

WAN Wandalla Land System

Steep range of hills north of Burra

Area: 279.3 km²

Annual rainfall: 300 – 425 mm average

Geology: Siltstones, fine sandstones and tillites of the Tapley Hill and Appila Formations. These rocks are at or near the surface over most of the hills and rises. Sediments eroded from the hills have been deposited on outwash fans and drainage depressions. A veneer of aeolian carbonates mantles both rocks and sediments, but the cover is patchy.

Topography: The land system encompasses the moderately steep to steep range of hills north of Burra, and its associated outwash fans. The hills are generally steep (20 - 75% slopes) and very strongly dissected, but in the north the topography is more subdued. Here the terrain is undulating to rolling rises and low hills with slopes of 3-20%. Drainage from the range is mostly to the west and east. On the west, sediments deposited by streams from the hills have formed gently inclined fans with slopes up to 10%. These are included in the land system. On the east, sediments from the hills form the Stone Chimney Creek Land System. There is also some sediment accumulation within the hills, in narrow drainage depressions, most of which are severely eroded.

Elevation: 460 m in the south east to 789 m (Mt. Cone) in the centre of the land system

Relief: Maximum relief in hills: 150 m, but in undulating land in the north, relief typically 20 - 50 m.

Soils: Most soils are shallow to moderately deep over weathering rock. Sandy loams to loams directly overlying rock, or a carbonate layer capping the rock, are most common. Others have red clayey subsoils. On lower slopes, soils are deeper, usually with hard sandy loam to loam surfaces over red clay subsoils.

Main soils

Soils formed over basement rock on rises and hills

A2 Shallow calcareous loam - usually on finer grained rocks

L1 Shallow stony loam - rocky slopes

D1 Loam to sandy loam over red clay on rock - sandier surface on sandstones, loamy surfaces on siltstones

C2 Shallow gradational loam - gentler slopes

Minor soils

Deep soils formed over alluvium on outwash fans

D2 Hard loam over well structured red clay - upper fans

D3 Hard sandy loam over dispersive red clay - lower fans and drainage depressions

C3 Deep gradational red loam - fans

A3 Deep calcareous loam - fans and drainage depressions

M1 Deep sandy loam - fans and flats

D4 Loam over red friable clay - fans



Main features: The striking features of this land are the steepness of the slopes, and the degree of erosion that has occurred in the past (largely attributable to the Burra mines). Scalded areas (where sheet erosion has occurred) are still evident, and most watercourses are gullied. Soils are often shallow and of moderately low fertility, and rocky outcrops are common. Much of the land is not easily accessible and is capable of light grazing only. The gentler sloping rises and outwash fans however are not as degraded and generally have moderately deep, fertile soils with good productive potential. Poor surface soil structure is the main limitation in these areas. Erosion potential is moderate to high throughout.

Soil Landscape Unit summary: 31 Soil Landscape Units (SLUs) mapped in the Wandalla Land System

