5.7 DISTRIBUTION OF GEOLOGIC MATERIALS

The main geologic materials in the mapped Armidale study area are:

1. Alluvium
2. Colluvium
3. Silcrete
4. Variably cemented sediments
5. Ferricrete
6. Tertiary basalt
7. Armidale Formation
8. Dummy Creek Conglomerate
9. Granitic rocks
10. Rocks of the Sandon Beds (chert, jasper, greywacke, sandstone, siltstone, mudstone).

5.7.1 ALLUVIUM

Alluvium in the Armidale-Uralla region is concentrated along Saumarez and Dumaresq Creeks. The distribution of alluvium is variable along both creeks, with the Saumarez Creek valley containing deposits of alluvium almost to its headwaters. In these upper reaches the valley of Saumarez Creek is narrow and the deposits of alluvium are also narrow, usually less than 100 m wide. The confluence of the two main headwater tributaries of Saumarez Creek (at Dumaresq sheet GR 586336) marks the upper limit of substantial deposits of alluvium. Alluvium has been deposited here as a result of a marked decrease in stream gradient, from 14 m/km above the confluence to 7 m/km downstream of the confluence. Immediately below the confluence the alluvium covers the valley floor to a width of 500 m. This width increases to as much as 700 m and is maintained for 8 km until the valley of Saumarez Creek is constricted by Redmans Knob, a steeply sloping basalt remnant that forms the eastern bank of Saumarez Creek at Dumaresq sheet GR 646257. This restricts the width of alluvium to 200 m, but downstream the valley widens and in the next 4.5 km the width of alluvium increases to 700 m. At this point (Armidale sheet GR 465193), steeply sloping (up to 20^{o}) basalt forms the eastern bank, and more gently sloping (5^{o}) basalt the western bank (Plates 44, 45). The basalt on the eastern side of Saumarez Creek has trapped alluvium against its upstream side. The creek flows in an arc around this basalt outcrop, and the alluvium regains a width on the valley floor of up to 500 m, before the junction with Lambing Gully (at Armidale sheet GR 649146).

Below the confluence with Lambing Gully the width of alluvium is constrained by basalt hills on the northeast side and hills of Palaeozoic Sandon Beds on the southwest side.

Dumaresq Creek has much less extensive deposits of alluvium than Saumarez Creek. The gradient of Dumaresq in its headwaters on Mount Duval is up to 185 m/km, measured over 1.0 km segments. Where Dumaresq Creek flows out of the Armidale-Uralla region the gradient has fallen to 3.8 m/km, measured over 5.3 km. Upstream of its confluence with Pipeclay Creek (Armidale sheet GR 685276), the Dumaresq Creek valley is narrow and flood plain development is minimal. Below this confluence, even though Dumaresq Creek continues to flow across rocks of the Sandon Beds, the valley widens and a flood plain up to 700 m wide has developed.

The tributaries of the Gwydir River west of the Main Divide have minor deposits of alluvium along their courses, as is consistent with their situation in the extreme headwaters of these streams.

5.7.2 COLLUVIUM

Unconsolidated rock debris and soil was mapped as colluvium only in the

Plate 44. Valley floor basalt at 'Saumarez', a site of drainage diversion by basalt (Armidale sheet GR 605193). Saumarez Creek here is a lateral stream, and the low gradient of the creek (3 m/km) has aided development of extensive alluvial deposits in the area (Plate 45).

Plate 45. Extensive alluvial deposits on the valley floor of Saumarez Creek, immediately upstream of the site shown in Plate 44. The site in Plate 44 is in the centre background, at the base of the low, timbered ridge running from the left (east) of the Plate.

absence of bedrock outcrop. There are areas of colluvium throughout the Armidale-Uralla region, concentrated along the upper and middle reaches of Saumarez Creek. Deposits of colluvium usually coalesce with valley floor alluvium and the boundary between the two is indistinct. The texture and composition of the colluvium varies, depending mainly on upslope lithology. Colluvium downslope of basalt is usually clayey, with minor loam or sand. Downslope of Sandon Beds, colluvium is usually sandy loam to sandy clay loam, often containing angular rock fragments, in particular erosion resistant chert and jasper.

Colluvium occurs on one section of the divide between Saumarez and Dumaresq Creeks (at Armidale sheet GR 640221). This material consists of unconsolidated soil and ferruginous weathering products on upper slopes and interfluves. This deposit of colluvium is surrounded by basalt and ferricrete, and the ferricrete is underlain by basalt. There is little doubt that the colluvium is also underlain by basalt, and is part of a weathering profile formed on the basalt.

5.7.3 SILCRETE

Silcrete occurs as scattered deposits from valley floor to interfluve throughout the Armidale-Uralla region, though valley floor deposits are much less common than upper slope and interfluve deposits. The surface outcrop of silcrete deposits varies from less than 10 m, to elongate deposits more than 2 km in length and up to 1 km wide. Most silcrete in the Armidale area either adjoins or lies near Tertiary basalt, particularly where it occurs on upper slopes and interfluves. Some silcrete is sub-basaltic. This is shown by mining records (David, 1886) and the presence of silcrete in the waste heaps of disused gold mine shafts (for example at Armidale sheet GR 531132 and 535104).

Silcrete low in the landscape is frequently surrounded by ferricrete (for example at Armidale sheet GR 576187, 600130, 608207), and does not always abut basalt outcrops. These low-lying deposits usually consist of silica-cemented sorted sediments (fine to medium quartz sand, cryptocrystalline cement). They may have formed from floodplain deposits, rather than stream channel deposits that could be expected to contain some coarser material. Despite these exceptions, where silcrete is found basalt is usually close by.

This does not imply a causal relationship. Much of the silcrete in the Armidale-Uralla region is silicified fluvial sediments. These sediments were in or close to stream beds that would have been filled by Tertiary basalt. Erosion since that time has removed all but remnants of the Tertiary basalt, and has re-exposed the now silicified sediments of the pre-basalt streams.

