

FRE Freeling Land System

Gently undulating clayey rises in the Freeling - Roseworthy area

Area: 126.8 km²

Annual rainfall: 445 – 565 mm average

Geology: The land system is underlain at depth by siltstones and shales of the Woolshed Flat and Saddleworth Formations. The basement rocks are covered by deposits of Tertiary sediments which are predominantly clayey, but with some sandier areas (mainly on the eastern side). The underlying basement rocks outcrop sporadically on some dissection slopes where the Tertiary cover has been stripped away. Dissection valleys are partially infilled with more recent clayey alluvium. All sediments are mantled by soft carbonates of aeolian origin.

Topography: The Freeling Land System is a remnant Tertiary land surface which has been dissected to form a very gently undulating plateau with drainage valleys up to 30 m deep. The elevated surface of the plateau has very low relief and slopes of less than 2%. Valley side slopes are up to 8%.

Elevation: 300 m in the east to 140 m in the west

Relief: Maximum local relief is 40 m

Soils: The characteristic soils are red gradational loams, hard loamy to sandy red texture contrast soils, and cracking clays. There are limited calcareous loams.

Main soils

On Tertiary sediments

- C3a** Gradational clay loam
- D2a** Hard sandy loam over friable red clay
- E3** Grey brown cracking clay

Minor soils

On Tertiary sediments or deeply weathered rock

- A4** Calcareous sandy loam
- A6** Calcareous loam to clay loam
- B6/D1** Loam over red clay on calcrete or rubble
- C1** Gradational red sandy loam
- D3a** Hard sandy loam over dispersive red clay
- D3/D7** Sandy loam over dispersive red clay on deeply weathered rock
- D5** Loamy sand over dispersive red clay
- E1** Black cracking clay
- E2** Red cracking clay
- F2** Hard loam over dispersive brown clay
- M4** Brown gradational loam

On alluvium

- C3b** Gradational clay loam on calcareous alluvium
- D2b** Hard loam over friable red clay on alluvium
- D3b** Hard loam over dispersive red clay on alluvium
- M2** Gradational red clay loam on alluvium



Main features:

The Freeling Land System is a fully arable undulating landscape characterized by clayey soils. These include cracking clays and clay loamy soils becoming clayey at shallow depth. They are deep and fertile, although intractable when wet and prone to waterlogging in wet seasons. There are limited areas of poorly structured texture contrast soils which are susceptible to erosion and patchy crop emergence. Limited areas of sandy texture contrast soils on the eastern side of the system have low fertility and are also prone to wind erosion. High subsoil boron levels are likely over much of the area - tolerant varieties are necessary in such situations. Overall, the fertility and depth of the predominant soils make the land system highly productive.

Soil Landscape Unit summary: 7 Soil Landscape Units (SLUs) mapped in the Freeling Land System:

SLU	% of area	Main features #
HJB	8.3	Rises to 20 m high with slopes of 2-4% formed on Tertiary sands to sandy clays or deeply weathered basement rock. Main soils: <u>sandy loam over dispersive red clay on deeply weathered rock</u> - D3/D7 (E), <u>loamy sand over dispersive red clay</u> - D5 (C) and <u>gradational clay loam</u> - C3a (L), with <u>brown gradational loam</u> - M4 (L) and <u>hard sandy loam over friable red clay</u> - D2a (M). These soils are generally poorly structured and have moderate to low fertility, due to their low clay content. The predominantly sandy loam surfaces are prone to compaction, hard setting and sealing with associated runoff and water erosion potential. The sandier soils are also prone to wind erosion.
HXB	12.7	Gently undulating rises formed on heavy clays. Slopes are 1-3% and relief is up to 25 metres. Watercourses are very weakly defined. There is no rock outcrop. Soils with loamy to clay loamy surfaces are most common. Subsoils vary from well structured red brown clays to dispersive brown clays. Main soils: <u>hard sandy loam over friable red clay</u> - D2a (E), with <u>hard loam over dispersive brown clay</u> - F2 (C), <u>hard sandy loam over dispersive red clay</u> - D3a (C), <u>brown cracking clay</u> - E3 (L) and <u>gradational red sandy loam</u> - C1 (M). <u>Calcareous sandy loam</u> - A4 occurs on minor stony rises. The soils are deep and inherently fertile. The F2/D3 soils are poorly structured and dispersive, and susceptible to poor infiltration, water erosion, surface sealing and emergence problems. The D2, C1 and A4 soils are well drained. The cracking clays, although fertile, become intractable once wet. Slight limitations are due to salinity, boron toxicity and waterlogging throughout.
JAE	8.8	Drainage depressions with slopes of less than 2%. Water courses are well defined and generally stable. Main soils: <u>gradational red clay loam</u> - M2 (E) and <u>hard loam over friable red clay</u> - D2b (E), with <u>gradational clay loam on calcareous alluvium</u> - C3b (L), <u>hard loam over dispersive red clay</u> - D3b (L), <u>brown cracking clay</u> - E3 (M) and <u>red cracking clay</u> - E2 (M). These soils are deep and fertile, but being clayey and in low lying situations are prone to waterlogging. The D3 soils have the additional disadvantage of poor surface and subsoil structure. Salinity is not apparent, but monitoring soil salt levels is advisable. Boron toxicity is likely.
TAB TAZ	2.0 32.3	Gently undulating land formed on clayey sediments or deeply weathered basement rock. TAB Gentle slopes of 2-5%. TAZ Very gently undulating elevated plain with slopes of 0-2%. Main soils: <u>gradational clay loam</u> - C3a (E), <u>black cracking clay</u> - E1 (E), <u>red cracking clay</u> - E2 (L) and <u>calcareous loam to clay loam</u> - A6 (L), with <u>brown cracking clay</u> - E3 (M) and <u>hard loam over dispersive brown clay</u> - F2 (M). These soils are deep, very fertile and generally well structured. They tend to become very sticky and intractable when wet, so prolonged rain early in the season is a problem. These soils commonly have high subsoil boron levels, necessitating the use of tolerant varieties. Production potential on this land is very high.