SLU	% of area	Main features #
AAB AAC AAi AAj AAk	0.4 0.5 19.2 22.7 8.1	<p>Moderately steep to steep rocky low hills and hills formed on basement rock.</p> <p>AAB Low hills with slopes of 10-20% and relief to 40 m</p> <p>AAC Low hills with slopes of 20-30% and relief to 60 m.</p> <p>AAi Slopes of 10-30% with relief to 80 m, eroded watercourses and 5-10% of the land affected by scalding.</p> <p>AAj Slopes of 30-50% with relief to 80 m, eroded watercourses and 5-10% of the land affected by scalding.</p> <p>AAk Slopes of 30-75% with relief to 150 m, eroded watercourses and 5-10% of the land affected by scalding.</p> <p>Main soils: <u>shallow stony loam</u> - L1 (E) and <u>shallow calcareous loam</u> - A2 (E), with <u>shallow gradational loam</u> - C2 (L) and <u>loam over red clay on rock</u> - D1 (L). This land is non arable due to the roughness and steepness of the terrain; large areas are so steep as to be inaccessible to vehicles. Runoff is rapid and exposure is high, so a proportion of rainfall does not infiltrate the soil. There is a significant amount of moderately deep fertile soils on the slopes and these are potentially productive for grazing. The scars of past erosion are still visible - this historic degradation makes the soils more erodible. Erosion control through grazing management is a major issue. Watercourses are particularly susceptible to erosion.</p>
ACg ACh	2.9 6.1	<p>Rises and low hills formed on fine grained rocks of the Tapley Hill Formation, characterized by gully erosion, scalding and sporadic rocky outcrops.</p> <p>ACg Undulating rises to 35 m high with slopes of 5-10%.</p> <p>ACh Dissected low hills to 50 m high with slopes of 10-25%.</p> <p>Main soils: <u>shallow gradational loam</u> - C2 (E) and <u>shallow calcareous loam</u> - A2 (E) with <u>shallow stony loam</u> - L1 (L). Shallow stony soils and rocky outcrops limit the usefulness of this land. The slopes, although gentle in places, are highly erodible, as indicated by the scars of past sheet and gully erosion.</p>
ADg ADh ADj	0.7 0.9 3.1	<p>Undulating rises to dissected steep low hills formed on fine grained calcareous rocks of the Tapley Hill Formation. There is sporadic rock outcrop and extensive surface stone.</p> <p>ADg Undulating slopes of 5-15%, up to 50 m high, with minor scalding and gully erosion.</p> <p>ADh Moderately steep slopes of 10-20% to 40 m high, with minor scalding and gully erosion.</p> <p>ADj Rolling to steep dissected slopes of 10-40%, up to 70 m high, with extensive watercourse erosion.</p> <p>Main soils: <u>shallow calcareous loam</u> - A2 (E) and <u>shallow stony loam</u> - L1 (E) with <u>shallow gradational loam</u> - C2 (L). Shallow stony soils and rocky outcrops limit the usefulness of this land, particularly the steep, irregular and eroded slopes of ADj. Even the gentler slopes of ADg are susceptible to severe erosion if bared off.</p>