Silicification of sand-sized sediments is more common near the margins of pre-basalt fluvial deposits than in the stream beds proper. There is usually unsilicified quartz sand in waste heaps at deep lead mine shafts close to the estimated centre of deep leads in the Uralla-Rocky River area 25 km south of Armidale (for example at Armidale sheet GR 529114, 531113, 533097). On the other hand, sediments exposed near the margins of deep leads are usually silicified (for example at Armidale sheet GR 531132, 533133, 612188). The estimate of the centre of deep leads is based on records of gold production from known shafts, and the likelihood that gold would have been concentrated in the main stream bed. The preferential silicification of sediments at the margins of deep leads was well known to the early gold miners in the Uralla-Rocky River area. Miners spoke of 'the dreaded billy' (silcrete), and sunk their shafts through thick basalt close to the estimated centre of the deep lead, rather than risk encountering the extremely hard silicified sediments at the deep lead margins (A. Goode, 'Spring Creek', Uralla, pers. comm.).

Because of the close field relationship between silcrete and basalt, the distribution of silcrete is not uniform.

The following areas contain little or no silcrete.

1. North of an east-west line through Dumaresq Dam (Dumaresq sheet GR 654326; Map 1). Much of this northern area is composed of Mount Duval Adamellite

and rocks of the Sandon Beds, though there is Tertiary basalt along the Main Divide, and between Mount Duval (Dumaresq sheet GR 690352) and Little Duval (1.3 km north of the northern boundary of the mapped Armidale study area, at Dumaresq sheet GR 653383).

2. Along the western edge of the Armidale-Uralla region, from Dumaresq sheet GR 565305 in the north to Armidale sheet GR 530150 in the south. This area of 15 km north-south by 1-3 km east-west is on rocks of the Sandon Beds. Silcrete deposits are located along the eastern edge of this area in association with the Tertiary basalt on the Main Divide (Map 1).
3. Along Dumaresq Creek from Dumaresq Dam to where the creek crosses the eastern edge of the Armidale-Uralla region at Dumaresq sheet GR 690254). This section of Dumaresq Creek flows over rocks of the Sandon Beds, except for the first kilometre below Dumaresq Dam, which is on Mount Duval Adamellite (Maps 1, 2).
4. The eastern reaches of Saumarez Creek in the Armidale-Uralla region. This section of Saumarez Creek crosses Sandon Beds and Tertiary basalt (Maps 1,2).
5. The southeast corner of the Armidale-Uralla region. This region is composed entirely of Gostwyck Adamellite (Map 1).

5.7.4 VARIABLY CEMENTED SEDIMENTS

Sand and gravel, cemented to varying hardnesses by siliceous and ferruginous cement, occurs mainly in the northern half of the Armidale-Uralla Region (Map1). Even where the cement is silica-rich, it is usually iron-stained, indicating the concurrent mobilisation of silica and iron. Rounding of pebble-sized clasts is common, suggesting stream transport prior to cementation.

There are deposits of variably cemented sand and gravel at all levels in the landscape, and its distribution is not related to the present drainage pattern (Maps 1,2). Therefore the sediments that comprise this material were deposited during an earlier drainage regime, possibly the same regime responsible for the quartz grains in silcrete.

The main deposits of cemented sediments are in the following areas.

1. In the headwaters of Dumaresq Creek, from Martins Gully in the south (Armidale sheet GR 665210), to the property 'Beverly' in the north (Dumaresq sheet GR 665260).
2. In the Saumarez-Arding ferricrete area, between Saumarez Creek in the east and the Main Divide in the west; and Thomas Lagoon in the south (Armidale sheet GR 581185), and Farm Lagoon in the north (Dumaresq sheet GR 620256). The deposits of cemented sediments in this area vary from sub-circular deposits 200 m in diameter to elongate deposits up to 300 m by 1700 m.
3. West of the Main Divide, in the vicinity of Armidale sheet GR 559176 and GR 549172.

Of the 34 deposits of cemented sediments recorded in the Armidale-Uralla region only five are not contiguous with either basalt or ferricrete. None of these five deposits is more than 400 m from either basalt or ferricrete, and these materials are the likely sources of the iron now present in the ferruginous cement that often binds these sediments.

There are few non-silica cemented sediments in the southern parts of the Armidale-Uralla region. This is despite extensive deposits of ferricrete that indicate iron mobilisation and re-concentration has been active. It appears either that the sediments in the south of the study area were silicified to form silcrete before iron was weathered from the Tertiary basalt in sufficient quantities to infiltrate and cement the sediments, or that silicification was pre-basaltic.

5.7.5 FERRICRETE

Deposits of ferricrete are plentiful throughout the Armidale-Uralla region, being found along parts of the Main Divide and other drainage divides, as well as on valley floors (Plates 46, 47). There is no distinctive difference in appearance or constituents, between ferricrete in different slope situations. Variations in ferricrete petrography are usually due to variations in parent rock lithology. For example the proportion of chert, quartz and jasper fragments in ferricrete, increases with proximity to outcrops of the Sandon Beds.

The main deposits are in a broad band through the central and southern parts of the region, where the topography is undulating to flat, and in places poorly drained. The northern part of this band of ferricrete incorporates the Saumarez-Arding ferricrete area, covering about 20 km2 (Map 1; Figure 2). Across this very low relief area are numerous minor outcrops of basalt, silcrete and unconsolidated rounded sands and gravels. Bore logs (Figure 5) indicate that the ferricrete in this area is underlain by basalt that is in turn underlain by clay, sand and 'quartzite'. This 'quartzite' is probably silica-cemented sediments, as the term 'quartzite' has long been used in New England (David, 1886; Stonier, 1895) and elsewhere to refer to 'white billy' and 'grey billy', colloquial terms for silica-cemented sediments.

