

MRB Marrabel Land System

Upper Light River valley from Waterloo to Hamilton

Area: 225.0 km²

Annual rainfall: 475 – 610 mm average

Geology: The Land System has a symmetrical geological pattern, with the various components arranged in north - south bands. The eastern and western sides of the valley are marked by ridges of Gilbert Range Quartzite. Abutting these ridges on both sides of the valley are bands of quartzitic and coarse grained rocks of the Appila Tillite Formation. The centre of the valley is underlain by siltstones and shales of the Tapley Hill Formation. These are deeply weathered to heavy clays in places, particularly the Waterloo Plains area in the south. The Tapley Hill rocks are largely covered by alluvial sediments deposited by the River Light and its tributaries. These sediments have mixed textures, reflecting the variable source rock types, but are generally silty to clayey. There are minor remnant outcrops of Tertiary sandstones and silcretes on upper slopes. The rocks and sediments are generally mantled by soft carbonates of aeolian origin.

Topography: The Upper Light River Valley is contained within two parallel north - south trending quartzite ridges, which give it a long rectangular shape. The Tapley Hill Formation (underlying the centre of the valley) contains the softer and more erodible rock types, so the river has cut a straight course down the centre of the valley. Either side of the river flats are gently inclined outwash fans and drainage depressions lying between basement rock rises. The rises are low and very gently sloping near the river, but become higher and steeper towards the edges of the valley. However, only in small areas do slopes exceed 10%. These steeper areas are rocky, have very uneven topography and usually occur on Appila Formation rocks adjacent to the quartzite ridges. In the Waterloo Plains area the river flat widens and is contained between gently undulating rises formed on clayey sediments.

Elevation: 617 m on a quartzite ridge north east of Waterloo to 340 m where the River Light flows out of the system.

Relief: Maximum relief is 70 m (quartzite ridges). Elsewhere, relief is between 10 and 30 m

Soils: Dominant soils are loamy texture contrast types with red clayey subsoils. Gradational loams and sandy loams, with cracking clays are limited in extent.

Main soils

Soils formed on rises

D7a/D1 Hard loam over (dispersive) red clay on rock

D7b Hard stony sandy loam over dispersive red clay on rock

E3/E2 Brown / red cracking clay

Soils formed lower slopes and flats

D3 Hard sandy loam over dispersive red clay

Minor soils

Soils formed lower slopes and flats

D2 Hard loam over well structured red clay

C3 Gradational loam

F2 Loam over poorly structured brown clay

M4 Deep silty loam



*Soils formed on rises***L1** Shallow stony sandy loam**K4** Sandy loam over yellow sandy clay on sandstone**Main features:**

The Marrabel Land System is a river valley bounded by steep, rocky and non-arable ridges, but between which virtually all land is arable. Undulating rises formed on basement rocks are characterized by sandy loam to clay loam texture contrast soils, less than a metre deep, with poorly structured surfaces and often dispersive subsoil clays. The sandier types have moderately low fertility and are very stony. All slopes, and particularly those with sandier soils are susceptible to water erosion. The dominant soils on fans and valley floors are deep sandy loam to loam over clay soils, with poor surface structure and prone to waterlogging. Sporadic saline seepage is a feature of these areas, and acidity is becoming an increasing problem. Provided that management practices focus on soil structure amelioration, fertility maintenance and erosion control, the valley has high productive potential. The Waterloo Plains area at the southern end of the Land System is a small but distinctive area of flat to gently undulating land bisected by the Light River. The soils are deep and moderately to highly fertile, with high productive potential. The main limitations are poor soil structure, waterlogging and minor salinity in the texture contrast soils on the flats, and workability problems and waterlogging on the clayey soils of the rises.

Soil Landscape Unit summary: 20 Soil Landscape Units (SLUs) mapped in the Marrabel Land System:

