KLB Kalbeeba Land System

Undulating rises in the Sandy Creek - Concordia - Sheoak Log area

Area: 74.8 km^2

Annual rainfall: 435 – 570 mm average

Geology: The land is underlain by basement siltstones, slates and fine sandstones, so deeply weathered in places that there is no rock-like material within the upper 200 cm. The rocks and deep weathering materials are commonly capped by a veneer of carbonate of aeolian origin, which has been leached into the upper layers of the rock. In places it has become indurated to calcrete. There are localized deposits of outwash clays, silts and sands on lower slopes and drainage depressions. Remnant Tertiary sediments occur in the south.

Topography: The landscape is typically undulating with slopes of 2 - 12%. However, the North Para River flowing across the System from east to west, together with its short tributaries, has gouged a gully up to 50 m deep, with moderately steep to steep rocky slopes. There are minor moderately steep rocky slopes elsewhere, due to localized dissection. Outwash fans and creek flats make up about 15% of the land area, undulating to gently rolling rises about 75%, and moderately steep to steep rocky slopes about 10%.

Elevation: 50 m in the west where the North Para River flows out on to the plains, to 200 m in the south east.

Relief: Up to 50 m

Soils: Most of the soils are moderately deep to shallow over basement rock. Typically they have hard loamy surfaces overlying either weathering rock, or more commonly a red friable clay loamy to clayey subsoil. Some are calcareous throughout. On rising ground there are limited areas of deep clay loamy to clayey gradational soils on highly weathered rocks. On minor lower slopes and creek flats, deep red loam over clay soils predominate, with small areas of deep sandy loams and heavy dark soils. Sandier soils occur on Tertiary remnants.

Main soils

Soils formed on calcified basement rock

D1 Shallow loam over red clay
C2 Shallow gradational red loam
L1 Shallow stony loam

Minor soils

Soils formed on strongly calcified basement rock

A2 Shallow calcareous loam
B6 Shallow loam over red clay on calcreted rock

Deep soils formed on highly weathered rock

A6 Gradational calcareous clay loam
C3 Gradational friable red clay loam
E1 Black cracking clay

Soils formed on alluvium

C1 Gradational red sandy loam
D2 Loam over red clay
D3a Sandy loam over poorly structured red clay
M1 Deep sandy loam
Soils formed on Tertiary sediments
D3b Gravelly sandy loam over poorly structured red clay
G2 Bleached sand over sandy clay loam
H3 Moderately deep sand

Main features: The Kalbeeba Land System is characterized by undulating to gently rolling rises and low hills. The soils are moderately deep to shallow over basement rock, and usually have loamy surfaces and red more clayey subsoils. They are inherently fertile and well drained, with high production potential. They are especially suited to viticulture where water is available. Mixed with these soils are deeper clay loamy soils over highly weathered materials. These soils are fertile with very high water holding capacities, but may suffer from waterlogging and high boron levels in places. Deep loamy texture contrast soils on creek flats and outwash fans are potentially productive but often poorly structured with hard setting surfaces and dispersive clayey subsoils. The steep rocky slopes, mainly associated with the North Para River, are non arable with mainly shallow stony loams.

Soil Landscape Unit summary: 13 Soil Landscape Units (SLUs) mapped in the Kalbeeba Land System:

SLU	% of area	Main features #
AAC	2.1	Moderately steep rocky slopes underlain by siltstones, slates and fine sandstones. Slopes are 18-30% with relief of 20-50 m. There is up to 20% surface stone and rock outcrop. Soils are generally loamy and shallow over rock, but some have more clayey subsoils. Main soils: Shallow stony loam - **L1** (E) Shallow calcareous loam - **A2** (C) Shallow loam over red clay on calcrete - **B6** (L) Shallow gradational red loam - **C2** (L) Shallow loam over red clay - **D1** (M) all on weathering rock These slopes are too steep and rocky, and the soils too shallow for cropping. They are used for rough grazing.
AZm AZn	7.7 0.5	Moderately steep to steep slopes created by the down cutting of the North Para River. Slopes are variable up to 100% and relief is 20-50 m. There is up to 50% surface stone and rocky outcrop. Minor discontinuous flats adjoin the river. **AZm** Slopes are generally not eroded. **AZn** Slopes are commonly eroded. Main soils: Shallow stony loam - **L1** (V) on rocky slopes Shallow loam over red clay - **D1** (L) on slopes Deep sandy loam - **M1** (L) on flats This land is either steep and rocky, or subject to flooding, so has very limited agricultural potential, but high conservation and water resource protection value.
DCC DCD	32.0 13.3	Undulating rises and rolling low hills formed on calcified siltstones, slates and fine sandstones. Slopes range from 4% to 18%. Rock outcrop is sporadic, but there is up to 10% surface stone. **DCC** Undulating rises with relief to 40 m and slopes of 4-10%. **DCD** Moderate slopes of 10-18%, up to 40 m high. Most soils are moderately deep to shallow over calcified siltstone, or siltstone mantled by soft to semi hard carbonate. Main soils: Shallow loam over red clay - **D1** (E) } on slopes Shallow gradational red loam - **C2** (C) } Shallow loam over red clay on calcrete - **B6** (L) }