Bore logs (Figure 5) suggest that ferricrete in the Saumarez-Arding area has formed on basalt that now extends to a depth of 15-25 m below the surface. Underlying this basalt is sand, 'quartzite' (probably silica-cemented sediments) and clay, that may all be sediments from a stream flooded by basalt.

In some well authenticated Victorian deep lead systems, the basalt is underlain by several metres of fine white clay (I.G. Matthias, CRA Exploration, pers. comm.). The white clay encountered in the un-numbered bore at the F.J. White property 'Saumarez', (Figure 5) extends from the 25 to 30 m level immediately below the basalt, grading into red and white clay at 30 m. Thus it is very similar in description and situation to the Victorian deep lead clays, and supports the possibility that the Saumarez-Arding area is

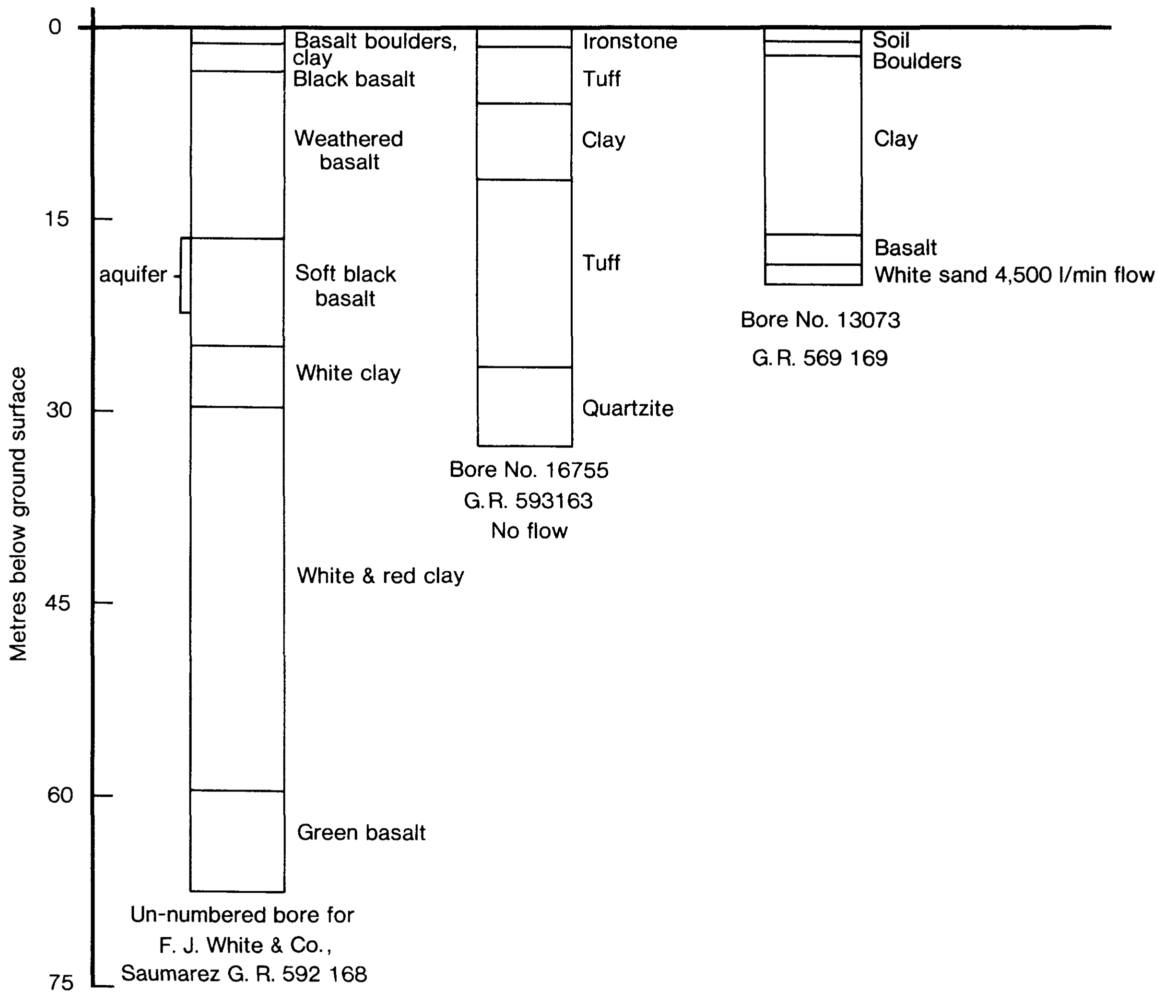


Figure 5. Redrawn profiles for bore logs in the Saumarez-Arding area. The profile discriptions are verbatim from the bore logs, and may not be geologically accurate. Grid references are to the Armidale sheet, and bore numbers are Water Resources Commission numbers. The 'quartzite' recorded in bore no. 16755 is probably silcrete formed on fluvial sediments underlying the basalt that extends over the area.

underlain by a deep lead system.

Ferricrete is not extensive west of the Main Divide in the Armidale-Uralla region. This may be because the higher erosion on the steep western fall means that weathered material is removed completely from the slopes, rather than being redeposited elsewhere within the soil profile.

At several sites in the Armidale-Uralla region, highly weathered, massive ferricrete horizons are overlain by relatively fresh basalt that has no more than a thin 2 mm rind of surface weathering. These sites include Bald Knobs, (Armidale sheet GR 710145) Arthurs Seat (Armidale sheet GR 551199) and the Mount Butler area (Armidale sheet GR 551199) (Plates 48, 49).

South of the divide between Lambing Gully and Saumarez Creek, ferricrete deposits lie either side of extensive basalt remnants that extend as far south as the divide between Lambing Gully and Dog Trap Creek. The distribution of ferricrete and basalt shown in Map 1 suggests that ferricrete has formed on the gentler basalt slopes where iron minerals leached from the steeper slopes have precipitated. Bore logs, dam excavations and holes dug for poles carrying high voltage transmission lines, all show that ferricrete in the Armidale-Uralla region is usually underlain by Tertiary basalt.