DGB DGC	0.5 4.6	<p>Rises formed on mainly fine grained basement rocks.</p> <p>DGB Low rises of 2-3%, less than 10 m high.</p> <p>DGC Gentle slopes and rises up to 30 m high with gradients of 3-12% and some short steeper slopes and minor rocky outcrops.</p> <p>Main soils: <u>loam over red clay on rock</u> - D1 (E) and <u>shallow gradational loam</u> - C2 (E) with <u>shallow calcareous loam</u> - A2 (L) and <u>shallow stony loam</u> - L1 (L). The soils of these landscapes are moderately deep and reasonably fertile. Poor surface structure which increases runoff and erosion potential, and affects plant establishment, is the main limitation. Except for the minor rocky areas with shallow soils, this land is potentially productive.</p>
DXm DXn	3.6 0.6	<p>Complex of rises and low hills formed on basement rocks, and locally derived alluvium in valleys.</p> <p>DXm Undulating rises and low hills with slopes of 4-10% and relief to 50 m. Scalded land and eroded watercourses are common.</p> <p>DXn Rolling rises with slopes of 10-20% and relief to 30 m. Scalded land and eroded watercourses are common.</p> <p>Main soils: <u>loam over red clay on rock</u> - D1(E), with <u>shallow calcareous loam</u> - A2 (C) on rises, and <u>hard sandy loam over well structured OR dispersive red clay</u> - D2/D3 (E) in valleys. The soils are inherently productive but historic erosion has degraded their structure. The soils are consequently prone to excessive runoff and further erosion and emergence / root growth problems. Protection of eroded watercourses and scalded areas where still active is a key management issue.</p>
Dal	0.3	<p>Undulating rises and outwash fans with slopes of 4-10% formed on fine grained basement rock and associated alluvial sediments. There is significant scalding and gully erosion.</p> <p>Main soils: <u>loam over red clay on rock</u> - D1 (C) and <u>shallow calcareous loam</u> - A2 (L) with <u>shallow gradational loam</u> - C2 (L) on rises, and <u>loam over friable red clay</u> - D4 (C) and <u>hard loam over well structured red clay</u> - D2 (L) on fans. The soils of the rises are generally shallow, and those of the fans are deep, but susceptible to erosion due to poor surface structure. Otherwise, the land is potentially productive, limited principally by low rainfall.</p>
EHI EHm EHnn	0.7 2.1 0.3	<p>Undulating to gently rolling rises formed on tillites and siltstones, with associated outwash fans formed on locally derived alluvium. Rocky outcrop and surface stone are extensive on rises.</p> <p>EHI Moderately steep cone shaped rises up to 30 m high with slopes of 10-20% and limited areas of outwash fan.</p> <p>EHm Rises and low hills, 20-50 m high with slopes of 5-15% (some steeper knobs), and extensive areas of scalded and eroded outwash fan.</p> <p>EHnn Valley flanked by rocky rises with slopes of 10-20%, grading to gently inclined outwash fans with severely eroded watercourses.</p> <p>Main soils: <u>shallow calcareous loam</u> - A2 (E) and <u>shallow stony sandy loam to loam</u> - L1 (E) on rises, with <u>deep calcareous loam</u> - A3 (M) and <u>deep sandy loam</u> - M1 (M) on fans. The soils of the rises are shallow and stony, with limited productive potential. The gentler slopes of the fans have deeper soils, but they are highly susceptible to erosion.</p>
ETC ETD ETI ETX ETn	2.9 0.3 1.0 0.8 4.4	<p>Rises and low hills formed on interbedded sandstones and siltstones with extensive rock outcrop.</p> <p>ETC Low hills to 50 m high with slopes of 3-12%.</p> <p>ETD Slopes and rises to 20 m high with slopes of 10-20%.</p> <p>ETI Low hills to 50 m high with slopes of 10-20% and eroded watercourses.</p> <p>ETX Rises to 30 m high with slopes of 8-15% and scalding.</p> <p>ETn Low hills to 50 m high with slopes of 8-20%, eroded watercourses (severe in places), and scalding.</p> <p>Main soils: <u>sandy loam to loam over red clay on rock</u> - D1 (E), <u>shallow stony sandy loam to loam</u> - L1 (C) and <u>shallow calcareous loam</u> - A2 (C). Most of the land is too dry, stony, steep and eroded for cropping. The gentler slopes of ETC, with less outcrop and more rainfall than the other SLUs are cropped - shallow stony soils are the main limitation. The rest of the land is mostly used for grazing. Erosion control is paramount.</p>
EZC	0.4	<p>Complex of basement rock rises and outwash fans formed on locally derived alluvium. Slopes are 4-10%. There is minor watercourse erosion on the fans.</p> <p>Main soils: <u>shallow calcareous loam</u> - A2 (E) and <u>shallow stony sandy loam to loam</u> - L1 (C) on rises, and <u>deep calcareous loam</u> - A3 (C) and <u>deep sandy loam</u> - M1 (C) on fans. Shallow soils on rises have limited waterholding capacity, while the soils of the fans are deeper and potentially productive. Erosion potential is significant on the fans.</p>