SLU	% of area	Main features #
ANC	0.6	Moderately steep rocky slopes formed on tillites. Slopes are 10-25%, and relief is up to 60 m. There is 10-20% rock outcrop and 20% or more surface stone. Main soils: <u>shallow stony sandy loam - L1</u> (E) with <u>hard stony sandy loam over dispersive red clay on rock - D7b</u> (E). This land is moderately steep and rocky with shallow soils. Where tree cover remains, it provides useful stock shelter.
AQB AQC AQD	1.0 5.4 2.9	Abrupt rocky ridges formed on Gilbert Range Quartzite. There is up to 50% surface quartzite and up to 20% reefs of outcropping quartzite. AQB Low ridges to 20 m high with slopes of 10-20%. AQC Moderately steep ridges 30 to 70 m high with slopes of 20-35%. AQD Steep ridge, 70 m high with slopes of 30-50%. Main soils: <u>shallow stony sandy loam - L1</u> (E) with <u>hard stony sandy loam over dispersive red clay on rock - D7b</u> (E). This land is steep, stony, exposed and with mainly shallow soils. Agricultural use is restricted to rough grazing.
DAB DAC	10.8 18.7	Undulating rises formed on siltstones and shales of the Tapley Hill Formation. DAB Very gently undulating rises up to 10 m high with slopes of 2-4%. DAC Gently undulating rises to 30 m high with slopes of 3-10%. Main soils: <u>hard loam over (dispersive) red clay on rock - D7a/D1</u> (V), with <u>brown / red cracking clay - E3/E2</u> (L) and <u>shallow stony loam - L1</u> (M). The D7a/D1 soils are often ironstone gravelly in the south. These soils are moderately fertile and usually have sufficient depth to store adequate moisture. Their main drawback is poor structure, particularly of the surface which seals over and sets hard. This leads to excessive runoff and erosion, limited opportunities for effective working, and patchy emergence and early growth in some seasons. Dispersive subsoils in the D7a soils cause perched water tables (subsurface waterlogging) in wet years. Modifications to surface management and the use of gypsum will help improve soil structure and reduce erosion. Together with the cracking clays (which are highly fertile), these soils are potentially productive.
DHC DHD	17.6 1.4	Undulating to moderately steep rises and slopes formed on mainly medium to coarse grained rocks of the Appila Tillite Formation. These landscapes include significant slope wash deposits derived from adjacent steep quartzite ridges. DHC Irregular undulating rises to 30 m high with slopes 3-12%, separated by fans with slopes up to 8%. There is 10-20% surface quartzite and minor watercourse erosion on fans.



		<p>DHD Moderately steep rises to 30 m high with slopes of 10-20%, up to 10% rock outcrop and 20% or more surface quartzite.</p> <p>Main soils: <u>hard stony sandy loam over dispersive red clay on rock</u> - D7b (E), with <u>hard loam over (dispersive) red clay on rock</u> - D7a/D1 (C) and <u>shallow stony sandy loam</u> - L1 (M), all on rises, and <u>hard sandy loam over dispersive red clay</u> - D3 (C) on outwash fans. Although the predominant soils are moderately deep and fertile, they are poorly structured, have low infiltration rates, high erodibilities, poor workability and unfavourable root growth conditions. Erosion control is critical on these soils, which are particularly susceptible to rilling. However with careful management to improve soil structure, they can be productive.</p>
ESD	0.5	<p>Moderately steep rises to 30 m high formed on quartzitic shales within the Tapley Hill Formation. Slopes are 10-20%, and there is up to 10% rock outcrop and up to 20% surface stone.</p> <p>Main soils: <u>shallow stony loam</u> - L1 (E) and <u>hard loam over (dispersive) red clay on rock</u> - D7a/D1 (E). These minor isolated rises are semi arable due to moderate slopes, shallow soils and rockiness.</p>
ETD	4.1	<p>Rocky slopes and ridges to 30 m high formed on coarse grained Appila Formation rocks or remnant Tertiary sandstones or silcretes. Slopes are 10-20%. There is 10-20% rocky outcrop and up to 50% surface quartzite and sandstone.</p> <p>Main soils: <u>shallow stony sandy loam</u> - L1 (E), with <u>hard stony sandy loam over dispersive red clay on rock</u> - D7b (C), <u>hard loam over (dispersive) red clay on rock</u> - D7a/D1 (C) and <u>sandy loam over yellow sandy clay on sandstone</u> - K4 (L). The extent of rocky outcrop and the moderate slopes limit cropping potential of this land. Soils are generally shallow and erosion potential is high. Most of the land carries at least a scattered tree cover providing useful stock shelter.</p>
JBB JBC JBG JBJ JBK JBL JBO JBb JBe	6.0 0.4 1.9 0.5 11.7 0.3 0.6 7.7 4.6	<p>Outwash fans, drainage depressions and creek flats formed on mixed alluvium.</p> <p>JBB Very gently inclined fans with slopes of 2-3%.</p> <p>JBC Gently inclined fans with slopes of 3-6%.</p> <p>JBJ Very gently inclined fans with slopes of 2-3% and some watercourse erosion.</p> <p>JBK Drainage depressions with some water course erosion.</p> <p>JBL River and creek flats with slopes of less than 1% and 2-10% salt affected areas.</p> <p>JBO Very gently inclined fans with slopes of 2-3% and up to 2% saline seepage.</p> <p>JBb Drainage depressions with well defined watercourses, slopes of 1-2% and minor sporadic saline seepage.</p> <p>JBb Very gently inclined fans with slopes of 2-3%, up to 2% saline seepage and some watercourse erosion.</p> <p>JBe Drainage depressions with 2-10% saline seepage and minor watercourse erosion.</p> <p>Main soils: <u>hard sandy loam over dispersive red clay</u> - D3 (V) and <u>hard loam over well structured red clay</u> - D2 (C), with <u>loam over poorly structured brown clay</u> - F2 (L), <u>gradational loam</u> - C3 (M) and <u>deep silty loam</u> - M4 (M). The sandier surfaced soils tend to be concentrated on fans on the eastern side of the catchment. These soils are deep, but generally poorly structured. Hard setting surfaces cause excessive runoff on slopes, are difficult to work and cause emergence/early growth problems. Perched water tables develop on dispersive subsoils resulting in subsurface waterlogging. The loamy soils are inherently fertile, but the sandier types have moderately low fertility. Salt affected land occurs sporadically - soil salt levels should be monitored. Acidity is also an increasing problem on these soils.</p>
TAB	3.3	<p>Low rises up to 20 m high with slopes of 2-4% formed on heavy clays.</p> <p>Main soils: <u>brown / red cracking clay</u> - E3/E2 (V) with <u>hard sandy loam over dispersive red clay</u> - D3 (C). These soils are deep and fertile with high productive potential. However, they are prone to waterlogging and are very difficult to manage once wet.</p>