There is little ferricrete in the northeast of the Armidale-Uralla region where the geology consists of Mount Duval Adamellite and rocks of the Sandon Beds (Map 1). Similarly ferricrete is rare in the southeast of the region, where Gostwyck Adamellite outcrops (Map 1). The paucity of ferricrete from these areas is to be expected, as ferricrete in the Armidale-Uralla region is strongly associated with basaltic soils, which on weathering release abundant iron oxides that can then be mobilised and concentrated to form ferricrete.

In the Armidale-Uralla region there are numerous examples of ferricrete horizons still in the soil profile. These horizons have been exposed in stream banks and in excavations such as road and rail cuttings (Plates 50, 51). Ferricrete now exposed in the Armidale-Uralla region is generally above the water table, though deposits exposed in stream banks are often within 1-2 m of it.

There is a close field relationship between ferricrete and silcrete in the Armidale-Uralla region. For example 8 km southwest of Armidale at 'Saumarez' (Armidale sheet GR 605192), ferricrete on the valley floor cements silcrete cobbles (Plate 52). The significance of this site is discussed in Chapter 7, but the relationship is to be expected, as silcrete in the area very often marks the position of old drainage lines that were infilled by basalt flows. These basalt flows supplied the iron minerals that were later concentrated to form ferricrete horizons.

The margins of ferricrete outcrops in the Armidale-Uralla region range in elevation from 1000 m to 1260 m (Figure 6) The spot heights used in compiling Figure 6 were recorded in metres above sea level, at intervals of 250 m. Spot heights were recorded for all contacts between ferricrete and Sandon Beds, ferricrete and granitic rocks and ferricrete and Tertiary basalt. The Sandon Beds, granites and some basalts pre-date the ferricrete in the Armidale-Uralla region. For contacts with less than 250 m surface expression, a single spot height was recorded.

The clustering of ferricrete elevations at 1025-1085 m cannot be interpreted as evidence for the existence of a ferricrete surface. The distribution of ferricrete base elevations follows closely the distribution of the surface elevations of the present topography in the Armidale-Uralla region. That is, there is a real cluster in ferricrete base elevations at 1025-1085 m, corresponding with the distribution of elevations in the surrounding landscape. Elevations of 1025-1085 take in the broad valleys and gentle interfluves of most of the study area outside the northern and northeastern sections. These latter parts of the study area comprise a very minor cluster of higher elevation land (1185-1245 m), that lie on and near the slopes of Mount Duval, the highest feature in the Armidale-Uralla landscape (Plate 56; Section 5.7.9). Ferricrete outcrops in the northern and northeastern parts of the study area constitute this cluster.

Plate 46. Ferricrete remnant deposits on mid-slopes. Upper slope in background is basalt (Armidale sheet GR 633242). The ferricrete near the ranging pole was probably removed from the paddock to enable cultivation.

Plate 47. Ferricrete pavement on mid-slope. The ferricrete at this site forms an almost continuous cover at the ground surface, unlike the discrete boulders at the site shown in Plate 46 (Armidale sheet GR 665237).

Plate 48. *Highly weathered ferricrete underlying relatively unweathered basalt at Arthurs Seat 6 km south of Armidale. The site is 5.5 km east of the eastern boundary of Map 1 (Armidale sheet GR 551199). Traces of spheroidal weathering are visible in the ferricrete near the base of the ranging pole, and suggest that ferricrete may have weathered from basalt much older than the relatively unweathered, 45 m thick, Arthurs Seat basalt.*

Plate 49. *Ferricrete from Uralla Trig., 5 km northeast of Uralla (Gostwyck sheet GR 555073). The material is highly weathered like that shown in Plate 48, but the deposit is not overlain by basalt. Ferricrete at this site forms a topographic high, above the level of surrounding basalts.*

Plate 50. Ferricrete horizon 0.5 m below ground surface. Ferricrete is beginning to weather into boulders. Underlying horizon is slightly pallid. Bedrock in this area is Sandon Beds sandstone, shale and chert. The site is backed by basalt-capped hills 300 m to the south, and may once have had a partial or complete basalt cover. Thus the ferricrete horizon probably contains a major contribution from the basalt. The underlying pallid horizon is on weathered Sandon Beds (Armidale sheet GR 666241).

Plate 51. Ferricrete horizon 300 m west of site shown in Plate 50. The ferricrete is 1.2 m below the ground surface, and there is no pallid zone. At this site the ferricrete horizon appears to have formed in soil derived mainly from the Sandon Beds. Bedrock and relationship to basalt is the same as for the site shown in Plate 50.

Plate 52. *Silcrete cobbles cemented by ferricrete, 2 m above the level of Saumarez Creek. The occurrence here of reworked ferricrete cobbles within ferricrete, indicates that the ferricrete formed after the silcrete it cements. The silcrete might not have formed in situ; it could have been transported by Saumarez Creek from silcrete deposits upstream. The site is at 'Saumarez', 8 km southwest of Armidale, about 200 m south of the site shown in Plate 44.*

5.7.6 TERTIARY BASALT

Tertiary basalt is found at all levels of the landscape in the Armidale-Uralla region, but its characteristic mode is on upper slopes and interfluves. Much of the Tertiary basalt in the Armidale-Uralla region is in the form of scattered discontinuous outcrops. Basalt covers about 20% of the 420 km^2 area in Map 1, and is found along almost the entire length of the Main Divide in this region.

In the extreme north of the Armidale-Uralla region, basalt summits on the Main Divide have an elevation of 1170 m. The elevation of the basalt falls to 1060 m in the central parts of the Armidale-Uralla region, then rises again to 1130 m in the south.

The sub-basalt surface shows a similar dip to the central section of the Armidale-Uralla region. In the north, along the western margin of the Main Divide basalts, the sub-basalt surface has an elevation of 1110 m. The surface falls to 990 m in the central section, before rising to 1080 m at the southern boundary of the Armidale-Uralla region (Figure 7). The sub-basalt surface on the eastern margin of the Main Divide basalts also slopes downward from the northern and southern ends of the Armidale-Uralla region (Figure 7).

