BRO Brownhill Land System

Steep frontal hillslopes abutting the Adelaide Plains between Woodforde and Darlington

Area: 48.6 km^2

Annual rainfall: 520 - 1,020 mm average

Geology: The land is underlain at shallow depth by siltstones, shales, calcareous siltstones, dolomites and quartzites of the Saddleworth, Balhannah, Castambul and Beaumont Formations. There is a strip in the south formed on a complex of sandstones, siltstones, tillites, shales, quartzites and calcareous shales of the Belair and Willochra Subgroups, Sturt Tillite, and Tapley Hill Formation. The rocks are variably calcified by aeolian carbonates. Where present, these occur as a veneer of soft carbonate at the soil - rock interface. In places it is weakly indurated to semi-hard lime.

Topography: The Brownhill Land System is a belt of steep hillslopes forming the backdrop escarpment to Adelaide's eastern and south eastern suburbs. The escarpment is strongly dissected by water courses, creating a complex of spurs, steep side slopes and narrow gullies, invariably less than 100 m wide. Occasionally, upper slopes and some footslopes are rounded and gently sloping, but more than 85% of the area is steeper than 30%.

Elevation: 50 m to 570 m

Relief: Typical relief is between 100 and 200 m

Soils: The soils are virtually all formed over basement rocks within a metre of the surface. Most are loamy, reflecting their fine grained parent rocks. Many lie directly on weathering rock, but red friable clayey subsoils, with or without fine carbonate are common. On the limited areas of coarser grained rocks, the soils are sandier and very stony. Red clayey subsoils are common.

Main soils

L1a Shallow stony loam over calcified basement rock
L1 Shallow stony loam (**L1b**) or sandy loam (**L1c**) over non calcified basement rock
C2 Shallow gradational red loam
D1 Shallow loam to sandy loam over red clay – highly calcareous (**D1a**), moderately calcareous (**D1b**)
K2 Acidic loam over red clay

Minor soils

A2 Shallow calcareous loam
K1 Acidic gradational brown loam

Main features: The Brownhill Land System is characterized by steep hillslopes with shallow to moderately deep red loamy soils, often with carbonate at shallow depth. These soils are fertile and well drained, and potentially highly productive. However, the steep terrain severely restricts land use options, as does the land's proximity to the city. Zoning regulations effectively preclude most agricultural activity. Most land is either in reserves, urban areas or used for light grazing.

Soil Landscape Unit summary: 8 Soil Landscape Units (SLUs) mapped in the Brownhill Land System:

SLU	% of area	Main features #
ACC ACD	7.7 28.0	Strongly dissected escarpment slopes formed on calcified siltstones, shales, calcareous siltstones and quartzites. **ACC** Dissected footslopes with rounded spurs separated by moderately steep slopes of 12-30%, up to 50 m high. There is minor rock outcrop. **ACD** Steep slopes comprising east-west trending spurs, separated by gullies with side slopes of 25% to 100%. Maximum relief is 200 metres. Water courses are very well defined in narrow valley floors. There is sporadic rock outcrop. The majority of soils are shallow to moderately deep, loamy, and underlain by a thick massive layer of soft to semi-hard carbonate. Main soils (all formed on basement rock): Shallow gradational red loam - **C2** (E) Shallow calcareous loam - **A2** (L) Shallow loam over red clay - **D1a** (L) Shallow stony loam - **L1a** (C) Although these soils are naturally fertile and well drained, they are commonly shallow and plants suffer from moisture stress in spring time. However, the steep slopes are the major limitation to land use. Most of the land is moderately timbered and lies in Hills Face Zone or urban areas.
AaC AaD AaF	6.3 27.9 1.0	Steep to very steep hills formed on siltstones, fine sandstones and minor quartzites and dolomites of the Saddleworth, Balhannah and Castambul Formations. Slopes range from 20% to 50% generally, but are up to 150% in places. On some upper slopes and broader crests, slopes are less than 10%. Relief is typically between 100 and 200 m. Drainage depressions are narrow with well defined water courses. There is usually an abrupt break between creek flats and adjacent hillslopes. **AaC** Rounded upper slopes and crests with slopes of less than 5% on crests, grading to 20% on margins. Moderately steep upper slopes of 15-30%. There is minor surface stone. **AaD** Steep to very steep hillslopes with relief to 200 m, slopes of 30-75%, occasional rock outcrop and moderate surface stone. **AaF** Precipitous rocky hillslopes with relief to 150 m and slopes of 75-150%. There is extensive rock outcrop and surface stone. The soils are predominantly loamy with red to yellow clay subsoils forming in weathering rock. On steeper slopes, loamy surface soils are formed directly in rock. Red loamy soils overlying abundant soft to semi-hard carbonate occur on calcareous rocks. Main soils: Shallow stony loam - **L1b** (E), most abundant on steeper slopes Shallow gradational red loam - **C2** (L) Acidic loam over red clay - **K2** (E-L) most abundant on gentler slopes Acidic gradational brown loam - **K1** (L) Although most soils are shallow, there is a significant proportion that are moderately deep, well drained and inherently fertile. However, the steep terrain limits land use options. The land is used mostly for light grazing where it has been cleared. On the limited rounded crests and moderate slopes (**AaC**), there is potential for more intensive use, where water is available.
AcD	4.8	Steep to very steep hillslopes underlain by calcareous siltstones and dolomites, with beds of non calcareous fine grained rocks of the Saddleworth and Beaumont Formations. The hills are up to 100 metres high with slopes of 25% to 100%. Water courses are well defined in narrow gullies. Rock outcrop is common on steeper slopes. The soils are shallow and loamy. Main soils: Shallow gradational red loam - **C2** (C) } Shallow calcareous loam - **A2** (L) } on calcareous rocks Shallow loam over red clay - **D1a** (L) } Acidic loam over red clay - **K2** (L) } on non-calcareous rocks Shallow stony loam - **L1b** (E) } Shallow but fertile well drained soils, development of which is limited by the steep terrain.
AwE	24.2	Steep dissection and escarpment slopes formed on mixed sandstones, siltstones, tillites, shales, quartzites and calcareous shales of the Belair and Willochra Subgroups, Sturt Tillite, and Tapley Hill Formation. Relief is up to 130 metres and slopes range from 30% to 80%. Soils are variable but usually shallow over rock. Textures vary from loamy sands to clay loams, reflecting the range of grain size in the parent rocks. Carbonate occurs sporadically in subsoils. Main soils: Shallow stony loam to sandy loam - **L1a**, **L1b** and **L1c** (V) over calcified rock, non calcified siltstone and non calcified sandstone respectively Shallow loam to sandy loam over red clay - **D1a** / **D1b** (L)

