

# WBT Ward Belt Land System

Gently undulating sandhill – swale country north west of Gawler

**Area:** 56.0 km<sup>2</sup>

**Annual rainfall:** 400 – 475 mm average

**Geology:** The land system is underlain by Tertiary age Hindmarsh Clay. This formation is characterized by heavy clays with strongly developed slickensides. They are usually red, but tend to greenish colours in poorly drained situations. In lower lying parts of the landscape they are within a meter of the surface. Overlying the Hindmarsh Clay is a thin (generally less than two metres thick) layer of highly calcareous sandy loam to sandy clay loam sediment of the Woorinen Formation. This occurs either as finely divided material, or as nodules, occasionally cemented into sheets (calcrete). This material is in turn overlain by more recent Molineaux Sand, a deposit formed by the localized reworking of sandier soils and sediments. It typically occurs on parallel sandhills.

**Topography:** The land system is a gently undulating dunefield, superimposed on a very gently undulating plain. The dunes are linear and parallel with an ESE-WNW orientation. They are low to moderate with a maximum height of 10 m. The land between the dunes is very gently undulating comprising a complex of flats and very low rises less than 10 m high and with slopes of less than 4%.

**Elevation:** 25 - 70 m

**Relief:** 5-15 m

**Soils:** Most soils formed on the Tertiary clays are loamy with more clayey subsoils. On rising ground where Woorinen Formation carbonates generally underlie the land, soils are typically calcareous sandy loams and sandy texture contrast soils. Deep sands, or soils with thick sandy surfaces are confined to the sandhills.

**Main soils:**

- A4a** Rubbly calcareous sandy loam - rises
- G1** Sand over red sandy clay loam - rises
- G4** Sand over dispersive clay - rises
- A6** Calcareous gradational loam - flats
- A4b** Calcareous sandy loam - rises

**Minor soils:**

*Soils on loamy and clayey flats*

- A5** Calcareous sandy loam over clay
- D2** Hard loam over red clay
- D3** Hard loam over dispersive red clay
- E3** Brown cracking clay
- F2** Loam over dispersive brown clay

*Soils on sandy loam and sandy rises*

- B2** Shallow calcareous sandy loam on calcrete
- B3** Gradational sandy loam on calcrete
- C1** Gradational sandy loam

*Soils on sandhills*

- G2** Bleached sand over sandy clay loam
- G3** Thick sand over clay
- H2** Deep red sand
- H3** Deep bleached sand



**Main features:** The Ward Belt Land System is an undulating dunefield comprising three components. The sandhills are low to moderate with sandy infertile soils prone to wind erosion and sporadic water repellence. Low rises between the sandhills have either calcareous sandy loams or sandy soils with more clayey subsoils. The calcareous soils are more fertile although prone to nutrient fixation and variable waterholding capacity. The sandy soils are usually deep, but prone to wind erosion. Some have restrictive clayey subsoils. The lower lying land is underlain within a metre by Hindmarsh Clay which often causes subsoil accumulations of salt, sodium and boron. The soils, mainly calcareous loams and sandy loam over clay profiles, are deep and inherently fertile, but with root growth restrictions due to these accumulations, and in some cases by dispersive subsoils at shallow depth. The land is generally unsuitable for irrigation.