The basalts on the divide between Saumarez and Dumaresq Creeks reach an elevation of 1300 m at the northern margin of the Armidale-Uralla region (Dumaresq sheet GR 642369). At this site an unnamed circular basalt hill stands about 40 m above the surrounding basalt. Prominent basalt hills are common on this drainage divide. Other examples are Belfield Trig. (1199 m) at Dumaresq sheet GR 615325; Mitchells Knob (1140 m) at Dumaresq sheet GR 651279; and Redmans Knob (1147 m) at Dumaresq sheet GR 646257. Mount Thomas and Mount Caroline (1100 m), two other prominent basalt hills, are located 2 km west of the divide at Armidale sheet GR 632201. The sub-basalt topography along the divide between Saumarez and Dumaresq Creeks falls from 1160 m in the vicinity of Belfield Trig., to 1060 m at Dumaresq sheet GR 643295, over a distance of 4 km. (Figure 8). This is a gradient on the sub-basalt surface of 20 m/km, falling to the southeast.

In the extreme north of the Armidale-Uralla region basalt does not follow the divide. The main basalt in this area covers an area of 6 km by up to 2 km, from the western slopes of Mount Duval (well within the Dumaresq Creek catchment), into the catchment of Saumarez Creek. This basalt deposit is truncated in the east by Dumaresq Creek at an elevation of 1210 m, rises to 1300 m on the drainage divide, then falls to 1110 m at its western margin in the Saumarez catchment. The sub-basalt topography here slopes down to the west; from an elevation of 1260 m at Dumaresq sheet GR 672369, to 1130 m at Dumaresq Sheet GR 607252, a gradient on the sub-basalt adamellite and Sandon Beds of 20 m/km (Figure 9).

The main area of Tertiary basalt in the south of the Armidale-Uralla region is in the valley of Lambing Gully (Maps 1, 2). This basalt is not restricted to the major interfluves; it is also found on minor interfluves, and at Armidale sheet GR 599135 it is transected by Lambing Gully at 1020 m.

The sub-basalt surface in this area slopes gently down to the north; from 1070 m on the interfluve between Lambing Gully and Dog Trap Creek (Gostwyck sheet GR 460076), to 1040 m near the interfluve between Saumarez Creek and Lambing Gully at Armidale sheet GR 611152 (Figure 10). This is a gradient on the sub-basalt Sandon Beds of 4 m/km, substantially less than the 20 m/km sub-basalt gradients calculated elsewhere in the study area.

South of the drainage divide between Lambing Gully and Dog Trap Creek the sub-basalt topography slopes to the south. From Gostwyck sheet GR 603076 to the southern margin of the Armidale-Uralla region at Gostwyck sheet GR 600033, the elevation of the sub-basalt surface falls from 1070 m to 1040 m in 3 km; a sub-basalt gradient of 10 m/km. The fall in the sub-basalt topography to the north and south of the divide between Lambing Gully and Dog Trap Creek suggests that this contemporary divide was also a pre-basalt divide.

There are no recorded faults or lineaments in the Tertiary basalt in the Armidale-Uralla region. As there appear to be no structural weaknesses that