		Shallow stony loam - **L1** (L) } Deeper loam over red clay - **D2** (L-M) on lower slopes and creek flats Gradational friable red clay loam - **C3** (M) on gently inclined upper slopes The soils are fertile and well drained, although often shallow, thereby restricting water holding capacity. Surface soils set hard, creating workability and emergence problems, and increasing erosion susceptibility. However, the land is potentially productive - DCC is suitable for cropping provided that adequate erosion control measures are used, but DCD is marginal due to the potential for erosion. The land is suited to horticultural development where water is available.
DFC	27.4	Undulating rises and low hills to 50 m high formed on calcified siltstones and slates, commonly deeply weathered. Slopes are 3-10%. A wide variety of soils occurs, differences being mainly attributable to parent materials. Common profiles include loams over red brown clays, cracking clays, and calcareous and non-calcareous loams. Main soils: Shallow loam over red clay - **D1** (C) } on basement rock Shallow gradational red loam - **C2** (C) } Shallow stony loam - **L1** (L) } Gradational calcareous clay loam - **A6** (L) } on deeply weathered rocks Gradational friable red clay loam - **C3** (L) } Black cracking clay - **E1** (M) } Loam over red clay - **D2** (M) on alluvium on lower slopes The shallower soils on basement rock are similar to those of DCC. The deeper soils on highly weathered rocks or alluvium are fertile and have high water holding capacities. Although some have poor surface structure, they are potentially highly productive. Boron toxicity may be a problem on the deeper soils.
DHC	2.0	Undulating rises to 40 m high with slopes of 4-10%. There is negligible rock outcrop, but minor surface slate, sandstone, quartz and calcrete. Water courses are moderately well defined in shallow broad drainage depressions. These are occasionally salinized. Main soils: Shallow loam over red clay - **D1** (V) on slopes Loam over red clay - **D2** (C) on lower slopes and drainage depressions These soils are moderately deep to deep, inherently fertile and mostly adequately drained. Poor surface structure and associated erosion potential, together with sporadic lower slope salinity, require appropriate management, but productive potential for both field and horticultural crops is nevertheless high.
GBD	1.6	Undulating to gently rolling slopes of 6-16%, to 30 m high, formed on Tertiary clayey sands, sandy clays and sandstones. Sandy loam to sand over clay soils, with uniform to gradational sands, are characteristic. Main soils: Bleached sand over sandy clay loam - **G2** (E) Gravelly sandy loam over red clay - **D3b** (E) Moderately deep sand - **H3** (L) The soils are variable, with low natural fertility characterizing the sandy soils (G2 and H3), and poor structure / drainage typical of the loamier soils (D3b). The soils are highly erodible to both wind and water, so care is needed during crop establishment. The land is generally suited to perennial horticulture and viticulture, where water is available.
JBB JBE JBJ	4.5 3.6 0.5	Very gently sloping outwash fans and drainage depressions formed on alluvial clays derived from the erosion and deposition of basement rock materials, mantled by fine grained carbonates of aeolian origin. **JBB** Very gently inclined fans with slopes of 2-4%. **JBE** Drainage depressions with well defined and sometimes eroded water courses. **JBJ** Drainage depressions with well defined, eroded water courses. Most soils have red texture contrast profiles with a range of surface textures from sandy loam to clay loam, and clayey subsoils. Main soils: Loam over red clay - **D2** (E) Sandy loam over poorly structured red clay - **D3a** (E) Gradational red sandy loam - **C1** (L) These soils are deep and inherently fertile. Poor structure (especially in D3a soils) and associated drainage, infiltration, workability and emergence problems are the main limitations. Improved surface management and gypsum applications will help to alleviate the problem. Sheet/rill erosion