		Shallow gradational red loam - **C2** (L). The soils are mostly shallow and stony. This land is all Hills Face, with no agricultural development opportunities.
KUE	0.1	Valley flats and drainage depressions with well defined water courses, formed on alluvial loams to clays, mantled by soft fine grained carbonates. Slopes in channels are less than 2%, but on margins adjacent to rising ground, slopes are up to 10%. The soils are deep with sandy loam to clay loam surfaces and variable subsoils. Main soils: Gradational red sandy loam - **C1** (E) Deep sandy loam - **M1** (C) Deep dark clay loam - **M2** (L) Loam over red clay - **D2** (L) These areas are small and mostly in urban areas. Minor occurrences in the south are potentially productive, as the soils are deep and inherently fertile. Drainage may be restrictive in places.

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

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

Detailed soil profile descriptions:

A2 Shallow calcareous loam on rock (Paralithic, Calcic Calcarosol)
Medium thickness calcareous reddish brown stony loam, overlying a brown highly calcareous stony clay loam, increasingly calcareous and paler coloured with depth. Highly calcareous weathering siltstone or slate occurs at about 50 cm.

C2 Shallow gradational red loam over calcareous rock (Eutrophic, Red Dermosol)
Medium thickness dark reddish brown loam, overlying a reddish well structured loam to clay loam, grading to soft highly calcareous siltstone, or soft carbonate with siltstone fragments throughout at about 50 cm.

D1a Shallow loam over red clay (Hypercalcic, Red Chromosol)
Medium thickness hard setting loam with a paler and stony A2 horizon, overlying a dark reddish brown well structured clay which is highly calcareous from about 50 cm. Weathering, calcified siltstone or slate occurs within 100 cm.

D1b Shallow loam over red clay (Calcic, Red Chromosol)
Medium thickness reddish sandy loam with a pink gravelly A2 horizon, overlying a red well structured clay with occasional soft calcareous segregations at depth, grading to weathering fine sandstone.

K1 Acidic gradational brown loam (Eutrophic, Brown Dermosol)
Medium thickness loamy surface soil, becoming clay loamy and gravelly with depth, overlying an orange, friable clay subsoil, grading to soft shale or siltstone.

K2 Acidic loam over red clay on rock (Eutrophic, Red Kurosol)
Medium thickness loam with a paler coloured and gravelly A2 horizon, overlying a reddish brown to red well structured clay with rock fragments, grading to weathering siltstone or slate by 100 cm.

L1a Shallow stony loam (Calcareous, Paralithic, Leptic Tenosol)
Thick stony reddish brown loam, grading to calcified weathering siltstone or fine sandstone within 50 cm.

L1b Shallow stony loam (Basic, Paralithic, Leptic Tenosol)
Thick gravelly and stony brown loam, grading to a pinkish very stony clay loam over hard siltstone or slate.

L1c Shallow stony sandy loam (Acidic, Paralithic, Bleached-Leptic Tenosol)
Thick very gravelly loamy sand to sandy loam, overlying a brown gravelly clayey sand, grading to weathering sandstone by 50 cm.

Further information: DEWNR Soil and Land Program