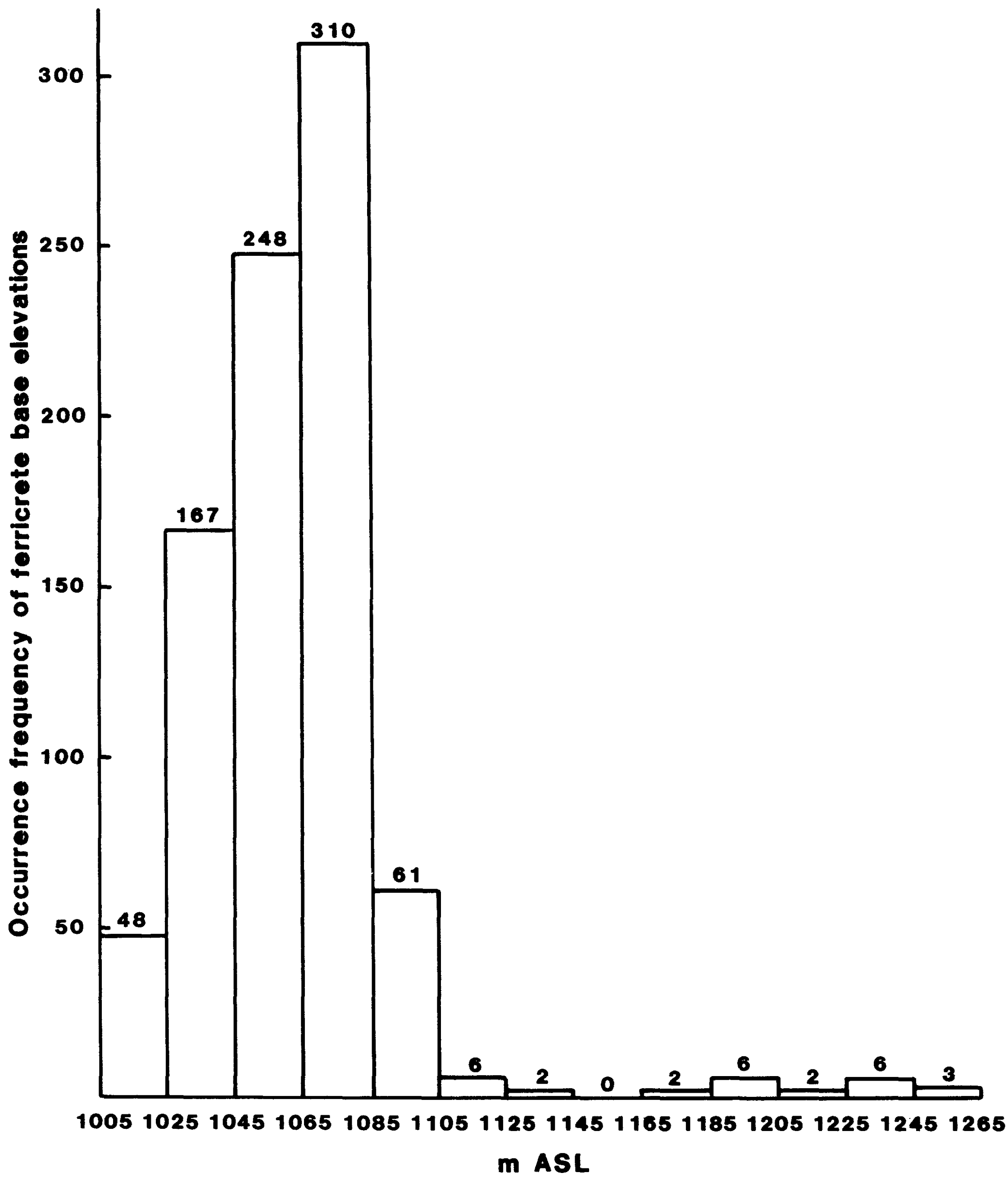


Figure 6. Histogram of ferricrete base elevations, drawn from measurements of spot heights on the base of ferricrete outcrops in the Armidale-Uralla region. Numbers on bars give the number of spot height readings in each elevation class. Base elevations are clustered at 1025-1085 m.

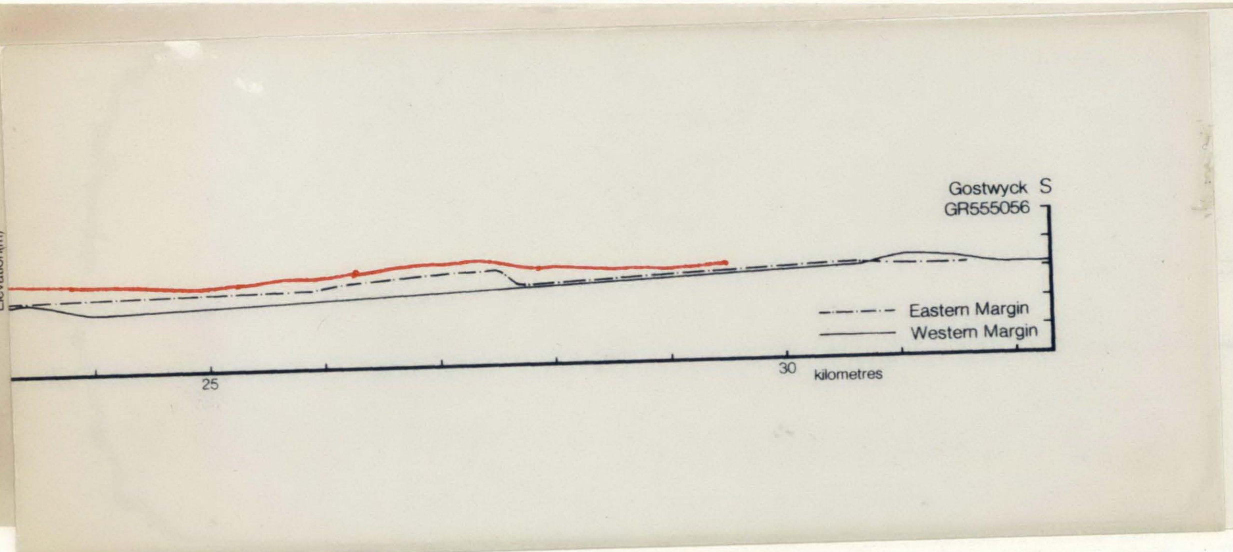


Figure 7. Profile 1: sub-basalt topography in the west of the Armidale-Uralla region. The profile location is shown in Map 1, and follows the Main Divide through most of the Armidale-Uralla region.. Along this north-south profile the sub-basalt topography slopes down to the centre of the Armidale-Uralla region from the northern and southern ends. The profile of the basalt sections of the interfluve between the basalt margins, is shown in red. This profile indicates a possible basalt thickness of up to 60 m along the Main Divide, though for much of the profile a basalt thickness of 10-20 m is indicated.

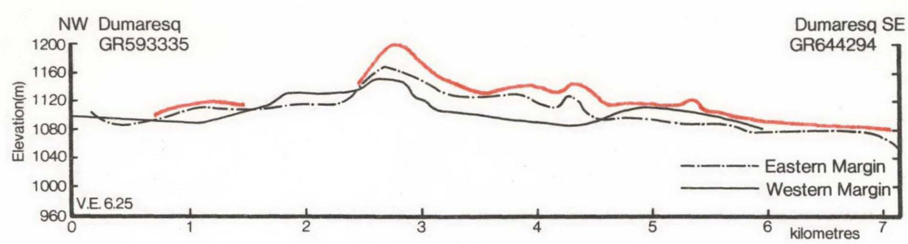
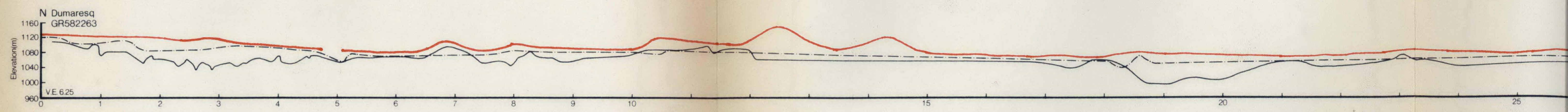


Figure 8. Profile 2: sub-basalt topography in the northeast of the Armidale-Uralla region. The profile location is shown in Map 1. This profile follows the drainage divide between Saumarez and Dumaresq Creeks. The sub-basalt topography slopes down to the southeast. The profile of the basalt sections of the interfluve between the basalt margins, is shown in red. The maximum basalt thickness suggested by the profile is 30 m, with 10-20 m being characteristic.



