

# MNS Monarto South Land System

Gentle slopes in the Monarto South area

**Area:** 39.9 km<sup>2</sup>

**Annual rainfall:** 370 – 460 mm average

**Geology:** The land is underlain at depth by schists and metasandstones of the Kanmantoo Group. These are for the most part deeply buried, but are within a metre of the present land surface in places. Most of the rocks are covered by Tertiary sediments. These include clayey sands, sandy clays and heavy clays (Blanchetown Clay). The latter outcrops at the surface in the Para Gum depression. The Tertiary sediments are capped by windblown calcareous sediments which have hardened to calcrete in places. The sandier sediments have given rise to sandy surface soils which have been reworked by wind into dune forms. This windblown material is equivalent to Molineaux Sand.

**Topography:** The landscape is a very gently undulating plain with an overall fall of 1 - 3% from west to east, as it follows the macro topography of the underlying Monarto Fault Block. The gentle slopes end in several internally draining depressions in the southeast. The largest of these is at Para Gum. The main features of the topography are numerous linear sandhills with a pronounced east - west orientation, and sporadic calcreted rises. Gilgai microrelief is a feature of the depressions.

**Elevation:** 90 m in the Para Gum Depression to 180 m in the north west

**Relief:** Less than 10 m

**Soils:** There is a wide variety of soils reflecting the range of underlying rocks and sediments listed above. Texture contrast soils with both sandy and loamy surfaces are common, as are shallow and deep calcareous soils. Cracking clays and deep sands, at opposite ends of the soil variability spectrum also occur.

## Main soils

### *Soils on loamy flats*

**D3** Sandy loam over red clay

**A6a** Red calcareous sandy loam

### *Soils on sandy flats and rises*

**G4** Sand over sandy clay

## Minor soils

### *Soils on clay flats*

**F2** Sandy clay loam over heavy clay

**E3** Brown cracking clay

**C3** Gradational clay loam

**C4** Hard gradational loam

### *Soils on loamy flats*

**A6b** Grey calcareous loam

### *Soils on sandhills*

**H3** Deep siliceous sand



*Soils on sandy flats and rises***G2** Thick sand over compact subsoil*Soils on calcrete rises***B2/B3** Shallow loamy sand on calcrete*Soils on basement rock rises***D1** Hard sandy loam over red clay**A2** Calcareous silty loam**Main features:**

The Monarto South Land System is a broad very gently undulating plain. Its geological complexity is reflected in a wide range of soils. These include sands and sandy loams over sodic clays, sandy loams over friable clays, calcareous loams, cracking clays and deep sands. The sandy surface soils are generally infertile and prone to water repellence and wind erosion. The heavier soils are potentially productive, but are commonly affected by subsoil boron toxicity and salinity. Workability and seedling emergence are impaired on some of these soils due to poor surface structure. Waterlogging is a problem on soils with sodic subsoils, and cracking clays. This is particularly so in the depressions.