**Soil Landscape Unit summary:** 8 Soil Landscape Units (SLUs) mapped in the Ward Belt Land System

SLU	% of area	Main features #
GSA	17.9	<p>Flats and gently undulating low rises less than 10 m high and with slopes of less than 4%, underlain at depth by Tertiary clays which are mantled by highly calcareous Woorinen Formation deposits, in turn partly covered by siliceous sand. This land occurs in association with bleached siliceous sandhills.</p> <p>Main soils: <u>Sand over dispersive clay</u> - <b>G4</b> (E)  <u>Sand over red sandy clay loam</u> - <b>G1</b> (C)  <u>Rubbly calcareous sandy loam</u> - <b>A4a</b> (C)            Calcareous sandy loam over clay - <b>A5</b> (M)            Hard loam over dispersive red clay - <b>D3</b> (M)</p> <p>These soils are generally low in fertility and prone to wind erosion. Irrigation potential is low due to dispersive clay at shallow depth in the predominant soil.</p>
IVA	21.7	<p>Very gently undulating flats underlain by Tertiary clays, or occasionally sandier sediments, usually within a metre of the surface. About half of the soils are calcareous.</p> <p>Main soils: <u>Calcareous gradational loam</u> - <b>A6</b> (E)  <u>Hard loam over red clay</u> - <b>D2</b> (C)  <u>Hard loam over dispersive red clay</u> - <b>D3</b> (C)  <u>Calcareous sandy loam over clay</u> - <b>A5</b> (L)  <u>Loam over dispersive brown clay</u> - <b>F2</b> (M)  <u>Brown cracking clay</u> - <b>E3</b> (M)</p> <p>These soils are mostly deep and inherently fertile (although high pH and surface carbonate reduce nutrient availability). Waterholding capacity is high. Elevated subsoil boron and salt levels restrict rooting depth. Irrigation potential is low due to impeding clay layers within a metre of the surface, or shallower in the case of soils with dispersive subsoils at shallow depth (D3).</p>
O-C O-D OIF	1.9 5.2 4.3	<p>Gently undulating dunefields formed by the reworking of sandy soils and sediments into parallel sandhills with an ESE-WNW orientation. Bleached siliceous sands (as opposed to red alkaline sands) are predominant on these sandhills.</p> <p><b>O-C</b> Moderate longitudinal sandhills to 10 m high  <b>O-D</b> Low longitudinal sandhills to 5 m high.  <b>OIF</b> Complex of moderate sandhills and gently undulating swales and rises.</p> <p>Main soils: <u>Bleached sand over sandy clay loam</u> - <b>G2</b> (E) }  <u>Thick sand over clay</u> - <b>G3</b> (E) } on sandhills  <u>Deep bleached sand</u> - <b>H3</b> (C) }</p> <p>Soils as for <b>GSA</b> on the rises and in the swales of <b>OIF</b></p> <p>These soils are infertile and prone to wind erosion and water repellence. Some of the larger sandhills have not been cleared. Although the soils are mostly well drained, irrigation potential is low due to the uneven nature of the landscape.</p>
SDA	38.0	<p>Gently undulating rises less than 10 m high and with slopes of less than 4%, underlain at depth by Tertiary clays which are mantled by highly calcareous Woorinen Formation deposits. This land is similar to <b>GSA</b>, but with a greater proportion of calcareous soils.</p> <p>Main soils: <u>Rubbly calcareous sandy loam</u> - <b>A4a</b> (C)  <u>Calcareous sandy loam</u> - <b>A4b</b> (C)</p>



		<p><u>Sand over red sandy clay loam</u> - <b>G1</b> (C)  <u>Shallow calcareous sandy loam on calcrete</u> - <b>B2</b> (L)  <u>Gradational sandy loam</u> - <b>C1</b> (L)  <u>Gradational sandy loam on calcrete</u> - <b>B3</b> (M)</p> <p>These soils are mostly deep and moderately fertile, although high pH and carbonate contents reduce nutrient availability. The shallower soils (on sheet calcrete or heavy rubble) have limited moisture holding capacities. Irrigation potential is moderately low due to the presence of impermeable clay within 150 cm of the surface.</p>
U-C U-D	3.0 8.0	<p>Parallel sandhills with an ESE-WNW orientation formed by the reworking of sandy soils and sediments.</p> <p>These sandhills differ from those of <b>O-C</b> and <b>O-D</b> in being mainly red and alkaline.</p> <p><b>U-C</b> Moderate linear sandhills.  <b>U-D</b> Low linear sandhills.</p> <p>Main soils: <u>Deep red sand</u> - <b>H2</b> (E)  <u>Sand over red sandy clay loam</u> - <b>G1</b> (C)  <u>Gradational sandy loam</u> - <b>C1</b> (L) } on lower slopes and where sand has been eroded  <u>Calcareous sandy loam</u> - <b>A4a</b> (L) }</p> <p>These soils are infertile and prone to wind erosion. The larger sandhills are not suitable for regular cropping, and some have been left uncleared. They are more suitable for irrigation than the bleached sandhills, but given the generally low potential of the flats and swales with which they are associated, overall irrigation prospects are low.</p>