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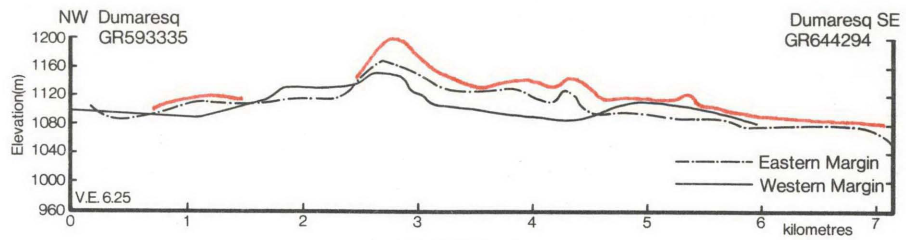
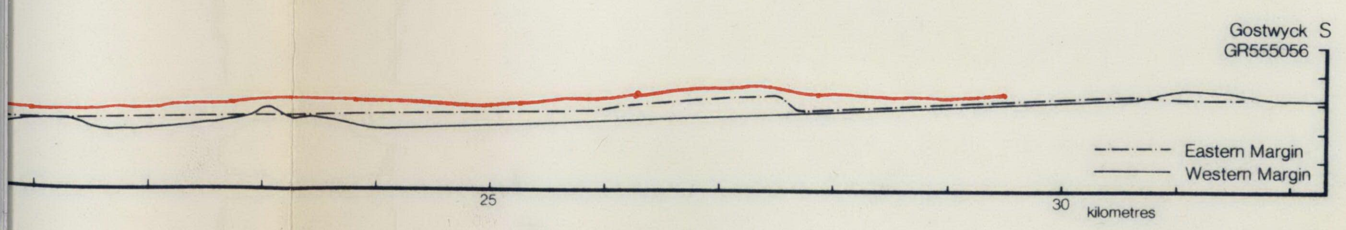


Figure 8. Profile 2: sub-basalt topography in the northeast of the Armidale-Uralla region. The profile location is shown in Map 1. This profile follows the drainage divide between Saumarez and Dumaresq Creeks. The sub-basalt topography slopes down to the southeast. The profile of the basalt sections of the interfluve between the basalt margins, is shown in red. The maximum basalt thickness suggested by the profile is 30 m, with 10-20 m being characteristic.


Gostwyck S
GR555056
Eastern Margin
Western Margin
25
30
kilometres

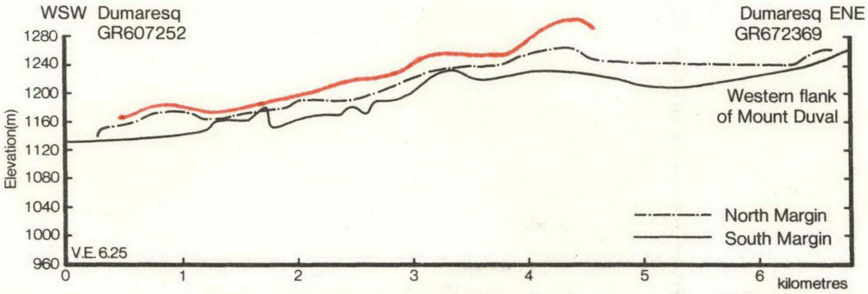


Figure 9. *Profile 3: sub-basalt topography in the north of the Armidale-Uralla region. The profile location is shown in Map 1. In this area the sub-basalt topography slopes down from the western flanks of Mount Duval. The profile of the basalt sections of the interfluve between the basalt margins, is shown in red. The maximum basalt thickness indicated by the profile is 40 m, but 10-20 m is more usual.*

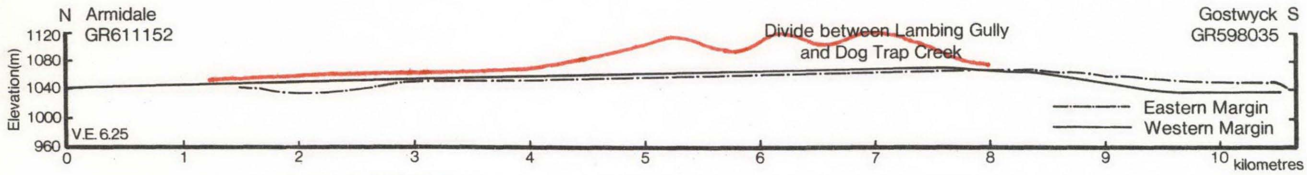


Figure 10. *Profile 4: sub-basalt topography in the south of the Armidale-Uralla region. The profile location is shown in Map 1. In this southern section of the Armidale-Uralla region the sub-basalt topography is of low relief, and is highest at the location of the modern divide between Lambing Gully and Dog Trap Creek. The profile of the basalt sections of the interfluve between the basalt margins, is shown in red. This profile indicates the thickest basalt cover of the four profiles. For a distance of 4 km the indicated basalt thickness is 30-60 m.*

might have caused preferential localised basalt extrusions along the lateral stream valleys flanking the Saumarez-Arding area, there is no good reason to assume that volcanic activity should have taken place preferentially along these lateral streams. Thus the preservation of basalt remnants on interfluves is indicative of regional valley-fill lava flows that have been relief-inverted, not of minor localised extrusions.

5.7.7 ARMIDALE FORMATION

These beds of fluvial sediments were named, and their type section described, by Voisey (1942a). The Armidale Formation consists of quartz, jasper and chert pebble conglomerate, muddy sandstone, ferruginous cemented quartz sandstone, and ferruginous mudstone, as well as minor clay and lignite. The sediments were interpreted by Voisey (1942a) as lacustrine. Slade (1966) reinterpreted the sediments as fluvial, because of the common presence of cross-bedded sandstone and pebble conglomerate, as well as the changes in facies over short distances. Slade (1966) dated the Armidale Formation as Eocene on the basis of the plant remains and pollen spore assemblage in the formation. There are good exposures of Eocene sediment beds in the Madgwick Drive road cutting near the University of New England (Plate 53; Armidale sheet GR 705256), and near Bundarra Road 8 km west of Armidale, at Armidale sheet GR 618230 (Plates 54, 55).