**Soil Landscape Unit summary:** 16 Soil Landscape Units (SLUs) mapped in the Monarto South Land System:

SLU	% of area	Main features #
DfA DfB	0.8 0.4	Flats and gentle slopes underlain within a metre of the surface by schists and metasandstones of the Kanmantoo Group. There is occasional surface stone and no outcrop. <b>DfA</b> Flats with slopes of less than 2%. <b>DfB</b> Gentle slopes of 2-3%. Main soils: <u>hard sandy loam over red clay</u> - <b>D1</b> (E) and <u>calcareous silty loam</u> - <b>A2</b> (E). These soils are moderately shallow to moderately deep, and may suffer moisture stress in dry finishes. The sandy loam over clay soils are naturally fertile but tend to have hard setting surfaces, while the calcareous soils are easier to work but are more alkaline, less inherently fertile and often marginally saline.
GGB	9.4	Low elongate rises with slopes of less than 3%. Underlying materials are sandy Tertiary sediments. Main soils: <u>sand over sandy clay</u> - <b>G4</b> (V) and <u>thick sand over compact subsoil</u> - <b>G2</b> (L) with <u>deep siliceous sand</u> - <b>H3</b> (L) on higher crests. These soils are moderately deep to deep but invariably sandy, with low natural fertility and susceptibility to water repellence and wind erosion. The sand over sandy clay soils are prone to waterlogging where the depth to clay is less than 30 cm. Depending on the depth to the restrictive subsoil layer, they have moderate to high potential for irrigated horticulture.
GOA GOK	16.6 1.5	Very gently inclined flats underlain by Tertiary sandy clay and clays. <b>GOA</b> Very gently inclined flats <b>GOK</b> Imperfectly drained depressions. Main soils: <u>sand over sandy clay</u> - <b>G4</b> (V) with <u>sandy clay loam over heavy clay</u> - <b>F2</b> (L) and <u>red calcareous sandy loam</u> - <b>A6a</b> (L). These soils are deep but root zones depths are restricted by dispersive subsoil clays in the predominant soils. These also cause perched water tables, so waterlogging is a problem in wet winters, particularly in GOK. Poor deep drainage has prevented the leaching of salts and boron, so elevated levels of these also limit root depth. These potential problems are also more likely in GOK. The sandy soils are infertile and prone to erosion but the more clayey soils are more fertile and stable.
HEA HEB HEE	26.2 2.7 1.0	Flats, gentle slopes and drainage depressions underlain by Tertiary sandy clays and clays. <b>HEA</b> Flats with slopes of less than 2%. <b>HEB</b> Gentle slopes of 2-3%. <b>HEE</b> Drainage depressions with slopes of about 2%. Main soils: <u>sandy loam over red clay</u> - <b>D3</b> (E) with <u>red calcareous sandy loam</u> - <b>A6a</b> (L), <u>grey calcareous loam</u> - <b>A6b</b> (L), <u>gradational clay loam</u> - <b>C3</b> (L) and <u>hard gradational clay loam</u> - <b>C4</b> (L). These soils are deep, moderately fertile, erosion resistant and generally well drained. They are productive cropping soils. Possible limitations include subsoil boron and salinity.
IBA	7.0	Flats formed on Tertiary clays.



		Main soils: <u>grey calcareous loam</u> - <b>A6b</b> (E) and <u>red calcareous sandy loam</u> - <b>A6a</b> (E). These soils are deep, but with very highly calcareous subsoils which restrict root growth due to one or more of high pH, sodicity, boron or salinity. However, surfaces are loamy and fertile, and physical fertility is favourable. They are generally highly productive cropping soils.
IVA	12.0	Flats formed on Tertiary clays. Main soils: <u>red calcareous sandy loam</u> - <b>A6a</b> (E) and <u>sandy loam over red clay</u> - <b>D3</b> (E) with <u>gradational clay loam</u> - <b>C3</b> (C). These soils are deep and inherently fertile, although very highly calcareous subsoils restrict root growth, due to one or more of high pH, sodicity, boron or salinity. Surfaces are loamy and fertile, and physical fertility is favourable. They are generally highly productive cropping soils.
O-B O-C O-D	6.5 2.5 1.5	Linear east - west sandhills formed on sands which have been reworked from surrounding sand over clay soils. <b>O-B</b> Moderate sandhills <b>O-C</b> Low to moderate sandhills. <b>O-D</b> Low sandhills. Main soils: <u>deep siliceous sand</u> - <b>H3</b> (V) and <u>thick sand over compact subsoil</u> - <b>G2</b> (C), with <u>sand over sandy clay</u> - <b>G4</b> (L) on lower slopes. These soils are deep but very infertile, and prone to water repellence and wind erosion. They have little agricultural value. Most of the larger dunes have not been cleared. They are not suitable for cropping.
QVB	2.2	Low stony rises formed on calcrete. 20% or more surface stone and areas of sheet rock at surface. Main soils: <u>shallow loamy sand on calcrete</u> - <b>B2/B3</b> (D). The land is essentially non arable due to shallow stony soils and rock.
THA	7.8	Depressions underlain by Blanchetown Clay, with gilgai microrelief. Main soils: <u>sandy clay loam over heavy clay</u> - <b>F2</b> (E) and <u>brown cracking clay</u> - <b>E3</b> (E). This land is imperfectly drained. In wet winters the gilgai hollows are commonly water filled for weeks or even months. The soils are heavy and difficult to work. Salinity and boron levels are high, often within 50 cm of the surface. Although arable, productivity is limited. Horticultural potential is very low.
TPA	1.9	Flats underlain by Blanchetown Clay. Main soils: <u>gradational clay loam</u> - <b>C3</b> (E) and <u>hard gradational clay loam</u> - <b>C4</b> (C) with <u>sandy loam over red clay</u> - <b>D3</b> (L) and <u>red calcareous sandy loam</u> - <b>A6a</b> (L). These soils are deep and inherently highly fertile. The only potential limitations are high subsoil boron and salinity levels.

