less common sandy beds. The most common minerals are quartz and hornfels. Some areas are strongly contact metamorphosed which has resulted in the obliteration of most sedimentary details. The Dulladerry Volcanics (Dd), in a low angle unconformity, overlies the Toongi Group near Baldry. The Toongi Group is also intruded by the Yeoval Batholith (Obley Granite).

#### *Early Devonian Volcanics*

#### Gregra Group

This group runs from Cudal in the south to Gollan in the north. The Gregra group (Dg) occurs along the eastern catchment boundary, to the east of the Cudal or Goonigal groups, which it overlies. It has been overlain by the Catombal Group (Dt). To the west, it is intruded by the Yeoval batholith, leaving outcrops around the extremities of the granitic complex.

Volcanic centres were located on the Mumbil Shelf and to the west in the area later intruded by the granites. Volcanism was largely submarine. The debris from the volcanoes was deposited on the crest and slopes of the Shelf and in the adjacent Cowra Trough. Following the cessation of volcanism, a widespread carbonate platform formed (Garra Formation).

It is a very thick formation, particularly the Cuga Burga Volcanics (Dgc) near the base, along with the Berkley Formation (Dce) (sediments derived from reworked volcanic rocks) and in the east, the Garra Formation (limestone) (Dgg), that overlies the two earlier formations.

Berkley Formation (Dce) is made up of fine to coarse-grained bedded sandstones with siltstones and shales. Some massive breccias and conglomerates within the formation outcrop as tors.

#### Cuga Burga Volcanics (Dgc)

To the north and the west, they are enclosed by various members of the Yeoval Batholith. In the east they are bound by the Curra Creek Fault. They are dominated by volcanoclastic rocks, including breccia, sandstones, siltstones and tuff. There is a strong link between the Cuga Burga Volcanics and the Yeoval Batholith and Cabonne groups (θc), suggesting that they were derived from the same mantle source.

#### Garra Formation (Dgg)

This formation extends from Cudal to Geurie, where it disappears below the Surat Basin sediments. It includes the Wellington Caves. It is overlain by the Catombals (Dt) (in Little

River / Bell catchment). It outcrops on shallow valleys and low broad ridges and is associated with thick terra rosa soils. It is comprised of fossiliferous limestone and is strongly bedded. It was formed under shallow marine conditions, due to continued carbonate sedimentation.

### *Early Devonian Intrusives*

#### **Yeoval Batholith**

The Yeoval Batholith occupies the majority of the central and western part of the Little River Catchment including much of the Baldry subcatchment. The recent mapping has differentiated the granites within the Yeoval batholith (In previous mapping and on the Narromine sheet, the granites within the batholith have been described as the Obley Granites). There are two main granitic complexes: the Nallawa (Dig) and Yeoval Complexes (Dy) (including the Naringla Granodiorite (Dyx) which is part of the Yeoval Complex) plus five major "plutons".

The Yeoval batholith is unique in the way it was formed in the Lachlan, and the result is that it has a very high potential for copper, gold and molybdenum mineralisation. The Yeoval Complex has a higher copper abundance in the area around Yeoval, and two mines are located in the Naringla Granodiorites near Yeoval.

The Nallawa Complex (Dig) intrudes the Toongi (S-Dt) and Gregra Groups (Dg). It is found on the north western catchment boundary. It is dominated by felsic intrusions, and the dominant rock is fine-grained pink leucogranite. However there is a wide range of rock types present, including diorites (mafic), granodiorites (sodic) and granites.

The Yeoval Complex (Dy) makes up a major part of the Yeoval Batholith. It stretches from east west from Yeoval to Obley and runs nor-nor-west almost to Arthurville. The Complex intrudes through the Cabonne and the Cudal Groups into parts of the Gregra Group, and to the south is intruded by one of the major plutons - the Kyuna Granites (Dkg). Faulting is generally east -west, with the massive Yeoval - Obley fault that caused displacement of up to 3 kms.

The Yeoval Complex has four constituent units. The eastern part has more mafic rocks (granodiorites and gabbros) (the Naringla Granodiorites (Dyx)), while felsic granitic rocks dominate the western side (Dyg); formerly part of the "Obley Granites". These "Obley Granites" appear to be higher in sodium chloride salts than those further west. Two minor intrusive units are found within Dyg. The felsic granites Dyg are made up of sodic and potassic granites. The sodic granites may be the most fractionated, and are found in the southern part of unit.

#### **Naringla Granodiorite (Dyx)-**

Good agricultural land, forming chocolate brown soils. Lots of mineralisation, especially copper. Generally higher in potassium and lower in sodium than the western rocks.

#### **Yennora Granites (Dog)**

On boundary of Dubbo and extends mostly into the Narromine sheet. Separated from the Yeoval complex by Cuga Burga Volcanics.

Further to the east are the Kyuna Granites (Dkg). Separated from Yeoval complex by Cuga Burga Volcanics. These appear as large tors and boulders.

To the east of this again are the Glenrowe granites (Dwg) - a circular mass. It also is typed by large tor outcrops.

Sorronto Granites (Dsg) is located south of Dwg and Little River drains through this circular mass. It borders and is probably intruded by the Dulladerry Volcanics.