TBB	31.5	Gentle slopes formed on clayey sediments or deeply weathered basement rock. TBB Slopes of 2-4%. TBC Slopes of 4-8%. Main soils: <u>gradational clay loam - C3a</u> (E), <u>brown cracking clay - E3</u> (E) and <u>hard sandy loam over friable red clay - D2a</u> (L), with <u>calcareous loam to clay loam - A6</u> (M), <u>red cracking clay - E2</u> (M), <u>black cracking clay - E1</u> (M) and <u>loam over red clay on calcrete or rubble - B6/D1</u> (M). <u>Hard sandy loam over dispersive red clay - D3a</u> , <u>brown gradational loam - M4</u> and <u>calcareous sandy loam - A4</u> 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.
TBC	4.4	

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

(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:

- A4** Calcareous sandy loam (Hypercalcic Calcarosol)
10 - 40 cm calcareous sandy loam grading to a highly calcareous brown sandy clay loam with abundant soft carbonate from about 60 cm, over sandy Tertiary sediments.
- A6** Calcareous loam to clay loam (Pedal, Hypercalcic Calcarosol)
20 - 35 cm calcareous loam to clay loam grading to a very highly calcareous well structured medium clay with abundant soft carbonate from about 50 cm, over Tertiary clay.
- B6/D1** Loam over red clay on calcrete or rubble (Petrocalcic / Lithocalcic, Red Chromosol)
Medium thickness red brown loam over a red well structured clay loam to clay on a rubbly to massive variably cemented calcrete pan, with highly calcareous weathering siltstone from 50 cm. Occurs on rises.
- C1** Gradational red sandy loam (Hypercalcic, Red Kandosol)
25 cm firm sandy loam to loam grading to a weakly structured clay loam to light clay, highly calcareous from about 55 cm.
- C3a** Gradational clay loam (Vertic, Calcic / Hypercalcic, Red Dermosol)
Medium thickness clay loam to light clay grading to a well structured red clay, with variable amounts of fine carbonate from about 60 cm, over Tertiary clay. These soils commonly crack at the surface.
- C3b** Gradational clay loam on calcareous alluvium (Calcic / Hypercalcic, Red Dermosol)
Medium thickness loam to clay loam grading to a well structured red clay, with variable amounts of fine carbonate from about 60 cm, over alluvium.
- D2a** Hard sandy loam over red friable clay (Hypercalcic, Red Chromosol)
15 - 30 cm hard loam abruptly overlying a well structured red clay, calcareous from about 40 cm grading to clayey Tertiary sediment.
- D2b** Hard loam over friable red clay on alluvium (Hypercalcic, Red Chromosol)
15 - 30 cm hard loam abruptly overlying a well structured red clay, calcareous from about 40 cm grading to clayey Tertiary sediment or medium to fine grained alluvium.
- D3a** Hard sandy loam over dispersive red clay (Hypercalcic, Red Sodosol)
20 - 40 cm hard sandy loam to sandy clay loam abruptly overlying a coarsely structured dispersive red clay, calcareous from about 55 cm, grading to Tertiary clay.



- D3b** Hard loam over dispersive red clay on alluvium (Hypercalcic, Red Sodosol)
Medium to thick hard loam to clay loam abruptly overlying a coarsely structured dispersive red clay, calcareous from about 55 cm, grading to alluvium.
- D3/D7** Sandy loam over dispersive red clay on deeply weathered rock (Hypercalcic, Red Sodosol)
Medium thickness hard sandy loam abruptly overlying a coarsely structured dispersive red clay, calcareous from about 30 cm, grading to deeply weathered rock.
- D5** Loamy sand over dispersive red clay (Hypercalcic, Red Sodosol)
25 cm loamy sand to light sandy clay loam abruptly overlying a coarsely structured dispersive red sandy clay, calcareous from about 50 cm, grading to sandy Tertiary sediments.
- E1** Black cracking clay (Self-mulching / Epipedal, Black Vertosol)
Strongly structured seasonally cracking dark calcareous clay grading to a coarsely structured dark heavy clay with soft carbonate segregations at depths ranging from 15 to 75 cm. Strong slickensides with depth.
- E2** Red cracking clay (Self-mulching / Epipedal, Red Vertosol)
Strongly structured seasonally cracking dark calcareous clay grading to a coarsely structured red heavy clay with soft carbonate segregations at depths ranging from 15 to 75 cm. Strong slickensides with depth.
- E3** Grey brown cracking clay (Massive / Epipedal Brown Vertosol)
Coarsely structured seasonally cracking dark grey calcareous clay grading to a coarsely structured greyish brown heavy clay with soft carbonate segregations at depths ranging from 15 to 75 cm. Strong slickensides with depth.
- F2** Hard loam over dispersive brown clay (Calcic, Brown Sodosol)
30 - 60 cm hard brown fine sandy loam to clay loam with a sporadically bleached A2 layer, over a dark brown dispersive clay, calcareous from 75 cm, grading to heavy clay.
- M2** Gradational red clay loam on alluvium (Calcic, Red Dermosol)
Well structured red brown loam to clay loam overlying a deep, well structured red brown clay, weakly calcareous with depth, grading to alluvium
- M4** Brown gradational loam (Calcic, Brown Kandosol)
40 - 60 cm massive loam grading to a weakly structured dark brown clay loam, calcareous from about 85 cm, over Tertiary sediments.

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