# 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 flats

- D3** Sandy loam over red clay (Hypercalcic, Red Sodosol / Chromosol)  
Medium thickness loamy sand to hard sandy clay loam abruptly overlying a red clay with coarse to fine blocky structure and abundant soft carbonate from about 30 cm, grading to sandy clay from about 100 cm.
- A6a** Red calcareous sandy loam (Hypercalcic Calcarosol)  
Medium thickness calcareous red brown loamy sand to sandy clay loam, becoming more clayey and calcareous with depth over clayey Class I carbonate at about 30 cm. This grades to sandy clay from about 100 cm.
- A6b** Grey calcareous loam (Hypervescent, Supracalcic Calcarosol)  
Medium thickness highly calcareous grey sandy loam to sandy clay loam, becoming more clayey with calcareous nodules at depth grading to Tertiary sandy clay to clay from about 100 cm.



*Soils on clay flats*

- F2** Sandy clay loam over heavy clay (Calcic, Brown Sodosol)  
Thin sandy clay loam sharply overlying a coarsely structured brown and grey mottled clay, calcareous with depth grading to Blanchetown Clay within 50 cm.
- E3** Brown cracking clay (Epipedal, Brown Vertosol)  
Thin hard coarsely structured and seasonally cracking sandy clay over a brown and grey mottled heavy clay, calcareous within 30 cm of the surface, grading to Blanchetown Clay from about 60 cm.
- C3** Gradational clay loam (Hypercalcic, Red Dermosol)  
Medium thickness clay loam to clay grading to a red well structured heavy clay with abundant soft carbonate from about 25 cm, over Tertiary sandy clay at about 100 cm.
- C4** Hard gradational clay loam (Sodic, Hypercalcic, Red / Brown / Black Dermosol)  
Medium thickness dark sandy clay loam grading to a hard red, dark brown or black clay with coarse prismatic structure, calcareous from about 30 cm, over Tertiary clay.

*Soils on sandy flats and rises*

- G4** Sand over sandy clay (Calcic, Brown Sodosol)  
Medium to thick loose grey sand with a bleached A2 layer, sharply overlying a columnar structured sandy clay loam to sandy clay, calcareous from about 60 cm and grading to Tertiary clayey sand, sandy clay or clay.
- G2** Thick sand over compact subsoil (Calcic, Yellow Kandosol)  
Very thick white sand, organically darkened at the surface, overlying a reddish yellow massive clayey sand to light sandy clay loam with variable soft to rubbly calcareous segregations (Class IV or IIIA carbonate) from 90 cm. The profile becomes sandier with depth.

*Soils on sandhills*

- H3** Deep siliceous sand (Basic, Arenic, Bleached-Orthic Tenosol)  
Very thick bleached sand, organically darkened at the surface grading to a yellow sand becoming paler with depth and extending below 100 cm

*Soils on calcrete rises*

- B2/B3** Shallow loamy sand on calcrete (Petrocalcic Calcarosol / Tenosol)  
Medium thickness loamy sand (often calcareous) with variable calcrete stone over sheet or rubbly calcrete. This softens with depth to a white rubbly clayey sand to sandy clay loam which may be metres thick, but usually overlies Blanchetown Clay.

*Soils on basement rock rises*

- D1** Hard sandy loam over red clay (Calcic, Red Chromosol)  
Medium thickness hard loamy sand to sandy loam abruptly overlying a red well structured clay with soft carbonate from about 40 cm, grading to weathering rock at about 80 cm.
- A2** Calcareous silty loam (Paralithic, Hypercalcic Calcarosol)  
Medium thickness grey brown calcareous loamy fine sand to silty loam, becoming more clayey, more calcareous and paler coloured with depth over a pale brown very highly calcareous clay loam with variable amounts of carbonate nodules. Very soft highly calcareous weathered schist occurs from about 100 cm.

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