5.7.8 DUMMY CREEK CONGLOMERATE

This Permian terrestrial sequence includes moderately folded conglomerate, sandstone and siltstone. The main outcrop in the Armidale-Uralla region is about 20 km north of Armidale. Korsch (1982a, 1982b) argued that this sequence consisted of sediments eroded off the dome formed by the emplacement of the Mount Duval diapir. Research by Brownlow (1982) substantiated Korsch's interpretation of the geomorphic effect of diapirism in the Mount Duval area.

Plate 53. Eocene Armidale Formation sediments overlying weathered rocks of the Sandon Beds in Madgwick Drive near the University of New England. The site is 1.5 km east of the eastern boundary of Map 1. Iron appears to have been mobile in the Armidale-Uralla region throughout much of the post-basaltic period (Section 7.4), and may also have been mobile in the pre-basalt environment. The apparent folding is differentially weathered iron-rich colour banding. The resistant iron-rich bands could have formed during one of the weathering phases responsible for ferricrete development in the Armidale-Uralla region, but their date of formation is unknown. The western end of the cutting (off the right of Plate 53), contains narrow horizons of nodular ferricrete 30-100 cm below the ground surface. (Armidale sheet GR 705256). The deposition pattern of the Armidale Formation suggests a braided stream environment (Section 9.3).

Plate 54. Well rounded Eocene pebbles of the Armidale Formation overlain by Tertiary basalt, in a small quarry 8 km west of Armidale, and 25 m above the modern level of Saumarez Creek (Armidale sheet GR 618230). The exposure is confined to little more than the working area of the quarry. Exposures of uncemented fluvial sediments are not common in the Armidale - Uralla region. This exposure is shown on Map 1 as variably cemented sand and gravel. The extensive basaltic colluvial material in the area probably obscures other exposures of Eocene pebbles along the base of the basalt. The existence of these deposits is suggested by several natural springs, along contour, downslope from the basalt margin (Plate 55).

Plate 55. *Looking east to the small quarry shown in Plate 54. The quarry is visible on the midslope to right of centre. The green patches on the slope to the right of the quarry mark the location of sub-basalt springs, probably reaching the ground surface through the permeable sub-basalt sediments. The upper slope is basalt. Saumarez Creek flows south (to the right in the Plate), across the base of the slope.*

Plate 56. *Mount Duval, a Permian gravity driven diapir, and part of the New England Batholith (Section 5.7.9). Seen from the south, from a basalt-capped hill at Dumaresq sheet GR 695268, 0.5 km east of the eastern boundary of Map 1.*

In his discussion of thermal provinces in northeastern New South Wales, Brownlow (1982) noted that diapirism 'can profoundly affect sedimentation in the surrounding region', due to the uplift of the groundsurface as the diapir rises.

5.7.9 GRANITIC ROCKS

There are three main areas of granitic rocks in the Armidale-Uralla region, all belonging to the New England Batholith, a large granitic pluton that outcrops along the New England plateau from Tamworth to the Queensland border. Three samples from the southern end of the New England Batholith in the Armidale-Uralla region have been dated at 250-245 my (Cooper et al., 1963). This age is consistent with ages on granitic rocks obtained elsewhere in New England, for example the 243 my for a sample from 40 km south of Tenterfield (Evernden and Richards, 1962).

In the northeast of the Armidale-Uralla region, Mount Duval Adamellite is the dominant rock type, and is drained by the headwaters of Dumaresq Creek. The elevation of the Mount Duval Adamellite varies from 1393 m at the summit of Mount Duval (Dumaresq sheet GR 690352) to 1050 m in Dumaresq Creek at the contact with rocks of the Sandon Beds (Dumaresq sheet GR 653318). Korsch (1982a, 1982b) has interpreted Mount Duval (Plate 56) as a gravity driven diapir that was emplaced close to the surface during the Permian, doming the covering rocks. Korsch (1982a, 1982b) suggested that the Mount Duval pluton was above the level of the original land surface even before it was exposed by erosion of a thin cover of overlying rocks.

In the southwest of the Armidale-Uralla region, Uralla Granodiorite outcrops. This rock type extends out of the study area to the west, and its surface outcrop is bounded on the east by the Tertiary basalts on the Main Divide. The topography on the Uralla Granodiorite is undulating, with elevations of 1000-1060 m. The southeast of the Armidale-Uralla region is composed of Gostwyck Adamellite. The topography of this area is also undulating, but with elevations of 1000-1070 m, has slightly more relative relief than the landscape on the Uralla Granodiorite.

5.7.10 SANDON BEDS

The Carboniferous Sandon Beds are the basement rocks of the Armidale-Uralla region. Rock types present in the Sandon Beds include greywacke, chert, jasper, sandstone, mudstone, argillite and basic volcanics. Exposures of the Sandon Beds are seldom found on interfluves in the Armidale-Uralla region. Outcrops are usually on lower slopes and valley floors where they have been exposed by stream erosion. Exceptions to this occur along the western side of the Main Divide, where Sandon Beds on steep upper slopes have been exposed by the west-flowing tributaries of the Gwydir River (Maps 1,2).

There are minor exposures of Sandon Beds at several sites in the Saumarez-Arding ferricrete area and as far south as Lambing Gully (for example at Armidale sheet GR 597163, 592153, 605155, 609145, 615152). These exposures are the tops of sub-basalt topographic highs along interfluves of the pre-basalt landscape.

Quartz veins 1-10 cm in width occur in the Sandon Beds throughout the Armidale-Uralla region. There is no marked variation in quartz vein frequency in different areas.