# 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:

#### Soils on loamy and clayey flats

- A6** Calcareous gradational loam (Pedal, Hypercalcic Calcarosol)  
10 - 25 cm calcareous sandy loam to clay loam grading to a highly calcareous well structured brown clay over soft Class I carbonate from 30 cm with heavy clay from 90 cm.
- A5** Calcareous sandy loam over clay (Hypercalcic / Supracalcic Calcarosol)  
10 - 20 cm calcareous sandy loam to loam becoming more calcareous and containing variable rubble with depth, overlying heavy clay at 90 cm.
- D2** Hard loam over red clay (Hypercalcic, Red Chromosol)  
15 - 25 cm hard loam to clay loam over a well structured red clay with abundant soft or occasionally rubbly carbonate from about 40 cm, grading to Tertiary clay from about 80 cm.
- D3** Hard loam over dispersive red clay (Calcic, Red Sodosol)  
10 - 25 cm hard sandy loam to sandy clay loam abruptly overlying a coarsely structured dispersive red clay, calcareous from 40 cm, grading to heavy clay from 70 cm.
- E3** Brown cracking clay (Brown Vertosol)  
10 cm dark strongly structured seasonally cracking medium clay, usually calcareous, grading to a brown coarsely structured heavy clay with soft carbonate from 25 cm. Strongly slickensided red and grey mottled heavy clay from about 60 cm.
- F2** Loam over dispersive brown clay (Calcic, Brown Sodosol)  
20 - 35 cm hard fine sandy loam to clay loam with a pale brown A2 layer, over a dark brown coarsely structured dispersive clay, calcareous from about 40 cm, grading to heavy clay from about 60 cm.



*Soils on sandy loam and sandy rises*

- A4a** Rubbly calcareous sandy loam (Lithocalcic / Supracalcic Calcarosol)  
10-30 cm calcareous sandy loam grading to a highly calcareous brown sandy clay loam over rubbly Class III C/B carbonate from 30 cm, becoming less rubbly at depth.
- A4b** Calcareous sandy loam (Hypercalcic Calcarosol)  
10-30 cm calcareous sandy loam grading to a highly calcareous brown sandy clay loam with abundant fine carbonate from about 30 cm, continuing below 100 cm.
- B2** Shallow calcareous sandy loam on calcrete (Petrocalcic Calcarosol)  
15-30 cm calcareous sandy loam to loam with variable rubble, becoming more rubbly with depth over rubbly or sheet calcrete within 45 cm.
- B3** Gradational sandy loam on calcrete (Petrocalcic, Red Kandosol)  
10-20 cm sandy loam to loam grading to a thin friable red sandy clay loam over sheet or rubbly calcrete between 30 and 45 cm.
- C1** Gradational sandy loam (Hypercalcic / Lithocalcic, Red Kandosol)  
15-30 cm sandy loam grading to a red sandy clay loam over Class IIIA / IIIC carbonate from about 40 cm, continuing below 100 cm with decreasing rubble.
- G1** Sand over red sandy clay loam (Hypercalcic / Supracalcic, Red Chromosol)  
15-20 cm soft loamy sand over a weakly structured red sandy clay loam to sandy light clay with fine or rubbly carbonate from about 35 cm, continuing below 100 cm.
- G4** Sand over dispersive clay (Hypercalcic, Red / Brown Sodosol)  
20-30 cm soft sand with a bleached A2 layer over a coarsely structured dispersive red or brown mottled sandy clay to clay with fine carbonate from about 40 cm, and Tertiary clay as shallow as 80 cm.

*Soils on sandhills*

- G2** Bleached sand over sandy clay loam (Calcic / Petrocalcic, Red Kandosol)  
More than 60 cm loose bleached sand over a yellowish red light sandy clay loam with variable fine, rubbly or hard carbonate at depths as shallow as 80 cm.
- G3** Thick sand over clay (Hypercalcic, Red Chromosol)  
More than 50 cm loose bleached sand over a red to brown sandy clay to clay with fine carbonate from about 80 cm.
- H2** Deep red sand (Calcareous, Arenic, Red-Orthic Tenosol)  
Up to 80 cm loose loamy sand to sand grading to a red sandy loam over fine to rubbly carbonate from about 100 cm.
- H3** Deep bleached sand (Calcareous, Arenic, Bleached-Orthic Tenosol)  
40-50 cm loose sand with a pronounced bleached A2 layer over a yellowish red clayey sand, calcareous with depth, continuing below 100 cm.

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