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:

- C3** Gradational loam (Calcic, Brown / Red Dermosol)
20 - 30 cm clay loam grading to a well structured brown to red clay, calcareous from about 60 cm over alluvium.
- D2** Hard loam over well structured red clay (Calcic, Red Chromosol)
20 - 50 cm hard loam to clay loam abruptly overlying a well structured red clay, calcareous from about 65 cm over alluvium
- D3** Hard sandy loam over dispersive red clay (Calcic, Red Sodosol)
10 - 50 cm hard fine sandy loam to clay loam abruptly overlying a red and brown mottled coarsely structured dispersive clay, calcareous from about 60 cm over alluvium.
- D7a/D1** Hard loam over (dispersive) red clay on rock (Calcic, Red Sodosol / Chromosol)
15 - 40 cm hard loam to clay loam abruptly overlying a red clay which is either coarsely structured and dispersive (Sodosol - D7a) or well structured and friable (Chromosol - D1). There are usually soft carbonate segregations from about 50 cm, grading to weathering siltstone or shale at about 80 cm.
- D7b** Hard stony sandy loam over dispersive red clay on rock (Calcic / Eutrophic, Red Sodosol)
20 - 50 cm massive quartz gravelly loamy sand to sandy clay loam with a bleached A2 layer, abruptly overlying a red or orange coarsely structured dispersive clay with soft carbonate from 65 cm in 60% of profiles. Soil is formed over weathering quartzitic shale or sandstone as shallow as 40 cm, but often deeper than 100 cm.
- E3/E2** Brown / red cracking clay (Brown / Red Vertosol)
Seasonally cracking dark strongly structured clay grading to a coarsely structured red, brown or black heavy clay, highly calcareous from about 50 cm. Weathering rock is deeper than 100 cm.
- F2** Loam over poorly structured brown clay (Calcic, Brown Sodosol)
30 - 45 cm hard sandy loam to clay loam with a bleached A2 layer, over a brown, grey and yellow mottled coarsely structured heavy clay with fine carbonate segregations from about 70 cm.
- K4** Sandy loam over yellow sandy clay on sandstone
25 - 35 cm firm sandy loam with quartz and ironstone gravel, over a yellowish red and yellow finely structured sandy clay over sandstone at about 80 cm.
- L1** Shallow stony sandy loam (Lithic, Leptic Tenosol / Rudosol)
Stony sandy loam to loam directly overlying basement rock within 50 cm.
- M4** Deep silty loam (Regolithic, Red-Orthic Tenosol)
Very thick silty loam to loam, becoming slightly more clayey with depth.

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