JBB	1.7	Outwash fans and drainage depressions on stony medium to fine grained alluvium.
JBH	4.8	JBB Fans with slopes of 2-4% and minor watercourse erosion.
JBL	3.3	JBH Fans with slopes of 4-12% and moderate watercourse erosion.
JBo	1.3	JBL Fans with slopes of 2-3% and sporadic saline seepage. JBo Drainage depressions and lower slopes with gradients of up to 20%, and severe gully erosion and scalding. Main soils: deep <u>hard sandy loam over dispersive red clay</u> - D3 (E) and <u>hard sandy loam over well structured red clay</u> - D2 (E) with <u>deep gradational red loam</u> - C3 (C). The fans have deep fertile soils which are potentially productive provided that good structural condition is maintained. The most common soil types have hard setting surfaces which seal over, and dispersive subsoils which restrict water penetration. They are difficult to work and can have emergence and root growth problems. Conservation farming and the use of gypsum will help overcome these conditions. Surface and profile stones are common in many areas, causing excessive implement abrasion. Saline seepage affects some lower slopes. This problem can only be overcome by an overall increase in water use efficiency throughout the Land System. However, salt tolerant pasture species will provide useful feed. Water erosion is a threat in all parts of these landscapes. The drainage depressions of JBo are severely degraded and highly susceptible to further damage – conservation is the main goal of management of these areas.
KQoo	0.9	Severely eroded drainage depressions including watercourses, creek flats and lower slope basement rock rises, the latter accounting for about a quarter of the land area. Medium to coarse grained alluvium underlies the flats. Main soils: <u>deep calcareous loam</u> - A3 (E) and <u>deep sandy loam</u> - M1 (E) on flats, and <u>shallow calcareous loam</u> - A2 (L) and <u>shallow stony sandy loam to loam</u> - L1 (L) on rises. The outstanding feature and main limitation of these landscapes is the extent of watercourse erosion.
KZoo	0.6	Similar to KQoo , except that the proportion of basement rock rises is higher (40-50% of the landscape).
XAB	0.3	Drainage depression with severely eroded watercourse and up to 10% of the land affected by scalding. Main soils: <u>deep sandy loam</u> - M1 (E) and <u>deep calcareous loam</u> - A3 (E). The severity of watercourse erosion is the outstanding feature of this landscape.

PROPORTION codes assigned to soils within Soil Landscape Units (SLU):

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|----------------------------------------------|---------------------------------------|
| (D) Dominant in extent (>90% of SLU) | (C) Common in extent (20–30% of SLU) |
| (V) Very extensive in extent (60–90% of SLU) | (L) Limited in extent (10–20% of SLU) |
| (E) Extensive in extent (30–60% of SLU) | (M) Minor in extent (<10% of SLU) |



Detailed soil profile descriptions:

- A2** Shallow calcareous loam (Paralithic, Hypercalcic / Supracalcic Calcarosol)
Calcareous loam grading to a very highly calcareous clay loam or rubble layer merging with calcareous weathering rock within 100 cm, usually 50 cm.
- A3** Deep calcareous loam (Regolithic, Calcic Calcarosol)
Calcareous stony (quartzite) loam becoming more clayey, calcareous (soft or rubbly) and stony with depth. 30% of profiles are derived from siltstones and contain siltstone fragments and become silty with depth.
- C2** Shallow gradational loam (Calcic, Red Dermosol)
Loam to clay loam grading to a well structured red clay with soft carbonate at depth, over weathering siltstone within 100 cm.
- C3** Deep gradational red loam (Calcic, Red Dermosol)
Loam to clay loam grading to a friable clay with soft carbonate at depth.
- D1** Loam to sandy loam over red clay on rock (Calcic, Red Chromosol)
Hard red gravelly loamy sand to loam abruptly overlying a well structured red clayey subsoil, usually with soft carbonate at depth, over weathering rock within 100 cm.
- D2** Hard loam over well structured red clay (Calcic, Red Chromosol)
Hard loam, often stony, abruptly overlying a well structured red clay, with soft carbonate at depth over alluvium.
- D3** Hard sandy loam over dispersive red clay (Calcic, Red Sodosol)
Medium thickness hard setting sandy loam to sandy clay loam abruptly overlying a poorly structured dispersive red clay with soft carbonate accumulations at depth over alluvium.
- D4** Loam over red friable clay (Calcic, Pedaric, Red Sodosol)
Thin to medium thickness fine sandy loam to loam over a finely structured friable red clay, calcareous from about 50 cm, grading to fine or medium grained alluvium.
- L1** Shallow stony loam (Lithic, Leptic Tenosol / Rudosol)
Shallow stony loam, sometimes calcareous with depth, overlying basement rock within 50 cm.
- M1** Deep sandy loam (Basic, Regolithic, Red-Orthic Tenosol OR Eutrophic / Calcic, Red Kandosol)
Thick sandy loam, continuing below 100 cm, or gradually becoming more clayey, with minor fine carbonate at depth, and variable stone content.

Further information: [DEWNR Soil and Land Program](#)