### ***Middle Devonian Volcanics***

#### **Dulladerry Volcanics**

The Dulladerry Volcanics (Dd) cover the large part of the south west of the catchment. It runs west and north to the Hervey Syncline and south beyond Manildra toward Eugowra. These volcanics overlie the Canowindra Volcanics (Scv) on their eastern margin. It also overlies or intrudes the Cuga Burga Volcanics (Dgc) and Yeoval batholith. Some minor areas of Mesozoic sediments overlie this formation on the north and eastern extremities.

There are eight members of this unit, which are difficult to differentiate by radiometrics. They range from a suite of predominantly rhyolitic and lesser basaltic to andesitic volcanic rocks. The Yahoo Peaks are a major eruptive centre. The Dulladerry Volcanics have undergone regional metamorphism.

It seems that the volcanics have formed in a non-marine environment - probably in a rift. The main member, the Warraberry member (Ddw), probably formed through deposition in an alluvial plain.

### ***Late Devonian***

#### **Catombal Group**

Only minor areas of the Catombal group lies within the plan area in Curra Creek; most of this group lies just to the east, running north south. It overlies the Garra Formation (limestones). The group is generally resistant to erosion, forming strike ridges along a syncline.

The Catombals are made up of two Subgroups - Black Rock (Dtb) which is overlain by Canangle (Dtc). It is 1100 metres thick in the Catombal syncline. The Catombals are a sequence of quartzose sandstones, siltstones and conglomerates, commonly red in colour.

These sediments have been deposited by fluvial systems, interrupted by marine transgression. Fluvial systems were re-established. The siltstones were deposited under relatively low energy, while conglomerates such as the Curra Creek Conglomerates (Dtcu) and Kurrool Formation (Dtck) resulted from high-energy deposition of alluvial fans from the east.

Undifferentiated Black Rock sediments form the steep sides of the Catombal Syncline, while the lower centre is made of Curra Creek conglomerates surrounded by Kurrool Formation of the Canangle Group. Kurrool is a dominantly siltstone sequence.

#### **Hervey Group (Narromine notes)**

The Hervey Group (Dh) is folded into a north-south syncline that forms the Hervey Ranges in the west of the catchment area. The Hervey Syncline is faulted against older sediments and volcanics along its western margin. In the south, the Syncline rests paraconformably on the Dulladerry Volcanics (Dd). Hervey Group formations found within the Little River

catchment include Burrill Formation (Dhb), Caloma Sandstone (Dhl), Pipe Formation (Dhp) and Mandagery Sandstone (Dhm).

The Hervey Group is dominantly quartz sandstone with local conglomerates developed at the base. Most of the sandstone is off white to iron-stained and the fine sandstone and siltstone is reddish to deep reddish purple. The coarser beds are usually cross bedded. These rocks are poorly fossiliferous. Strong cleavage on the western flank of the Hervey Range tends to mask the bedding. Shallow dips in the northern part of the syncline also produce a different outcrop pattern when compared to the steep dips in the south.

The Hervey Ranges was deposited under fluvial to fluvio-deltaic conditions. Laminate sandstone and siltstone units alternating with the cross-bedded sandstone formations indicate a change in environment, possibly terrestrial to marine. The laminate sandstones are associated with a silty mudstone, which may indicate a well oxygenated environment.

### ***Mesozoic Sediments***

There are only small areas of mesozoic sediments within the catchment. These are located north west of Arthurville and north-north east of Cumnock along the Googodery Creek. Most lack formal names with the exception of the Googodery Trachyte.

The Googodery Trachyte (Mg) crops out as outliers and intrusions and forms low, broad ridges. The intrusions are generally aligned along large-scale conjugate lineament sets. The different groups mentioned may represent magma from decreasing depths in a progressively thinning lithosphere. The Googodery Trachyte overlies the Hanover Formation. The rocks generally form rounded hills to flat-topped plateaus. This unit is of extrusive origin. The Googodery Trachyte is surrounded by siltstone north of the Cumnock to Eurimbla road.

The other area of mesozoic sediments overlies the Toongi Group, south west of Toongi. The rocks are composed of intrusions, plugs and flow remnants. Ponto Hill is an example of a trachyte outcrop. Some of these outcrops have jointing which suggests that the rock is a dipping lava flow.

### ***Cainozoic Alluvials and Colluvials***

Alluvial deposits (Qa, Cza) are distributed along perennial and intermittent watercourses. The largest areas are found along the Macquarie River. Other areas include Little River and a number of creeks in the Cumnock area. Some of the areas along the Macquarie River have deep accumulations of alluvium that allow it to be used as a near surface aquifer. The alluvial deposits may overlie older unconsolidated sediments, bedrock or earlier transported regolithic material. The deposits are mainly silt and clay with some sand content. Some gravel deposits can be observed at erosional banks along some streams. In some areas there are up to four levels of alluvial terraces which have been deposited at various flow levels and discharges.

Colluvial deposits (Qc, Qt, Qr) are found along Curra, Barney's, and Gundy Creek as well as Little River in the Suntop/Arthurville area. There is also a large area to the south of Baldry. Colluvial deposits generally overlie older unconsolidated sediments or bedrock. Composition is determined by the uplands provenance. The deposits represent alluvial fans moving into an alluvial zone.