		in paddocks, and gully erosion in water courses are potential problems. Provided erosion is controlled, productive potential is high.
TBB	3.8	Gentle slopes formed on clayey sediments or deeply weathered basement rock. **TBB** Slopes of 2-4%. Main soils: gradational clay loam - **C3a** (E), brown cracking clay - **E3** (E) and hard sandy loam over friable red clay - **D2a** (L), with calcareous loam to clay loam - **A6** (M), red cracking clay - **E2** (M), black cracking clay - **E1** (M) and loam over red clay on calcrete or rubble - **B6/D1** (M). Hard sandy loam over dispersive red clay - **D3a**, brown gradational loam - **M4** and calcareous sandy loam **- A4** occur sporadically. These soils are predominantly deep, fertile and well structured. Exceptions are the D3, D2 and M4 soils which set down hard, shed water and are prone to patchy emergence. The clayey soils are difficult to manage when wet, but are inherently highly productive. High subsoil boron levels are likely in these soils, so tolerant varieties will be needed where symptoms occur.
XHR	1.0	Alluvial flats of the lower North Para River including watercourses, terraces and banks. Underlying sediments are variable silts, clays and sands of relatively recent alluvial deposition, usually mantled by fine grained soft carbonates. Because of the variability of parent sediments, there is a range of soils with sandy to loamy surfaces and reddish or dark coloured sandy clay loam to sandy clay subsoils, calcareous at depth. Near watercourses there are deep medium to coarse grained alluvial soils. Main soils: Deep sandy loam - **M1** (E) Gradational red sandy loam - **C1** (E) These flats are subject to flooding, but are potentially productive, with deep, albeit often sandy and silty soils. Watercourse protection is a significant issue.

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.

A6 Gradational calcareous clay loam (Pedal, Calcic Calcarosol)
Medium thickness reddish brown calcareous loam to clay loam, grading to a well structured reddish brown clay subsoil, becoming more clayey and calcareous with depth. Coarsely structured, brown heavy clay continues below 200 cm.

B6 Shallow loam over red clay on calcrete (Petrocalcic, Red Chromosol)
Medium thickness hard setting loam with a paler and stony A2 horizon, overlying a dark reddish brown, well structured clay with a massive calcrete pan at 55 cm, overlying a highly calcareous clay loam which grades to weathering, calcified rock at variable depths averaging 100 cm.

C1 Gradational red sandy loam (Calcic, Red Kandosol)
Thick reddish brown sandy loam to fine sandy loam with a pink A2 horizon, overlying a yellowish red weakly structured clay loam to clay, calcareous with depth.

C2 Shallow gradational red loam on rock (Hypercalcic, Red Dermosol)
Medium thickness red brown loam to clay loam, grading a red, well structured clay loam, grading to massive semi hard carbonate, over weathering siltstone below 50 cm.

C3 Gradational friable red clay loam (Calcic, Red Dermosol)
Medium thickness dark reddish brown clay loam, overlying a dark reddish brown, well structured clay subsoil which is calcareous with depth. Highly calcareous clay continues below 100 cm.

D1 Shallow loam over red clay on rock (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.

D2 Loam over red clay (Sodic, Calcic, Red Chromosol)
Thick loam with a paler coloured A2 horizon, overlying a dark reddish brown, well structured clay , which is highly calcareous (Class I carbonate) from about 60 cm. The soil grades to medium to fine grained alluvium below 100 cm.

D3a Sandy loam over poorly structured red clay (Calcic, Red Sodosol)
Thick reddish brown massive sandy loam to loam with a pink very hard A2 horizon, overlying a reddish brown clay with prismatic structure and many soft carbonate segregations (Class I carbonate) from 65 cm.

D3b Gravelly sandy loam over poorly structured red clay (Calcic, Red Sodosol)
Medium thickness hard massive sandy loam with variable quartz and ironstone gravel, sharply overlying a coarsely structured red, brown and grey mottled heavy clay, calcareous with depth, grading to Tertiary sandy clay or sandstone between 100 and 150 cm.

E1 Black cracking clay (Self-Mulching, Black Vertosol)
Medium thickness brown to black well structured light clay, grading to dark brown to black strongly structured heavy clay, calcareous with depth. Coarsely structured, brown heavy clay with soft calcareous segregations continues below 200 cm.

G2 Bleached sand over sandy clay loam (Bleached, Mesotrophic, Brown Chromosol)
Thick grey sand with a bleached A2 horizon containing ironstone and sandstone gravel, overlying a brown, yellow and red sandy clay loam to clay, grading to weakly cemented Tertiary sandstone within 100 cm.

H3 Moderately deep sand (Basic, Arenic, Bleached-Orthic Tenosol)
Thick bleached sand grading to yellowish sand, clayey sand or soft sandstone within 100 cm.

L1 Shallow stony loam (Calcareous, Paralithic, Leptic Tenosol)
Thick, stony, reddish brown loam, grading to highly calcified weathering siltstone or fine sandstone before 50 cm.

M1 Deep sandy loam (Regolithic, Brown-Orthic Tenosol)
Thick brown sandy loam to loamy sand, overlying a reddish brown clayey coarse sand to silty sand, grading to variable sandy and gritty alluvial sediments.

Further information: DEWNR Soil and Land Program